GOA UNIVERSITY
MINUTES OF THE MEETING

As resolved by the Academic Council in its mee ng, the on-Campus Deans mee ng held on 11th August, 2022 in the Council Hall, Goa University convened by the Vice-Chancellor to consider the minutes of the Boards of Studies rela ng to General Educa on Post Graduate Programmes o ered at the University Campus and A liated Colleges and the A lia on Inquiry Commi ee Reports.

The Registrar, Deans of the Facul es/Schools, the Chairpersons of the Board of Studies and the Chairpersons of the A lia on Inquiry Commi ee, Controller of Examina ons, Joint Registrar (Academic), and Assistant Registrar Academic PG/General a ended the mee ng.

The Chairperson (Vice-Chancellor) welcomed the members for the mee ng and therea er the agenda was taken up for discussion:

Agenda 1: To consider the minutes of the Boards of Studies rela ng to General Educa on Post Graduate Programmes o ered at the University Campus and a liated colleges.

The Chairpersons of the Board of Studies presented the minutes of their respec ve Boards. A er discussion the minutes of the following Board of Studies were approved:

1. Minutes of the Board of Studies in Mathema cs mee ng held on 22.04.2022.
2. Minutes of the Board of Studies in Commerce UG mee ng held on 19.04.2022.
3. Minutes of the Board of Studies in Microbiology mee ng held on 19.07.2022.
4. Minutes of the Board of Studies in History mee ng held on 03.08.2022.
5. Minutes of the Board of Studies in Botany mee ng held through Circula on.
6. Minutes of the Board of Studies in Portuguese mee ng held on 22.07.2022.
7. Minutes of the Board of Studies in Social Work mee ng held through Circula on.
8. Minutes of the Board of Studies in Women Studies mee ng held through Circula on.
9. Minutes of the Board of Studies in Biotechnology mee ng held on 08.08.2022.
10. Minutes of the Board of Studies in Food Technology mee ng held on 27.07.2022.
11. Minutes of the Board of Studies in Chemistry UG mee ng held on 28.06.2022.
    The minutes of the Board of Studies in Chemistry UG mee ng held on 28.06.2022 was approved with the request to submit the nal document/copy.

The minutes of the following Board of Studies were approved with the sugges ons:

1. **Minutes of the Board of Studies in Economics mee ng held on 27.07.2022.**
   The minutes of the Board of Studies in Economics mee ng held on 27.07.2022 was approved with the sugges on to change the Course Codes for the Programme.

2. **Minutes of the Board of Studies in Marathi mee ng held on 18.03.2022.**
   The minutes of the Board of Studies in Marathi mee ng held on 18.03.2022 was approved with the following sugges ons:

   1. The Chairperson, Board of Studies was requested indicate the tles of the Courses in English language.

2. Course Codes for the Programme to be checked.
3. Columns indicating 'Courses' and 'Codes' to be checked under the proposed owchart of M.A. Marathi programme for the Academic Year 2022-23 onwards.
4. It was decided to place the same before the mee ng of the School Council and therea er submit the same to the Vice-Chancellor.

5 Minutes of the Board of Studies in Konkani mee ng held on 27.07.2022.

The minutes of the Board of Studies in Konkani mee ng held on 27.07.2022 was approved with the sugges on to indicate the tles of the Courses in English language.

6 Minutes of the Board of Studies in PGDMLT mee ng held on 26.07.2022.

The minutes of the Board of Studies in PGDMLT mee ng held on 26.07.2022 was approved with the following sugges ons:

1 Prerequisites for the Programme to be clearly speci ed. **(Biochemistry/Chemistry)**
2 The Course Codes for the Programme to be checked.

7 Minutes of the Board of Studies in Skill Enhancement and Voca onal Studies mee ng held on 22.07.2022.

The minutes of the Board of Studies in Skill Enhancement and Voca onal Studies mee ng held on 22.07.2022 was approved with the following sugges ons:

1 The Course Codes for the Programmes to be checked.
2 The Chairperson, Board of Studies was requested to rework on the references suggested readings indica ng the name of the Publisher, year of Publica on etc.

8 Minutes of the Board of Studies in Electronics mee ng held on 21.07.2022.

The minutes of the Board of Studies in Electronics mee ng held on 21.07.2022 was approved with the sugges on to check the Course Codes for the Programmes.

9 Minutes of the Board of Studies in Library & Informa on Science mee ng held on 21.07.2022.

The minutes of the Board of Studies in Library & Informa on Science mee ng held on 21.07.2022 was approved with the sugges on to bring the M.L.I. Sc. programme under the proposed new Ordinance.

10 Minutes of the Board of Studies in Chemistry PG mee ng held on 09.08.2022.

The minutes of the Board of Studies in Chemistry PG mee ng held on 09.08.2022.
It was informed to explore the possibility of permit ng students to undertake online courses or Bridge courses.

11 Minutes of the Sub-Board of Studies in Commerce (PG) (PGDFT) mee ng held on 08.08.2022.

The Chairperson approved the minutes of the Sub-Board of Studies in Commerce (PG) (PGDFT) mee ng held on 08.08.2022 with the following sugges ons:

1. The name of the College men oned under syllabus on the cover page to be removed/deleted.
2. The Course Codes for the Programmes to be checked.

12. Minutes of the Board of Studies in MBA (FS) mee ng held on 08.08.2022.

The Chairperson approved the minutes of the Board of Studies in MBA (FS) mee ng held on 08.08.2022 with the following sugges ons:

1. The Chairperson, Board of Studies was requested to submit the references in a proper format under suggested readings indica ng the name of the Publisher, year of Publica on followed by "or latest Publication".
2. The word 'Optional Courses' to be replaced with 'Elective Courses'.
3. **Summer Internship.**

13. Minutes of the Board of Studies in Management mee ng held on 04.08.2022.

The Chairperson approved the minutes of the Board of Studies in Management mee ng held on 04.08.2022 with the following sugges ons:

1. The Course Codes for the Programmes to be checked.
2. The Chairperson, Board of Studies was requested to submit the references in a proper format under suggested readings indica ng the name of the Publisher, year of Publica on followed by "or latest Publication".
3. More books for the Programmes to be added.
4. Prerequisites for the course to be made as 'Graduate in any UG discipline'.

14. Minutes of the Board of Studies in MCA mee ng held on 09.08.2022.

The Chairperson approved the minutes of the Board of Studies in MCA mee ng held on 09.08.2022 with the following sugges ons:

1. Bridge Courses to be recorded and made available to the students.
2. Zero Credit Courses to be assigned Credits and added as Generic Courses to encourage students to opt for such Courses

Agenda 2: Reports of the A lia on Inquiry Commi ee

A er discussion, the following reports of the A lia on Inquiry Commi ee presented by the respec ve Chairpersons of the A lia on Inquiry Commi ee were approved.

1	**Dr. Dada Vaidya College of Educa on, Farmagudi.**
	i) Diploma in Pre-Primary Teachers Training (One year) under Community College The recommenda on of the A lia on Inquiry Commi ee for Con nua on of a lia on to Diploma in Pre-primary teachers training (one-year dura on) programme for three academic years 2022-23, 2023-24 and 2024-25 was approved.
	ii) M.Ed. (2-year dura on) The recommenda on of the A lia on Inquiry Commi ee for Con nua on of a lia on to M.Ed. programme for the academic year 2022 -23 was approved.
	iii) Ph. D. Research Centre The recommenda on of the A lia on Inquiry Commi ee for con nuation of a lia on to Ph. D. Research Centre in Educa on programme for the academic year 2022-23, 2023-24 and 2024-25 was approved with the sugges on to indicate point no. 3 under observa on as 'Audio-visual room available"
	iv) Bachelor of Educa on The recommenda on of the A lia on Inquiry Commi ee for Permanent a lia on for Bachelor of Educa on (two year dura on) programme from the academic year 2022-23

	was approved with the following sugges ons under Observa ons: a) Point No. 4 to be indicated as 'Audio-visual room available" b) Point No. 5 to be deleted/removed.
2	**Ponda Education Society's College of Educa on , Ponda-Goa** **B.Ed. Programme** The recommenda on of the A lia on Inquiry Commi ee for Con nua on of a lia on for B.Ed. Programme for the academic year 2022-23, 2023-24 and 2024-25 was approved.
3	**Agnel Ins tute of Technology & Design, Assagao- Goa.** **i) B.E. Computer Engineering program.** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on to Bachelor of Computer Engineering program for three academic years 2022-23, 2023-24 and 2024-25 was approved. **ii) B.E. Mechanical Engineering program.** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on to Bachelor of Mechanical Engineering program for three academic years 2022-23, 2023-24 and 2024-25 was approved. **iii) B.E. Electronics & Communica on Engineering program** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on to Bachelor of Electronics & Communica on Engineering program for three academic years 2022-23, 2023-24 and 2024-25 was approved.
4	**Goa College of Pharmacy, Panaji-Goa.** **i) M.Pharm. Pharmaceu cal Chemistry Program** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for First Year M.Pharm (Pharmaceu cal Chemistry) and extension of a lia on for Second Year M.Pharm (Pharmaceu cal Chemistry) for the academic year 2022-23 was approved. **ii) Ph. D. in Pharmacy Program** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for Ph. D. in Pharmacy Programme for the academic year 2022-23, 2023-24 and 2024-25 was approved.
5	**PES Rajaram & Tarabai Bandekar College of Pharmacy, Ponda-Goa.** **B.Pharm. Programme** The recommenda on of the A lia on Inquiry Commi ee for the a lia on for addi onal increase in 40 seats over and above earlier sanc oned of 60 seats from the academic year 2021-22 was approved. The a lia on has been granted for 100 seats from the year 2021-22, 2022-23, 2023-24 and 2024-25.
6	**V.M. Salgaocar College of Law, Miramar-Goa** **i) L.L.B. programme.** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for Three years Bachelor of Law (LLB Degree) Programme for the

	academic year 2022-23 was approved. **ii) L.L.M. programme** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for Master of Law (LLM) Programme for the academic year 2022-23, 2023-24 and 2024-25was approved. **Under Sugges ons of the AIC** point No. 1 A lia on from BCI to be obtained to be corrected to 'Accreditation from BCI to be obtained'.
7	**Government College of Arts, Commerce & Science, Khandola Goa.** **i) B.A. Geography (Honors)** The recommenda on of the A lia on Inquiry Commi ee for Con nua on of A lia on for B.A. Geography (Honors)Programme for the academic year 2022-23 was approved. **ii) B.A. Psychology (Honors)** The recommenda on of the A lia on Inquiry Commi ee for Con nua on of A lia on for B.A. Psychology (Honors) Programme for the academic year 2022-23 was approved. **iii) B.Sc. Geography** The recommenda on of the A lia on Inquiry Commi ee for Con nua on of A lia on for B.Sc. Geography (Honors) Programme for the academic year 2022-23 was approved. **iv) M.A. Geography** The recommenda on of the A lia on Inquiry Commi ee for Con nua on of A lia on for M.A. Geography Programme for the academic year 2022-23 and 2023-24 was approved. **v) M.Com.** The recommenda on of the A lia on Inquiry Commi ee for Con nua on of A lia on for M.Com. Programme for the academic years 2022-23, 2023-24 and 2024-25 was approved. **vi) M.Sc. Microbiology** The recommenda on of the A lia on Inquiry Commi ee for Con nua on of A lia on M.Sc. Microbiology Programme for the academic years 2022-23 and 2023-24 was approved.
8	**G.V.M.'s College of Commerce & Economics, Ponda – Goa** **i) BCA** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for B.C.A. Programme for the academic year 2022-2023 was approved. **ii) M.Com.** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for M .Com. Programme for the academic year 2022-2023 was approved.

9	**St. Joseph Vaz College, Cortalim Goa.** **i) B.Sc. Botany (Honours)** The recommenda on of the A lia on Inquiry Commi ee for con nua on of A lia on for B.Sc. Botany (Honours) Programme for the academic year 2022-23 was approved. **ii) B.Sc. Chemistry (Honours)** The recommenda on of the A lia on Inquiry Commi ee for con nua on of A lia on for B.Sc. Chemistry (Honors) Programme for the academic year 2022-23 was approved.
10	**Goa College of Hospitality and Culinary Educa on, Cidade De Goa.** **BBA (Hospitality & Culinary Educa on)** The recommenda on of the A lia on Inquiry Commi ee for temporary a lia on for the BBA in Hospitality & Culinary Educa on for the academic year 2022-23was approved. It was decided to hold a mee ng with the College Principal and the management of the College and the University to discuss the issue and report to the Academic Council**.**
11	**V. M. Salgaocar Ins tute of Interna onal Hospitality Management** **i) B.Sc. (Interna onal Hospitality Management)** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for the B.Sc. (Interna onal Hospitality Management) Programme for the academic year 2022-23 was approved. **ii) M.Sc. (Interna onal Hospitality and Tourism Management)** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for the M.Sc. (Interna onal Hospitality and Tourism Management) Programmes for the academic year 2022-23 was approved. **Under Observa ons point No. 1** to be indicated as 'The College should appoint regular/full time Principal'. The Chairperson (Vice-Chancellor) requested the Registrar to discuss the ma er pertaining to the appointment of a Principal on regular basis with the College and the Management.
12	**Narayan Zantye College of Commerce, Sarvan, Bicholim – Goa** **M.Com.** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for M .Com. Programme for the academic year 2022-2023, 2023-2024 and 2024-2025 was approved.
13	**Fr. Agnel College of Arts & Commerce, Pilar Goa.** **i) B.A. English (3 Units)** The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for F.Y.B.A.(General) in English and S.Y.B.A.(General) programme for the academic year 2022-2023 was approved.

ii) B.C.A.

The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on to the Bachelor of Computer Applica on program for the academic year 2022-2023 was approved.

iii) B.Com.(Business Management)

The recommenda on of the A lia on Inquiry Commi ee to start B.Com. (Business Management) programme for the academic year 2022-2023 was approved.

iv) B.A. Economics(Honors)

The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for the B.A. Economics (Honors) program for the academic year 2022-2023 was approved.

14 S.S. Dempo College of Commerce & Economics, Cujira, Bambolim – Goa.

i) B.B.A.

The recommenda on of the A lia on Inquiry Commi ee was approved for :

1. Ex-Post Facto approval for temporary a lia on for F.Y. B.B.A. for the academic year 2021-22.
2. Ex-Post Facto approval for extension of a lia on to S.Y. B.B.A.(3rd Division) for the academic year 2021-22.
3. Extension of temporary a lia on to S.Y.B.B.A. and T.Y.B.B.A. (3rd Division) for the academic year 2022-23.
4. Con nua on of temporary a lia on for two divisions of B.B.A. for three academic years from 2022-23 to 2024-25.

It was informed to replace the word 'ratification' with 'Ex-Post facto approval' under overall recommenda ons of the AIC.

ii) I M.Com

The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for I.M.Com. Programme for the academic year 2022-23 was approved.

iii) M.Com.

The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for M.Com. Programme for a period of ve years from the academic year 2022-23 to 2026-27 with an intake of **40** seats was approved.

iv) Master of Tourism & Travel Management

The recommenda on of the A lia on Inquiry Commi ee for con nua on and a lia on for Master of Tourism & Travel Management Programme for the academic year 2022-23 was approved.

v) Post Graduate Diploma in Management – Event Management

The recommenda on of the A lia on Inquiry Commi ee for con nua on of a lia on for Post Graduate Diploma in Management (Event Management) Programme for the academic year 2022-23 was approved.

Agenda 3:OA-35 Ordinance governing the M.A., M.Sc. M.Com., M.S.W., M.T.T.M., M.P.Ed., M.L.I.Sc., MBA, MBA (FS), MBA (Execu ve), MCA and M. Sc. (I.H.T.M.) and other such Masters Programmes of study conducted by the on-campus Schools of Goa University and its A liated Colleges based on the Choice Based Credit System of Instruc on. (E ec ve from Academic Year 2022-2023)

The proposed new Ordinance duly approved by the Dra ing and Ve ng Commi ee was presented before the members. The members suggested few correc ons/addi ons which were incorporated. The M.L.I. Sc. Programme was included in the Ordinance. A er discussion, it was decided to include the provision of Academic Audit in the Ordinance.

With the above sugges ons the proposed new Ordinance OA-35 was approved. It was informed that pending naliza on of the minutes of this mee ng, the nalized dra of OA-35 will be processed further due to urgency of the requirement.

The mee ng ended with thanks to the Chair.

Sd/-
(Prof. H. B. Menon)
Chairperson

Date: 07.08.2022

X AC- 9 (Special)
30.07.2022

GOA UNIVERSITY
Taleigao Plateau, Goa 403 206

F I N A L U P D A T E D A G E N D A

For the 9th Special Meeting of the

X ACADEMIC COUNCIL

Day & Date

30th July, 2022

Time

10.00 a.m.

Venue
Conference Hall
Administration Block

	Part G. The Remarks of the Dean of the Faculty i) The minutes are in order. ii) The minutes may be placed before the Academic Council with remarks if any. iii) May be recommended for approval of Academic Council. iv) Special remarks if any. Date: 26.07.2022 Sd/- Place: Goa University Signature of the Dean (Back to Index)
D 3.32	**Minutes of the Board of Studies in PGDCG & MLT meeting held on 26.07.2022.** **Part A**. i. Recommendations regarding courses of study in the subject or group of subjectsat the undergraduate level: NA ii. Recommendations regarding courses of study in the subject or group of subjectsat the postgraduate level: • **BOS approved and recommended to introduce two New courses ie MLC101: Clinical Genetics I and MLO201 Clinical Genetics II in the Post Graduate Diploma in Clinical Genetics and Medical Laboratory Techniques (PGDCG&MLT) from academic year 2022-2023** • **BOS approved and recommended minor changes in the existing courses of the PGDCG&MLT programme (MLC102, MLC103, MLC 104, MLO202, MLO203 and MLO204) from academic year 2022-2023** **Part B** i. Scheme of Examinations at undergraduate level: NA ii. Panel of examiners for different examinations at the undergraduate level: NA iii. Scheme of Examinations at postgraduate level: **The BOS approved and recommended the change of the format of examinations (Annexure II)** iv. Panel of examiners for different examinations at post-graduate level: NA **Part C.** i. Recommendations regarding preparation and publication of selection of reading material in the subject or group of subjects and the names of the persons recommended for appointment to make the selection: NA **Part D** i. Recommendations regarding general academic requirements in the Departmentsof University or affiliated colleges: **BOS approved the syllabus for GUART of PGDCG&MLT wef. 2022-2023** ii. Recommendations of the Academic Audit Committee and status thereof: NA **Part E.** i. Recommendations of the text books for the course of study at undergraduatelevel: NA ii. Recommendations of the text books for the course of study at post graduate level:

Included with the syllabus

Part F.

Important points for consideration/approval of Academic Council

i. The important points/recommendations of BoS that require consideration/approval of Academic Council (points to be highlighted) asmentioned below:

a) The PG Diploma would be jointly conducted by the Zoology Prog. Of School of Biological Sciences and Biotechnology (SBSB) and Goa Medical College(GMC).ThePG Diploma has been renamed as Post Graduate Diploma in Clinical Genetics and Medical Laboratory Techniques (PGDCG&MLT) wef. 2022-2023 (Annexure I refer page no. 1233) .

b) Minor changes in the existing syllabus wef 2022-2023 (Annexure I).

c) Change in scheme of examination (Annexure II 1251)

d) GUART PGDCG&MLT syllabus (Annexure III 1255) wef 2022-2023.

ii. The declaration by the chairman that the minutes were readout by the Chairmanat the meeting itself.

Date: 26.07.2022 Sd/-
Place: Goa University Signature of the Chairman

Part G. The Remarks of the Dean of the Faculty

i) The minutes are in order.
ii) The minutes may be placed before the Academic Council with remarks if any.
iii)May be recommended for approval of Academic Council.
iv)Special remarks if any.

Date: 26.07.2022 Sd/-
Place: Goa University Signature of the Dean

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D 3.33

Minutes of the Board of Studies in Marathi meeting held on 27.07.2022.

Part A.

i. Recommendations regarding courses of study in the subject or group of subjects at the undergraduate level: NA

ii. Recommendations regarding courses of study in the subject or group of subjects at the postgraduate level: **Annexure II refer page no. 1265**

1. The BoS Finalized disciplines specific core courses for the semester I and II Following are the courses:

MRDSCC 201
मराठी व्याकरणाचा पुनर्विचार
A Review of Marathi Grammar

MRDSCC 202
आधुनिक मराठी साहित्याचा इतिहास - भाग १ (1818-1947)

represent a cone, intersection of line with a cone – tangent line and condition for tangency,right circular cone – definition and equation.

13. **Cylinder**. (4 hours)
Equation of a cylinder, right circular cylinder – definition and equation.

14. **The Conicoid**. (5 hours)
General equation of second degree, shapes of some surfaces, intersection of a line with aconicoid – tangent line, tangent plane at a point and condition for tangency, plane of contact.

Reference:

i) Analytic Geometry: Two and Three Dimension, D. Chatterjee, Narosa Publishing House,2009. **(for chapters 1 to 6**)
ii) Analytic Geometry, Shanti Narayan and P. K. Mittal, S. Chand and Company Ltd, 2007.(for chapters 7 to 14)

Remark:

i) Tracing of general second degree conics/conicoids using the mathematical softwareGEOGEBRA, SAGE, MATH and PYTHON.
ii) Properties of pair of lines, circles, parabola, Ellipse etc., may be verified using mathematical softwates lime GEOGEBRA/SAGEMATH.

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D 3.5 Minutes of the Board of Studies in Environmental Science meeting held on 20.04.2022.

Annexure I

M. Sc. / M. A. in Environmental Science
School of Earth, Ocean and Atmospheric Sciences, Goa University,
Taleigao Plateau, Goa, India - 403206.

Approved in the Board of Studies on 20.04.2022
Effective from September, 2022.

Why a programme in Environmental Science?

Environmental science has conventionally studied physical, chemical and biological processes in the Earth system (Lithosphere, hydrosphere, atmosphere, biosphere and cryosphere). Increasingly, it now incorporates nature-human interactions and the social, political and cultural processes which impact the planet. The anthropogenic pressures on the ecological processes have forced disciplinary boundaries to merge and a student of environmental science must understand the complex relationships that drive nature-human interactions. Sustainability is one of the grand challenges that human survival faces on planet Earth.

Why at Goa University?

Goa is a biodiversity-rich state with Western Ghats on one side and the Arabian sea on the other. It has both terrestrial as well as marine biodiversity that sustains human livelihoods and provides numerous ecosystem services.

Goa University is uniquely positioned to offer students a stimulating programme to study the human-environment interaction. The university has all conventional programmes along with frontier areas like biotechnology, data science, hospitality, marine science, microbiology, women's studies among others.

What the course offers?

Goa University has designed an unique two-year postgraduate programme in environmental science keeping the above grand challenge in mind. The programme is hosted by the School of Earth Ocean and Atmospheric Sciences (SEOAS) in collaboration with Departments of Botany, Biotechnology, Zoology, Microbiology, Philosophy, Sociology, History, Faculty of Life Sciences, Goa Business School, Manohar Parrikar School of Law, Governance and Public Policy, and School of Chemical Sciences. It is conceived as a multidisciplinary programme which will teach students how to combine skills and knowledge from a variety of domains. It will allow students to explore courses from a large number of disciplines and skill themselves in a manner that they feel best suits them for their knowledge pursuits. The programme will provide a holistic approach to understand environmental issues and undertake environmental impact assessments with diverse perspectives, frameworks and using multiple data sources. All students will undertake fieldwork and laboratory work, to experience different habitats, climates, land formations and social structures.

Eligibility for admission to M. Sc. Environmental Science

Graduate in any science subject including Medicine and B. Tech.

Eligibility for admission to M.A. Environmental Science

Graduate in any discipline including Medicine and B. Tech.

Course structure and assessment methods

M. Sc. / M. A. in Environmental Scienceis a two year programme. The initial stages (first two semesters) of a student's study include compulsory core and optional courses, which aim to impart a general understanding of environmental science and introduce the student to some of the main principles. The following two semesters will typically allow students to choose research specific optional and generic courses, allowing for growing specialization. Towards the end of the program, one is likely to have the opportunity to carry out research on a topic of one's choice. Assessment methods include essays, written discussions, exams, problem sheets, laboratory reports, field exercises, field notebooks and seminar presentations.

Key skills

Common skills gained from an Environmental Science degree include:

- Environmental Impact Assessment
- Numeracy and data analysis
- IT skills
- Research skills
- Laboratory and fieldwork
- Team work
- Self-management, including planning and meeting deadlines
- Critical evaluation
- Effective and professional communication, both spoken and written

M. Sc. / M. A. Environmental Science structure and syllabus (Semester I & II).

Sr. no.	Course code	Course name	No. of credits
Semester I			
Core Courses			
1	ESC-22-101	Environmental Issues and Perspectives	3
2	ESC-22-102	Fundamentals of Economics	3
3	ESC-22-103	Environmental Ethics	3
4	ESC-22-104	Biodiversity Conservation	3
5	ESC-22-105	Land, Ocean and Atmospheric Interactions	3
6	ESC-22-106	Environmental Impact Assessment I	1
Optional Courses			
7	ESO-22-107	Coastal Ecology	1
8	ESO-22-108	Mangrove Ecology	1
9	ESO-22-109	Mangrove Restoration and Conservation	1
10	ESO-22-110	Environmental Externalities andPolicy	1
11	ESO-22-111	Concept of Sustainable Development	1

12	ESO-22-112	Introduction to Environmental Valuation	1
13	ESO-22-113	Basics of Geo-spatial Analysis	1
14	ESO-22-114	Spatial Economic Analysis	1
Semester II			
Core Courses			
15	ESC-22-201	Ecology and Society	3
16	ESC-22-202	Climate Change	3
17	ESC-22-203	Environmental Geology	3
18	ESC-22-204	Basic Statistics	3
19	ESC-22-205	Environmental Management	3
20	ESC-22-206	Environmental Impact Assessment II	1
Optional Courses			
21	ESO-22-207	Mineral ResourceManagement	1
22	ESO-22-208	Pollution and Environment	1
23	ESO-22-209	Natural and Manmade Hazards	1
24	ESO-22-210	Marine Habitat Conservation and Restoration	1
25	ESO-22-211	Ecological significance of symbiosis	1
26	ESO-22-212	Nitrogen and Climate Change	1
27	ESO-22-213	Environment and Literature	2
28	ESO-22-214	Gender Sensitivity and Equity	2

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Semester I

Title of the Course:Environmental Issues and Perspectives

Course Code: ESC-22-101

Number of Credits: 03

Prerequisites for the course:	There is no prerequisite for this course apart from the program requirements	
Objective:	This course is an invitation to the study of environment in its multiple nuances. While familiarising environmental issues, the course also intends to introduce students to perspectives on environment.	
Content:	**Module 1: Introduction to Environment** Concept of environment and types of environment Environmental heritage and human dimension of environmental science	06 hours

	Interdisciplinary and multidisciplinary approaches to environment and major themes – biological, ecological and social ecological orientations **Module 2: Human population and environment** Basic concepts of population dynamics, population growth, demographic transition, human population effects on Earth. Environmental systems and ecosystems: Concepts and fundamentals. **Module 3: Environmental issues and concerns** Environmental conservation, Food and agriculture Environmental health, pollution and toxicology Climate and global warming Solid and hazardous waste **Module 4: Social issues and environment** Urban growth and industrial planning Development, displacement and rehabilitation Ideologies of environmentalism Towards articulating sustainable environmental future	09 hours 15 hours 15 hours
Pedagogy:	Lectures/assignments/workshops/campus walks/documentaries and discussion/ presentations	
References/ Readings	1. Basu, M., & Xavier, S. (2016). *Fundamentals of environmental studies.* Cambridge University Press. 2. Carolyn, M. (Ed.). (1996). *Ecology*. Rawat Publications. 3. Gadgil, M., &Guha, R. (2000). *Use and abuse of nature.* Oxford University Press. 4. Gadgil, M., &Guha, R. (1995). *Ecology and equity.* Oxford University Press. 5. Guha, R. (2000). *Environmentalism: A global history.* Oxford University Press. 6. Joseph, B. (2009). *Environmental studies* (2nd ed).Tata McGraw Hill. 7. Krishna, S. (1996). *Environmental politics.* Sage Publications. 8. Rangarajan, M. (Ed.). (2007). *Environmental issues in India: A reader.* Dorling Kindersley.	
Learning Outcomes	1. Students are introduced to the multi-dimensional feature of environmental reality. 2. They are familiarized with the plural perspectives on environment both as an academic focus and lived-in reality.	

Title of the Course: Fundamentals of Economics
Course Code: ESC-22-102
Number of Credits: 03

Prerequisites for the Course:	There is no prerequisite for this course apart from the program requirements

Objective:	The aim of the course is to introduce students to the basic concepts, theories and principles that will provide the foundation for a proper understanding of how an economy works. The syllabus seeks to equip students with the basic tools necessary for an understanding and interpretation of economic issues affecting the economy.	
Content:	**Module 1: Introduction** Scope and method of economics; Building blocks of modern economy – agents, resources and classification of goods. **Module 2:Microeconomic analysis** Consumer equilibrium, producer equilibrium, market equilibrium, general equilibrium and possible disequilibrium situations. **Module 3: Macroeconomic analysis** Circular flow and national income, issues related to growth, unemployment and inflation. **Module 4:Public economics and international trade** Market failure, Taxation and Quotas, Efficiency versus Equity. Balanced budgets and Debt financing. International Trade: Comparative advantage theory, gains from trade; tariffs and protection, exchange rates.	06 hours 09 hours 15 hours 15 hours
Pedagogy:	Lectures/assignments/workshops/campus walks/documentaries and discussion/ presentations	
References/ Readings	1. Banerjee, A., &Duflo, E. (2019). *Good economics for hard times: Better answers to our biggest problems*. Penguin Books. 2. Dasgupta, P. (2010). *Economics: A very short introduction*. Sterling Pub. 3. Mankiw, G. (2020). *Principles of economics* (9th ed).Cengage Learning, Asia. 4. Samuelson, P., Nordhaus, W, Chaudhuri S., &Sen A. (2010). *Economics* (19th ed). McGraw-Hill.	
Learning Outcomes	1. The students will be able to understand the basic concepts-principles and theories of Economics. 2. This course will enable the students to understand and analyse different types of equilibrium, circular flow of the economy and factors affecting growth and employment in an economy. 3. The students will learn the basics of international trade and fundamental concepts in public economics.	

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Title of the Course:Environmental Ethics
Course Code: ESC-22-103
Number of Credits: 03

Prerequisites for the course:	There is no prerequisite for this course apart from the programme requirements	
Objectives:	1. To analyse different approaches and broad theories of environmental philosophy. 2. Understand the philosophical basis of various conservative theories.	
Contents:	**Module 1: Introduction** Introduction to environmental ethics **Module 2:Value and Nature** Value and Nature: Moral theories (Consequentialism, Virtue Ethics and Kantianism), Intrinsic value and Instrumental values, anthropocentrism. **Module 3: Ecology** Land ethics & deep ecology, Bio centrism, Eco-centrism, Speciesism, Culture and ecology.	05 hours 20 hours 20 hours
Pedagogy:	Lectures/assignments/workshops/campus walks/documentaries and discussion/ presentations	
References/ Readings	1. Jaquet, F. (2019). Is Speciesism Wrong by Definition? *Journal of Agricultural and Environmental Ethics, 32 (3)*. 2. Kopnina, H., Washington, H., Taylor, B., & Piccolo, J.J.(2018). Anthropocentrism: More than Just a Misunderstood Problem. *Journal of Agricultural and Environmental Ethics, 31.* 3. Sandler, R. (2017). *Environmental Ethics: Theory in Practice*. Oxford University Press. 4. Attfield, R. (2014). *Environmental Philosophy*. Polity Press. 5. Jamieson, D. (2008). *Ethics and Environment- An Introduction*. Cambridge University Press. 6. Grim, J.A .(Ed.). (2001.). *Indigenous Traditions and Ecology- The Inter-being of Cosmology and Community.* Harvard University Press. 7.Taylor, P. W. (1986). *Respect for Nature: A Theory of Environmental Ethics.* Princeton University Press. 8. Passmore, J. (1974). *Man's Responsibility for Nature*. Charles Scribner's son.	
Learning Outcomes	1. Students will be able to learn and evaluate different theories of environmental ethics. 2. Realize the significant role and responsibility towards the protection of the environment.	

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Title of the Course:Biodiversity Conservation
Course Code: ESC-22-104
Number of Credits: 03

Prerequisite for the course:	There is no prerequisite for this course apart from the program requirements	
Objective:	The course provides the fundamentals about ecosystems, their types, distribution, components, functioning, services and their role in biodiversity. Biotic components of ecosystems, fundamentally understood as Biodiversity, their measure, and factors that lead to enormous biodiversity, and essential components that maintain biodiversity. More importantly, knowledge on their resilience and thresholds, which are required for management and conservation of both biodiversity and ecosystems will be imparted.	
Content:	**Module 1: Introduction** Ecosystems - Development of concept and the current understanding; Ecosystem as a system. Structural and Functional components of Ecosystems. Ecological complexity. Energy flow in ecosystems; adaptive cycle view of ecosystem development and change; Ecosystem attributes and functioning. Thermodynamics and Information theory in ecosystems. Types of ecosystems, their distribution and composition. Case study - Tropical rain forests ecosystem. **Module 2: Ecosystems processes and applications** Role of species in ecosystem functioning. Applications of ecosystems knowledge. Ecosystem services. Measuring Ecosystem Health. Ecosystem Processes; Controls over Ecosystem Processes. Human-Induced Ecosystem Change: Human Impacts on Ecosystems, Resilience and Threshold Changes, Degradation in Ecosystem Services. **Module 3: Biodiversity** Definition; the past (diversity and extinction) and present; major groups of biological organisms; evolution of biodiversity and drivers of biodiversity. The role of geology and climate in their distribution. Patterns in biodiversity: Spatial and temporal patterns at genetic, species and taxonomic diversity, Approaches	09 hours 09 hours 09 hours

	to biodiversity studies. Loss of biodiversity and biodiversity targets 2020. **Module 4: Measuring Biodiversity** Species richness and Biodiversity Indices (diversity and evenness indices); Methods of Measuring Biodiversity; Alpha, Beta and Gamma-diversity; Genetic, Species and Ecosystem Diversity; Centres of plant diversity, Hotspots of Biodiversity and their distribution; Drivers of biodiversity change. **Module 5: Biodiversity of India** Bio-geographical regions of India; Forest types and major ecosystems of India. Major groups of organisms and their diversity. Endemism. Concepts of keystone, umbrella and flagship species.	09 hours 09 hours
Pedagogy:	Lectures/assignments/workshops/campus walks/documentaries and discussion/ presentations.	
References/ Readings	1. Chapman, J. L., &Reiss, M. J.(1999). *Ecology: Principles and applications*(2nded). Cambridge University Press. ISBN: 0521588022, 9780521588027. 2. Kormondy, E. J.(2017).*Concepts of ecology*(4thed) p. 978-9332586093. PubMed: 9332586098; ISBN-13. Pearson. 3. Singh, J.S., Singh, S.P., &Gupta, S.R.(2014). *Ecology*.Environmental Science& Conservation. Chand, S.*Publishing*. ISBN: 9383746009, 9789383746002. 4. Begon, M., Howarth, R.W., &Townsend, C.R.(2014). *Essentials of ecology*(4th Ed). ISBN: 1118802373, 9781118802373. 5. Bowman, W.D., Hacker, S.D., &Cain, M.L.(2020). *Ecology*(5thed). Oxford University Press, Incorporated. ISBN: 160535922X, 9781605359229. 6. ChapinIII, S.F.,Matson, P.A., &Vitousek, P.(2011). *Principles of terrestrialecosystemecology*(2nded). Springer. ISBN: 1441995048, 9781441995049. 7. Gaston, K.J., &Spicer, J.I.(2004).*Biodiversity: Anintroduction*(2nded). Blackwell Science. ISBN: 978-1-405-11857-6. 8. Gaston, K.J.(Ed.).(1996). *Biodiversity: Abiology of numbers and difference*. PubMed: 0865428042. Blackwell Science. ISBN: 978-0865428041 9. Groombridge, B., &Jenkins, M.D.(2002). *World Atlas of biodiversity: Earth's Living Resources in the 21stCentury*.University of California Press. ISBN: 0520236688, 9780520236684.	

	10. Henderson, P.A., &Southwood, T.R.E.(2016). *Ecological methods*(4th ed). John Wiley & Sons. ISBN:1118895282, 9781118895283. 11. Jørgensen, S., Xu, L., &Costanza, R.(2016). *Handbook of ecologicalindicators for assessment of ecosystemhealth*(2nd ed). CRC Press. ISBN: 1439809372, 9781439809372. 12. Jorgensen, S. E.(Ed.).(2009). *Ecosystem ecology*. Elsevier. ISBN: 0444534660, 9780444534668. 13. Krebs, C.J.(2013). *Ecology: Theexperimentalanalysis of distribution and abundance*(6th ed). Pearson. ISBN: 1292026278, 9781292026275. 14. Raffaelli, D.G., &Frid, C.L.J.(Eds.).(2010). *Ecosystem ecology: Anewsynthesis*. Cambridge University Press. ISBN: 1139486144, 9781139486149. 15. Smith, T.M., &Smith, R.L.(1988). Biodiversity in E.O. Wilson(Ed.). *Elements of ecology*(9th ed). Pearson. ISBN: 1292077409. National Academy Press, 9781292077406. ISBN: 030956736X, 9780309567367.	
Learning Outcomes	After successful completion of the course, students will be able to: 1. Understand and interpret the structure, variables, processes and functions operating in ecosystems. 2. Foresee how the alteration of the components would affect the ecosystem and its functions. 3. Able to see the connectivity among all the components of ecosystems and their services. 4. Understand the importance of biodiversity and methods to measure it. 5. Understand the threshold of resilience and predict the impact of removal of a species in an ecosystem.	

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Title of the Course:Land, Ocean and Atmospheric interactions
Course Code: ESC-22-105
Number of Credits: 03

Prerequisites for the course:	There is no prerequisite for this course apart from the program requirements	
Objective:	The course will impart an insight to the students about the need for an integral approach to study an ecosystem.	
Content:	**Module 1: Introduction** Earth system science; Evolution of geosphere, biosphere, atmosphere, hydrosphere and cryosphere; Properties of sea and	06 hours

	fresh water - distribution of temperature, salinity, density and oxygen in space and time. **Module 2:** Optical characteristics of sea water; Water type and masses: formation and classification, identification of water masses. General circulation of the world ocean; Wind driven and thermohaline circulation; Indian monsoon circulation. Tides- generation and propagation, characteristics of tides, spring and neap tides. **Module 3:** Atmospheric instability and convection-stability criteria; Mixing and convective condensation levels; Potential instability and latent instability; Cloud formation and types; Laws of black body radiation; Solar radiation transfer; Latitudinal and seasonal variation, absorption, scattering and reflection; Photosynthetically available radiation; Terrestrial radiation; Low and high pressure. **Module 4:** Upwelling and downwelling; Major and minor nutrients; Residence time; Dissolved gases; Marine habitats; Marine photosynthesis; Photosynthetic pigments; Biological productivity; Gross and net productivity; Redfield ratio; New and regenerated productivity; Food chain and food web; Exclusive economic zone.	09 hours 15 hours 15 hours
Pedagogy:	Use of conventional, online and ICT Methods. Lecture/Tutorials/Assignments	
References/ Readings	1. Wallace, J.M., &Hobbs, P.V. (2006). *Atmospheric science: Anintroductorysurvey*(2nded).Elsevier Academic Press. 2. Marshall, J., &Plumb, R.A. (2008).Atmosphere ocean and climatedynamics: Anintroductory.*Textile*.Elsevier Academic Press. 3. Hess, L.S. (1959). *Introduction to theoreticalmeteorology*.Holt, Rinehart & Winston, New York. 4. Houghton, J. T. (2002).*Physics of the atmosphere*.Cambridge University Press. 5. Stewart, R.L.(2008).*Introduction to physicaloceanography*. Department of Oceanography, Texas A&M University. 6. Open University Course Team(1999).*Waves, tides and shallowwaterprocesses*. Butterworth-Heinemann Publications. 7. Williams, F.J., &Elder, S. (1989). *Fluid Physics for Oceanographers and Physics: An introduction to incompressible.*Butterworth-Heinemann, England. 8. Sverdrup, H.U., Johnson, M.W., &Flemming, R.H. (1962). *The ocean: Theirphysics, chemistry and biology*.Asia Publishing House.	

	9. Miller, C.B., &Wheeler, P.A.*Biological oceanography*. (2nded). Wiley-Blackwell Publishers. 10. Grant Gross, M. (1990). *Oceanography* (5thed).Prentice Hall. 11. Thurman, H.V., &Mercill, C. (1988). *Introductory oceanography* (5thed) Publ. CO, OH. 12. Talley, L.D., Pickard, G.L., Emery, W.J., &Swift, J.H. (2011). *Descriptive physicaloceanography*(6thed).Elsevier. 13. Lenton, T. (2016). *Earth systemscience: Averyshortintroduction*(1sted).Oxford University Press. 14. Ehlers, E., &Kraft, T.*Earth systemscience in the Anthropocene: Emergingissues and problems.* Springer.	
Learning Outcomes	Understanding the interrelation between each component of Earth system to decipher meaningful information of an ecosystem.	

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Title of the Course:Environmental Impact Assessment - I
Course Code:ESC-22-106
Number of Credits: 01

Prerequisites for the course:	There is no prerequisite for this course apart from the programme requirements	
Objective:	In order to overcome the problems of environmental degradation, it is very necessary to plan the development process in a sustainable manner so that control and mitigation measures can be undertaken prior to occurrence of degradation. One important tool to do this is carrying out Environmental Impact Assessment. Hence, knowledge of this subject is very important for an environmental engineer.	
Content:	**Module 1: Introduction to the Environmental Impact Assessment process** • **Introduction and principals:** Introduction; nature and purpose of EIA; Project, Environment and nature of Impacts; Changing perspective and current issues in EIA; EIA regulations. • **Starting up early stages:** Managing the EIA process; project screening, scoping; understanding the project/development action; establishing the environmental baseline; impact identification. • **Participation, presentation and review:** Impact prediction; Evaluation; mitigation and enhancement; public consultation and participation; the importance of monitoring and auditing in the EIA process; Monitoring and auditing practice; EIA presentation and review. • **Practice and prospects:** Legal Challenges, cost and benefits of EIA; Case studies of EIA in practice; strategic environmental assessment; extending EIA to project implementation.	15 hours

Pedagogy:	Lectures/assignments/workshops/ street play/brain storming sessions/outreach programmes/campus walks/documentaries and discussion/ presentations.	
References/ Readings	1. Glasson, J., Therivl, R., &Chadwick, A.(2005). *Introduction to environmentalimpactassessment*. Routledge, Taylor &Francis Group. 2. Arts, J., &Morrison-Saunders, A.(Eds.). (2012). *Assessing impact: Handbook of EIA and SEA follow-up*. Routledge, Taylor &Francis Group. 3. Abaza, H., Bisset, R., &Sadler, B.(2004). *Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated approach*. UN Environmental Program. 4. Therivel, R., &Wood, G.(Eds.). (2017). *Methods of environmental and social impact assessment*. Routledge, Taylor &Francis Group. 5. Morris, P., &Therivel, R.(Eds.). (2001). *Methods of environmental impact assessment*, *2*. Taylor & Francis.	
Learning Outcomes	After learning the course the students should be able to: 1. Explain the need for EIA 2. Define EIA 3. Demonstrate the understanding of concept of Sustainable Development and justify the methods of achieving SD. 4. Appreciate the importance of EIA as an integral part of planning process. 5. Apply the different methodologies to predict and assess the impacts of minor/major projects on various aspects of environment. 6. Enumerate the role of public participation in environmental decision making process. 7. Characterize the environmental attributes.	

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Title of the Course: Coastal Ecology
Course Code: ESO-22-107
Number of Credits: 01

Prerequisites for the course:	Graduates in any discipline with science subjects at 10+2 level.	
Objective:	To introduce the students to the dynamic mangrove ecosystem, its composition – abiotic and biotic, benefits, threats and need for conservation.	
Content:	**Module 1: Introduction** Mangroves, global distribution, current status, threats, ecology and environment, relation with other ecosystems, uses of mangroves. **Module 2: Structure and function of mangrove ecosystem** Physical mangrove environment, forest types – overwashed,	02 hours 13 hours

	fringe, dwarf, riverine, basin, hammock; true mangroves – red, white, green, black; mangrove associates, adaptations in mangroves, patterns and processes in mangrove ecosystem, environmental factors - climate and habitats Biodiversity in mangrove ecosystem: flora and fauna	
Pedagogy:	Lectures/ case studies/ tutorials/ videos/ assignments/ self-study/ visits	
References/ Readings	1. Kathiresan, K., &Ajmal Khan, S. (2005). UNU-INWEH-UNESCO International training course on Coastal Biodiversity in Mangrove Ecosystem- Course manual (pp. 410). Annamalai University, India. 2. FAO (2007). The world's mangroves: 1980–2005. FAO, Rome, Italy. 3. Sandilyan, S., &Kathiresan, K. (2012). Mangrove conservation: a global perspective. *Biodiversity Conservation*, *21*, 3523–3542. 4. Nagelkerken, I., Blaber, S.J.M., & Bouillon, S. et al. (2008). The habitat function of mangroves for terrestrial and marine fauna: a review. *Aquatic Botany, 89*, 155–185. 5. Nanjo, K., Kohno, H., Nakamura, Y., Horinouchi, M., & Sano, M. (2014). Effects of mangrove structure on fish distribution patterns and predation risks. *Journal of Experimental Marine Biology and Ecology, 461,* 216–225. 6. Shinnaka, T., Sano, M., Ikejima, K., Tongnunui, P., Horinouchi, M., &Kurokura, H. (2007). Effects of mangrove deforestation on fish assemblage at Pak Phanang Bay, Southern Thailand. *Fisheries Science, 73*, 862–870. 7. 1st International Training Course onMangrove Ecosystems in the Western Indian Ocean Region. (December 2-9, 2013) Mombasa, Kenya. UNU-INWEH-UNESCO. 8. Singh, V.P., &Odaki, K. (2004). *Mangrove ecosystem: structure and function.* Scientific Publishers, Jodhpur, India.	
Learning Outcomes	Students will gain knowledge about mangrove ecosystem, its floral and faunal biodiversity.	

Title of the Course: Mangrove Ecology
Course Code: ESO-22-108
Number of Credits: 01

Prerequisites for the course:	Graduates in any discipline with science subjects at 10+2 level.
Objective:	To introduce the students to the dynamic mangrove ecosystem, its composition – abiotic and biotic, benefits, threats and need for conservation.

Content:	**Module 1: Introduction** Mangroves, ecology and environment, uses of mangroves, threats to mangrove. **Module 2: Ecological importance of mangrove ecosystem and the impact of anthropogenic activities** Functional aspects – biomass, productivity, litter and its decomposition, carbon sink and organic carbon productivity, nitrogen and sulfur cycling, nutrient status, nurseries, biofilters for toxic pollutants, breeding grounds – fish, birds; mitigation of climate change, coastal defence mechanism Indigenous people of mangroves – livelihood dependency –Case study on Sunderban Anthropogenic destruction - deforestation, landfills, land reclamation, waste disposal sites, pollution – water quality and persistent chemicals, loss of mangrove biodiversity.	02 hours 13 hours
Pedagogy:	Lectures/ case studies/ tutorials/ videos/ assignments/ self-study/ visits	
References/ Readings	1. Kathiresan, K., &Ajmal Khan, S. (2005). UNU-INWEH-UNESCO International training course on Coastal Biodiversity in Mangrove Ecosystem- Course manual (pp. 410). Annamalai University, India. 2. FAO (2007). The world's mangroves: 1980–2005. FAO, Rome, Italy. 3. Nagelkerken, I., Blaber, S.J.M., & Bouillon, S. et al. (2008). The habitat function of mangroves for terrestrial and marine fauna: a review. *Aquatic Botany, 89*, 155–185. 4. Nanjo, K., Kohno, H., Nakamura, Y., Horinouchi, M., & Sano, M. (2014). Effects of mangrove structure on fish distribution patterns and predation risks. *Journal of Experimental Marine Biology and Ecology, 461,* 216–225. 5. Shinnaka, T., Sano, M., Ikejima, K., Tongnunui, P., Horinouchi, M., &Kurokura, H. (2007). Effects of mangrove deforestation on fish assemblage at Pak Phanang Bay, Southern Thailand. *Fisheries Science, 73*, 862–870. 6. 1st International Training Course onMangrove Ecosystems in the Western Indian Ocean Region. (December 2-9, 2013) Mombasa, Kenya. UNU-INWEH-UNESCO. 7. Singh, V.P., &Odaki, K. (2004). *Mangrove ecosystem: structure and function.* Scientific Publishers, Jodhpur, India.	
Learning Outcomes	1. Imprint the importance of mangroves in maintaining the global climate and balance in the nutritional as well as biogeochemical cycles. 2. Awareness about indigenous people and anthropogenic destruction	

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Title of the Course: Mangrove Restoration and Conservation
Course Code:ESO-22-109
Number of Credits: 01

Prerequisites for the course:	Graduates in any discipline with science subjects at 10+2 level.	
Objective:	To introduce the students to the dynamic mangrove ecosystem, its composition – abiotic and biotic, benefits, threats and need for conservation.	
Content:	**Module 1: Introduction** Mangroves, global distribution, current status, threats, uses of mangroves. **Module 2: Restoration and conservation** Restoration and afforestation projects, ecosystem based management, protected areas, restoration tools, monitoring methods – remote sensing and GIS, awareness programmes, training programmes, community based management, role of institutions, NGOs, global conservation strategies, economic valuation (cost benefit analysis), national and global mangrove conservation policies, conservation and mangrove protection laws, international agreements – Ramsar convention, case study – mangroves of Goa.	02 hours 13 hours
Pedagogy:	Lectures/ case studies/ tutorials/ videos/ assignments/ self-study/ visits	
References/ Readings	1. Kathiresan, K., &Ajmal Khan, S. (2005). UNU-INWEH-UNESCO International training course on Coastal Biodiversity in Mangrove Ecosystem- Course manual (pp. 410). Annamalai University, India. 2. FAO (2007). The world's mangroves: 1980–2005. FAO, Rome, Italy. 3. Sandilyan, S., &Kathiresan, K. (2012). Mangrove conservation: a global perspective. *Biodiversity Conservation*, *21*, 3523–3542. 4. Nagelkerken, I., Blaber, S.J.M., & Bouillon, S. et al. (2008). The habitat function of mangroves for terrestrial and marine fauna: a review. *Aquatic Botany, 89*, 155–185. 5. Nanjo, K., Kohno, H., Nakamura, Y., Horinouchi, M., & Sano, M. (2014). Effects of mangrove structure on fish distribution patterns and predation risks. *Journal of Experimental Marine Biology and Ecology, 461,* 216–225. 6. Shinnaka, T., Sano, M., Ikejima, K., Tongnunui, P., Horinouchi, M., &Kurokura, H. (2007). Effects of mangrove deforestation on fish assemblage at Pak Phanang Bay, Southern Thailand. *Fisheries Science, 73*, 862–870. 7. 1st International Training Course onMangrove Ecosystems in the Western Indian Ocean Region. (December 2-9, 2013) Mombasa, Kenya. UNU-INWEH-UNESCO.	

	8. Singh, V.P., &Odaki, K. (2004). *Mangrove ecosystem: structure and function.* Scientific Publishers, Jodhpur, India.	
Learning Outcomes	This paper will highlight the need to conserve and protect the mangroves.	

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Title of the Course:Environmental Externalities and Policy
Course Code:ESO-22-110
Number of Credits: 01

Prerequisites for the course:	Graduate in any discipline from a recognised University	
Objective:	This course aims to equip the learner with tools of resource allocation using basic concepts in Economics. This will include market and non-market-based approaches to understanding problems of global and local pollution and challenges to sustainability using techniques of environmental valuation.	
Content:	**Module 1: Introduction** Meaning of externalities, environmental policy in the presence of externalities. **Module 2: Theory of externalities & environmental policy** Missing Markets, Non-convexity, Non-linearity, Public Goods, Common Property Resources, Coase Theorem and Issues in Property Rights; Pigouvian Taxes, Subsidies, Tradable Permits, Price v/s Quantity tools.	02 hours 13 hours
Pedagogy:	In class/online lectures, assignments, group activities, presentations.	
References/Readings	1. 1. Harris, J.M., & Roach, B. (2021). *Environmental and Natural Resource Economics: A Contemporary Approach*. Routledge. 2. Kolstad, C. (2012). *Intermediate Environmental Economics*. Oxford University Press. 3. Perman, R, Ma Y., Common, M., Maddison, D, &McGilvray. (2011). *Natural Resource and Environmental Economics* (4thed). Addison Wesley. 4. Rondeau, D., & Conrad, J.M. (2020). *Natural Resource Economics: Analysis, Theory, and Applications*. Cambridge University Press. 5. Tietenberg, T. (2000). *Environmental and Natural Resource Economics* (5thed). Addison Wesley.	
Learning Outcomes	On successful completion, course participants will be able to: 1. Understand how the environmental resources affect human welfare. 2. Have an informed opinion on environment-development trade-offs. 3. Assess international challenges of sustainability.	

Title of the Course:Introduction to Sustainable Development

Course Code: ESO-22-111
Number of Credits: 01

Prerequisites for the course:	Graduate in any discipline from a recognised University	
Objective:	This course aims to equip the learner with tools of resource allocation using basic concepts in Economics. This will include market and non-market based approaches to understanding problems of global and local pollution and challenges to sustainability using techniques of environmental valuation.	
Content:	**Module 1: Introduction** Meaning of sustainable development. **Module 2: Sustainable development** Renewable and Non-renewable Resources - Optimal use under different market Structures. Strong and weak sustainability; Global agreements, Economics of ecosystems and biodiversity. Issues of climate change adaptation and mitigation.	02 hours 13 hours
Pedagogy:	In class/online lectures, assignments, group activities, presentations.	
References/Readings	1. Harris, J.M., & Roach, B. (2021). *Environmental and Natural Resource Economics: A Contemporary Approach*. Routledge. 2. Kolstad, C. (2012). *Intermediate Environmental Economics*. Oxford University Press. 3. Perman, R, Ma Y., Common, M., Maddison, D, &McGilvray. (2011). *Natural Resource and Environmental Economics* (4thed). Addison Wesley. 4. Rondeau, D., & Conrad, J.M. (2020). *Natural Resource Economics: Analysis, Theory, and Applications*. Cambridge University Press. 5. Tietenberg, T. (2000). *Environmental and Natural Resource Economics* (5thed). Addison Wesley.	
Learning Outcomes	On successful completion, course participants will be able to: 1. Understand how the environmental resources affect human welfare. 2. Have an informed opinion on environment-development trade-offs. 3. Assess international challenges of sustainability	

Title of the Course:Introduction to Environmental Valuation
Course Code: ESO-22-112
Number of Credits: 01

Prerequisites for the course:	Graduate in any discipline from a recognised University
Objective:	This course aims to equip the learner with tools of resource allocation using basic concepts in Economics. This will include market and non-market based approaches to understanding problems of global and local pollution and challenges to sustainability using techniques of environmental valuation.

Content:	**Module 1: Introduction** Meaning, importance of environmental valuation. **Module 2: Issues in valuation** Costs and benefits. Use values, Non-use values, Option values, Discount rates. Methods of valuation: Revealed and stated preferences; Market and non-market valuation; Applications of valuation in developing countries.	02 hours 13 hours
Pedagogy:	In class/online lectures, assignments, group activities, presentations.	
References/Readings	1. Harris, J.M., & Roach, B. (2021). *Environmental and Natural Resource Economics: A Contemporary Approach*. Routledge. 2. Kolstad, C. (2012). *Intermediate Environmental Economics*. Oxford University Press. 3. Perman, R, Ma Y., Common, M., Maddison, D, &McGilvray. (2011). *Natural Resource and Environmental Economics* (4thed). Addison Wesley. 4. Rondeau, D., & Conrad, J.M. (2020). *Natural Resource Economics: Analysis, Theory, and Applications*. Cambridge University Press. 5. Tietenberg, T. (2000). *Environmental and Natural Resource Economics* (5thed). Addison Wesley.	
Learning Outcomes	On successful completion, course participants will be able to: 1. Understand how the environmental resources affect human welfare. 2. Have an informed opinion on environment-development trade-offs. 3. Assess international challenges of sustainability.	

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Title of the Course: Basics of Geo-spatial Analysis
Course Code: ESO-22-113
Number of Credits: 01

Prerequisites for the course:	Graduate in any discipline with science subjects at 10+2 level.	
Objective:	Introduce learners to understanding spatial data and its applications	
Content:	**Module 1: Introduction** Introduction to remote sensing and GIS. Application remote sensing and GIS, sources of information on remote sensing data. **Module 2: Spatial Analysis** Raster and vector data, Analysing raster data -clipping, analyzing elevation, terrain and raster calculator,Analysing vector- creating shapefile, attribute table, field calculator and data joins, Layer styling, zonal statistics, print layout.	03 hours 12 hours

Pedagogy:	Lectures/ class discussion/case studies/ assignments	
References/ Readings	1. Chuvieco, E. (2016). *Fundamentals of satellite remote sensing: An environmental approach.* CRC press. 2. Cutts, A.,Graser, A.(2018).*Learn QGIS, Your Step-by-step Guide to the Fundamental of QGIS 3.4*(4thed).Packt Publishing,Livery Place, UK. 3. Menke, K.et. al. (2016).*Mastering QGIS*.Packt Publishing, Livery Place, UK.	
Learning Outcomes	Candidates will be able to extract and process spatial images using open source software for economic decision-making.	

Title of the Course: Spatial Economic Analysis
Course Code: ESO-22-114
Number of Credits: 01

Prerequisites for the course:	Graduate in any discipline with science subjects at 10+2 level.	
Objective:	1. To introduce spatial economic analysis to the students to make them understand the development and growth process. 2. To expose the students to toolsthatintegrate GIS (Geographic Information System) and remote sensing in order to analyse economic change.	
Content:	**Module 1: Introduction** Fundamentals of Remote Sensing Signals, Electromagnetic Spectrum, Spectral Signatures in the Solar Spectrum. **Module 2:Remote sensing applications in urban socio-economic analysis** Principles of urban socio-economic studies using remote sensing technologies, Socio-economic information estimation- Population estimation, Employment estimation, GDP estimation, Electrical power consumption estimation, Land use land cover, Advantages and limitations of remote sensing technologies in socio-economic applications.	03 hours 12 hours
Pedagogy:	Lectures/ class discussion/case studies/ assignments	
References/ Readings	1. Chuvieco, E. (2016). *Fundamentals of satellite remote sensing: An environmental approach.* CRC press. 2. Mesev, V. (2007). *Integration of GIS and Remote Sensing*. John Wiley & Sons. 3. Cutts, A., Graser, A. (2018). *Learn QGIS, Your Step-by-step Guide to the Fundamental of QGIS 3.4(*4thed).Packt Publishing, Livery Place, UK.	
Learning Outcomes	The students will be able to extract and process satellite images using open source software and use it to study economic and demographic change.	

Title of the Course: Ecology and Society
Course Code: ESC-22-201
Number of Credits: 03

Prerequisites for the course:	There is no prerequisite for this course apart from the programme requirements	
Objective:	The module on Goan Society, Gender and Ecology which is taught by faculty from the Women's Studies Programme of ManoharParrikar School of Law, Governance and Public Policy will introduce students to the politics behind the popular connect between women and nature, and will deliberate on the concerns regarding land, water and livelihoods, menstruation and environment with a focus on issues in Goa. The larger objective of ecology is to understand the nature of environmental influences on individual organisms, their populations, and communities, on eco-scapes and ultimately at the level of the biosphere. One core goal of ecology is to understand the distribution and abundance of living things in the physical environment and its importance to humans.	
Content:	**Module 1: Introduction** Introduction to Ecology & Environment: Physical environment; biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept of habitat and niche, niche, width and overlap, resource partitioning. Environmental concepts: laws and limiting factors, ecological models. Ecological structure, Ethno-zoology: The study of the past and present interrelationships between human cultures and the animals in their environment. **Module 2: Ecology and society** Culture and cultural ecology, Environmental ethics, Community based conservation (Sacred Grooves etc.), Society and Laws (Environment Protection Act, Biodiversity Act etc.) **Module 3: Disciplinary traditions** An overview of disciplinary traditions and the study of Environmental issues. Society, culture and environment; Ecological consciousness and ecological conflicts.Environment, development and sustainable development. Environmental movements in India: Issues, ideologies and methods. **Module 4: Gender and Ecology in Goan Society** "Is Female to Male as Nature is to Culture" Sherry Ortner. Menstruation: Hygiene, Management, Eco-cultural practices and social exclusion. Forest Law, Tribes and Livelihood: Women's experiences in Goa - Kumeri cultivation, Social Ecology, Traditional knowledge, Power and Agency.	06 hours 09 hours 15 hours 15 hours

	Ecology, Livelihood and Gender: Water, Land ownership, Work, Participation and impacts (tourism, mining, agriculture, fishing, craft and small scale industry).	
Pedagogy:	Lectures/assignments/workshops/ street play/brain storming sessions/outreach programmes/campus walks/documentaries and discussion/ presentations	
References/Readings	Module 1 and Module 2: 1. Chapman, J. L., &Reiss, M. J.(1999). *Ecology: Principles and applications*.Cambridge University Press. 2. Conklin, A.R.(2004).*Field sampling: Principles and practices in environmentalanalysis*.CRC Press. 3. Fahey, T.J., &Knapp, A.K.(2007).*Principles and standardsfor measuringprimaryproduction*.Oxford University Press. 4. Grant, W.E., &Swannack, T.M.(2008).*Ecological Modelling, Blackwell*. 5. Odum, E.P., &Barrett, G.W.(2004). *Basic ecology: Fundamentals of ecology*(5th ed).Oxford and IBH Publishing Co, Pvt. 6. Sutherland, W.J.(2006).*Ecological Census techniques a handbook*.Cambridge University Press. 7. Wilkinson, D. M.(2007).*Fundamental Processes in Ecology: An Earth system Approach*.Oxford University Press. 8. Garcia, S.L.(2019). Gender and water. *Gender CC—Women for climatejustice*. UN. 9. Lynn, H.(2018). Seeing red: Menstruation and the environment, #PLASTICFREEPERIODS. *Women's environment network: London*. 10. Kaur, R., Kaur, K., &Kaur, R.(2018). Menstrual hygienemanagement, and wastedisposal: Practice and challengesfaced by girls/women of developingcountries. *Journal of Environmental and Public Health*Feb 20; 2018:1730964. doi: 10.1155/2018/1730964. 11. Manisha, P.et al.(2009). *Human rights, gender and the environment*. Dorling Kinderseley.	
Learning Outcomes	1. Essential in depth understanding of the concepts and components of ecology. 2. Learners will learn ecosystem structure and function along with the interactions involved at various levels. 3. It would provide a vision to understand the ecosystem ecology along with sufficient knowledge of energy flow and exchange. 4. Sensitization of students towards the environment with respect to the global scenario and the related problems, impact, along with methods to tackle the problems.	

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Title of the Course:Climate Change

Course Code: ESC-22-202
Number of Credits: 03

Prerequisites for the course:	Basic understanding of the marine environment and microorganisms.	
Objective:	To introduce the students to climate change and also examine the methods and policies for the mitigation of climate change	
Content:	**Module 1: Introduction** Earth system, greenhouse gases: carbon dioxide, methane, nitrous oxide, warming potential, radiation and energy balance, solar variability, ozone and chlorofluorocarbon, aerosols, paleoclimate, ice-ages, carbon budget and global carbon cycle. **Module 2: Impact of climate change and future projections** Land and water resources, global warming, weather and heatwave, drought, biodiversity, extinction, migration, vegetation, agriculture and food security, human livelihood and health, ozone layer depletion, melting ice sheets, sea-level rise, precipitation. **Module 3: Ecological response** Floods, cyclone, changes in physical and biogeochemical properties of ocean: ocean acidification, deoxygenation, oxygen minimum zones, ocean circulation, effect on marine organisms, effect on polar regions, future projections and predictions: decadal, centennial, economic consequences. **Module 4: Mitigation and sustainability** Future Earth, adaptation, alternate energy sources: solar, wind energy, geothermal, biomass, biogas, hydrogen, lithium-ion battery, ocean thermal energy conversion, integrated assessment, emission budgets, future technologies: biofuels, hydrogen, geoengineering, carbon sequestration, contribution of oceans in mitigation, ethics and environmental policy, International agreements: United Nations Framework Convention on Climate Change, Kyoto Protocol, Paris Agreement, role of India, youth and mass media in climate change mitigation.	06 hours 09 hours 15 hours 15 hours
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	1. Reichle, D. E.(2020). *The globalcarbon cycle and climateChange: Scalingecologicalenergetics from organism to biosphere*.Elsevier Science. 2. Johansen, B.E.(2017). *Climate Change: Anencyclopedia of science, society, and solutions*.ABC-CLIO. 3. Mélières, M. A., &Maréchal, C.(2015). *Climate Change: Past, present and future*.Wiley-Blackwell. 4. Hodgson, P. E.(2010). *Energy, the environment and climateChange*.Imperial College Press.	

	5. Laczko, F., &Aghazarm, C.(2009). *Migration, Environment and Climate Change: Assessing the evidence*.International Organization for Migration. 6. National Research Council.(2008). *Ecological impacts of climateChange*.National Academies Press. 7. Dessler, A.(2016). *Introduction tomodernclimateChange*(3rd ed).Cambridge University Press. 8. Srivastav, A.(2019). *The science and impact of climateChange*.Springer. 9. Chen, W. Y., Suzuki, T., &Lackner, M.(2012). *Handbook of climatechangemitigation and adaptation* (2nd ed).Springer.	
Learning Outcomes	1. Provides brief knowledge about climate change, its impact on all life forms and what measure can be taken to mitigate it. 2. It also highlights the role of youth in adopting a sustainable lifestyle to tackle this global issue.	

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Title of the Course:Environmental Geology
Course Code:ESC-22-203
Number of Credits: 03

Prerequisites for the course:	Bachelor's degree of this University or an examination of any other University recognised as equivalent.	
Objective:	1. To understand the rock and soil mechanics. 2. To study civil structures and their implications on the environment. 3. To impart knowledge about different slope failures as well as understand the remedial measures. 4. To gain knowledge on coastal processes and hazards.	
Content:	**Module 1: Introduction to rock and soil mechanics** • Engineering properties of the soil, soil profile, size of the soil particles; cohesion and alteration of clays. • Structure: Porosity, Voids ratio and degree of saturation. Plasticity and Atterberg limits, clay swelling and tests to determine. • Engineering properties of the rock: physical and mechanical properties, RQD, RMR. **Module 2: Civil structures and environment** • Dams: Earth dams, classification, causes of failure, introduction to stability analysis; Gravity dams, forces acting, classification, modes of failure, factors of safety and stability analysis. Reservoir induced seismicity and case studies. • Tunnels and bridges: Design and construction, identifying and managing geologic hazards - groundwater,	06 hours 09 hours

	problematic ground conditions, impacts to existing utilities and adjacent structures. • Nuclear plants: Construction, nuclear reactor accidents and safety. Case study. **Module 3: Landslides and their mitigation** • Introduction, Landslide classification, Natural landslides in soils and rocks. Types and modes of slope failure. Stability of slopes. Classification in slope stability evaluation. Remedial measures for stabilizing slopes. Monitoring and control. **Module 4: Coastal processes** • Waves, beach form and processes, transport and deposition of sediment, rip currents, coastal erosion, and erosional factors. Sea level changes. Coastal hazards and Stabilization: soft stabilization, hard stabilization and managed retreat; human activity and coastal erosion.	15 hours 15 hours
Pedagogy:	Lectures, case studies, discussions and assignments.	
References/ Readings	1. Keller, E.A. (2012). *Introduction to Environmental Geology* (5th ed). Prentice Hall. 2. Montgomery, C.W. (2010). *Environmental geology* (9th ed). Professor Emerita, Northern Illinois University. 3. Montgomery, C.W. (2020). *Environmental geology*. (11th ed). Professor Emerita, Northern Illinois University. 4. Bodansky, D. (2007). *Nuclear energy: principles, practices, and prospects.* Springer Science & Business Media. 5. Krynine, D.P., Judd, W.R., &Krynine, D. P. (1957). *Principles of engineering geology and geotechnics* (pp. 1-3). New York: McGraw-Hill. 6. Meiswinkel, R., Meyer, J., & Schnell, J. (2013). *Design and construction of nuclear power plants.* John Wiley & Sons.	
Learning Outcomes	In this course a student will learn about: 1. Concepts of engineering geology and basics of rock and soil mechanics. 2. Types of major civil structures and their impact on the environment. 3. Different types of landslides, their stabilization and control measures. 4. Various coastal processes, their hazards and mitigation.	

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Title of the Course: Basic Statistics
Course Code: ESC-22-204
Number of Credits: 03

Prerequisites for the course:	Completion of first semester of the programme	
Objective:	The aim of the course is to introduce students to the study of basic statistics so that they can independently explore data, analyse it and present it to academics, policy-makers and civil society.	
Content:	**Module 1: Introduction** Exploring Data: Basic concepts of descriptive statistics -- measures central tendency (mode, median and mean) and dispersion (range, interquartile range, variance and standard deviation). Displaying data. **Module 2:Correlation and regression** Bivariate analyses: Correlation, Measures of correlation: (Pearson's r). Scatter plots and Linear regression analysis. Goodness of fit (R-squared). **Module 3:Probability and distribution** Introduction to probability, random variables, concepts of events, sample space and random trials. Conditional probabilities, independence. Probability Distributions:Discrete probability distribution: Binomial and Poisson. Continuous probability distribution: Student-t, Normal, Standard Normal, Chi-square and F-distributions. **Module 4:Sampling distributions and inferential statistics** Sampling methods: Random, stratified random, non-random sampling methods. Determining sample size. Inferential statistics:Confidence interval; Testing of hypotheses: the null hypothesis and the alternative hypothesis.	06 hours 09 hours 15 hours 15 hours
Pedagogy:	Lectures/assignments/workshops/ street play/brain storming sessions/outreach programmes/campus walks/documentaries and discussion/ presentations.	
References/Readings	1. Heumann, C., Schomaker, M., &Shalabh. (2016). *Introduction to statistics and dataanalysis: Withexercises, solutions and applications in R*. Cham, Switzerland: Springer. 2. Levine, S.D., Krehbiel, &Berenson. (2008). *Statistics for managers: UsingMicrosoft Excel* (5thed). Pearson Education, Inc. 3. McClave, J.T., Benson, P.G., &Sincich, T.(2018). *Statistics for business and economics*. Pearson. 4. Witte, R.S., Witte, J.S.(2017). *Statistics* (11thed). John Wiley & Sons, Inc.	
Learning Outcomes	1. The students will be able to understand the basic concepts in statistics. 2. They will learn how to collect, arrange, present and analyze data.	

Title of the Course: Environmental Management
Course Code: ESC-22-205
Number of Credits: 03

Prerequisites for the course:	Completion of first semester of the programme	
Objective:	The objective of the course is to enable participants to have a holistic understanding of the environment and know the methods of managing environmental issues.	
Content:	**Module 1: Introduction environmental management** Introduction to environmental management: Pollution and its various forms, Sustainability and sustainable development. **Module 2: Biodiversity and resources** Biodiversity and Resources: Societal ownership, Biodiversity, Benefits of natural resource protection, Traditional biodiversity knowledge, Bio-piracy. **Module 3: Environmental policies and management** Environmental policies and legislations and life cycle assessment: Environmental sustainability index, National and international environmental legislation, Life cycle assessment, LCA framework, Stages in LCA Energy Management and ISO Certification: Energy audits and methods, Energy conservation, Energy demand and balances, ISO 9000 and ISO 14000 series, Environment management certification. **Module 4: Pollution management** Water, air and noise pollution: Water pollution and management of water, Waste water and industrial waste water, Air pollution control measures. Noise pollution law and control measures. Solid waste and hazardous waste: Solid and hazardous waste sources and composition, Effect on health, storage, treatment and disposal of hazardous waste, Landfill designs, methods of disposal of solid waste. Monitoring environment using analytical methods: Statistical and instrumental methods, Analyses of all types of environmental pollution.	06 hours 09 hours 15 hours 15 hours
Pedagogy:	Lectures/tutorials/ laboratory work /field work/outreach activities/ project work/ vocational training/ viva /seminars / term papers/ assignments / presentations / self-study/case studies etc. or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.	
References/ Readings	1. Murali Krishna, V., &Manickam, V. (2017).*Environmental Management*.Butterworth-Heinemann. 2. Kulkarni, V., &Ramchandra, T.V. (2009).*Environmental management, commonwealth of learning*.Indian Institute of Science.	
Learning Outcomes	At the end of the course the participant should be able to identify: 1. Environmental impact 2. Methods of control of such impacts 3. Analyse the impact using statistical and other analytical tools 4. Suggest specific interventions to alleviate environmental issues.	

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Title of the Course: Environmental Impact Assessment II
Course Code: ESC-22-206
Number of Credits: 01

Prerequisites for the course:	Completion of first semester of the programme	
Objective:	To understand the Environmental Impact Assessment processes through the study of EIA reports available for various kinds of projects.	
Content:	**Module 1:** Study of EIA reports for major projects of the country available online and understand the methods used, interpretations made, conclusions drawn, objections raised and decisions taken and their implementation.	15 hours
Pedagogy:	Lectures/tutorials/ laboratory work /field work/outreach activities/ project work/ vocational training/ viva /seminars / term papers/ assignments / presentations / self-study/case studies etc. or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.	
References/ Readings	1. Yerramilli, A., &Manickam, V. (2020). *Environmental impactassessmentmethodologies* (3rd ed). BS Publications/British Society of Periodontology Books. 2. Glasson, J., &Therivel, R. (2019). *Introduction to environmentalimpactassessment* (5th Ed.). Routledge. 3. Khandeshwar, S.R., Raman N.S., &Gajbhiye, A.R. (2019). *Environmental Impact Assessment.* Dreamtech Press. EIA manuals available at: 1. http://environmentclearance.nic.in/writereaddata/Form-1A/HomeLinks/ommodel3.html 2. Sectoral Manuals under EIA Notification, 2006: 3. http://environmentclearance.nic.in/writereaddata/Form-1A/HomeLinks/ommodel2.html 4. Anonymous. Environmental Impact Assessment Training Manual. 2016. International Institute for Sustainable Development. 5. http://www.iisd.org/learning/eia/wp-content/uploads/2016/06/EIA-Manual.pdf 6. EIA Online Learning Platform www.iisd.org/learning/eia	
Learning Outcomes	After the discussion of case studies, the students will be able to understand how to work and write EIA reports for each of the major sectors.	

Title of the Course:Mineral resource management
Course Code: ESO-22-207
Number of Credits: 01

Prerequisites for the course:	Bachelor's degree of this University or an examination of any other University recognised as equivalent.	
Objective:	To understand the interaction of humans with the geological environment.	
Content:	**Module 1: Introduction** • Earth in space and time • Internal structure of the earth and Geological time scale **Module 2: Earth, its resources and the management** • Geological evolution of earth: plate tectonics and seafloor spreading • Mineral resources and reserves; UNFC. • Mining: surface and underground mining, mine ventilation, mine drainage, environmental effect of mining, environmentally sensitive green mining, mine closure. Trace elements and their implications on health.	02 hours 13 hours
Pedagogy:	Lectures, case studies, discussions and assignments.	
References/ Readings	1. Merrits. D., De Wet, A., &Menking, K. (1997). *Environmental Geology: an earth system science approach.* W. H. Freeman, New York. 2. Keller, E. A. (2012). *Introduction to Environmental Geology* (5thed). Prentice Hall. 3. Montgomery, C. W. (2010). *Environmental geology*. (9th Ed.). Professor Emerita, Northern Illinois University. 4. Montgomery, C. W. (2020). *Environmental geology*. (11thed). Professor Emerita, Northern Illinois University. 5. Pipkin, B. W., Trent, D. D., Hazlett, R., &Bierman, P. (2013). *Geology and the Environment*. Cengage Learning. 6. Valdiya, K. S. (1987). *Environmental geology, Indian context*. Tata McGraw-Hill Pub. Co.	
Learning Outcomes	In this course a student will learn about: 1. Concepts of environmental geology and its interaction with the human beings, 2. Management of geological resources.	

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Title of the Course: Pollution and Environment
Course Code: ESO-22-208
Number of Credits: 01

Prerequisites for the course:	Bachelor's degree of this University or an examination of any other University recognised as equivalent.

Objective:	• To understand the interaction of humans with the geological environment. • To study pollutants in the environment and to find the suitable remedial measures to cover harmful effects.	
Content:	**Module 1: Introduction** • Human and geological environment **Module 2: Types of pollution and remedial measures** • Hydrology and pollution – Impact assessment of degradation and contamination of surface water and groundwater quality due to industrialization and urbanization; remedial measures. • Soil Science - Soil profile, soil types and their classification and formation; soil quality degradation, control measures Waste and its disposal - surface and subsurface disposal of toxic, metallic and radioactive wastes. Planning and management of hazardous waste. Domestic refuse and landfill.	02 hours 13 hours
Pedagogy:	Lectures, case studies, discussions and assignments.	
References/ Readings	1. Keller, E. A. (2012). *Introduction to Environmental Geology* (5th ed.). Prentice Hall. 2. Montgomery, C. W. (2010). *Environmental geology*. (9th Ed.). Professor Emerita, Northern Illinois University. 3. Montgomery, C. W. (2020). *Environmental geology*. (11th Ed.). Professor Emerita, Northern Illinois University. 4. Pipkin, B. W., Trent, D. D., Hazlett, R., &Bierman, P. (2013). *Geology and the Environment*. Cengage Learning. 5. Valdiya, K. S. (1987). *Environmental geology, Indian context*. Tata McGraw-Hill Pub. Co.	
Learning Outcomes	In this course a student will learn about: 1. Concepts of environmental geology and its interaction with the human beings, 2. Management of geological resources, 3. Appropriate use of the geological site for waste disposal.	

Title of the Course: Natural and manmade hazards
Course Code: ESO-22-209
Number of Credits: 01

Prerequisites for the course:	Bachelor's degree of this University or an examination of any other University recognised as equivalent.	
Objective:	1. To understand the interaction of humans with the geological environment. 2. To impart knowledge about different natural as well as manmade hazards with deterrent measures.	
Content:	**Module 1 : Introduction** • Life on Earth	02 hours

	Module 2 : Geological hazards Assessing geological hazards and risks: Earthquakes, volcanic eruptions, floods and droughts, mass movement-landslides, rock fall, preventive and mitigation measures.	13 hours
Pedagogy:	Lectures, case studies, discussions and assignments.	
References/ Readings	1. Keller, E. A. (2012). *Introduction to Environmental Geology* (5thed). Prentice Hall. 2. Montgomery, C. W. (2010). *Environmental geology*. (9thed). Professor Emerita, Northern Illinois University. 3. Montgomery, C. W. (2020). *Environmental geology*. (11thed). Professor Emerita, Northern Illinois University. 4. Pipkin, B.W., Trent, D.D., Hazlett, R., &Bierman, P. (2013). *Geology and the Environment*. Cengage Learning. 5. Valdiya, K.S. (1987). *Environmental geology, Indian context*. Tata McGraw-Hill Pub. Co. 6. Valdiya, K. S. (2013). *Environmental Geology: Ecology, Resource and Hazard Management*. McGraw-Hill Education.	
Learning Outcomes	In this course a student will learn about recognition of natural hazards and mitigation.	

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Title of the Course: Marine Habitat conservation and Restoration
Course Code: ESO-22-210
Number of Credits: 01

Prerequisites for the course:	Bachelor's degree of this University or an Examination of any other University recognised as equivalent.	
Objective:	To create awareness regarding habitat degradation, monitoring and strategies for restoration with specific reference to coastal habitats.	
Content:	**Module 1 : Introduction** Introduction to restoration, importance, types, concepts and principles **Module 2 : Habitat monitoring and restoration** Habitat degradation, Human interference and anthropogenic inputs, tourism effect, damaged ecosystems, fragmentation Marine Protected areas, restoration ecology and global framework, Coral reef damage, bleaching, restoration, Seagrass beds, restoration initiatives at GBR and India, Cost-benefit analysis of restoration, ecosystem development and restoration program design, Monitoring and evaluation - adaptive management, the purpose and importance of monitoring and evaluation, and feedback mechanisms to improve the management of the restoration process.	03 hours 12 hours
Pedagogy:	Lectures, case studies, discussions and assignments.	

References/ Readings	1. Andrew, W. (2013). *Handbook of environmental degradation of materials* (3rded). Elsevier, Amsterdam, Netherlands. 2. Kellert**, S.R. (1996).** ***The Value of Life: Biological Diversity and Human Society***.Island Press, Washington, DC. 3. Hawksworth, D.L. (2020). Books on biodiversity and conservation. Biodiversity and Conservation. *29*, 3843–3862. 4. Perrow, M.R., Davy, A.J. (Eds.). (2009). *Handbook of ecological restoration*, *Volume 1: Principles of Restoration.* Cambridge University Press.	
Learning Outcomes	Ability to identify the potential areas likely to be subjected for degradation and to evolve with appropriate remedies for conservation and restoration	

Title of the Course: Ecological significance of symbiosis
Course Code: ESO-22-211
Number of Credits: 01

Prerequisites for the course:	Graduate in any discipline with science subjects at 10+2 level.	
Objective:	1. To describe the diversity of symbiotic associations in the environment. 2. To understand the nuances of symbiotic interactions, their multifaceted nature, relevance and role in evolution.	
Content:	**Module 1: Introduction** • Concept of symbiosis. • Diversity of microbial symbiotic associations: Concept of rhizosphere, mycorrhizosphere, phycosphere, satellite bacteria, microbiome. **Module 2: Intricacies, molecular evolution and ecological significance of symbiosis** • Multipartner symbiotic systems:the multifaceted and dynamic nature of symbiotic interactions; establishment and maintenance of symbiotic associations, vertical versus horizontal transmission of symbionts; quorum sensing; mixotrophy, kleptoplastidy. • Influence of symbiotic interactions on Circadian rhythms and gene expression; holobiont concept, the hologenome theory of evolution and the role of microorganisms in speciation; endosymbiotic theory for the origin of eukaryotic organelles.	03 hours 12 hours
Pedagogy:	Lectures/ case studies/ tutorials/ videos/ assignments/ self-study	
References/ Readings	1. Duplouy, A., Dotson, B. R., Nishiguchi, M. K., & Cárdenas, C. A. (2021). Symbiosis in a Changing Environment. *Frontiers in*	

	Ecology and Evolution, 536, https://doi.org/10.3389/fevo.2021.731892. 2. Lipnicki, L. I. (2015). The role of symbiosis in the transition of some eukaryotes from aquatic to terrestrial environments. *Symbiosis,* 65(2), 39-53. 3. Munn, C. B. (2011). *Marine microbiology: ecology & applications*. CRC Press. 4. Hawksworth, D. L., &Grube, M. (2020). Lichens redefined as complex ecosystems. *The New Phytologist*, *227*(5), 1281-1283. 5. Pacheco, A. R., &Segrè, D. (2019). A multidimensional perspective on microbial interactions. *FEMS Microbiology Letters*, *366*(11), fnz125. 6. Heath-Heckman, E. A. (2016). The metronome of symbiosis: interactions between microbes and the host circadian clock. *Integrative and Comparative Biology.* 56(5), 776-783. 7. Lee, S. J., Morse, D., &Hijri, M. (2019). Holobiont chronobiology: mycorrhiza may be a key to linking aboveground and underground rhythms. *Mycorrhiza*, *29*(5), 403-412. 8. Rosenberg, E., &Zilber-Rosenberg, I. (2018). The hologenome concept of evolution after 10 years. *Microbiome*, *6*(1), 1-14.	
Learning Outcomes	Students will appreciate the ubiquity and relevance of symbiotic associations in the environment, and their diverse roles, including in evolution.	

Title of the Course: Nitrogenand Climate Change
Course Code: ESO-22-212
Number of Credits: 01

Prerequisites for the course:	Graduate in any discipline with science subjects at 10+2 level.	
Objective:	To enable students to understand: 1. Nitrogen (N) cycling in the marine environment. 2. Factors responsible for causing pertubations in biogeochemical cycling of the element. 3. Impact of oceanic production of the greenhouse gas nitrous oxide (N_2O) on the climate.	
Content:	**Module 1: Introduction** Nitrogen (N) species in the marine environment; Primary routes for entry of N into the marine environment; Spatial and seasonal distribution of dissolved nitrogen compounds in seawater. **Module 2: Nitrogen transformations in the marine environment and its impact on the climate** Biogeochemical cycling of N; Controlling factors; analytical methods for the study of N compounds; Disruptions caused to marine N cycle due to seawater stratification and upwelling;	03 hours 12 hours

	Impact of agricultural activities, fossil fuel burning and aquaculture; Nitrous oxide as a driver of climate change, Influence of warming, deoxygenation and acidification on oceanic N_2O cycling and emissions to the atmosphere, Mitigation strategies for excess N in aquatic systems.	
Pedagogy:	Lectures/ case studies/ tutorials/ videos/ assignments/ self-study	
References/ Readings	1. Bonaglia, S. (2015). Control factors of the marine nitrogen cycle : The role of meiofauna, macrofauna, oxygen and aggregates (PhD dissertation, Department of Geological Sciences, Stockholm University). 2. Capone, D.G., Bronk, D.A., Mulholland, M.R., & Carpenter, E.J. (Eds.) (2008). *Nitrogen in the marine environment* (2nd ed). Academic Press. 3. Capone, D.G., & Hutchins, D.A. (2013). Microbial biogeochemistry of coastal upwelling regimes in a changing ocean. *Nature Geoscience*, *6,* 711-717. 4. Fowler, D., Coyle, M., Skiba, U., Sutton, M. A., Cape, J.N., Reis, S., Sheppard, L.J., Jenkins, A., Grizzetti, B., Galloway, J. N., Vitousek, P., Leach, A., Bouwman, A.F., Butterbach-Bahl, K., Dentener, F., Stevenson, D., Amann, M., & Voss, M. (2013). The global nitrogen cycle in the twenty-first century. *Philosophical Transactions of the Royal Society B*: *Biological Sciences*, *368,* 1621. 5. Hutchins, D.A., & Capone, D.G. (2022). The marine nitrogen cycle: new developments and global change. *Nature Reviews Microbiology*.https://doi.org/10.1038/s41579-022-00687-z. Epub ahead of print. PMID: 35132241. 6. McCarthy, M.D., &Bronk, D.A. (2008). **Analytical methods for the study of nitrogen. In:**D.G. Capone, D.A. Bronk, M.R. Mulholland, E.J. Carpenter (Eds.). *Nitrogen in the Marine Environment* (2nd ed.), (pp. 1219-1275) Academic Press. 7. Reay, D. (2015). *Nitrogen and Climate Change: an Explosive Story* (pp. 193–205). Palgrave Macmillan, UK, London. 8. Voss, M., Baker, A., Bange, H., Conley, D., Cornell, S., Deutsch, B. et al. (2011). Nitrogen processes in coastal and marine ecosystems. In: M. Sutton, C. Howard, J. Erisman, G. Billen, A. Bleeker, P. Grennfelt, et al. (Eds.), *The European Nitrogen Assessment: Sources, Effects and Policy Perspectives* (pp. 147-176). Cambridge University Press. 9. Voss, M., Bange, H.W., Dippner, J.W., Middelburg, J.J., Montoya, J.P., & Ward, B. (2013). The marine nitrogen cycle: recent discoveries, uncertainties and the potential relevance of climate change. *Philosophical Transactions of the Royal Society B*: *Biological Sciences*, 368, 20130121. 10. Zehr, J.P., &Kudela, R.M. (2011). Nitrogen Cycle of the Open Ocean: From Genes to Ecosystems. *Annual Review of Marine Science*, *3*, 197-225.	

Learning Outcomes	This course will enable students to: 1. Predict human impacts on nitrogen biogeochemistry in aquatic systems. 2. Suggest and/or initiate mitigation measures to counter excessive nutrient input in coastal waters.	

Title of the Course: Environment and Literature
Course Code: ESO-22-213
Number of Credits: 02

Prerequisites for the course:	Bachelor's degree in any discipline	
Objectives:	1. To highlight the symbiotic relationship between environment and literature beginning from the Vedic times. 2. To focus on the preoccupation of modern writers with issues related to environmental degradation, consumerist culture etc. 3. To encourage the students to adopt an interdisciplinary perspective while dealing with the large spectrum of issues pertaining to environment and literature. 4. To drive home the idea that questions related to aesthetics cannot be divorced from ethics.	
Content:	**Module 1:Introduction** Tracing the Trajectory of Environmental Concerns in Indian & Western Literature: Moments & Movements **Module 2:Paradigms & Categories** Romanticism Martin Heidegger on Technology Ecocriticism Ecofeminism Environmental Humanities Externality Deep Ecology **Module 3:Indian Perspective** *The Upheaval* by PundalikNaik (Novel) **Module 4:Western Perspective** *The Road* by Cormac McCarthy (Novel)	04 hours 08 hours 09 hours 09 hours
Pedagogy:	Lectures/tutorials/assignments/seminars.	
References/ Readings:	1. Bellamy P. (2007). *Dictionary of Environment* (3rded) New Delhi, Academic (India) Publishers.. 2. Blanning, T.C.W. (2010). *The Romantic Revolution*, George Weidenfield& Nicholson Publishers. *3.* Broswimmer, F.(2002). *Ecocide: A Short History of Mass Extinction of Species* Pluto Press Publishers.	

	4. Buell, L. 1998. *The Environmental Imagination: Thoreau, Nature Writing, and the Formation of American Culture*. Cambridge: Harvard University Press. 5. Garrard, G. (2004). *Ecocriticism: The New Critical Idiom* Oxford, Blackwell. 6. McCarthy, C. (2006). *The Road*, London, Pan Macmillan. 7. Vacoch, D.A.& Mickey, S. (Eds.) (2018). *Literature and Ecofeminism: Intersectional and International Voices*(1st ed). Routledge, London. 8. Naik, P.N. (2002). *The Upheaval*. Translated by V.Pai, Oxford University Press, New York.	
Learning Outcomes	1. Understand the relationship between literature and environment. 2. Appreciate and recognise the aesthetic as well as the ethical dimensions of literature. 3. Make an independent analysis of literary texts in the context of issues related to environment.	

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Title of the Course:Gender Sensitivity and Equity
Course Code: ESO-22-214
Number of Credits: 02

Prerequisites for the course:	Student should be registered with Goa University Post Graduate Programme	
Objective:	This course aims to develop the basic understanding of gender related issues in the society among students with multidisciplinary approach.	
Content:	**Module 1: Introduction** The universal commitment to Gender Equality and Social Equity – SDGs, Provisions in the Indian Constitution, Towards Equality Report and the creation of the discipline of Women's Studies in India. Sex and Gender: Non-duality of these terms. Nature vs Nurture debate, socialisation, stereotyping. **Module 2: Social Equity** Power, Intersectionality. Marginalised sections based on caste, class, abilities, religion etc. Women's rights as human rights. Women's issues in Goa. **Module 3: Introduction to Laws** Sexual Harassment at Work Place (Protection, Prohibition, and Redressal Act of 2013) and Protection of Women from Domestic Violence Act of 2005. Forms of violence against women: a review.	10 hours 10 hours 10 hours
Pedagogy:	This course will be taught through workshops/ lectures/ group discussions/assignment/quiz games/ tutorials/ assignments/ films/ documentaries/ group	

References/Readings	1. Government of India. (2005). DV Act 2005 http://ncw.nic.in/acts/TheProtectionofWomenfromDomesticViolence Act2005.pdf 2. Government of India, (2013). Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act of 2013.http://www.iitbbs.ac.in/notice/sexual-harrassment-ofwomen-act-and-rules-2013.pdf 3. Pilcher J., &Whelehan, I. (2005). *50 Key Concepts in Gender Studies.*Sage Publications, New Delhi. 4. UNDP (2014). Women's Rights are Human Rights. file:///C:/Users/admin/Desktop/WomenRightsAreHR.pdf	
Learning Outcomes	1. Students will be enabled to develop the sensitive approach towards gender issues. 2. Students will have an understanding of equity, its importance in our society.	

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D 3.6 Minutes of the Board of Studies in Sociology meeting held on 26.04.2022.

Annexure I

GOA UNIVERSITY

DEPARTMENT OF SOCIOLOGY

MA Syllabus based on Choice Based Credit System as per the NEP 2020

Total Credits 80

List of P.G. papers revised and approved by the BOS in Sociology held on 26 April 2022

The course and credit distribution

Courses	Course Code	SEM I	SEM II	SEM III	SEM IV	Total Credits
Discipline Specific Core Courses	DSCC	16	16			32
Discipline Specific Optional Courses	DSOC	4	4			8
Research Specific Optional Courses	RSOC			8	4	12
Optional Generic Course	OGC			12		12
Discipline Specific Dissertation	DSD				16	16
Total Credits	20	20	20	20	20	80

One credit is 15 contact hours

Compulsory courses

Course Number and Name	Lecture hours per week	Credits	Page Number
DSCC-SO 101: Classical Sociology	5	4	3
DSCC-SO 102: Sociology of Indian Society	5	4	6
DSCC-SO103: Contemporary Sociological Theories	5	4	9
DSCC-SO 104: Indian Sociological Perspectives	5	4	11
DSCC-SO 105: Recent Trends in Sociological Theorising	5	4	13
DSCC-SO 106: Political Sociology	5	4	15
DSCC-SO 107: Sociology of Social Stratification	5	4	18
DSCC-SO 108: Philosophy of Social Sciences	5	4	20

Optional Courses

Course Number and Name	Lecture hours per week	Credits	
DSOC- SO 201 Agrarian Social Structure in India	5	4	22
DSOC-SO 202: The Indian Diaspora	5	4	26
DSOC-SO 203: Education and Society	5	4	29
DSOC-SO 204: Understanding Goa	5	4	31
CSSEIP 204: Social Exclusion: Theories, Concept, and Policies	5	4	34

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SYLLABUS OF THE M. A. SOCIOLOGY PROGRAMME

COMPULSORY COURSES

Programme: M. A. (Sociology)

Course Code: DSCC-SO 101 **Title of the Course**: Classical Sociology

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	As the advanced studies in Sociology begin with this course there are no prerequisites.	
Objectives:	The main focus of this course is to introduce students to the theories and perspectives of the major founders of sociological thought: Karl Marx, Max Weber, and Emile Durkheim. The course will invite students to engage with theory through examining its application to contemporary concerns, and issues they may be familiar with. The attempt is to make the discussion relevant and inviting students to re-examine their perception about sociological theory.	
Content:	1. Introduction - Background for the emergence of Sociology, Organicism of Herbert Spencer, Positivism of Saint Simon and Auguste Comte	12 hours
	2. Karl Marx - Marx's Conception of Society: Historical and Dialectical Materialism, Alienation of Labour, Class Conflict	12 hours
	3. Max Weber - Verstehen, Protestant Ethics and the Spirit of Capitalism, Authority, Bureaucracy	12 hours
	4. Emile Durkheim - The Division of Labour, Rules of Sociological Method, Theory of Suicide, Elementary Forms of Religious Life	12 hours
	5. Differing perspectives - Feminist critique of classical theory, Gandhi and Hind Swaraj	12 hours
Pedagogy:	Lectures, discussions, tutorials, student presentations	
References/Readings:	1. Adams, Bert N. Rosalind Ann Sydie and R. A. Sydie. 2001. *Sociological Theory.* California: Sage Publications. 2. Allan, Kenneth and Kenneth D. Allan.2009. *Explorations in Classical Sociological Theory: Seeing the Social World.* California: Pine Forges Press. 3. Aron, Raymond. 1967 (1982 reprint). *Main Currents in Sociological thought, (Two Vols.).* Middlesex: Penguin Books.	

	4. Calhoun, Craig J.2002. Classical Sociological Theory. Hoboken, NJ: Wiley-Blackwell. 5. Coser, Lewis, A. 1977. *Masters of Sociological Thought.* Harcourt: Brace Jovanovich. 6. Craib, Ian. 1997. *Classical Sociological Theory.* U.K.: Oxford University Press. 7. Giddens, Anthony. 2006. *Capitalism and Modern Social Theory.* U.K: Polity Press, (1971). 8. Edles, Laura and Desfor Scott Appelrouth. 2010. Sociological Theory in the Classical Era:Text and Readings. California: Pine Forge Press. 9. Isaksson, Anna.2000. Classical Sociology Through the Lens of Gendered Experiences Frontiers in Sociology https://doi.org/10.3389/fsoc.2020.532792 10. John, Hughes. 1995. *Understanding Classical Sociology.* London: Sage Publications Publication. 11. Kimmel, Michael S. 2007. *Classical Sociological Theory.* New York: Oxford University Press. 12. Marx, Karl and Engels, Frederick. 1982. *Selected Works*. Moscow: Progress Publishers. 13. Morrison, Ken. 1995. *Marx, Durkheim, Weber: Formations of Modern Social Thought.* London: Sage Publications. 14. Ritzer, George. 2007.Sociological Theory. New York: McGraw-Hill. Pine Forge Press. 15. Turner, Jonathan H.2007. *Handbook of Sociological Theory.* New York: Springer. Films: 16. Charlie Chaplin: *Modern Times* (1936) 17. Akira Kurosawa: *Rashomon* (1950)	
Learning outcomes:	1. Students will identify sociology as the discipline that emerged to make sense of modernity. 2. Will have a critical and comparative understanding of the methodological preferences and empirical concerns of the founders of sociology as a distinctive discipline.	

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Programme: M. A. (Sociology)

Course Code: DSCC-SO 102 **Title of the Course**: Sociology of Indian Society

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	No prerequisites are identified as this is an invitation to sociologically approaching Indian society.	
Objectives:	This course is an introduction to the sociology of Indian society. It traces the origin of sociological tradition in India, examines the concerns and contributions of the pioneers. It illustratively reviews the works of scholars presenting the field-view (as contrasted from the book-view) of Indian society.	
Content:	1. Emergence and growth of Sociology in India: Approaches, Ambedkar's approach to Indian soceity.	8 hours
	2. Contribution of pioneers: D. P. Mukerji, D. N. Majumdar, Radhakamal Mukerjee	12 hours
	3. Field view of caste: Problematizing caste, Caste in modern India.	10 hours
	4. Field view of Indian village: Critical analyses of village, Transformations in Villages.	10 hours
	5. Field view of kinship and marriage**:** Kinship organization in India, Kinship and marriage in contemporary India.	10 hours
	6. Field view of Tribes: Tribes in transition, Contemporary issues.	10 hours
Pedagogy:	Lectures, discussion, field- based assignments and presentations	
References/Readings:	1. Ambedkar, B. R. 2002. 'Annihilation of Caste' in *The Essential Writings of B. R. Ambedkar by V. Rodrigues.* New Delhi: Oxford University Press. 2. Ambedkar, B. R. 2002. 'Castes in India' in *The Essential Writings of B. R. Ambedkar* by V. Rodrigues. New Delhi: Oxford University Press. pp. 241-260 3. Bose, N. K. 1975. *The Structure of Hindu Society.* Delhi: Orient Longman. 4. Cohn, B. S. 1987. *An Anthropologist among Historians.* Delhi: Oxford University Press. 5. Deshpande, Satish. 2003. *Contemporary India: A Sociological View*. Delhi: Penguin Books.	

6. Dhanagare, D.N. 1993. *Themes and Perspectives in Indian Sociology.* Jaipur and New Delhi: Rawat Publications.
7. Dumont, L. 1980. *Homo Hierarchicus.* University of Chicago Press.
8. Ghurye, G.S. 1963. *The Scheduled Tribes.* Bombay: Popular Prakashan.
9. Karve, Irawati. 1990. *Kinship Organization in India.* Bombay: Munshiram Manoharlal Publishers.
10. Madan, T. N. 2011. *Sociological Traditions: Methods and Perspectives in the Sociology of India.* New Delhi: Sage Publications.
11. Madan, T.N. 2000. *Pathways: Approaches to the Study of Society in India.* New Delhi: Oxford University Press.
12. Marriott, M. (Ed.). 2017. *Village India: Studies in the Little Community.* Delhi: Asia Publishing House.
13. Mayer, A. 1960. *Caste and Kinship in Central India.* London: Routledge and Kegan Paul.
14. Oomen, T.K. and Mukherjee, P. N. (Eds.) 1986. *Indian Sociology: Reflections and Introspections.* Bombay: Popular Prakashan.
15. Robinson, R. (2007). Outlining Trends of Social Change in Marriage and the Family: An Analysis of the Urban Indian Service Class. *Indian Anthropologist*, *37*(2), 1–16.
16. Singh, Yogendra. 1986. *Indian Sociology: Social Conditioning and Emerging Trends.* New Delhi: Vistar.
17. Singh, Yogendra. 1988. *Modernisation of Indian Tradition: A Systemic Study of Social Change*. Jaipur: Rawat Publications.
18. Singh, Yogendra. 2000. *Culture Change in India*. Jaipur: Rawat Publications.
19. Srinivas, M. N. and M. N. Panini. 1973. 'The Development of Sociology and Social Anthropology in India', *Sociological Bulletin,* 22 (2): 179-215.
20. Srinivas, M. N. 1987. *The Dominant Caste and Other Essays.* Delhi: Oxford University.
21. Srinivas, M. N. 2005. *Cast: Its Twentieth Century Avatar.* New Delhi: Viking Penguin.
22. Uberoi, Patricia, Nandini, Sundar, Satish, Deshpande (eds). 2010. *Anthropology in the East: Founders of Indian Sociology and Anthropology.* Delhi: Permanent Black.

	23. Uberoi, Patricia. 1999. *Family, Kinship and Marriage in India.* New Delhi: Oxford University Press 24. Xaxa, Virginius. 2003. 'Tribes in India', in Veena, Das. *Oxford India Companion to Sociology and Social Anthropology (Volume I).* New Delhi: Oxford University Press. 25. Xaxa, Virginius. 2005. Politics of Language, Religion and Identity: Tribes in India. *Economic and Political Weekly*, *40*(13), 1363–1370. 26. Xaxa, Virginius. 1999. Transformation of Tribes in India: Terms of Discourse. *Economic and Political Weekly*, *34*(24), 1519–1524.	
Learning outcomes:	Students will get disciplinary and interdisciplinary ideas on the Sociology of Indian Society as a preparation to discern the perspectives on Indian society and culture.	

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Programme: M. A. (Sociology)

Course Code: DSCC-SO 103

Title of the Course: Contemporary Sociological Theories

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	An understanding of Classical Sociology is a prerequisite to study this course.	
Objectives:	This course is intended to introduce students to the schools of thought that have dominated sociology in the latter half of the 20th century. The course will examine the theoretical relevance and analytical utility of the premises, methodology, and conclusions of these diverse theoretical schools in understanding social structure and change.	
Content:	1. Nature of sociological theory	2 hours
	2. Functional theory in sociology: Parsons, Merton, Neo-Functionalism	10hours
	3. Structural theory in Anthropology	10 hours
	4. Conflict theory and Critical theory	10 hours
	5. Symbolic interactionism	8 hours
	6. Phenomenology and Ethnomethodology	10 hours
	7. Neo-Marxism	5 hours
	8. Feminist sociological theory	5 hours
Pedagogy:	Lectures, discussions and presentations	

References/Readings:	1. Alexander, Jeffrey C. 1987. *Twenty Lectures: Sociological Theory since World War II.* New York: Columbia University Press. 2. Appelrouth, Scott and Edles, D. 2008. *Classical and Contemporary Sociological Theory: Text and Readings.* California: Pine Forge Press. 3. Collins, Randall. 1997. *Sociological theory (Indian Edition).* Jaipur and New Delhi: Rawat Publications. 4. Connerton, Paul. (Ed.). 1976. *Critical Sociology*. Harmondsworth: Penguin. 5. Craib, Ian. 1992. *Modern Social Theory: From Parsons to Habermas (2nd edition).* London: Harvester Press. 6. Ritzer, George. 1992. *Sociological theory (3rd edition).* New York: McGraw-Hill. 7. Turner, Jonathan H. 1995. *The Structure of Sociological Theory (4th edition).* Jaipur and New Delhi: Rawat Publications. 8. Zeitlin, Irving M. 1998. *Rethinking Sociology: A Critique of Contemporary Theory (Indian Edition).* Jaipur and New Delhi: Rawat Publications. 9. Chafetz Janet Saltzman. 1997. Feminist Theory and Sociology: Underutilized Contributions for Mainstream Theory. *Annual Review of Sociology*, 1997, Vol. 23 (1997), pp. 97-120	
Learning outcomes:	After studying the advances in sociological theorising in the 20th century the students can recognise continuity and novelty in sociological theory building enterprises.	

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X AC- 9 (Special)
30.07.2022

Programme: M. A. (Sociology)

Course Code: DSCC-SO 104 **Title of the Course**: Indian Sociological Perspectives

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	No prerequisites for this course.	
Objectives:	The course primarily focuses on the different theoretical perspectives on Indian Society from late 19th century to the end of 20th century and their role in shaping the field of sociology. It helps the students to acquire a fairly adequate and comprehensive understanding of Indian society in its multi-faceted dimensions.	
Content:	1. Conceptualising Indian Society	5 hours
	2. Indological/Textual Perspective: G. S. Ghurye, Louis Dumont	10 hours
	3. Structural-Functional Perspective: M. N. Srinivas, S. C. Dube	12 hours
	4. Marxist Perspective: D.P. Mukerji, A. R. Desai	10 hours
	5. Subaltern Perspectives: David Hardiman, Ranajit Guha	10 hours
	6. Feminist Perspectives	5 hours
	7. Re-imagining sociology in India, Sociology for/of/in India	8 hours
Pedagogy:	Lectures, discussions and presentations	
References/Readings:	1. Bose. N. K. 1988. *Cultural Anthropology and Other Essays.* Calcutta: Indian Associated Publishing Company 2. Das, V. 1993. Sociological Research in India: The State of Crisis. *Economic and Political Weekly*, *28*(23). http://www.jstor.org/stable/4399815 3. Desai, A. R. 1975. *State and Society in India.* Bombay: Popular Prakashan. 4. Deshpande, S. 1994. Crisis in Sociology: A Tired Discipline? *Economic and Political Weekly*, *29*(10), 575–576. http://www.jstor.org/stable/4400900 5. Dhanagare, D. N. 1993. *Themes and Perspectives in Indian Sociology.* Jaipur and New Delhi: Rawat Publications. 6. Dube, Leela. 1986. *Visibility and Power: Essays on women in Society and Development*. Delhi: Oxford University Press 7. Dube, S. C. 2003. *India's Changing Villages: Human Factors in Community Development.* London: Routledge and Kegan Paul.	

	8. Dube, S. C. 2005. *Indian Society.* Mumbai: National Book Trust 9. Dumont, Louis. 1970. *Homo Hierarchicus: The Caste System and its Implications.* Delhi: Oxford University Press. 10. Ghurye, G. S. 2005. *Caste and Race in India.* Bombay: Popular Prakashan. 11. Guha, Ranajit. 1982. 'Introduction' in *Subaltern Studies* Vol. I. 12. Hardiman, D. 1996. *Feeding the Baniya: Peasants and Usurers in Western India*. Delhi: Oxford University Press 13. Hardiman, D. 2011. *Histories for the subordinated*. Delhi: Oxford University Press 14. Madan, T. N. 2011. Sociological Traditions: Methods and Perspectives in the Sociology of India. New Delhi: Sage Publications. 15. Madan, T. N. 1978. *Dialectic of Tradition and Modernity in the Sociology of D. P. Mukherji.* Lucknow: Manohar Publications. 16. Rege, Sharmila, 1998 'Dalit Women Talk Differently: A Critique of 'Difference' and towards a Dalit Feminist Standpoint Position', in *Economic and Political Weekly,* Vol. 33, No. 44 *17.* Rege, Sharmila. 2003. *Sociology of Gender: The Challenge of Feminist Sociological Thought.* New Delhi: Thousand Oaks 18. Singh, Yogendra. 1986. *Indian Sociology: Social Conditioning and Emerging Trends.* New Delhi: Vistar. 19. Srinivas, M. N. 1995. *Social Change in Modern India.* New Delhi: Orient Longman.	
Learning outcomes:	Students get a critical appraisal of sociological perspectives on Indian society and culture and can utilise this knowledge in pursuing their own explanations and/or interpretations.	

Programme: M. A. (Sociology)

Course Code: DSCC-SO 105 **Title of the Course**: Recent Trends in Sociological Theorising

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	The students should have studied SOC 01 Classical Sociological Theories.	

Objectives:	This course traces the development of sociological theory in the later part of the 20th century until present times. Focussing mainly on the theories of late modernity, the course acquaints the students with developments in Sociological theory in recent times.	
Content:	1. Modernity, Conventional sociological theory, and dualisms.	8 hours
	2. Agency–Structure and micro-macro integration: Structuration theory of Anthony Giddens, Pierre Bourdieu's theory of Practice, Jurgen Habermas' 'Colonisation of the Life World' thesis, Norbert Elias' Process Sociology	16 hours
	3. Contemporary theories of modernity: Giddens and the Juggernaut of modernity, Ritzer's McDonaldisation thesis, Bauman on Holocaust, Beck's Risk Society thesis.	16 hours
	4. Post structuralism and post modernism	10 hours
	5. Theorising Contemporary India	10 hours
Pedagogy:	Lectures, discussions, and presentations	
References/Readings:	1. Adams, Bert, N. and Sydie R. A. 2001. *Sociological Theory*. New Delhi: Vistar Publications. 2. Boron, Atilio. 1999. 'A Sociological Theory for the 21st Century?' in *Current Sociology.* October 47, pp. 47-64. 3. Bourdieu, Pierre. 1977. *Outline of a Theory of Practice.* London: Cambridge University Press. 4. Das, Veena. 1995. *Critical Events: An Anthropological Perspective on Contemporary India.* New Delhi: Oxford University Press. 5. Giddens, Anthony and Jonathan H. Turner (Eds.) 1987. *Social Theory Today.* Stanford: Stanford University Press. 6. Giddens, Anthony. 1984. *The Constitution of Society: Outline of the Theory of Structure.* Berkley: University of California Press. 7. Habermas, Jurgen. 1987. *The Philosophical Discourses of Modernity: Twelve Lectures.* Mass.: MIT Press. 8. Layder, Derek. 1994. *Understanding Social Theory.* London: Sage Publications. 9. Ritzer, George. 1996. *Modern Sociological Theory.* New York: McGraw-Hill Companies. 10. Scott, Lash. 1990. *Sociology of Postmodernism.* London: Routledge. *11.* Singh, Yogendra. 1988. *Modernization of Indian Tradition*. New Delhi: Rawat Publication. 12. Uberoi, Patricia, Sunder, Nandini, and Deshpande, Satish. 2007. *Anthropology in the East: Founders of Indian Sociology and Anthropology,* Delhi: Permanent Black.	

Learning outcomes:	Students get a critical understanding of attempts at bridging the gap between theoretical dualisms in social theory, and the knowledge of the competing discourses on the nature of modernity, late modernity and post-modernity.	

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Programme: M. A. (Sociology)

Course Code: DSCC-SO 106 **Title of the Course**: Political Sociology

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	The students should have a basic knowledge of contemporary political scenario in India and Goa. They should also have studied SOC 02 Sociology of Indian society.	
Objectives:	After introducing the sub-discipline of political sociology, the course introduces some basic concepts. It situates itself at the interface of society and polity in post-independent India. The objective is to equip the students with a critical understanding of the contemporary processes of socio-political changes and also touches upon some of the problematic aspects of the enterprise of nation-building.	
Content:	1. Introduction and Overview of the Course- Definition and Origin of Political Sociology, and Political Sociology in a Globalized and Complex World.	10 hours
	2. Basic Concepts: Power and authority, Elite and masses, Hegemony, Nation-state.	10 hours
	3. Tradition, Modernity and Democratic Politics: Structural Constrains and Social Churnings of Caste, Religion, Language, Ethnicity	15 hours
	4. Nationalism, Multi-culturalism and Citizenship: The Politics of Recognition/ Representation	10 hours
	5. Dialectics of State and Civil Society: State and civil society - The Indian Experience, Challenges to Nation Building, Nation as an imagined community	15 hours
Pedagogy:	Lectures, discussions, book reviews, debates and presentations	

References/Readings:	1. Baxi, Upendra and Bhikhu, Parekh. 1995 (Eds.). *Crisis and Change in Contemporary India.* New Delhi: Sage Publications. 2. Bottomore T. B. 1968*. Elites and Society*. Britain: Penguin Book. 3. Brass, Paul, R. 1992. *The Politics of India since Independence*. London: Cambridge University Press. 4. Chandra, Bipin.1984 *Communalism in Modern India*. New Delhi: Vikas Publishing 5. Chatterjee, Partha (Ed.) 1997. *State and Politics in India*. New Delhi: Oxford University Press. 6. Chatterjee, Partha. 1993. *The Nation and its Fragments.* New Delhi, Oxford University Press. 7. Corbridge, Stuart et. al. 2005. *Seeing the State: Governance and Governmentality in India.* Cambridge: Cambridge Univ. Press. 8. Drake, Michael. 2010. Political Sociology for a Globalized World (Ch1 pp. 3-24: "Political Sociology and Social Transformation.) U.S.A: Polity Press. 9. Fraser, Nancy. 1990. *Rethinking the Public Sphere: A Contribution to the Critique of Actually Existing Democracy.* Durham: Duke University press. Pp. 56-80. 10. Fazal, Tanweer.2015. *Nation-state and Minority Rights in India.* London: Routledge. 11. Gramsci, A. (1971) *Selections from the Prison Notebooks.* New York: International Publishers. 12. Gupta, Dipankar.1995. *Political Sociology*. New Delhi: Orient Longman House. 13. Jayaram, N. 2005. *On Civil Society: Issues and Perspectives.* New Delhi: Sage Publications. 14. Kaviraj, Sudipta. 1997. *State and Politics in India*. New Delhi: Oxford University Press. 15. Kothari, Rajani. (Ed.). 1973*. Caste and Indian Politics.* Delhi: Oxford Longman. 16. Marshall, T.H, Citizenship and social Class in J. Manza and M. Sauder ed. Inequality and Society, New York: W.W Norton, 2009 17. Mills, C. W. 1956. *The Power Elite.* New York: Oxford University Press. 18. Pareto, V. 1985. *The Mind and Society.* New York: Dover Publications. pp. 1421-1432. 19. Rudolph, Lloyd. 1987. *In the Pursuit of Lakshmi: The Political Economy of the Indian State.* Hyderabad: Orient Longman.	

	20. Sills, David L (Ed). *International Encyclopaedia of Social Sciences.* Vol 12. Macmillan Co & The Free Press. 21. Srinivas, M. N. 1972. *Social Change in Modern India.* New Delhi: Orient Blackswan Private Limited. 22. Taylor, Graham. 2010. *The New Political Sociology: Power, Ideology and Identity in an Age of Complexity. (*U.K: Palgrave Macmillan.	
Learning outcomes:	The students will get analytical knowledge of power relations in relation to democratic politics in India and facilitate them to take informed decisions while participating in it as citizens.	

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Programme: M. A. (Sociology)
Course Code: DSCC-SO 107 **Title of the Course**: Sociology of Social Stratification

Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites for the course:	The students should have studied SOC 02 Sociology of Indian Society.	
Objectives:	This course aims to introduce students to the major theories of inequality and social stratification. It will give a comprehensive, integrated and empirical understanding of social stratification in India while discussing various dimensions of social stratification like caste, gender, and class.	
Content:	1. Important concepts: Social differentiation, Hierarchy and inequality, social stratification, social exclusion and inclusion.	10 hours
	2. Theories of stratification: Functional theory (Kingsley Davis & W. E. Moore), Marxist theory (Karl Marx), Weberian theory (Max Weber)	20 hours
	3. Forms of stratification: Estate, Class, Varna and Caste (M. N. Srinivas), Tribal identity and class differentiations (Ghanshyam Shah)	15 hours
	4. Social mobility: P. A. Sorokin on social mobility, social mobility in contemporary times.	15 hours
Pedagogy:	Lectures, discussions, field visits, and presentations	
References/Readings:	1. Acker, J. 1998. 'Women and Social Stratification: A Case of Intellectual Sexism', in Kristen *et. al.* (Eds.) *Feminist Foundations: Towards Transforming Sociology*, Delhi: Sage Publications. 2. Ambedkar, B. R. 1916. ´Castes in India: Their Mechanism, Genesis and Development', Anthropology Seminar of Dr.	

	A. A. Goldenweizer at The Columbia University, New York, U.S.A. on 9th May 1916, Source: Indian Antiquary, May 1917, Vol. XLI, 1916. 3. Beteille, A. 1977. *Inequality among Men.* Oxford: Basil Blackwell. 4. Crompton, R. and Mann, M. (Eds.). 1986. *Gender and Stratification*. Cambridge: Polity Press. 5. Das, Veena. 2003. *The Oxford Companion to Sociology and Social Anthropology*. New Delhi: Oxford University Press. 6. Davis, K. & W. E. Moore. 1945. 'Some Principles of Stratification'. *American Sociological Review*. 10(2): 242. 7. Fuller, C.J. 1996. *Caste Today.* Delhi: Oxford University Press. 8. Giddens, A 1973. *The Class Structure of Advanced Societies*. London: Hutchinson. 9. Grusky, D. 1994. *Social Stratification: Race, Class, and Gender in Sociological Perspective.* Colorado: Westview Press, 10. Gupta, D. (Ed.) 1991. *Social Stratification.* Delhi: Oxford University Press. 11. Haralambos, M. and Holborn, M. 2010. *Sociology: Themes and Perspectives.* Delhi: Oxford University Press. 12. Marx, Karl and Frederick Engels. 1959. *Selected Work (3 vols.), vol. 1*. Moscow: Progress Publishers.	
Learning outcomes:	The students will realise how inequality and stratification are socially constructed and reproduced and not divinely ordained or biologically determined.	

Programme: M. A. (Sociology)

Course Code: DSCC-SO 108

Title of the Course: Philosophy of Social Sciences

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:		
Objectives:	This paper seeks to familiarise the students with philosophical questions relating to the processes and procedures of knowledge production.	
Content:	1. Introduction: Philosophy and sociology, Scope of philosophy of social sciences, *Ideographic* and *Nomothetic* disciplines, *Emic* and *Etic* knowledge, Problems of concept and theory formation in the social sciences.	15 hours

	2. Positivism, causality and its critique: Science and common sense, Patterns of scientific explanation, 'Covering law model of explanation' and its critique, Reason-action explanation and its critique.	15 hours
	3. Hermeneutics, interpretation and subjectivity: Dilthey on hermeneutically oriented social sciences, Weber on the methodology of social sciences.	15 hours
	4. Values and social science knowledge production: The concept of 'value' and role of values in social inquiry, Weber on objectivity in social science and social policy.	12 hours
	5. Sociology of knowledge	3 hours
Pedagogy:	Lectures, discussions, book review, presentation	
References/Readings:	1. Benton, Ted and Craib, Ian. 2001. *Philosophy of Social Science: The Philosophical Foundations of Social Thought.* New York: Palgrave. 2. Bleicher, Josef. 1980. *Contemporary Hermeneutics: Hermeneutics as Method, Philosophy and Critique.* London: Routledge and Kegan Paul. 3. Hollis, Martin. 1994. *The Philosophy of Social Science: An Introduction.* Cambridge: Cambridge University Press. 4. Mahajan, Gurpreet. 1997. *Explanation and Understanding in the Human Sciences.* Delhi: Oxford University Press. 5. Mantzavinos, C. (Ed.). 2009. *Philosophy of the Social Sciences: Philosophical Theory and Scientific Practice.* Cambridge: Cambridge University Press. 6. Mukherji, Parth, Nath. 2000. *Methodology in Social Research: Dilemmas and Perspectives Essays in Honour of Ramkrishna Mukherjee*. New Delhi: Sage Publications Publications. 7. Nagel, Ernest. 1979. *The Structure of Science*. New Delhi: Macmillan. 8. Natson, Maurice. 1963. *Philosophy of the Social Sciences (A Reader)*. Random House: New Delhi. 9. Ryan, Alan. 1970. *The Philosophy of Social Sciences*. London: Macmillan.Truzzi, Marcello. 1974. *Verstehen: Subjective Understanding in the Social Sciences.* Philippines: Assison-Wesley Publishing Company, Inc.	
Learning outcomes:	After being introduced to the philosophical underpinnings of social science knowledge production, students can attempt achieving intellectual sophistication in their own research activities.	

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OPTIONAL COURSES

Programme: M. A. (Sociology)

Course Code: DSOC-SO 201

Title of the Course: Agrarian Social Structure in India

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	This course is open to all students who are pursuing their post graduate studies at Goa University.	
Objectives:	This course aims to familiarise students with the realities of rural India. It attempts to provide a background of agrarian studies and its growth in Indian Sociology. It provides a comprehensive understanding of agrarian structure and change in India under the impact of colonialism, planning, and the recent neo-liberalism.	
Content:	1. Emergence of agrarian studies as a subject of Sociological inquiry, Origin and Scope of rural sociology in India.	8 hours
	2. Evolution of agrarian social structure in pre-colonial and colonial India, Commercialisation of Agriculture, Commodification of land and De-peasantisation.	15 hours
	3. Agrarian Changes in post-Independent India: Land reforms, Green revolution, Agricultural productivity and regional disparity, Class differentiation and mode of production debate in Indian agriculture, Farmers' suicides.	20 hours
	4. Agrarian mobilisation and movements: Peasant mobilization and movements in colonial and post-colonial period and new farmers' movements.	12 hours
	5. Goa's Agrarian structure in transition	5 hours
Pedagogy:	Lectures, discussions, presentations, documentaries, and field visits	
References/Readings:	1. Axelrod, Paul, and Michelle A. Fuerch. 1998. 'Portuguese Orientalism and the Making of the Village Communities of Goa', *Ethnohistory*, Vol. 45 (3). pp. 439-476. 2. Beteille, Andre. 1974. *Six Essays in Comparative Sociology*, New Delhi: Oxford University Press. 3. Beteille, Andre. 1974. *Studies in Agrarian Social Structure*, New Delhi: Oxford University Press. *4.* Brass, T. 2013. *New Farmers Movements in India*, New York: Routledge. 5. D'Souza, B. G. 1975. *Goan Society in Transition: A Study in Social Change*, Bombay: Popular Prakashan. 6. D'Souza, T. R. 1979. *Medieval Goa: A Socio-economic history.* New Delhi: Concept Publishers. 7. Desai, A. R. (Ed.) 1979. *Peasant Struggles in India.* Bombay: Oxford University Press.	

	8. Desai, A. R. 2008. *Rural Sociology in India (New Edition)*. Bombay: Popular Prakashan. 9. Deshpande, V. and Arora, S (Eds.). 2010. *Agrarian Crisis and Farmer Suicides.* New Delhi: Sage Publications. 10. Dhanagare, D. N 1988. *Peasant Movements in India.* New Delhi: Oxford University Press. 11. Dhanagare, D. N. 1987. 'The Green Revolution and Social Inequalities in Rural India', *Bulletin of Concerned Asian Scholars*, Vol.20 (2), pp. 2-13. 12. Frankel, F. R. 1971. *India's Green Revolution: Economic Gains and Political Costs*. Bombay: Oxford University Press. 13. Government of Goa. 2022. *Economic Survey 2020-2021*. Porvorim: Directorate of Planning, Statistics and Evaluation. 14. Joshi, P. C. 1975. *Land Reforms in India: Trends and Prospect*. Bombay: Allied Publishers. 15. Mohanty, B. B (Ed.) 2012. *Agrarian Change and Mobilisation*. New Delhi: Sage Publications. 16. Mohanty, B. B. 2005. 'We are Like the Living Dead: Farmer Suicides in Western India', *The Journal of Peasant Studies*, Vol. 32 (2), pp.243-276. 17. Mohanty, B. B. 2009. 'Regional Disparity in Agricultural Development of Maharashtra', *Economic and Political Weekly*, Vol. 44 (6), 63-69. 18. Roy Burman, B. K, Singh, Y., Oommen, T. K., Joshi, P. C., and Dube, S. C. 1974. 'Land Reforms in a Sociological Perspective', *India International Centre Quarterly*, Vol. 1(1), pp. 51-68. 19. Rudra, Ashok. 1978. 'Class Relations in Indian Agriculture', *Economic and Political Weekly*, Vol. 13 (22, 23, 24), pp. 916-22, 963-68, 998-1004. 20. Sarkar, S. 2015. 'Beyond Dispossession: The Politics of Commodification of Land under Speculative Conditions', *Comparative Studies of South Asia Africa and the Middle East,* Vol.35 (3), pp. 438-450. 21. Sharma, K. L. (Ed.). 2014. *Sociological Probing of Rural Society.* New Delhi: Sage Publications. 22. SinghaRoy, D. K. 2005. 'Peasant Movements in Contemporary India: Emerging Forms of Domination and Resistance', *Economic and Political Weekly*, Vol.40 (52), pp. 5505-5513. 23. Singh, S and Bhogal, S. 2014. 'Depeasantization in Punjab: Status of farmers who left farming', *Current Science,* Vol. 106 (10). pp. 1364- 1368. 24. Thakur, M. 2014. *Indian Village: A Conceptual History.* New Delhi: Rawat Publications Publishers. 25. 'Special issue on New Farmers' Movements in India'. 1994. *The Journal of Peasant Studies*, Vol. 21 (3&4).	
Learning outcomes:	The students will get theoretical and empirical knowledge of the past and present rural scenarios in India and Goa.	

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Programme: M. A. (Sociology)

Course Code: DSOC-SO 202 **Title of the Course**: The Indian Diaspora

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	This course is open to all students who are pursuing their post graduate studies at Goa University.	
Objectives:	This course is intended to introduce the students to the Indian diaspora as an area of sociological study. It describes the socio-historical background of Indian diaspora, analyses the processes of change and continuity among the diasporic Indians. While examining the issues confronting them, it discusses the mutual orientations of the diasporic Indians and India. The course concludes with an analysis of various dimensions of the Goan diaspora.	
Content:	1. Sociology of Diaspora: The concept diaspora, Approaches to the study of diaspora, Scope and significance of diasporic studies.	10 hours
	2. Historical background of the Indian diaspora: Pre-colonial: Trade, and spread of religion, Colonial: The indentured system, Post-colonial: Brain-drain and skill-drain.	10 hours
	3. The Indian Diaspora: Case studies - The Caribbean, Fiji, Malaysia, South Africa, Mauritius, UK and US.	15 hours
	4. Diaspora and the Homeland: Political Impact, Remittance economy, Influence of/on Indian Cinema.	15 hours
	5. Goa and its diaspora: A Socio historical account, Case Studies of the Goan Diaspora.	10 hours
Pedagogy:	Lectures, discussions, presentations, field visits and case studies	
References/Readings:	1. Basu, Sudeep. 2016. "Diasporas Transforming Homelands: Nuancing 'Collective Remittance' Practices in Rural Gujarat". *Economic and Political Weekly*. Vol. 51(41). pp. 54-62. 2. Baumann, Martin. 2000. "Diaspora: Genealogies of Semantics and Transcultural Comparison". *Numen*. Vol. 47(3). pp. 313-337. 3. Carvalho, Selma. 2010. *Into the Diaspora Wilderness- Goa's Untold Migration Stories from*	

the British Empire to the New World. Panjim, Goa: Broadway Publishing.

4. Clarke, Colin, Ceri Peach and Steven Vertovec (Eds.). 1990. *South Asians Overseas.* Cambridge: Cambridge University Press.
5. Cohen, Robin. 2008. *Global Diasporas: An Introduction*. New York: Routledge.
6. D'Souza, Eugene J. 2000. "Indian Indentured Labour in Fiji". *Proceedings of the Indian History Congress.* Vol. 61. pp. 1071-1080.
7. Dabydeen, David and Brinsley Samaroo (Eds.). 1996. *Across the Dark Waters: Ethnicity and Indian Identity in the Caribbean.* London and Basingstoke: Macmillan Education.
8. Gosine, Mahin. (Ed.). 1994. *The East Indian Odyssey: Dilemmas of a Migrant People.* New York: Windsor Press.
9. Gracias da Silva, Fatima. 2000. "Goans Away from Goa: Migration to the Middle East". *Lusotopie*. pp. 423-432.
10. Jain, Ravindra K. 1993. *Indian Communities Abroad: Themes and Literature.* New Delhi: Manohar.
11. Jayaram, N. 1998. "Social Construction of the Other Indian: Encounters between Indian Nationals and Diasporic Indians". *Journal of Social and Economic Development*. Vol. 1. pp. 46-63.
12. Jayaram, (Ed.). 2004. *The Indian Diaspora: Dynamics of Migration.* New Delhi: Sage Publications.
13. Jayaram, N. (Ed.). 2011. *Diversities in the Indian Diaspora: Nature, Implications, Responses*. New Delhi: Oxford University Press.
14. Klass, Mortan. 1991. *Singing with Sai Baba: The Politics of Revitalisation in Trinidad.* Boulder, Colorado: Westview Press.
15. Kurian, George and Ram P. Srivastava (Eds.). 1983. *Overseas Indians: A study in Adaptation.* New Delhi: Vikas Publishing House.
16. Kurien, Prema. 2018. "Shifting U.S. Racial and Ethnic Identities and Sikh American Activism". *The Russell Sage Foundation Journal of the Social Sciences*. Vol. 4 (5). pp. 81-98.
17. Mascarenhas-Keyes, Stella. 2010. *Colonialism, Migration and the International Catholic Goan Community* .Saligao: Goa 1556.

	18. Oonk, Gijsbert (Ed.). 2007. *Global Indian Diasporas: Exploring Trajectories of Migration and Theory*. Netherlands: Amsterdam University Press. 19. Rao, M. S. A. (Ed.). 1986. *Studies in Migration: Internal and International Migration in India.* Delhi: Manohar Publications. 20. Sarma Hegde, Radha and Ajaya Kumar Sahoo (Eds.). 2018. *Routledge Handbook of the Indian Diaspora.* New York: Routledge. 21. Sahoo, Ajaya, K. (Ed.). 2017 *Mapping Indian Diaspora: Contestations and Representations.* New Delhi: Rawat Publications. 22. Sharma, S. L. 1989. "Special Issue on Indians abroad". *Sociological Bulletin*. Vol. 38 (1). 23. Sheffer, Gabriel. 2003. *Diaspora Politics: At Home Abroad*. England: Cambridge University Press. 24. Tinker, Hugh. 1993. *A New System of Slavery: The Export of Indian Labour Overseas, 1830-1920 (2nd edition).* London: Hansib Publishing Limited. 25. Vaz, Yvonne Ezdani. 2007. Songs of the Survivors. Saligao, Goa: Goa 1556. 26. Vertovec, Steven (Ed.). 1991. *Aspects of the South Asian Diaspora.* New Delhi: Oxford University Press.	
Learning outcomes:	The students will be aware of the extent of diaspora and its impact on the sending societies.	

Programme: M. A. (Sociology)
Course Code: DSOC-SO 203

Title of the Course:
Education and Society

Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites for the course:	Students from any branch of post graduate study are eligible for this course.	
Objectives:	This course will introduce students to the education system in India and relationship between education and society at various levels. The course focuses on the issues of quality education, access to education and social justice in Indian society.	
Content:	1. Introduction: Educational sociology or Sociology of education, Education and socialisation, History of education in India, Education policies in India.	15 hours
	2. Sociological perspectives on education: Classical perspectives, Liberal perspectives, Conflict perspectives.	15 hours
	3. Contemporary perspectives on education: De-schooling society (Ivan Illich), Cultural reproduction (Bourdieu), Knowledge and power (Foucault), Cultural hegemony (Gramsci), Feminist perspectives.	15 hours

	4. Education and contemporary issues: Right to Education Act Privatisation of education, Education and medium of instruction, NEP 2020 and Higher education in India.	15 hours
Pedagogy:	Lectures, discussions, presentations and field-based assignments	
References /Readings:	1. Banks, O. 1971. *Sociology of Education. (2nd Edition).* London: Batsford. 2. Bulle, N. 2008. *Sociology and Education: Issues in Sociology of Education.* New York: Peter Lang. 3. Dreze, J and Sen, A. 2013. *An Uncertain Glory: India and its Contradictions.* Princeton University Press. 4. Gore, M. S et al. (Ed.). 1975. *Papers on Sociology of Education in India.* New Delhi: NCERT. 5. Govinda, R. 2020. *NEP 2020. A Critical Examination*. 50 (4) 603-607 Social Change: Sage Publications. 6. Haralambos, M. 1980. *Sociology: Themes and Perspectives.* Delhi: Oxford University Press. 7. National Education Policy 2020: https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf. 8. Indira, R. (Ed.). 2013. *Themes in Sociology of Education.* New Delhi: Sage Publications. 9. Jayaram, N. 1990. *Sociology of Education in India*, New Delhi: Rawat Publications. 10. Krishna, Kumar. 2005. *Political Agenda of Education: A Study of Colonialist and Nationalist Ideas.* New Delhi: Sage Publications. 11. Patel, S. 2002. *History of Education Policy in India.* https://epgp.inflibnet.ac.in. *12.* Pathak, Avijit. 2004. *Social Implications of Schooling: Knowledge, Pedagogy and Consciousness.* New Delhi: Rainbow Publications. 13. Velaskar, P. 2013. '*Reproduction, Contestation and the Struggle for a Just Education in India'*, in S. Patel and T. Uys (Eds.), Contemporary India and South Africa: Legacies, Identities, and Dilemmas. New Delhi: Routledge.	
Learning outcomes:	While studying the sociological dimensions of educational practices students recognise gaps in policy implementations. Students will also be familiar with the sociological dimensions of New Education Policy 2020 with reference to Higher Education in India	

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Programme: M. A. (Sociology)

Course Code: DSOC-SO 204 **Title of the Course**: Understanding Goa

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	There are no pre-requisites for this course.	
Objectives:	The course is an invitation and introduction to study Goa, its society and historiography. While considering some social science perspectives in understanding societal transformations in Goa, the course hints that studying Goa can pose challenging and interesting questions for the social sciences.	
Content:	1. Introduction: Studying one's own society, Narratives on Goa.	5Hours
	2. Historiography of Goa: The *Skanda Puranna* and other myths of origin, Pre-Portuguese *Konkan* and its geo-politics, Formation of old and new conquests.	15 Hours
	3. Community Life in Goa: *Gaonkari* System in Goa, The dynamics of *Bhatkar-Mundkar* relationship, Estuarine production. Uniform Civil Code.	10 Hours
	4. Cultural and demographic shifts under Colonialism: The process of religious conversion, religious syncretism in Goa, Goa *Indica* and Goa *Dourada,* Trends of Migration.	15 Hours
	5. Post Liberation Goan Society: Goa's Democratic politics and shifts in power, The Education debate in Goa, Land reforms, Emergence of tourism industry.	15 Hours
Pedagogy:	Discussions, Lectures, Field visits and Presentations	
References/Readings:	1. Almeida, Jose C. 1967. *Aspects of Agricultural Activity in Goa, Daman and Diu*. Panaji: Government Printing Press. 2. Alvares, Claude. 2001. *Fish, Curry and Rice: A Citizen's Report on The Goan Environment.* Mapusa: The Other India Book Press. 3. Angle, P. 1994. *Goa: Concepts and Misconcepts.* Bombay: The Goa Hindu Association. 4. Axelrod, Paul, and Michelle A. Fuerch. 1996. "Flight of the Deities: Hindu Resistance in	

Portuguese Goa." *Modern Asian Studies*. Vol. 30(2). pp. 387-421.

5. Axelrod, Paul, and Michelle A. Fuerch. 1998. "Portuguese Orientalism and the Making of the Village Communities of Goa." *Ethnohistory* , Vol. 45 (3). pp. 439-476.
6. Bragança, Pereira. 2008. *Ethnography of Goa, Daman and Diu*. Tipografia Rangel, 1940 translated by Maria Aurora Couto. New Delhi: Penguin.
7. D'Souza, B. G. 1975. *Goan Society in Transition: A Study in Social Change*, Bombay: Popular Prakashan.
8. D'Souza, T. R. 1990. *Goa though the Ages* (Vol. II - An economic history). New Delhi: Concept Publishers.
9. D'Souza, T. R. 1979. *Medieval Goa: A Socio-economic history.* New Delhi: Concept Publishers.
10. Dantas, Norman (Ed.). 1999. *The Ttransforming of Go*a. Mapusa: The Other India Press.
11. Gune, V T. 1979. *Gazetteer of the Union Territory of Goa, Daman and Diu (Part I)*, Panaji: Gazetteer Department.
12. Kamat, Pratima. 1999. *Farar Far: Popular Resistance to Colonial Hegemony in Goa, 1510-1961.* Panaji: Institute Menezes Braganza.
13. Kosambi, D. D. 1975. *An Introduction to the Study of Indian History*. Bombay: Popular Prakashan.
14. Mascarenhas-Keyes, Stella. 2010. *Colonialism, Migration and the International Catholic Goan Community*. Saligao: Goa 1556.
15. Newman, Robert, S. 2001. *Of Umbrellas, Goddesses and Dreams: Essays on Goan Culture and Society.* Mapusa: The Other India Press.
16. Parobo, Parag. 2015. *India's First Democratic Revolution: Dayanand Bandodkar and the Rise of Bahujan in Goa*. New Delhi: Orient BlackSwan.
17. Rangel- Ribiero, Victor, Jose Lourenco and Salil Chaturvedi (Eds.). 2019. *Hanv Konn (Who Am I): Re-searching the Self.* Saligao: Goa 1556.

	18. Robinson, Rowena, 1998. *Conversion, Continuity and Change: Lived Christianity in Southern Goa.* New Delhi: Sage Publications. 19. Sahoo, Ajaya, K. (Ed.). 2017 *Mapping Indian Diaspora: Contestations and Representations.* New Delhi: Rawat Publications. 20. Siqueira, Alito. 2002. "Postcolonial Portugal, Postcolonial Goa: A Note on Portuguese Identity and its resonance in Goa and India". *Lusotopie*. pp. 211-213. 21. Trichur, Raghuraman, S. 2013. *Refiguring Goa: From Trading Post to Tourism Destination.* Saleigao, Goa: Goa 1556 22. Routledge, Paul. 2000. "Consuming Goa: Tourist Site as Dispensable Space." *Economic and Political Weekly.* Vol. 35 (30). pp. 2647-2656. 23. Rubinoff, Arthur G. 1992. "Goa's Attainment of Statehood". *Asian Survey*. Vol. 32 (5). pp. 471-487.	
Learning outcomes:	While getting a nuanced understanding of historical, sociological, and social-anthropological aspects of Goa, the students can pursue their research on sociological problems of their interest having Goa as their field.	

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Programme: M. A. (Sociology)

Course Code: CSSEIP 204

Title of the Course: Social Exclusion: Theories, Concept, and Policies

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the Course:	Students of any discipline can Choose for this Course.	
Objective:	This course will introduce the concepts of social exclusion inequality and poverty. The course deals with theoretical discussions on social exclusion and the policies of inclusion of marginalized groups.	

Content:	1. Concepts of Social Exclusion and Inclusive Policy: Histories and Meanings of the Terms-Social Exclusion and Inclusion; Political, Social, Economic, and Cultural dimensions of social exclusion and inclusion.	15 hours
	2. Poverty and Dimensions of social exclusion: Human Rights Approach; Deprivation; Globalization, Poverty and Processes of Social Exclusion; The Language of Exclusion; Unemployment and Exclusion; Policy Issues: Democracy and Political Participation; Diversity of Exclusions.	15 hours
	3. Social Exclusion and Marginalization: religion, race, caste, gender, ethnicity, class, region, culture, language, disability, migration, and forced migration.	15 hours
	4. Socially Exclusion and Inequality: Concepts and Strategies for Combating Social Exclusion; Equality, Inequality; Capability; Post-industrial Structuralism; Norm of structural exclusion; Social Exclusion and Inequality: Challenges before a Developing Society; Inequality, Poverty and Social Exclusion in India; Challenging gender inequality and social exclusion;	15hours
Pedagogy:	Lectures, discussions, presentations, and assignments.	
References/Readings:	1. Chebolu, & Radha Mohan. (2007). *Corporate Quotas: The Myth Action'. Pravartak.* 2. Atal, Yogesh, (2003), Managing Multiplicity: The Insider - Outsider Duality Ideological Dimension, Social Exclusion: Essays in HonourVolume-I), (A. Lal, Ed.) New Delhi: Concept Publishing Company. 3. Beall, J. (2002). *Globalization and Social Exclusion in Cities: Framing the Debate with Lessons from Africa and Asia.* London: Development Studies Institute. 4. Buvinic, M. A. (2005). Gender and Social Inclusion: Social Policy Perspectives from Latin America and the Caribbean. *Arusha Conference.* 5. Buvinic, Mayra and Jacqueline Mazza, (2005), Gender and Social Inclusion: New Frontiers of Social Policy. 6. David. (1999). *Social Exclusion.* Buckingham: Open University Press. 7. Evans, R. A. (2006). *Inclusion, Social Networks, and Resilience: Strategies, Practices, and Outcomes for Disabled Children and their Families.* Social Policy and Society 8. Haan, & Arjan de. (2001) *Social Exclusion: Enriching the Understanding of Deprivation, Institute of Development Studies and Poverty Research Unit.* UK: University of Sussex. 9. Jenkins, R. (2006) *Social Exclusion of Scheduled Caste Children from Primary Education in India.* New Delhi: UNICEF India	

	10. Kabeer, N. (2006)*Social Exclusion and the MDGs. The Challenge of 'Durable Inequalities, in the Asian Context.* Institute of Development Studies and Overseas 11. Kothari, R. (2003) *Social Exclusion: Historical, Institutional and Ideological Dimensions, Social Exclusion: Essays in Honour of Dr. Bindeswar Pathak* (Vols. Volume-I.). (A.K. Lal, Ed.) 12. Kurzhan, R. A. (2001). *Evolutionary Origins of Stigmatization: The Functions of Social Exclusion,* (Vols. Vol. 127,). America: Psychological Bulletin. 13. Loury, G. (2000). Social Exclusion and Ethnic Groups: The Challenge to Economics. *Annual World Bank Conference on Development Economics 1999. The International Bank for Reconstruction and Development! The World Bank.* 14. O'Brien, Wilkes, D. J., de Haan, A., & Maxwell, S. (1997), *Poverty and Social Exclusion in North and South, University of Sussex UK.* UK: Institute of Development Studies and Poverty Research Unit, University of Sussex 15. Prasad, R.R. (2003) Social Exclusion: Concept, Meaning, and Scope. Ideological Dimensions, Social Exclusion: EssaNew Delhi: Concept Publishing Company. 16. Saavedra, J. M. (2002). *Social Exclusion in Peru: An Invisible Wall.* Lima Peru: Grupo de Analisis para el Desarrollo 17. Saith, R. (2001). Social Exclusion: The Concept and Application to Developing Countries, . QEH Working Paper Series -72. 18. sen, A. (2000) *Social Exclusion: Concept, Application, and Scrutiny.* Manila, Philippine: Asian Development Bank. 19. sen, A. (1992). *Inequality Re-examined.* New Delhi: Oxford University Press. Byrne. 20. Sen, A. K. (2007) *Social Exclusion. Development in Practice.* Published online. 21. Silver, Hilary, & Miller, S. M. (2003) *Social Exclusion: The European Approach to Social Disadvantage, Poverty & Race.* Washington: Research Action Council. 22. Sullivan, & Elizabeth. (2002) *Social Exclusion, Social Identity, and Social Capital: Reuniting the Global, the Local and the Personal,* UK: De Montfort Universit	
Learning Outcomes:	While being sensitised to the prevalence and magnitude of social exclusion students grasp the ways and means of social inclusion.	

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D 3.7 Minutes of the Board of Studies in Public Administration meeting held on 01.07.2022.

Annexure I

GOA UNIVERSITY
Sub P.O. Goa University, Taleigao Plateau, Goa 403 206

PUBLIC ADMINISTRATION PROGRAMME
MANOHAR PARRIKAR SCHOOL OF LAW, GOVERNANCE & PUBLIC POLICY

M.A. Public Administration Syllabus following the Choice-based Credit System
IN LINE WITH NEP 2020
Total 80 credits

About the Programme:
The M.A. Programme in Public Administration is a multi-disciplinary Programme taught over 4 semesters and designed to enable students to be absorbed into jobs in the public and NGO sectors. The Programme integrates theoretical and practical perspectives in the field of Public Administration.

Prerequisites for Admission:
The prerequisite for admission into the M.A. Public Administration Programme is the minimum prescribed percentage in a Bachelor's Degree in any subject and as per Goa University Ordinance for admission.

Semesters and Courses:
The Manohar Parrikar School of Law, Governance and Public Policy offers a two-year M.A. Programme in the subject of Public Administration taught over 4 semesters. The M.A. Programme is governed by Goa University Ordinances and in line with the National Education Policy 2020.

MA Public Administration Programme

The Course and Credit Distribution is as follows:

Courses	Codes	SEM1	SEM2	SEM3	SEM4	Total Credits
Discipline Specific Core Course	DSCC	16	16			32
Discipline Specific Optional Course	DSOC	4	4			08
Research Specific Optional Course	RSOC			8	4	12

Optional Generic Course	OGC			12		12
Discipline Specific Dissertation	DSD				16	16
Total Credits		20	20	20	20	80

One Credit is 15 contact hours

The MA Public Administration Programme Courses and Semester-wise Structure:

MA Public Administration Programme		
Semester I		
Title of the Course	**Course Code**	**Credits**
Administrative Theory	PADSCC1	4
Public Finance and Financial Administration	PADSCC2	4
Political Economy of India	PADSCC3	4
Indian Administration	PADSCC4	4
One course from the list of PADSOC	PADSOC	4
Total Credits in Semester 1		20
Semester 2		
Title of the Course	**Course Code**	**Credits**
Local Governance in India	PADSCC5	4
Administrative Thought	PADSCC6	4
Public Personnel Administration	PADSCC7	4
Public Policy	PADSCC8	4
One course from the list of PADSOC	PADSOC	4
Total Credits in Semester 2		20
Compulsory Internship in the break which is a non-credit mandatory part of the programme		
Semester 3		
Title of the Course	**Course Code**	**Credits**
Qualitative and Quantitative Research Methodology	PARSOC1	4
Policy Analysis: Monitoring and Evaluation	PARSOC2	2
Project Design and Management	PARSOC3	2
Courses from the list of PAOGC	PAOGC	12
Total Credits in Semester 3		20

Semester 4		
Title of the Course	**Course Code**	**Credits**
Participatory Research Techniques and Practice **OR**	PARSOC3	4
Community Engagement and Rural Development	PARSOC4	4
Dissertation	PADSD	16
Total Credits in Semester 4		20
Total Credits in all 4 Semesters of MA Public Administration Programme		**80**

PUBLIC ADMINISTRATION DISCIPLINE SPECIFIC CORE COURSES (COMPULSORY)

Course Code	Course Title	Number of Credits
PADSCC1	Administrative Theory	4
PADSCC2	Public Finance and Financial Administration	4
PADSCC3	Political Economy of India	4
PADSCC4	Indian Administration	4
PADSCC5	Local Governance in India	4
PADSCC6	Administrative Thought	4
PADSCC7	Public Personnel Administration	4
PADSCC8	Policy Analysis	4

PUBLIC ADMINISTRATION DISCIPLINE SPECIFIC OPTIONAL COURSES

Course Code	Course Title	Number of Credits
PADSOC1	Gender, Development and the State	4
PADSOC2	Social Systems and Welfare Administration	4
PADSOC3	Governance: Theories and Concepts	4
PADSOC4	Development Administration	4
PADSOC5	International Political Economy	4
PADSOC6	Public Policy and Analysis	4
PADSOC7	Project Management	4

PUBLIC ADMINISTRATION RESEARCH SPECIFIC OPTIONAL COURSES

Course Code	Course Title	Number of Credits
PARSOC1	Qualitative and Quantitative Research Methodology	4

PARSOC2 - Policy Analysis: Monitoring and Evaluation	2
PARSOC3 - Project Design and Management	2
PARSOC4 - Participatory Research Techniques and Practice	4
PARSOC5 - Community Engagement and Rural Development	4

PUBLIC ADMINISTRATION OPTIONAL GENERIC COURSES

Course Code	Course Title	Number of Credits
PAOGC1	Citizen Centric Administration	4
PAOGC2	Administration of NGOs	4
PAOGC3	Environment Administration	4
PAOGC4	Office Management	4
PAOGC5	– Economic Administration	4
PAOGC6	Disaster Management	4
PAOGC7	Management of Disciplinary Proceedings	4
PAOGC8	Public Health Policy and Administration	4
PAOGC9	Corporate Governance	4
PAOGC10	Ethics in Governance	4
PAOGC11	Education Policy and Administration	4
PAOGC12	Labour Policy and Administration	4
PAOGC13	Regulatory Governance	4
PAOGC14	Public Enterprise Management	4
PAOGC15	Police Administration	4
PAOGC16	Organisational Psychology	4
PAOGC17	Organisational Development and Administrative Improvement	4
PAOGC18	Administrative Law	4

PUBLIC ADMINISTRATION DISCIPLINE SPECIFIC DISSERTATION

Course Code	Number of Credits
PADSD	16

Dissertation will be governed by the relevant Goa University Ordinance

COURSE OUTLINE FOR M. A. PUBLIC ADMINISTRATION (SEMESTER SYSTEM)

PUBLIC ADMINISTRATION COURSE OUTLINES
PUBLIC ADMINISTRATION DISCIPLINE SPECIFIC CORE COURSES

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Programme: M.A. Public Administration
Title of the Course: Administrative Theory
Course Code: PADSCC1
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course will introduce students to basic concepts of Public Administration in developed and developing countries. In addition, the course will also cover new areas and developments in the field of Public Administration and theories of organization.	
Content:	**Module 1:** Meaning, Nature and Scope of Public Administration; Evolution of the discipline and its present status in developed and developing countries; New Public Administration; New Public Management; Principal-Agent Theory Concept: New Public Service; Critical Theory **Module 2:** Organization: Meaning; Types: Formal and Informal Organizations; Hierarchy; Unity of Command; Span of Control; Centralization; Decentralization; The Chief Executive: Types, Functions and Role **Module 3:** Line and Staff Agencies; Headquarter and Field Relationships; Concept, Process and Barriers in Communication, Supervision and Coordination **Module 4**: Accountability of Administration: Legislative, Executive and Judicial; Citizen and Administration Interface: Concept and Philosophy; Citizen Charter; Administrative Reforms: Concept and Philosophy; Good Governance: Concept, Application and Rationale	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Lectures, special talks/lectures from experts as well as practitioners will be organized to establish links between theory and practice and develop the student's critical skills.	
Recommended Readings	Arora, R. K. (Ed.). (1979). Perspectives in Administrative Theory. New Delhi: Associated. Awasthi and Maheshwari (2017). Public Administration. Agra: Lakshmi Narain Agarwal Educational Publishers. Bhambri, C. P. (2010). Public Administration Theory and Practice (21st ed.). Meerut: Educational Publishers. Bhattacharya, M. (2000). Public Administration. Calcutta: World Press. Bhattacharya, Mohit (2016). New Horizons of Public Administration. New Delhi: Jawahar Publishers. Denhardt, Robert B. & Denhardt, Janet V. (2000). The New Public Service: Serving Rather than Steering. Public Administration Review. 60(6): 549-559	

	Drucker, P. F. (1999). Management: Tasks, Responsibilities, Practices. Bombay: Allied Publishers. Etzioni, A. (1995). Modern Organizations. New Delhi: Prentice Hall. Fadia, B.L. and Fadia, Kuldeep (2017). Public Administration in India. Agra: SahityaBhawan. Government of India Second Administrative Reforms Commission. (2008). First Report: Ministry of Personnel, Public Grievances and Pensions, Department of Administrative Reforms and Public Grievances, New Delhi Henry, N. (2012). Public Administration and Public Affairs (12th ed.). New Jersey: Prentice Hall. Hersey, P., & Blanchard, K. H. (2007). Management of Organisational Behaviour (5th ed.). New Delhi. Nigro, F. A., &Nigro, C. (1989). Modern Public Administration (7th ed.). New York: Lloyd Harper and Row. Osborne, D., & Gaebler, T. (1993). Re-inventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector. New York: Addison Wesley. Polinaidu, S. (2014). Public Administration. New Delhi: Galgotia Publications Robinson, Mark (2015). From Old Public Administration to the New Public Service – Implication for Public Sector Reform in Developing Countries. Singapore: UNDP Global Centre for Public Service Excellence Sharma, M.P. and Sadana, B.L. (2010). Public Administration in Theory and Practice. New Delhi: Kitab Mahal.
Learning Outcomes	Students will develop a conceptual understanding of Administrative Theory

Programme: M. A Public Administration
Title of the Course: Public Finance and Financial Administration
Course Code: PADSCC2
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objectives:	This course will introduce students to concepts in Public Finance as well as structures and processes of Financial Administration in India.

Content:	**Module 1:** Meaning and Significance of Public Finance and Public Financial Administration; Principles of Taxation; Tax Administration Issues and Reforms in India; Resource Mobilization: Tax and Non-Tax Sources, Public Borrowings and Deficit Financing Budget: Concept, Principles	15 hours
	Module 2: Types of Budgets: Line-item Budgeting; Performance Budgeting; Zero-Base Budgeting; Budget as an Instrument of Financial Administration and Public Policy Budget Preparation, Authorization and Execution with special reference to India	15 hours
	Module 3: Union Ministry of Finance: Organization, Functions and Role; Union-State Financial Relations; Finance Commission: Composition, Role and Functions	15 hours
	Module 4: Audit: Concept and types; Comptroller and Auditor General of India Legislative Control over Finances with special reference to Parliamentary Committees; Significance of Monetary and Fiscal Policy	15 hours
Pedagogy:	Lectures, discussions, seminars and budgeting exercises	
Recommended Readings	Burkhead, J. (1956). Government Budgeting. New York: Wiley Sons. Chand, P. (2010). Control of Public Expenditure in India (2nd edition). New Delhi: Allied Publishers. Chand, P. (2010). Performance Budgeting (2nd edition). New Delhi: Allied Publishers. Cox, Raymond, Vetter, Daniel E., Stout and R. Gene. (1996). Financial Administration and Control. New Jersey: Wiley. Garner, C. William. (1991). Accounting and Budgeting in Public and Non-profit Organizations: A Manager's Guide. New Jersey: Wiley. Green, Mark T. and Thompson, Fred (1998). Handbook of Public Finance. London: Routledge. Gupta, B. N. (2006). Indian Federal Finance and Budgetary Policy. Allahabad: Chaitanya Publishing House. Hillman, Arye L. (2009). Public Finance and Public Policy: Responsibilities and Limitations of Government 2nd Edition. Cambridge: Cambridge University Press. Indian Administrative Reforms Commission. (1969). Report on: (i) Financial Administration (ii) Finance, Accounts and Audit (iii) Centre-State Relations. New Delhi: Manager of Publications, Government of India. Indian Institute of Public Administration. (1983). Special Number on Administrative Accountability, Vol. XXIX (3). New Delhi. Lall, G. S. (1979). Public Finance and Financial Administration in India. New Delhi: Kapoor. Mahajan, Sanjeev Kumar and AnupamaPuri Mahajan (2014). Financial Administration in India. New Delhi: PHI Learning. Miller, Gerald J. (2011). Government Budgeting and Financial Management in Practice. London: Routledge.	

	Reed, B. J. and Swain, John W. (1996). Public Finance Administration. 2nd Edition. Sage. Shome, Parthasarathi (ed.) (2013). Indian Tax Administration: A Dialogue. New Delhi: Orient Blackswan Singh, Rajiva Ranjan (2016); Challenges Of Indian Tax Administration. Gurugram: Lexis Nexus Sury, M. M. (1990). Government Budgeting in India. New Delhi: Commonwealth Publishers. Thavaraj, M. J. K. (2001). Financial Administration in India (6th ed.). Delhi, Sultan Chand.
Learning Outcomes	At the end of the course, the student will be able to present reports and develop analytical skill regarding the monetary and fiscal system in India.

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Programme: M. A. Public Administration
Course Code for Public Administration : PADSCC3
Course Code for Political Science : PSDSCC104
Title of the Course: Political Economy of India
Number of Credits: 4
Effective from AY: 2022-23

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	The course intends to introduce students to some of the key issues relating to state and economic development in India from the independence period to the contemporary phase. It looks at both the aggregate and the sectoral spaces in India's public policy and performance with reference to the role of state, market and peoples' movements and concerns.

Content:	**Module1: Understanding Political Economy:** Meaning Scope and Definition of Political Economy, Classical and Contemporary Approaches to Political Economy, New Political Economy	10 hours
	Module 2: State in India: Historical Evolution of State, Planning, Public Sector, State in the Contemporary Sphere.	10 hours
	Module 3: Agriculture: Agrarian Relations and Land Reforms, New Agricultural Strategy and Green Revolution, Agrarian Crisis	10 hours
	Module 4: Industry: Inward Oriented /Import Substituting Industrialization and License-Permit Raj, Industrial Policy Reforms, Economic Liberalization, Impact on Labour.	10 hours
	Module 5: Social Movements in India: Tribals, Women, Dalits, Environment	10 hours
	Module 6: Contemporary Concerns: Conflicts over Water, Food Security, Digital Divide, Banking Crisis	10 hours
Pedagogy:	Lectures/assignments/self-study	
Recommended Readings:	Brass, Paul R. (1992), The Politics of India Since Independence, Cambridge University Press, Cambridge. Byres, Terence, J. (Ed) (1994), The State and Development Planning in India, Oxford University Press, Delhi. Caporaso, James A, (1992), Theories of Political Economy, Cambridge University Press. Chatterjee, Partha (1997), A Possible India: Essays in Political Criticism, Oxford University Press, Delhi. Das, Arvind N. (1994), India Invented: A Nation in the Making, Manohar, New Delhi. Frankel, Francine R (2009), India's Political Economy: 1947 – 2004, The Gradual Revolution, Princeton University Press, Princeton. Khilnani, Sunil (1997), The Idea of India, Hanush Hamilton, London. Kohli, Atul (1990), Democracy and Discontent: India's Growing Crisis of Governability, Cambridge University Press, Cambridge. Kohli, Atul (2012), Poverty amid Plenty in India, Cambridge University Press,Cambridge. M, McCartney (2009), India - The Political Economy of Growth, Stagnation and the State, 1951-2007, Routledge. Nayyar, Deepak (1996), Economic Liberalisation in India: Analytics, Experience and Lessons, in R.C. Dutt Lectures on Political Economy, Orient Longman. Panagariya, Aravind (2008), India the Emerging Giant, Oxford University Press.	

	Rudolph, L.l and Susanne Hoeber Rudolph (1987), In Pursuit of Lakshmi: The Political Economy of the Indian State, University of Chicago Press, Chicago. Vanaik, Achin (1990), The Painful Transition: Bourgeois Democracy in India, Verso, London.
Learning Outcomes	Students will be able to understand India's economic evolution since Independence, through the prism of state and market interaction and will be in a position to critically evaluate India's contemporary problems.

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Programme: M. A. Public Administration
Title of the Course: Indian Administration
Course Code: PADSCC4
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	To familiarize students with the Constitutional basis of the Indian Administrative system and critically engage with the Indian Administrative System; Case examples will be used to critically examine the institutions.	
Content:	**Module 1:** Philosophy and Features of the Indian Constitution; Union Executive: President, Prime Minister and Council of Ministers; Union Legislature – Lok Sabha and Rajya Sabha: Composition and Functions	15 hours
	Module 2: State Executive: Governor, Chief Minister, Council of Ministers; State Legislature: Legislative Assembly, Legislative Council; Centre-State Relations: Legislative and Administrative	15 hours
	Module 3: Central Secretariat: Structure, Functions and Role; Cabinet Secretariat: Significance, Functions and Role; Prime Minister's Office; Election Commission: Structure, Functions and Role; Electoral Reforms; Judiciary: Supreme Court; High Court; Judicial Review; Judicial Reforms	20 hours 10 hours
	Module 4: Relationship between Political and Permanent Executive; Generalist and Specialist in Administration Indian Administration: Problems and Challenges	
Pedagogy:	Lectures, seminars, case studies and field trips	

Recommended Readings	Arora, R.K. and Goyal R. (2020). Indian Administration: Institutions and Issues. New Delhi: New Age International. Austin, G. (2009). Indian Constitution. Oxford: Claredon. Avasthi, A.P. and Avasthi, A. (2017). Indian Administration. Delhi: Laxmi Narain Agarwal Publisher Chakrabarty, B. and Chand, P. (2016), Indian Administration: Evolution and Practice, New Delhi: Sage Publication Fadia, B.L. and Fadia, Kuldeep. (2014). Indian administration. New Delhi: Sahitya Bhavan Fadia, B.L. and Fadia, Kuldeep. (2017). Public Administration in India. Agra: Sahitya Bhavan Kapur, Devesh. Mehta, P.B. and Vaishnav, M. (eds.) (2007). Rethinking Public Institutions in India. New Delhi: Oxford University Press. M. Laxmikant (2014). Governance in India. New Delhi: McGraw Hill Education. Maheshwari (2001). Indian Administration. New Delhi: Orient Black Swan. Sapru, Radhakrishna. (2018). Indian administration: A Foundation of Governance. New Delhi: Sage Publication. Sharma, M.P. and Sadana, B.L. (2010). Public Administration in Theory and Practice. New Delhi: Kitab Mahal. Singh, H. (ed.). (2008). Indian Administration. Jaipur: Aalekh Publishers.
Learning Outcomes	The students will gain a critical, conceptual and historical understanding of the Indian Administration system. They will also be able to engage with contemporary issues in the working of these Institutions

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Programme: M. A. Public Administration
Title of the Course: Local Governance in India
Course Code: PADSCC5
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	The course will help students develop an understanding of the concept and theories of deecentralization and the nature of local institutions both at the urban and rural level, including problems and challenges of urban and rural development. They will be familiarized with the various programmes implemented by local bodies.	
Content:	**Module 1:** Meaning and significance of Local Self Government; Historical development and landmarks in the	10 hours

	evolution of Local Government; structures of local government in India and Goa.	18 hours
	Module 2: Urban Governance: Urbanisation: Concept, Trends & Challenges; Structure, Function and Role of Urban Local Bodies: Municipal Corporation; Municipal Council/Committee; Nagar Panchayat; Critical Evaluation of 74th Constitutional Amendment Act; Urban Development Programmes: Atal Mission for Rejuvenation and Urban Transformation (AMRUT); Deendayal Antyodaya Yojna – National Urban Livelihoods Mission (DAYNULM); Smart Cities	20 hours
	Module 3: Rural Governance: Rural Development: Perspectives, Policy & Strategies; Structure, Functions and Role of Panchayati Raj Institutions; Critical evaluation of the 73rd Constitutional Amendment Act; Rural Problems and Challenges; Rural Development Programmes: Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA); Deendayal Antyodaya Yojna – National Rural Livelihoods Mission (DAYNRLM) and major flagships programmes	12 hours
	Module 4: Rural-Urban Relationship; Local Government Finances; State Finance Commission; State Control over Local Bodies; Administrative Reforms in Local Governance; Decentralised Planning, District Planning Committees; Committees of urban and rural local bodies	
Pedagogy:	Lectures, discussions, presentations and field visits to understand the working of urban and rural local bodies.	
Recommended Readings	Ahluwalia, Isher Judge. (2017). Urbanisation in India. New Delhi: Sage. Arora, R. K. &Goyal, R. (1996). Indian Public Administration. New Delhi: Vishwa Prakashan. Aziz, A. (1996). Decentralised Governance in Asian Countries. Ed. New Delhi: Sage. Bhadouria, B. D. S. & Dubey, V. P. (1989). Panchayati Raj and Rural Development. New Delhi: Commonwealth Publishers. Bhattacharya, Mohit. (1976). Management of Urban Government in India. New Delhi: Uppal. Burns, D. et. Al. (1994). The Politics of Decentralisation: Revitalising Local Democracy. London: Macmillan. Cheema, G. S. & Ponoinelli D. (1983). Decentralisation and Development Policy Implementation in Developing Countries. Ed. London: Sage. Hochgesang, T. W. (1994). Rural Local Self-Government in India. Hyderabad: NIRD.	

	Khanna, B. S. (1992). Rural Development in South Asia. 4 Volumes. New Delhi: Deep and Deep. Maheshwari, S. R. (2003). Local Government in India. Agra: Lakshmi Narain Aggarwal. Mathew, G. (1994). Panchayati Raj in India: From Legislation to Movement. New Delhi: ISS. Mathur, S. N. (1997). Nyaya Panchayats as Instruments of Justice. New Delhi: ISS. ---- (1986). Panchayati Raj Bureaucracy and Rural Development. New Delhi: IIPA. ---- (1996). New Panchayati Raj in Action. New Delhi: Mittal Publication. Oakley, P et. Al. (1984). Approaches to Participation in Rural Development. Geneva: I.L.O. Oakley, P. (1991). Projects with People: The Practice of Participation in Rural Development. Geneva: I.L.O. Oommen, M. A. & Datta, A. (1995). Panchayats and their Finance. New Delhi: ISS. Oommen, M. A. (1995). Devolution of Resources from the State to the Panchayati Institutions. New Delhi: ISS. Sachdeva, Pradep. (2011). Local Government in India. Delhi: Pearson Sivaramakrishanan, K. C. (1993). Ed. Urbanisation in India: Basic Services and People's Participation. New Delhi: ISS.Chaturvedi, T. N &Datta, Abhijit. (1984). Local Government. New Delhi: IIPA.
Learning outcomes:	The students will be acquainted with the local government structures at the urban and rural level. They will be able to analyze the role of these institutions in development of the state.

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rogramme: M. A. Public Administration
Title of the Course: Administrative Thought
Course Code: PADSCC6
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	This course will introduce students to theories of various classical, neo-classical and modern thinkers in the area of administration and organization.

Content:	**Module 1:** Classical Approach: Kautilya (Principles and elements of public administration; Saptanga Theory of State; Recruitment and Training)**;** Principles of Management: Woodrow Wilson, Henri Fayol, Luther Gulick and L.B. Urwick ; Scientific Management: Frederick Winslow Taylor; Bureaucratic Theory: Max Weber, Karl Marx	20 hours
	Module 2: Human Relations and Behavioural Approach: Elton Mayo (Hawthorne Experiments); Mary Parker Follett (Conflict and Leadership); Chester I. Barnard (Functions of Executive); Herbert Simon (Decision making)	15 hours 15 hours
	Module 3: Chris Argyris (Immaturity-Maturity Theory); Rensis Likert (Systems Management); Motivation: Abraham Maslow (Needs Hierarchy), Frederick Herzberg (Motivation – Hygiene), Douglas McGregor (Theory X and Theory Y); Dwight Waldo (Administrative State)	10 hours
	Module 4: Fred W. Riggs (Ecological Approach); Peter Drucker (Modern Management); Vincent Ostrom (Public Choice Theory); Yehezkel Dror (Normative-Optimum Model)	
Pedagogy:	Lectures, assignment writing and presentations.	
Recommended Readings	Basu, Rumki. (2019). Public Administration: Concepts and Theories. New Delhi: Sterling Publications. Dong, L. (2015). Public Administration Theories. New York: Palgrave Macmillan. Goel S.L. (2008). Administrative and Management Thinkers. New Delhi: deep and Deep Publications. Hooja R. And Arora, R. (2007). Administrative Theories: Approaches, Concepts and Thinkers in Public Administration. New Delhi: Rawat Publication. Mahajan, A. (2020). Administrative Thinkers. New Delhi: Sage Publications. Maheshwari, S.R. (2003). Administrative Thinkers (2nd Edition). Delhi: Macmillan India Limited. Mitra, Subrata K. (2017). Kautilya's Arthashastra. New Delhi: Rupa Publications. Naidu S.P. (2005). Public Administration: Concept and Theories. New Delhi: New Age International Ostrom, Vincent. And Allen, Barbara. (2007). The Intellectual Crisis in American Public Administration. Alabama: The University of Alabama Press.	

	Petrick, O. (2014). King, Governance and Law in Ancient India: Kautilya's Arthashastra. New Delhi: Oxford University Press. Prasad, D., Prasad, V.S., Satyanaraya, P. and Pardhasaradhi, S. (ed.) (2011). Administrative Thinkers. New Delhi: Sterling Pugh, Derek S. (ed.) (1990). Organization Theory: Selected Readings. (Third Edition). London: Penguin Business. Riggs, Fred Warren. (1962). Ecology of Public Administration. USA: Asia Publishing House. Riggs, Fred Warren. (1964). Administration in Developing Countries: The Theory of Prismatic Society. Boston: Houghton Mifflin. Sahni, P. and Vayunandan, E. (2010). Administrative Theory. New Delhi: PHI Learning. Sapru, R.K. (2006). Administrative Theories and Management Thought. New Delhi: PHI. Waldo, D. (1948). The Administrative State. New York: The Ronald Press Company
Learning Outcomes	At the end of the course students will have developed a deep understanding of the historical evolution of administrative thought, various conceptualizations and their application.

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Programme: M. A. Public Administration
Title of the Course: Public Personnel Administration
Course Code: PADSCC7
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	Students will be introduced to concepts of Public Personnel Administration, career systems and personnel classification in India, various aspects of Human Resource Development, civil services, rules of service, code of conduct and ethics, disciplinary action and negotiation machinery	
Content:	**Module 1:** Meaning and Significance of Public Personnel Administration; Role of Public Services; Career Systems – Concept and Types; Rank and Position Classification – Concept and Bases **Module 2:** Concepts and Significance: Government structures; Human Resource Development; cadres; Manpower Planning, Recruitment, Training, Promotion and Performance Appraisal.	10 hours 20 hours

	Module 3: Constitutional Provisions regarding Civil Services in India; Pay Commissions in India; Union Public Service Commission (UPSC): Role and Functions; Capacity Building Commission – role and functions; emerging trends in Civil Service **Module 4:** Code of Conduct; Disciplinary Action; Employer-Employee Relations: Staff Associations and Unions; Administrative Tribunals; Ombudsman; Joint Consultative and Negotiation Machinery	15 hours 15 hours
Pedagogy:	Presentations, interaction with experts, case studies, departmental visits and discussions	
Recommended Readings:	Bhayana, S. S. and Singh S. (2016). Public Personnel and Financial Administration (4th ed.). Jalandhar: New Academics. Davar, Rustom S. (2008). Personnel Management and Industrial Relations in India (2nd ed.). New Delhi: Vikas Publishing House. Flippo, E. (2008). Principles of Personnel Management (4th ed.). Kogakusha: McGraw Hill. Goel, S. L. and Rajneesh, S. (2002). Public Personnel Administration. New Delhi: Sterling. Government of India, 2nd Administrative Reforms Commission. (2010). 10th Report: Refurbishing of Personnel Administration - Scaling New Heights. New Delhi: Manager of Publications. https://darpg.gov.in/sites/default/files/personnel_administration 10.pdf Government of India. (1988). Report of the Commission on Centre-State Relations. Nasik: General Manager. Koontz, H and O'Donnell, Cyril. (2008). Principles of Management (5thed). Tokyo: McGraw Hill. Pigors, P. and Myers, C.A. (1969). Personnel Administration: A Point of View and a Method (6thed). Kogakusha: McGraw Hill. Rouse, John E. (2008). Public Administration in American Society. Michigan: Gale Research. Saxena, A.P. (2010). Training and Development in Government. New Delhi. Stahl, O. Glenn. (1971). Public Personnel Administration (6th ed.). New Delhi: Oxford and IBH Publishing. United Nations. (2008). New Approaches to Personnel Policy for Development. New York.	
Learning Outcomes:	Students will be able to understand the structure of the civil services, issues related to Human Resource in Government, develop analytical skills.	

Programme: M. A. Public Administration
Title of the Course: Public Policy

Course Code: PADSCC8
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course comprehensively introduces the concept and significance of public policy, the history of policy sciences and the public policy process. The student will develop a critical understanding of the policy process as well as the capacity to undertake policy analysis in substantive areas of public policy	
Content:	**Module 1:** Public Policy: Concept, Significance and Scope; Evolution of Policy Sciences; Policy Transfer: Concept, Rationale, Types (Copying, Adaptation, Hybridization and Synthesis). Policy Analysis: Concept and Significance. Public Policy Approaches and Models with special reference to the Incrementalist and Rationalist Paradigms	15 hours
	Module 2: Public Policy Making Process: Role of Legislature, Executive, Judiciary, Planning Machinery at the Central and State levels in Policy Making. Role of other Stakeholders in Policy-making: Political Parties, Interest Groups, Mass-media, Civil Society and International Agencies.	15 hours 15 hours
	Module 3: Public Policy Implementation, Monitoring and Control: Approaches to Policy Implementation. Role of Executive (with special reference to Bureaucracy), Legislature, Judiciary, Non-Governmental Organisations, Pressure Groups. Issues in Policy Implementation	15 hours
	Module 4: Policy Evaluation: Approaches to Policy Evaluation. Policy Impact Criteria for Evaluation. Role of Staff, CAG, Parliamentary and Departmental Committees in Evaluation. Issues in Policy Evaluation	
Pedagogy:	Lectures, case studies, policy analysis exercises, seminars and presentations	
Recommended Readings	Anderson, J E. (2005). Public Policy Making (6th ed.). New York: Houghton Mifflin Co. Ayyar, Vaidyanathan R V. (2009). Public Policy Making in India. New Delhi: Pearson. Basu, D.D. (2011). Constitution of India (20th ed.). New Delhi: Prentice Hall of India. Chakraborty, Bidyut & Chand, Parkash (2016). Public Policy: Concept, Theory and Practice. New Delhi: Sage Chakraborti, Rajesh (2017). Public Policy in India. New Delhi: Oxford University Press	

	Dolowitz, D.P. & Marsh, D. (2000). Learning from Abroad: The Role of Policy Transfer in Contemporary Policy-Making. Governance: An International Journal of Policy and Administration, 13(1), 5-24 Dubhashi, P.R. (1986). Policy and Performance. New Delhi: Sage Publications. Dye, T. (2002). Understanding Public Policy. New Delhi: Pearson Education Singapore (Pte) Ltd. Farzmand, Ali. (ed.) (2018). Global Encyclopaedia of Public Administration, Public Policy and Governance. Berlin: Springer Gerston, Larry N. (2010); Public Policy Making: Process and Principles. (3rd Edition); U.K.: Routledge Henry, N. (2009). Public Administration and Public Affairs (11th ed.). New Jersey: Prentice Hall. Hill, Michael & Frédéric Varone. (2016). The Public Policy Process. London: Routledge. Hillman, Arye L. (2009); Public Finance and Public Policy: Responsibilities and Limitations of Government 2nd Edition; U.K.: Cambridge University Press Madan, K.D. (1982). Policy Making in Government. New Delhi: Publications Division, Government of India. Mathur, K. (1996). Development Policy and Administration. New Delhi: Sage. Munger, M.C. (2000). Analysing Policy: Choices, Conflicts and Practices. New York: W.W. Norton & Company. Nagel, S.S. (1991). Public Policy: Goals, Means and Methods. New York: St. Martin Press. Nedley, A. (2004). Policy Transfer and the Developing Country Experience Gap: Taking a Southern Perspective. In Mark Evans (Ed.), Policy Transfer in Global Perspective. (pp. 165-187). New York: Routledge. Page, E.C. (January 2000). Future Governance and the Literature on Policy Transfer Lesson Drawing. Prepared for the ESRC Future Governance Programme Workshop on Policy Transfer. London: Britannia House. Retrieved from: http://personal.lse.ac.uk/Pagee/Papers/EdPagePaper1.pdf Sapru, R.K. (2011). Public Policy: Art and Craft of Policy Analysis (2nd ed.). New Delhi: Prentice Hall of India learning. Stone, D. (2000). Learning Lessons, Policy Transfer and the International Diffusion of Policy Ideas. http:// poli.haifa.ac.il/~levi/res/stone-2000.pdf Rabin J., Hildreth, W. & Miller, G. (2007). Handbook of Public Administration (3rd ed.). Florida: Taylor & Francis Group. Rose, R. (1993). Lesson-Drawing in Public Policy: A Guide to Learning Across Time and Space. New Jersey: Chatham House.
Learning Outcomes	At the end of the course the student will understand the evolution of policy sciences, the significance and different stages of the public policy process in terms of the theoretical formulations as well as the working of this process with special reference to India.

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PUBLIC ADMINISTRATION DISCIPLINE SPECIFIC OPTIONAL COURSES

Programme: M. A. Public Administration
Title of the Course: Gender, Development and The State
Course Code for Discipline Specific Optional Course: PADSOC1
Course Code for Discipline Specific Core Course: WSDSCC5
Number of Credits: 4
Effective from Academic Year: 2022 – 2023

Course prerequisite	Registration in the MA Women's Studies Programme	
Objectives	This course will introduce students to development concepts and debates and the perspective of engendering development. Students will be introduced to the politics of development in India, gender analysis frameworks, (gender blind, gender neutral and gender redistributive policies), gender mainstreaming and gender budgeting. This course will also introduce the students to a critical understanding of gender issues in Goa in particular as well as the response of the state and women's organisations to these issues. The course will also aim to develop in the students the capacity to identify linkages between social issues, needs, policies and programmes. Case studies of tourism and mining and other local development projects in Goa will be analysed.	
Content:	**Module 1:** The 4th World Conference on Women held in Beijing, China in 1995, Platform for Action and the emergence of the empowerment approach to women's development- Women in/and Development (WID and WAD), Gender and Development (GAD), Structural Adjustment Programme, Women Empowerment: Meaning, concepts and objectives of women empowerment. Theories of Development. Globalization and Women in India**.** National Policy for Women.	15 hours
	Module 2: Women and land rights, feminization of labour: formal and informal labour, issues of livelihood and gender, feminization of poverty, female headed household. MDGs, Gender and Sustainable Development Goals, and its critique.	15 hours
	Module 3: Gender analysis frameworks, gender mainstreaming and gender budgeting. Analyzing policy and programme: Gender blind, gender neutral and gender redistributive policies. Development Policy in India: Five year plans, NITI Aayog, National Commission for Women, Ministry of Women and Child Development, Mahila Shakti Kendra, State Policies and Programmes for Women. Women and micro finance policies, Self Help Groups - a critique	15 hours 15 hours

	Module 4: Analyzing Goa's budget, Gender and Development Policy in Goa: Analyzing Tourism policy, Mining, Construction, casinos, alcohol, SEZ, Regional Plan, Nylon 66, Mopa Airport, etc.	
Pedagogy:	lectures/assignments/self-study/ group reading and discussions/ audio-visuals.	
Recommended Readings:	Afshar Haleh.1991.Women, Development and Survival in the Third World. London: Longman. Agarwal Bina et.al. 2007.Capabilities, Freedom & Equality: Amartya Sen's work from a Gender Perspective. Oxford University Press. Alvares Claude. 2002. Fish curry and rice: A sourcebook on Goa, its ecology and life-style. Goa: The Goa Foundation. Baviskar Amita.2004. In the Belly of the River: Tribal Conflicts over Development in the Narmada River. Oxford University Press. Boserup Ester. 2007(Reprint). Women's Role in Economic Development. USA: Earthscan. Das Bhaswati. 2009. Gender Issues in Development. Jaipur: Rawat Publications. Department of Women's Studies, Goa University.2018. Course pack on Development Eswaran Mukesh.2014. Why Gender Matters in Economics. Princeton University Press. Golombok Susan. 1994. Gender Development. Cambridge: Cambridge University Press. Gupta Amit. 1986.Women and Society: The Developmental Perspective. New Delhi: Criterion Publications. Heptulla Najma. 1992. Reforms for Women: Future Options. New Delhi: Oxford & IBH. Kalpagam U. 2011.Gender and Development in India. Jaipur: Rawat Publications. Kapadia Karin. 2003. The Violence of Development. New Delhi: Zubaan. Kelkar, Govind. 2005. Development Effectiveness through Gender Mainstreaming. EPW Vol XLno.44-45. Krishna Sumi. 2003. Livelihood and Gender: Equity in Community Resource Management. New Delhi: Sage. Phadke Shilpa et.al. 2011. Why Loiter? Women and Risk on Mumbai Streets. New Delhi: Penguin. Rai Shirin. 2008.The Gender Politics of Development. New Delhi: Zubaan. Samyukta A Journal of Women's Studies 2005, Vol 5(1) Singh Navsharan and Maitrayee Mukhopadhyay. 2007. Gender Justice, Citizenship Development. Zubaan. Tsikata Dzodzi and Pamela Golah. 2010. Land Tenure, Gender, and Globalisation. New Delhi Zubaan and IDRC. UNDP 2016. How to Conduct a Gender Analysis. Vishvanathan, Nalini et al (eds.)1998.The Women, Gender and Development Reader. London: Zed Books.	

	World Bank. 2002. Engendering Development. Oxford: Oxford University Press.
Learning Outcomes	1. Students will develop a critical perspective on development, understand Policy making and its impacts for women. 2. Students will understand the politics of development issues in Goa and will develop skills to conduct gender analyses of policy and programme.

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Programme: M. A. Public Administration

Title of the Course: Social Policy and Welfare Administration
Course Code: PADSOC2
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objectives:	This course is designed to help the student understand the multidisciplinary nature of the subject of Public Administration and the relationship between Sociology and Public Administration. The students will be introduced to the basic concepts of social structure, social change in contemporary Indian Society and social tensions and their relevance in the field of Public Administration.	
Content:	**Module 1:** Relevance of Sociology to Public Administration. Concept and Elements of Social Structure: Groups; Status and Role; Norms and Values. Social Stratification: Caste; Class - Difference and Convergence. Welfare State: Concept & Philosophy	15 hours
	Module 2: Social Change: Concept; Sources; Resistance. Social Change in Contemporary Indian Society. Social Tensions and Resolutions – Communalism; Regionalism; Violent Class Struggle	15 hours
	Module 3: Social Policy and Legislation in India: An Overview with special focus on SDGs. Reservation for SC, ST and OBC: Critical Analysis of Policy and Administration. Protection of Women from Domestic Violence Act, 2005. The Juvenile Justice (Care and Protection of Children) Act, 2013	15 hours 15 hours
	Module 4: Structures for Implementation of Social Policy: Union Ministry of Social Justice and	

	Empowerment; State Social Welfare Department; Central Social Welfare Board; State Social Welfare Board. Major programmes implemented	
Pedagogy:	Lectures, presentations and documentaries (audio-visual aids), case studies and special lectures by experts.	
Recommended Readings:	Bulsara, J.F. &Verma (2006). Perspective in Social Welfare in India. New Delhi: S. Chand & Co. Chowdhary, D.P. (1976). Social Welfare Administration. Delhi: Atma Ram and Sons. Dreze, Jean. (2017). Social Policy. Hyderabad: Orient Blackswan Encyclopedia of Social Change. Vol. 5. (n.d.). New Delhi: Anmol Publishers. Dube, S.C. (2009). Modernization and Development: The Search for Alternative Paradigms. 2nd ed. New Delhi: Sage Publishers. Friedlander, W. &Apte, R. (2006). Introduction to Social Welfare. 5th Ed. New Delhi: Prentice Hall. Gangrade, K.D. (1978). Social Legislation in India. Delhi: Concept Publishing House. Kuppuswamy, B. (2006). Social Change in India. Delhi: Konark Publisher Pvt. Ltd. Madan, G.R. (2006). Indian Social Problems. Vol. II: Social Work. New Delhi: Allied Publishers Ltd. Mendelbaum, David G. (1972). Society in India. Bombay: Popular Prakashan. Ministry of Information and Broadcasting (1987). Encyclopedia of Social Welfare in India. Vol. IV. New Delhi: GoI Publications Division. Ministry of Social Justice & Empowerment Govt. of India, Recent Annual Reports Planning Commission (2007-12). Eleventh Five Year Plan. New Delhi: Government of India. Moore, W.E. (1965). Social Change. New York: Prentice Hall. Pandey, Tejaskar and Pandey, Baleshwar (2019). SamajKalyanPrashasan. Jaipur: Rawat. Relevant Acts of Parliament and Reports of Commission, Committees & Study Teams. Research, Reference and Training Division (2010). A Reference Manual. New Delhi: GOI Publications Division. Robson, W. A. (1976). Welfare State and Welfare Society: Illusion and Reality. 2nd ed. London: Allen and Unwin. Roy, K. (2000). Women and Child Development. New Delhi: Commonwealth Publishers. Sachdeva, D.R. (2009). Social Welfare Administration. Allahabad: Kitab Mahal. Sankhdher, M.M. (1995). Welfare State. New Delhi: Deep & Deep. Sharma, G. D., (2016). Indian Social System. Delhi: Wisdom Press.	

	Singh, Y. (1986). Indian Sociology: Social Conditioning and Emerging Concerns. New Delhi: Vistaar Publications. United Nations. https://sustainabledevelopment.un.org/?menu=1300 Smelser, Neil J. (1970). Introduction to Sociology. New York: Wiley.
Learning Outcomes	Students will understand Indian Society and link this with social policy and administration. They will develop presentation, public speaking and analytical skills.

Programme: M. A. Public Administration
Title of the Course: Governance: Theories and Concepts
Course Code: PADSOC3
Number of Credits: 2
Effective from AY: 2022-23

Prerequisites for the course:	Registration in the MA Public Administration Programme	
Objectives:	The course intends to introduce students to the basic concepts, theories and recent developments in the subject with an intention to enhance their understanding and ability to analyse conceptual and theoretical questions related to governance.	
Content:	**Module 1:** Governance: meaning and evolution of the concept; Theories – Public Choice, Discourse, Institutional, Meta-governance; Information and Governing	10 hours
	Module 2: Practices of Governance: Governing without Government, Governance and institutional flexibility, Governance and administrative reforms, Public Management, Non-governmental organisations, Global Governance	10 hours 10 hours
	Module 3: Dilemmas of Governance: Legitimacy, Collaborative Governance, Capacity Building, Network Management, Social Inclusion	
Pedagogy:	Lectures, special talks/ lectures from experts as well as practitioners will be organized to establish links between theory and practice and develop the students critical skills	
Recommended Readings:	Ansell, Christopher and Torfing, Jacob. (ed.) (2022), Handbook on Theories of Governance, UK: Edward Elgar Publishing Limited Bevir, Mark. (2009), Key Concepts in Governance, London: Sage Bevir, Mark. (ed.) (2011), The Sage Handbook of Governance, London: Sage Chakrabarty & Bhattacharya (2008), The Governance Discourse: A Reader, OUP, New Delhi	

	Chhotray, Vasudha and Stoker, Gerry. Governance Theory and Practice: A Cross-Disciplinary Approach, New York: Springer Hyden G. (2005), Making Sense of Governance, Vikas Books, New Delhi Kjaer, A.M. (2004), Governance, New Jersey: Wiley Levi-Faur, David. (2012), The Oxford Handbook of Governance, New York: Oxford University Press. Peters G. (2006), Handbook of Public Administration, Sage Publication
Learning Outcomes	1. To enhance the ability of students to understand the theoretical base of governance. 2. To make students understand and critically analyse the conceptual and theoretical issues related to governance

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Programme: M. A. Public Administration
Title of the Course: Development Administration
Course Code: PADSOC4
Number of Credits: 2
Effective from AY: 2022-23

Prerequisites for the course:	Registration in the MA Public Administration Programme	
Objective:	The course will equip students with knowledge and understanding of the concept the development and its evolution through various stages and the interplay between various concepts related to development administration.	
Content:	**Module 1**: Development Administration: Meaning, Nature and Stages; Features of Development, Development Theory, Models of Development Administration (Weidner and Riggs)	8 hours
	Model II: Good Governance and Development, Bureaucracy and Development, Environment and Development, Organization Development and Development Administration, Public Management, Public Private Partnership	12 hours 10 hours
	Module III: Human Development, Human Development Index, Sustainable Development, Sustainable Development Goals, Participatory Development, Development and Opportunities	
Pedagogy:	Lectures, expert talks, Group tasks, assignments, presentations	

References/Readings	Bhattacharya, M. (2006), Social Theory, Development Administration and Development Ethics, New Delhi: Jawahar Publisher Dwivedi O.P. (1994), Development Administration, London: Palgrave Macmillan Hooja R. And Arora, R. (2007), Administrative Theories: Approaches, Concepts and Thinkers in Public Administration, New Delhi: Rawat Publication Mahajan A. P. (2019), Development Administration in India, New Delhi: Sage Publication Mathur, Kuldeep (1996), Development Policy and Administration, Sage Publications Mitra, Subrata (2006), The Puzzle of India's Governance, Routledge Naidu S.P. (2005), Public Administration: Concept and Theories, New Delhi: New Age International Palekar, S.A. (2012), Development Administration, New Delhi: PHI Learning Rathod, R. (2004), Elements of Development Administration, ABD Publisher Sahni, P. and Vayunandan, E. (2010), Administrative Theory, New Delhi: PHI Learning Sapru R.K. (2015), Development Administration, Sterling Publisher Sen, Amartya (1999), Development as Freedom, New Delhi: Oxford University Press Sen & Dereze (1999), The Amartya Sen and Jean Dreze Omnibus, New Delhi: Oxford University Press. Singh, Shivani (ed.,) (2016), Governance: Issues & Challenges, Sage Publication
Learning Outcomes	The students will be equipped to apply their understanding of the idea of development and development administration to the practical issues and problems/challenges related to development administration

Programme: MA Public Administration
Course Code for Public Administration : PADSOC4
Course Code for Political Science: PADSOC203
Title of the Course: International Political Economy
Number of Credits: 4
Effective from AY: 2022-23

Course prerequisite:	Open to all students who have a B.A. in social sciences or related disciplines. A basic understanding of the major international economic issues is expected.	
Objectives:	The course seeks to familiarize the students with the evolution, concepts and issues pertaining to International Political Economy, as a very dynamic field of enquiry within international relations. It helps the students to locate intersections between global power politics and economic interdependencies that shape not just bilateral, but regional and multilateral global relations, with an appropriate mix of theories and case studies. This would also deepen the understanding of issues of International Administration and Comparative Public Administration.	
Content:	**Module 1: International Political Economy:** Definition and Theories (Liberalism, Realism, Marxism and their contemporary contexts), Critical IPE, Feminist IPE; Evolution and Schools of IPE .	10 hours
	Module 2: Multilateral Economic Institutions and Problems: World Trade Organization (WTO); IMF and World Bank, Structures, Evolution and Problems.	10 hours
	Module 3: Political Economy of Regionalism: Theorizing Regionalism and its variants, European Union, ASEAN, NAFTA, RCEP, BRICS, Regionalism versus Globalism	10 hours
	Module 4: Non-State Actors in International Political Economy: Transnational Corporations (TNCs); Non-Governmental Organizations (NGOs)—National and International; Protest Movements.	10 hours
	Module 5: Transnational Issues: Migration, Climate Change; Human Rights, Poverty, Food Security, Energy Security.	10 hours
	Module 6: Contemporary Debates in IPE: Globalization and its discontents, Global Financial Crisis, Digital Technology and impact on IPE (Virtual Communities, Artificial Intelligence, Crypto-currencies)	10 hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self- Study /Discussions/Audio-Visuals	
Recommended Reading:	Adams, N.B. (1993), Worlds Apart: The North-South Divide and the International System, London: Zed. Baldwin, D. ed. (1993), Neorealism and Neoliberalism: The Contemporary Debate, NewYork: Columbia University Press. Barker, D. and J. Mander (1996), Invisible Government: The World Trade Organisation: Global Government for the Millennium, San Francisco, CA: International Forum on Globalisation.	

	Borzel, T. Lukas Goltermann and Kei Striebinger (2016), Roads to Regionalism: Genesis, Design, and Effects of Regional Organizations, London: Routledge. Boyer, R and D. Drache Eds. (1996), States Against Markets: The Limits of Globalisation, New York: Routledge. Cavahagh. J et al. Eds. (1994), Beyond Bretton Woods: Alternatives to the Global Economic Order, London: Pluto Press. Cox, R.W. Ed. (1997),The New Realism: Perspectives on Multilateralism and World Order, New York: St.Martins. Frieden, J,David Lake and J. Lawrence Broz, (2017), International Political Economy: Perspectives on Global Power and Wealth, New York: W.W. Norton &Co. Halperin, Sandra (2013) Re-envisioning Global Development: A Horizontal Perspective, London: Routledge. Li Xing, Li (2014), The BRICS and Beyond: The International Political Economy of the Emergence of a New World Order, London: Routledge. Mitchell Seligson, John T and Passe Smith eds., (2013), Development and Underdevelopment: The Political Economy of Global Inequality, Boulder: Lynne Rienner Publishers. Pettman, Ralph (2012), Handbook on International Political Economy, Singapore: World Scientific Publishing Co. Ravenhill, John (2011), Global Political Economy, Oxford: Oxford University Press. Shaw, Timothy and Emmanuel Fanta Eds. (2013), Comparative Regionalisms for Development in the 21st Century: Insights from the Global South, London: Routledge. Thorsten Olesen, Helge Pharo and Kristian Paaskesen (2013), Saints and Sinners: Official Development Aid and its Dynamics in Historical and Comparative Perspective, Bergen, Norway: Fagbokforlaget Publishers. Veltmeyer, Henry,(2016), New Perspectives on Globalization and Anti-globalization: Prospects for a New World Order?, London: Routledge.
Learning Outcomes	The students should be able to understand the inter-linkages between international relations and international economics with appropriate use of theory and basic empirical data.

Programme: M. A. Public Administration
Title of the Course: Project Management
Course Code: PADSOC5
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme

Objective:	To impart a deep understanding of all the stages of project management and the techniques required for project management	
Content:	**Module 1:** Project Management: Organisation, Planning including Prerequisites for Successful Project Implementation and Control. Project Planning: Resource Allocation Framework; Generation and Screening of Project Ideas	15 hours
	Module 2: Project Analysis: Market and Demand Analysis; Technical Analysis; Financial Analysis. Project Selection I: Project Appraisal Criteria – Project Cash Flow; Time Value of Money; Cost of Capital	15 hours 15 hours
	Module 3: Project Selection II: Project Risk Analysis; Social cost benefit analysis: Rationale and approaches. Shadow Pricing applications in India	15 hours
	Module 4: Project Implementation: Project Management Techniques: Network Analysis (PERT/CPM), Project Monitoring and Review: Integrated Cost Planning and Budgeting; Monitoring and Reporting Systems and Evaluation	
Pedagogy:	Lectures and practical exercises	
Recommended Readings	Burke, Rory (2004). Project Management: Planning and Control Techniques. Singapore: John Wiley & Sons Asia (Pvt Ltd.). Choudhry, Sadan (1988). Project Scheduling and Monitoring in Practice. Delhi: South Asian Publishers. Clifton, David S. and Fyefe, David E. (1977). Project Feasibility Analysis. New York: John Wiley. Harrison, F.L. (1992). Advance Project Management (2nd ed.). London: Gower. Little, I.M.D. and Mirlees, J.A. (1976). Project Appraisal and Planning for Development Countries. London: Heinemann Educational Books. Lock, Dennis (2007). Project Management. England: Gower. Planning Commission (1975). Guidelines for Preparation of Feasibility Reports of Industrial Projects. Delhi: Government of India. Prasanna, Chandra (1995). Projects: Preparation; Appraisal, Implementation. New Delhi: Tata McGraw Hill Srinath, L.S. (1996). PERT and CPM – Principles and Applications. New Delhi: Affiliated East West Press. UNIDO (1978). Guide to Practical Project Appraisal: Social Benefits Cost Analysis, Project Formulation and Evaluation. Delhi: Oxford and IBH.	
Learning Outcomes	Students will understand the processes and techniques of project management and obtain practical knowledge about project management	

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PUBLIC ADMINISTRATION RESEARCH SPECIFIC OPTIONAL COURSES

Programme: M. A. Public Administration
Title of the Course: Qualitative and Quantitative Research Methodology
Course Code: PARSOC1
Number of Credits: 4
Effective from Academic Year: 2022-2023

Prerequisite:	Registration in the MA Public Administration Programme	
Objective:	To equip students with skills in quantitative and qualitative research methods with feminist perspectives.	
Content:	**Module 1:** Steps and Concepts in Research; Types of Research: Fundamental; Applied; Evaluative; Concepts and Theory; Variables and Unit of Analysis. Hypotheses: Definition; Features and Types. Research Design and Sampling	8 hours
	Module 2: Introduction to Qualitative Research: Method, Tools and Sources, Identifying Participants, Ethnography, Case Study, Discourse Analysis, Content Analysis, Participant Observation, Focus Group Discussion (FGD), Interview, Grounded Theory, Oral History, Narratives and Using Unconventional Sources. Interview and Questionnaire. Data Processing: Editing, Coding and Tabulation	22 hours
	Module 3: Introduction to Quantitative Research: Descriptive Statistics (Mean, Median, Mode, Variability) Hypothesis Testing (Null & Alternative Hypothesis, Type I & II Errors, Level of Significance, t, Z, F & Chi-Square Tests, Correlation & Regression, Goodness of fit, Data Sources.	30 hours
Pedagogy:	Lectures, assignments, designing research projects, use of data analysis software (eg. Gretl)	
Recommended Readings:	Ahuja, Ram (2003). Research Methods. Jaipur: Rawat Bajpai, S. R. (1960). Methods of Social Survey and Research. New Delhi: Kitab Ghar. Denzin, N. K., & In Lincoln, Y. S. (2018). The Sage handbook of qualitative research. Thousand Oaks: Sage Publication Goode, W. J. &Hatt, P.K. (2006). Methods in Social Research. New Delhi: McGraw Hill Series. Gupta, S.P. (2001). Statistical Methods. New Delhi: Sultan Chand & Sons. Kothari, C.R. (2004). Research Methodology: Methods and Techniques. New Delhi: New Age International.	

	Nachmias, D. &Nachmias, C. (1981). Research Methods in the Social Sciences. New York: St. Martin's Press. Rawat, Salkind, N. J. (2000). Statistics for people who (think they) hate statistics. Thousand Oaks, Calif: Sage Publications, Inc. Silverman, David (ed.) (2012) Qualitative Research: Issues of Theory, Method and Practice. 3rd ed. New Delhi: Sage Publications Young, P. V. (2007). Scientific Social Research and Surveys. India: Asia Publishing House.
Learning Outcomes:	Students will be able to design research projects using both qualitative and quantitative methods and will be familiar with the use of data analysis software (eg:Gretl)

Programme: M. A. Public Administration
Title of the Course: Policy Analysis: Monitoring and Evaluation
Course Code: PARSOC2
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course introduces the concept and significance of public analysis. The student will develop a critical understanding of the policy process as well as the capacity to undertake policy analysis in substantive areas of public policy	
Content:	**Module 1:** Policy Analysis: Concept, Significance and Scope; Approaches, types **Module 2:** Steps in policy analysis, tools, techniques and methods adopted in policy analysis **Module 3**: Analysing Policy – practical component **Module 4:** Policy analysis report	5 hours 10 hours 10 hours 5 hours
Pedagogy:	Lectures, case studies, policy analysis exercises, seminars and presentations	
Recommended Readings:	Anderson, J E. (2005). Public Policy Making (6th ed.). New York: Houghton Mifflin Co. Ayyar, Vaidyanathan R V. (2009). Public Policy Making in India. New Delhi: Pearson. David L. Weimer, Aidan R. Vining. (2015). Policy Analysis: Concepts and Practice, Routledge, New York	

	Dolowitz, D.P. & Marsh, D. (2000). Learning from Abroad: The Role of Policy Transfer in Contemporary Policy-Making. Governance: An International Journal of Policy and Administration, 13(1), 5-24. Farazmand, Ali. (ed.) (2018). Global Encyclopaedia of Public Administration, Public Policy and Governance. Berlin: Springer Frank Fischer, Gerald J. Miller · (2017). Handbook of Public Policy Analysis: Theory, Politics, Taylor & Francis Group. Gerston, Larry N. (2010), public Policy Making: Process and Principles.(3rd Edition) Henry, N. (2009). Public Administration and Public Affairs (11th ed.). New Jersey: Prentice Hall. Hill, Michael & Frédéric Varone. (2016). The Public Policy Process. London: Routledge. Nagel, S.S. (1991). Public Policy: Goals, Means and Methods. New York: St. Martin Press. Rabin J., Hildreth, W. & Miller, G. (2007). Handbook of Public Administration (3rd ed.). Florida: Taylor & Francis Group. Radin Beryl. (2019). Policy Analysis in the Twenty-First Century: Complexity, conflict and cases, Routledge. Sapru, R.K. (2011). Public Policy: Art and Craft of Policy Analysis (2nd ed.). New Delhi: Prentice Hall of India learning.
Learning Outcomes:	At the end of the course the student will be able to apply the tools and techniques for data collection, monitoring and evaluation of policy and programmes.

Programme: M. A. Public Administration
Title of the Course: Project Design and Management
Course Code: PARSOC3
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	To impart a deep understanding of project design and project management

Content:	**Module 1:** Project: concept; project stakeholders; project planning; prerequisites for project planning and design; project blue prints. **Module 2:** Project Management process; techniques **Module 3:** Preparing a project plan for an organization **Module 4**: Project monitoring; concept and methods	10 hours 5 hours 10 hours 5 hours
Pedagogy:	Lectures, field visits, group work	
Recommended Readings	Burke, Rory (2004). Project Management: Planning and Control Techniques. Singapore: John Wiley & Sons Asia (Pvt Ltd.). Lester **Albert. (2013).** Project Management, Planning and Control: Managing and control. Elsevier Science Publication Prasanna, Chandra (1995). Projects: Preparation; Appraisal, Implementation. New Delhi: Tata McGraw Hill Srinath, L.S. (1996). PERT and CPM – Principles and Applications. New Delhi: Affiliated EastWest Press. UNIDO (1978). Guide to Practical Project Appraisal: Social Benefits Cost Analysis, Project Formulation and Evaluation. Delhi: Oxford and IBH.	
Learning Outcomes	The students will be able to prepare a project design for any given project.	

Programme: M. A. Public Administration
Title of the Course: Participatory Research Techniques and Practice
Course Code: PARSOC4
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	The course will familiarize the students with the conceptual and practical aspects of participatory methods for data collection and research work

Content:	**Module 1:** Participatory Research: concept, importance, evolution; approach and practice in development research and administration.	10 hours
	Module 2: Participatory Rural Appraisals Tools and techniques; Social Map, Resource map, Focussed Group Discussions, Seasonality mapping, Venn diagram, Time line, Process Map, Cause Effect diagram	20 hours
	Module 3: PRA tools for monitoring and evaluation of welfare programmes, impact assessments of programmes and projects; data analysis	10 hours
	Module 4: Practical component – report preparation using PRA tools for data collection	20 hours
Pedagogy:	Lectures, field visits, practicals, discussions	
Recommended Readings:	Creswell, John W. (1994). Research Design: Qualitative, Quantitative and Mixed Methods: Approaches. London: Sage Publications. Goode, William J. &Hatt, Paul K. (2006). Methods in Social Research. USA: McGraw Hill Book Company, 1st Indian Reprint. Mukherjee Amitava. (2015). Frontiers in Participatory Rural Appraisal and Participatory Learning Action, Practical Action Publishing, N Narayanasamy (2009). Participatory Rural Appraisal: Principles, Methods and application, Sage Publication Nachmias, David & Nachmias, Chava. (2008). Research Methods in the Social Sciences. (7th edition). New York: St. Martin's Press Inc. Pai Panandikar, V.A. (Ed.). (1997). A Survey of Research in Public Administration 1980- 1990. Delhi: Konark Publishers Pvt. Ltd. Somesh Kumar, Methods of Community Participation, A complete guide for practioners. (2002), Vistaar Publication Ltd Young, Pauline V. (2008). Scientific Social Surveys and Research (4th Edition). New Delhi: PHI Learning. Silverman, David (Ed.) (2012), Qualitative Research: Issues of Theory, Method and Practice. New Delhi: Sage Publications India Pvt. Ltd. Singleton Jr, Royce A.& Straits, Bruce C. (1999). Approaches to Social Science Research, Oxford: Oxford University Press.	

	UK Commission on Social Sciences. (2004). Great Expectations: The Social Sciences in Britain. London: Transaction Publishers. White, Jay D. & Adams, Guy B. (Eds.). (1994). Research in Public Administration Reflection on Theory and Practices. London: Sage Publications.
Learning Outcomes	Students will be equipped with knowledge and skills for conducting development research using participatory methods.

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Programme: M. A. Public Administration
Title of the Course: Community Engagement and Rural Development
Course Code: PARSOC5
Course Code: IDO-102
Number of Credits: 4
Effective from AY: 2022 – 2023

Prerequisite for the course:	Under Graduate degree in any discipline	
Objectives:	1. To enable students to understand rural society 2. To familiarise students with community development programmes and train them to prepare proposals for community development 3. To train students in participatory research methods 4. To enable students to understand rural institutions and their functioning by engaging with these institutions 5. To enable students to understand Human Rights based approach to Rural Development	
Content:	1. Meaning and Characteristics of Rural Society; Rural Poverty – nature and extent 2. Participatory Rural Appraisal Methods & Techniques – Transect Walk, Seasonal Calendar, Venn Diagram, Daily Routine Charts, Timeline, Flow Diagram, Interviewing, Preference ranking, Mapping and Modelling (Social, Resource and Topical Mapping & other methods) 3. Rural Resilience in relation to Environmental and Livelihood issues: Climate Change, Habitat degradation, Water conservation and Waste management. 4. Local Bodies: Panchayats, Gram Sabhas, Village Committees; Gram Panchayat Development Plan (GPDP). 5. Institutions in Rural Development: Schools, Health Centres, Self Help Groups, Cooperatives, Farmers Clubs. 6. Human Rights and Rural Development.	2 hours 6 hours 4 hours 4 hours 2 hours 2 hours 4 hours

	7. Community Development: Introduction, Objectives, Approaches, Programmes. 8. Field Component (to be carried out in Unnat Bharat Abhiyan (UBA) adopted villages): Planning for Community Development, Gram Panchayat Development Plan (GPDP), Situational Analysis, Participatory Rural Appraisal (PRA).	4 hours
Pedagogy:	Lectures/ assignments/field visits/learning by engaging with the rural community	
Recommended Reading:	Chatterjee, Shankar (2011)., Implementation of Rural Development, New Delhi: Serials Publication Pvt. Ltd. Desai, A.R. (2009). Rural Sociology in India, Mumbai: Popular Prakashan. Desai, Vasant (2012). Rural Development in India, Mumbai: Himalaya Publishing House. M.J. Vinod and Meena Deshpande (2013). Contemporary Political Theory, New Delhi: Axis Publications. Mukerjee, Neela (2003). Participatory Rural Appraisal, New Delhi: Concept Publisher Narayanaswamy, N. (2009). Participatory Rural Appraisal: Methods and Application, New Delhi: Sage Publication Rani, K.S. (2011). Peoples Participation in Development, New Delhi: Discovery Publishing House. Singh, Preeti (2010). Panchayati Raj Institutions and Rural Development, Delhi: Axis Publication Somesh Kumar (2002). Methods for Community Participation: A complete guide for practitioners.Vistaar Sudharshu, Shekhar (ed.) (2003), Regional Planning in India, vol-I and II, New Delhi: Anmol Publications. Vijayakumar, K. (2011). Empowerment of weaker section future planning and strategies for Rural Development in India, New Delhi: Serials Publication Pvt. Ltd. Government Reports on Rural Development of Goa and India EPW Issue on Rural Affairs Vol. 53, Issue No. 51, 29 Dec, 2018 Participation Pays by Praxis (http://www.praxisindia.org/PARTICIPATIONPAYS.php) The Human Rights based approach to development in the era of globalisation, (https://www.ohchr.org/Documents/Issues/Development/RTDBook/PartIIChapter8.pdf) Rural Community Engagement, National Council of Rural Institute,	

	Department of Higher Education, MHRD
Learning Outcomes:	Students will be able to 1. Understand theoretical and practical aspects of rural planning and development. 2. Prepare community development plans. 3. Carry out research on rural development and engage with rural institutions

PUBLIC ADMINISTRATION OPTIONAL GENERIC COURSES

Programme: M. A. Public Administration
Title of the Course: Citizen-Centric Administration
Course Code: PAOGC1
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objectives:	This course is designed to acquaint the student both with participatory and rights-based approaches to good governance and citizen centric administration. Students will be exposed to various cases of citizen initiatives.	
Content:	**Module 1:** Concept of Citizen Centric Administration: Concept, Evolution, Features and Significance. Rights and Obligations of Citizens; Civic Culture. Service provision and developmental functions of the Government.	15 hours
	Module 2: Citizen Charter - Evolution, Features and Applications. Social Audit - Evolution, Features and Applications. Citizens' Participation in Administration: Concept, Significance and Limitations. Citizen Engagement initiatives of GoI (My-Gov) at national level; Select state government initiatives (Bhagidari, Delhi; Citizen Report Card, Bengaluru)	15 hours
	Module 3: Right to Information Act, 2005. Lok Pal and Lok Ayukta in India. Grievance – Meaning; Agencies for Redressal of Grievances at centre and state levels in India	15 hours
	Module 4: Consumer Protection: Concept and Rationale. Consumer Protection Act, 1986. The Goa (Right of Citizens to Time-Bound Delivery of Public Services) Act, 2013.	15 hours
Pedagogy:	Lectures and special talks/lectures from experts as well as practitioners from the civil service will be organized to establish links between theory and practice and develop the student's critical skills.	
Recommended Readings	Bakshi, P.M. (2008). Consumer Protection and Professionals reported in Law India, the ILI Publication. Biswal, T. (2016). Governance and Citizenship. Jaipur: Rawat Chaudhary, R.N.P. (2010). Consumer Protection Law: Provisions and Procedure. Deep & Deep, New Delhi.	

	Chakrabarty, Bidyut and Prakash Chand. (2016). Public Policy: Concept, Theory and Practice. New Delhi: Sage Government of India Second Administrative Reforms Commission. (2008). 'Refurbishing of Personnel Administration – Scaling New Heights', Tenth Report: Ministry of Personnel, Public Grievances and Pensions, Department of Administrative Reforms and Public Grievances, New Delhi. Government of India Second Administrative Reforms Commission. (2009). 'Promoting e Governance: The Smart Way Forward', 11th Report: Ministry of Personnel, Public Grievances and Pensions, Department of Administrative Reforms and Public Grievances, New Delhi. Government of India Second Administrative Reforms Commission. (2009). 'Citizen Centric Administration - The Heart of Governance', Twelfth Report: Ministry of Personnel, Public Grievances and Pensions, Department of Administrative Reforms and Public Grievances, New Delhi. Public Affairs Centre. (2007). India's Citizen's Charters- A Decade of Experience, Public Affairs Centre: Bangalore Singh, Shivani. (Ed.) (2016). Governance: Issues and Challenges. Sage: New Delhi
Learning Outcomes	Students will understand the components of good governance and citizen centric administration.

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Programme: M. A. Public Administration
Title of the Course: Administration of NGOs
Course Code: PAOGC2
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	This course is designed to prepare future NGO and Public Administrators to understand the theoretical conceptualization of the NGO and the NGO Sector in the framework of a developing economy and society.

Content:	**Module 1:** Non-Governmental Organisations (NGOs): Concept, Rationale and Scope. National Policy on the Voluntary Sector 2007. NGO-Government Interface in India with special reference to the NITI Aayog, Ministries and Departments	15 hours
	Module 2: Organisational Forms and Governance Structures of NGOs: Trust; Society; Company. NGO-Government & NGO-Private sector partnerships: Rationale and practice. Sources of NGO Funding; Government and Foreign Grants: Eligibility, Requirements & Procedures with special reference to Foreign Contributions	15 hours 15 hours
	Module 3: Issues of Governance; Capacity Building; Autonomy; Ethics. Accountability of NGOs: Rationale, Mechanisms and Problems. Formulation of a Welfare/Development Project Proposal including Monitoring and Evaluation arrangements	15 hours
	Module 4: Case Studies (objectives, structure and working): Self Employed Women's Association (SEWA); Red Cross Society of India; Voluntary Action Network India (VANI); OXFAM India	
Pedagogy:	Lectures, case study analysis, presentations and field trips	
Recommended Readings	Bava, N. (ed.) (1997). Non-Government Organisations in Development: Theory and Practice. New Delhi: Kanishka Publishers. Chandra, Suresh. (2015). Non-Government Organisations. Jaipur: Rawat. Dantwala, M. L., Sethi Harsh and Pravin Visaria (eds.) (1998) Social Change Through Voluntary Action. New Delhi: Sage. Government of India (2007). Report of the Steering Committee on Voluntary Sector for The Eleventh Five-Year Plan (Planning Commission (2007). New Delhi: Planning Commission. Handy, C. (1990). Understanding Voluntary Organizations – How to make them Function Effectively. London: Penguin Books. Jain, R. B. (1995). NGOs in Development Perspective. New Delhi: Vivek Prakashan. Self Employed Women's Association http://www.sewa.org/	

	Mohanty M. and Singh A. (n.d) Voluntarism and Government: Policy, Programme and Assistance, Voluntary Action Network India (VANI). http:pcserver.nic.in/ngo/reports.aspx NanavatyMeher and Kulkarni P. (1998). NGOs in the Changing Scenario. New Delhi: Uppal Publishing House OXFAM India.www.oxfamindia.org. SEWA sewa.org Voluntary Action Network India. www.vaniindia.org. (VANI)
Learning Outcomes	1. At the end of the course the student will have an understanding of the commonly adopted organizational forms and governance structures of NGOs; issues of governance, capacity building and accountability; funding sources, making grant applications and project proposals; and also gain an understanding of the NGO-Government interface and its impact on the working of NGOs 2. Case studies of international and domestic NGOs will further their understanding and equip them to work as managers in the NGO sector

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Programme: M. A. Public Administration
Title of the Course: Environment Administration
Course Code: PAOGC3
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objectives:	This course introduces students to environmental policy, with a focus on India. It will examine the nature and scope of environmental, energy and natural resource problems; contrasting perspectives on their severity and policy implications; scientific, economic, political, and institutional forces that shape policymaking and implementation; approaches to environmental policy analysis; and a deep dive into select issues in environmental policy both within India and globally.

Content:	**Module 1:** Environment: Key Concepts and Issues: Climate, Biodiversity, Waste Management, Air, Water, Energy, Ecosystem Balance; Natural Resource Conservation & Management; Environmental Hazards and Risk Management; Environmentally Sustainable Development; Corporate Social Responsibility **Module 2:** Environmental Policy: Introduction to Environmental Policies. Environmental Economics & Regulatory Framework. Environmental Impact Assessment: Impact Prediction, Evaluation and Mitigation. Strategic Environmental Assessment (SEA); Forecasting Environmental Changes **Module 3:** Environmental Administration: Law and Institutions. Overview of Laws and Institutions for Environmental Administration in India. Central Pollution Control Board: Structure, functions and role. State Pollution Control Board: Structure, functions and role **Module 4:** International Perspective: Global Agenda for Environment Conservation; Sustainable Development Goals and Environment; Climate Change and Environmental Justice. Case Studies**.** Role of Biodiversity Board, National Green Tribunal.	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Lectures and Case Study discussions	
Recommended Readings	Bhatt, M.S., Ashraf, S., &Illiyan, A. (Eds.) (2008). Problems and Prospects of Environment Policy: Indian Perspective. Delhi: Aakar Books. Divan, S., &Rosencranz, A. (2001). Environmental Law & Policy in India (18th edition). New Delhi: Oxford University Press. Dwivedi, O.P. (1997). India's Environmental Policies, Programmes and Stewardship. London, UK: Palgrave Macmillan. Krishnamoorthy, B. (2017). Environmental Management: Text and cases (3rd ed.). New Delhi: PHI Learning Private Limited. Kulkarni, V., & Ramachandra, T.V. (2006). Environmental Management. New Delhi: TERI Press. Roberts, J. (2011). Environmental Policy (2nd ed.). Abingdon, Oxon: Routledge	
Learning Outcomes	Students will develop an understanding of environment policy and administration in India and globally.	

Programme: M. A. Public Administration
Title of the Course: Office Management
Course Code: PAOGC4
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	Administrative efficiency has, at its core, the systematization of organization and procedures thereby evolving work systems that are appropriate and procedures

	that eliminate unnecessary delays and allow the office work to be done effectively and at a reasonable cost. This course will train students to look at the setting up and working of an efficient and cost-effective office by familiarizing them with the core areas and issues of office administration	
Content:	**Module 1:** Administrative and Office Management: Nature and scope. Office organization: Role, functions and qualifications of office supervisor/office manager. Office layout and Space management **Module 2:** Physical and Psychological factors in the office – colour, light, noise, air-conditioning, safety. Office Furniture, Machines and Equipment. Office Stationery and Supplies: standardization and codification; purchase, receipt, issue, disposal; store layout and store accounting **Module 3:** Office communication: Role, Types & Means; handling incoming and outgoing mail. Records Management: Features of good records management; Filing, Classification and Indexing of records; Records Retention Schedules; Preservation of records and Disposal of unwanted records; Centralized and Decentralized record keeping systems **Module 4:** Office procedure and office manuals; forms designing and control. Quantitative and Qualitative office work control. Statutory and other Meetings: Drafting, Circulation, Preparation of agenda; Preparation and Confirmation of minutes and proceedings of meetings	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Lectures, site visits, guest lectures and discussions	
Recommended Readings	Chopra, K. R. (2008). Office Management. Mumbai: Himalaya Books. Ghosh, Prasanta K. (2003). Office Management: Principles and Practice. New Delhi: Sultan Chand & Sons. K, Zane &Quible. (1977). Introduction to Administrative Office Management. Cambridge: Winthrop Publishers. N. P, Reddy & R.H, Appannaiah. (1990). Office Organisation and Management. New Delhi: Himalaya Publishing House. R. G, Terry. (1958). Office Management and Control: The Administrative Managing of Information. Irwin: Home Wood. Rachel, Littlefield. (1981). Management of Office Operations. New Delhi: Prentice Hall. Robinson, M. E & I. H. W, Leffingwell. (1986). Text Book of Office Management. New Delhi: McGraw Hill. S, Gadkari. (1997). Office Management for Public Administration-Principles and Techniques. New Delhi: Concept Publishing Company. Relevant Websites /Internet Sources	
Learning Outcomes	Students will understand the core components of office management and their significance for effective working.	

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Programme: M. A. Public Administration
Title of the Course: Economic Administration

Course Code: PAOGC5
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objectives:	In this course the student will be familiarized with the economic models of the market and economy, key economic policies and economic legislations in India.	
Content:	**Module 1:** Relevance of Economics to Public Administration. Concepts: Market Mechanism, Perfect Competition, Monopoly, Monopolistic Competition, National Income. Concept and Features: Free Market Economy, Centrally Planned Economy, Mixed Economy	15 hours
	Module 2: Sustainable Socio-economic Development; SDGs and the Indian economy. Structure and Growth of the Indian Economy. Indian Economic Reforms: Concept, Rationale and Evaluation	15 hours
	Module 3: Economic Administration: Nature and Scope. Market Failure: The Rationale for Government Intervention; State versus Market Debate. Monetary Policy: Objectives, Instruments and Administration. Fiscal Policy: Objectives, Instruments and Administration	15 hours
	Module 4: Economic Legislation (Rationale, Philosophy and Overview): Industrial (Development and Regulation) Act, 1951; Foreign Exchange Management Act, 1999; Competition Act, 2002	15 hours
Pedagogy:	Apart from regular classroom teaching, special talks/lectures from experts as well practitioners from the civil service/industry will be organized to establish links between theory and practice and develop the student's critical analysis skills.	
Recommended Readings	Bailey, S. J. (2001). Public Sector Economics: Theory, Policy and Practice (2nd ed.). London: Palgrave. Chakraborty, Lekha S. (2016). Fiscal Consolidation, Budget Deficits and the Macro Economy. New Delhi: Sage. Jha, L.K. (1986). Economic Administration in India – Retrospect and Prospect. New Delhi: IIPA. Kuchhal, S.C. (1989). Industrial Economy of India. Allahabad: Chaitanya Publishing House. Marathey, S.S. (1986). Regulation and Development. New Delhi: Sage Publications. Mishra, S.K. and Puri, V.K. (2010). Indian Economy: Its Development Experience. New Delhi: Himalaya Publishing House. Ministry of Finance, https://www.finmin.nic.in/ Ramanadham, V.V. (1965). The Working of Public Sector. Bombay: Allied Publishers.	

	Ray, Partha (2013), Monetary Policy, Oxford Press, New Delhi United Nations. (1974). Organisation, Management and Supervision of Public Enterprises in Developing Countries. New York: U.N. https://sustainabledevelopment.un.org/?menu=1300 World Bank. (1995). Bureaucrats in Business: The Economics and Politics of Government Ownership. New York: World Bank.
Learning Outcomes	Students will get a deeper insight into economic models of the market and the economy, industrial policies and economic legislations

Programme: M. A. Public Administration
Title of the Course: Disaster Management
Course Code: PAOGC6
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course will introduce students to different types of disasters and their management in India.	
Content:	**Module 1:** Disaster: Concept & Dimensions Natural Disasters: Earthquakes, Volcanic Eruptions, Floods, Cyclones, Climate Change. Man-made Disasters: Anthropogenic, Soil degradation, Desertification, Deforestation	15 hours
	Module 2: Disaster Management Act 2005. Organisational Framework for Disaster Administration in India at the Union, State and Local levels (including Nodal Agency, National Disaster Management, Authority, State Authority)	15 hours
	Module 3: Role of Information and Communication Technology Systems in Disaster Management. Interstate and International Cooperation for Disaster Management. Role of NGOs and Army in Disaster Management	15 hours
	Module 4: Disaster Risk Reduction – Sustainable Development; Disaster Preparedness; Relief and Rehabilitation; Disaster Management Training	15 hours
Pedagogy:	Lectures, case studies, role plays, mock drills, field visits, documentaries and interaction with experts in the field of disaster management	
Recommended Readings	Goel, S. L. (2006). Encyclopedia of Disaster Management. New Delhi: Deep and Deep. Govt. of India/UNDP. (2002-07). Disaster Risk Management Programme: Community Based Disaster Preparedness and Risk Reduction through Participation of Committees and Local Self Governments www.ndmindia.nic.in/EQProjects/goiundp2.0.pdf	

	Monappa, K. C. (2004). Disaster Preparedness. New Delhi: Akshay Public Agencies. Narayan, B. (2009). Disaster Management. New Delhi: A.P.H. Publishing
Learning Outcomes	Students will understand disasters and factors contributing to them. They will develop leadership and management skills in disaster management

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Programme: M. A. Public Administration
Title of the Course: Management of Disciplinary Proceedings
Course Code: PAOGC7
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course will introduce students to Disciplinary Proceedings and the remedies available to public servants in India.	
Content:	**Module 1:** Disciplinary Proceedings: Concept and Significance. Position of Public Servants under the Constitution and Statutes. Meaning and Scope of Reasonable Opportunity. Conduct Rules	15 hours
	Module 2: Major Punishments: Suspension; Dismissal; and Termination. Minor Punishments: Censure; Withdrawal of Promotion and Incentives; Pay Recovery. Fundamentals of Departmental Enquiries	15 hours
	Module 3: Role and Scope of Rules of Natural Justice in Disciplinary Proceedings. Corruption/Embezzlement in Public Services. Application of Legal Measures	15 hours
	Module 4: Remedies for Public Servants against Unconstitutional and Illegal Actions of the State: 1) Departmental Remedies 2) Tribunal Remedies 3) Ombudsmanic Remedies 4) Court Remedies	15 hours
Pedagogy:	Lectures and case study method	
Recommended Readings	Basu, D. D. (2008). Constitution of India. New Delhi: Wadhwa and Company Law Publishers. Ghaiye, R. K. (1988). Law and Procedure of Departmental Enquiries. Lucknow: Eastern Book Company. Maheshwari, S.R. (2002). Administrative Reforms in India. New Delhi: Macmillan India Ltd. Massey, I.P. (1985). Administrative Law. Lucknow: Eastern Book Co. Muthuswamy, P. (1993). Swamy's Manual on Disciplinary Proceedings. Madras: Swamy Publishers. Wade, R.W. R. (1981). Administrative Law. Oxford: Clarendon .	
Learning Outcomes	The students would understand the procedures of enquiries, punishments and application of other legal measures available to employees and the employer.	

Programme: M. A. Public Administration
Title of the Course: Public Health Policy and Administration
Course Code: PAOGC8
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course will introduce students to theoretical issues related to the challenges of Public Health Administration and implementation.	
Content:	**Module 1:** Public Health Administration – Nature, Significance and Scope. Challenges of Public Health Administration. Implementation and Evaluation of Healthcare Policies and Programmes	15 hours
	Module 2: Union Ministry of Health and Family Welfare: Organization, Functions and Role. Health Administration at the State Level: Organization, Functions and Role of Department of Health. Administration of Primary Healthcare at the Local Level	15 hours
	Module 3: Healthcare Programmes in India – Family Welfare Programme; Reproductive Child Healthcare; Immunization Programme; National Health Mission (NHM). Hospital Management: Organization, Function and Role	15 hours
	Module 4: National Institute of Health and Family Welfare: Structure, Functions and Role. Medical Council of India: Structure, Functions and Role. WHO: Structure, Functions and Role in Asia**;** Role of State Institute of Health and Family Welfare	15 hours
Pedagogy:	Lectures, seminars, workshops and field trips	
Recommended Readings	Ballabh, C. (2007). Health Care Services in Hospital. New Delhi: Alfa Publication. Goel, S.L. (1980). Health Care Administration. New Delhi: Sterlhoursing Publishers Goel, S.L. (2010). Organisational Structure of Health Care System and Hospital Administration. New Delhi: Deep & Deep.	
Learning Outcomes	Students will understand healthcare policies and programmes including health care organization at the union, state and local levels.	

Programme: M. A Public Administration
Title of the Course: Corporate Governance
Course Code: PAOGC9
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	This course will introduce students to the concept and theories of corporate governance.

Content:	**Module 1:** Corporate Governance: Concept, Rationale and Evolution in India. Theories of Corporate Governance: Stakeholders Theory; Agency Theory; Sociological Theory. Principles of Corporate Governance with special reference to Principles of Organisation for Economic Co-operation and Development (OECD)	15 hours
	Module 2: Structure and Forms of Organisations – Ministries/Departments, Corporations, Companies, Boards and Commissions, Adhoc & Advisory Bodies, Regulatory Authorities, Public Private Partnerships; Corporate Social Responsibility	15 hours 15 hours
	Module 3: Board of Directors: Types; Composition & Functions. CEO: Appointment, Functions & Role. Rights and Privileges of Share Holders and Investors	15 hours
	Module 4: Corporate Governance in Public Enterprises. Corporate Governance in NGOs. Future Trends of Corporate Governance in India	
Pedagogy:	Lectures, Discussion and field trips	
Recommended Readings	Bansal, C.L. (2005). Corporate Governance – Law Practice & Procedures with Case Studies. New Delhi: Taxman Allied Services Pvt. Ltd. Bhatia, S.K. (2004). Business Ethics and Corporate Governance . New Delhi: Deep and Deep Publication Pvt. Ltd. Dewan, S.M. (2006). Corporate Governance in Public Sector Enterprises. New Delhi: Dorling Kindersley India Pvt. Ltd. Millin, C.A. (2007). Corporate Governance. New Delhi: Oxford University Press Prasad, D. (2006). Corporate Governance. New Delhi: Prentice Hall of India Pvt. Ltd.	
Learning Outcomes	The student will understand various structures of corporate governance as per the nature of the organisation. Also an understanding will be gained of various aspects of corporate governance such as ethics, corporate social responsibility and current issues and problems in India.	

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Programme: M. A. Public Administration
Title of the Course: Ethics in Governance
Course Code: PAOGC10
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	The aim of this course is to acquaint the students with the concept and philosophy of ethics with special reference to ethics in public life and accountability of public services in India.	
Content:	**Module 1:** Ethics: Concept and Significance; Introducing Key Concepts: Right, Duty, Obligation, Virtue, Freedom, Equality, Compassion, Fraternity, Karma, Purusharthas, Dharma, Rta (Cosmic Order). Contribution of Kautilya (Character Building, Measures to tackle Corruption), Vivekananda (Practical Vedanta and Idea of Daridra-Narayana) and Mahatma Gandhi (Satyagraha and Truth). Contribution of Western Administrative Thinkers to Ethics with special reference to Socrates (Moral Theory), Immanuel Kant (Deontological Theory) and J.S. Mill (Utilitarianism)	15 hours
	Module 2: Presuppositions of Ethics: Freewill, Self, God. Applied Ethics: Issues of Inequality, Prejudice & Discrimination, Abortion, Foeticide, Suicide, Animal Killing, Environment Degradation, Capital Punishment. Nature of Moral Dilemmas	15 hours
	Module 3: Ethics in Public Life: Civil Service Neutrality and Anonymity. Significance of Ethical and Moral Values in Governance. Code of Ethics and Code of Conduct for Civil Services in India	15 hours
	Module 4: Probity in Governance – Corruption: Concept and Causes. Overview of Institutional Arrangements for fighting Corruption in India. Work Culture – Concept, Significance and Characteristics of a good work culture. Case Studies on Ethics in Public Administration	15 hours
Pedagogy:	Lectures and discussions	
Recommended Readings	Arora, R. K. (2008). Ethics in Governance: Innovations Issues and Instrumentalities. Jaipur: Rawat. Arora, Ramesh K. (Ed.) (2014) Ethics, Integrity and Values in Public Service. New Delhi: New Age International Bhattacharya, Mohit. (2007). LokPrashasanKeNayeAyaam. New Delhi: Jawahar Publishers and Distributors. Fox, W. (2009). A Theory of General Ethics – Human Relationships, Nature and The Built Environment. New Delhi: PHI Learning	

	Gandhi, Mahatma (2009). Hind Swaraj. Delhi: Rajpal& Sons Ghere, R. K. & Frederickson, H. G.(Eds.). (2007). Ethics in Public Management. New Delhi: PHI Learning. Lillie, William (1948). Introduction to Ethics. Methuen: London Rangarajan, L.N. (ed.) (1987). The Arthashastra. New Delhi: Penguin Books Vivekananda (3rd Vol.). Complete Works of Swami Vivekananda. Kolkatta: Advaitya Ashram. http://www.advaitaashrama.org/cw/content.php
Learning Outcomes	This course will help students develop and understand about the importance of integrity in public life and the problem solving approach to issues and conflict. It will enhance their skills of ethical decision making.

Programme: M. A. Public Administration
Title of the Course: Education Policy and Administration
Course Code: PAOGC11
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	To familiarize the students with the concepts of various systems of education and educational administration in India.	
Content:	**Module 1:** Educational Administration: Concept, Significance and Scope. Concepts: Universalization of Elementary Education, Non-Formal Education, Vocationalization of Secondary Education, Autonomous Colleges. Problems and Challenges of Educational Administration	15 hours
	Module 2: National Policy on Education, 1986 as modified in 1992 (Plan of Action, 1992); NEP 2020. Education and Five-Year Plans: Approaches, Priorities and Investments; RTE Main Features; Organisation and administration of an Indian University	15 hours
	Module 3: Organization and Administration of Education at the Central Level with special reference to the Ministry of Education. University Grants Commission: Structure, Functions and Role. National Council of Educational Research and Training: Structure, Functions and Role	15 hours
	Module 4: Socio-economic Problems of Educational Development – Equality of Opportunity, Employment and Productivity. Nation Building and Citizenship; Globalization and Education. Implementation and Evaluation of Sarva Siksha Abhiyan	15 hours
Pedagogy:	Lectures, case studies, policy analysis exercises, seminars and presentations.	

Recommended Readings	Goel, S. L. (1994). Education Policy and Administration. New Delhi: Deep and Deep Publication. Government of India. (1966). Report of the Education Commission. Manning, Kathleen. (2017). Organisational Theory in Higher Education. New York: Routledge. Mukherji, S. N. (1962). Administration of Education, Planning and Finance. Baroda: Acharya Book Depot.
Learning Outcomes	Students will understand the Education Policy in India as well as schemes and programmes introduced to promote access to education and quality education.

Programme: M. A. Public Administration
Title of the Course: Labour Policy and Administration
Course Code: PAOGC12
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course covers the theory and policy of Labour in India. It covers the institutional structure dealing with labour administration at union and state levels in India.	
Content:	**Module 1:** State and Labour: Theoretical Aspects. Indian Labour: Characteristics. Industrialization and Growth of Indian Labour	15 hours
	Module 2: Evolution of Labour Policy in India. Labour Policy and Five Year Plans. Labour Policy with special reference to Terms and Conditions of Employment; Industrial Relations and Wages	15 hours
	Module 3: Organisation, Functions and Role of Union Ministry of Labour and Employment; Labour Bureau and Directorate General of Labour Welfare of Government of India; Labour Department at the State Level	15 hours
	Module 4: Labour Policy and Legislation in India. Employee Welfare: Concepts; Significance; Approaches. Second National Commission on Labour	15 hours
Pedagogy:	Lectures, self-study method, audio visuals techniques, brainstorming on various issues, power point presentation, study visits to industries	
Recommended Readings	Government of India. (1969). Report of the National Commission on Labour. Jagdish (ed.) (2004). Labour Welfare Administration: Theories and Legal Provisions. New Delhi: Akansha.	

	Kumar, Anil. (2003). Labour Welfare and Social Security: Awareness, Implementation and Utility of Labour Laws. New Delhi: Deep and Deep Publication.
Learning Outcomes	Students will understand concepts and dimensions related to labour policy and administration, employee welfare.

Programme: M. A. Public Administration
Title of the Course: Regulatory Governance
Course Code: PAOGC13
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	The course deals with rationale of regulatory governance. The key areas covered are the theoretical perspectives of regulatory governance and some key sectors where regulatory agencies have been set up in India post 1991.	
Content:	**Module 1:** Regulation – Concept, Rationale and Theories. Regulatory Governance: Concept, significance and limitations. Independent Regulatory Commission: Concept and Rationale	15 hours
	Module 2: Regulatory Failure: Reasons and Remedies. Independence of Regulator Transparency and Accountability of Regulator	15 hours
	Module 3: Sectoral Regulation: Telecom Regulatory Authority of India (TRAI) – Structure, Functions and Role; Insurance Regulatory and Development Authority of India (IRDAI) – Structure, Functions and Role; Central Electricity Regulatory Commission (CERC) – Structure, Functions and Role.	15 hours
	Module 4: University Grants Commission (UGC): Composition, Functions and Role. Food Standards and Safety Authority of India (FSSAI): Structure, Functions and Role. Central Pollution Control Board (CPCB): Composition, Functions and Role	15 hours
Pedagogy:	Lectures, seminars, group work, assignment writing, tutorials and presentations	
Recommended Readings	Baldwin, R., Cave, M., & Lodge, M. (2011) Understanding Regulation: Theory, Strategy and Practice (2 nd ed.). London: Oxford University Press. Government of India, (2006) Second Administrative Reforms Commission, Creating an Effective Regulatory Framework, 13th Report Chapter 6, New Delhi: Ministry of Personnel. Public Grievances and Pensions, Department of Administrative reforms and Public Grievances Government	

	of India, Approach to Regulation: Issues and Options, Planning commission New Delhi. Government of India, Report of the Working Group on Business Regulatory Framework, Towards Optional Regulatory Government in India, New Delhi: Government of India . Retrieved from planningcommission.nic.in/aboutus/committee/.../wg,,,brf 2013.pdf Government of India, Approach to Regulation of Infrastructure, Planning commission Retrieved from infrastructure.gov.in/event-Regulation_Law_and_Policy_final.pdf . Rosenbloom, D.H. (1989) Public Administration: Understanding Management, Politics and Law in the Public Sector, New York : McGraw-Hill Book Company. Online Sources: www.trai.gov.in www.cercind.gov.in www.fssai.gov.in www.ugc.ac.in www.irdai.gov.in www.cpcb.nic.in
Learning Outcomes	Students will understand the importance and systems of regulatory governance

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Programme: M. A. Public Administration
Title of the Course: Public Enterprise Management
Course Code: PAOGC14
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	This course discusses the concept and role of public sector enterprises, governing boards, privatization and performance of central public sector enterprises in India. Issues of management, control, pricing and finally public sector reforms will also be covered in this course.	
Content:	**Module 1:** Public Enterprise: Concept, Rationale and Objectives. Role of Public Sector in the Indian Economy. Industrial Policy Resolutions and Public Sector Enterprises	15 hours
	Module 2: Governing Boards: Types, Functions, Size and Composition. Legislative Control over Public Enterprises. Ministerial Control over Public Enterprises.	15 hours
	Module 3: Pricing and Public Enterprises. Public Sector Reforms: Rationale; Performance Contract System/Memorandum of Understanding (MOU); Professionalisation of Public Enterprise Boards of Governance in India	15 hours
	Module 4: Disinvestment: Objectives, Methods, Machinery and Assessment. Privatisation: Theory,	15 hours

	Objectives, Methods, Procedure, and Assessment; Lessons from the U.K. Experience. Contracting Out: Concept & Rationale; Contracting Out Local Services	
Pedagogy:	Course material will be supplemented by activities like case study discussions and interaction with experts.	
Recommended Readings	Bailey, S.J. (2001). Public Sector Economics: Theory, Policy and Practice. 2nd ed. London: Palgrave Bos, D. (1991). Privatization: A Theoretical Treatment. Oxford: Oxford University Press. Dubhashi, P.R. (1976). Economics, Planning and Public Administration. Bombay: Somaiya Publications Pvt. Ltd. Jha, L.K. (1986). Economic Administration in India – retrospect and prospect. New Delhi: IIPA Khera, S.S. (1977). Government in Business. New Delhi: National Publishing House Relevant websites including dpe.nic.in; finmin.nic.in .	
Learning Outcomes	The student will develop public speaking, critical thinking, group work and presentation skills	

Programme: M. A. Public Administration
Title of the Course: Police Administration
Course Code: PAOGC15
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme
Objective:	This course will introduce students to the complex role of police in contemporary society.

Content:	**Module 1:** Police Administration: Evolution; Concept and Significance. Police: Powers and Functions. Reforms in Police Administration after Independence. Crime: Types, Causes and Remedies	15 hours
	Module 2: Police set up at National Level: Organisation, Functions and Role. Police set up at State Level: Organisation, Functions and Role. Police set up at District Level: Organisation, Functions and Role. Police set up at Local Level: Organisation, Functions and Role	15 hours
	Module 3: Police Personnel: IPS and State Police Service. Recruitment, Promotion, Training, Conduct and Discipline	15 hours
	Module 4: Community Policing: Concept, Role and Significance. Police and Human Rights: Emerging Issues and Challenges. Police and Women	15 hours
Pedagogy:	Lectures, discussions, short films, role plays, field visits, case studies, visits to police stations.	
Recommended Readings	Chaturvedi, J. C. (2006). Police Administration and Investigation of Crime. New Delhi: Isha Books. Ghosh, G. (2010). Re-legitimizing Indian Police. New Delhi: Radha Publication. Ghosh, S. (1973). Police Administration: Organization and Procedure. Eastern Law House. Ghosh, S.K. & Hummer, Don. (2008). Encyclopedia of Police in India. Volume I. New York: Taylor & Francis Group. Hunter, R.D., Barker, T & Mayhall, P.D. (2010). Police Community Relations and the Administration of Justice. Prentice Hall. Jim, R &Rustamji, K.F. (1993). Handbook of Police Administration. CSR Press. New Delhi: Ashish Publishing House. Rohit, C. (2009). Policing: Reinventing Strategies in a Marketing Framework. New Delhi: Sage Publication. Rohtagi, M. (2007). Spy System in Ancient India. New Delhi: Gyan Books Pvt. Ltd Srivastava, A. (1999). Role of Police in a Changing Society. New Delhi: APH Publishing. Subramanian, K. S. (2007). Political Violence and the Police in India. SAGE Publications India. Swanson, C. R., Territo, L., & Taylor, R. W. (2011). Police Administration: Structures, Processes, and Behavior. Prentice Hall	
Learning Outcomes	The students will develop analytical and critical skills and develop an understanding of working of police administration.	

Programme: M. A. Public Administration

Title of the Course: Organisational Psychology
Course Code: PAOGC16
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objectives:	This course will introduce students to basic concepts of Organisational Psychology including functional aspects of Organizational Psychology such as human relations, employment, attitudes, groups, personality and work stress.	
Content:	**Module 1:** Organisational and Industrial Psychology: Concept, Nature and Scope. Leadership: Concept; Theories – Trait; Situational; Behavioural. Employee Needs: Concept, Hierarchy of Needs and Need Satisfaction	15 hours
	Module 2: Attitude: Concept, Nature and Significance. Industrial Morale: Concept, Nature and Determinants. Motivation of Industrial Employees: Concept and Determinants	15 hours
	Module 3: Personality: Concept, Significance and Types. Job Satisfaction: Concept, Significance and Determinants. Groups: Concept, Types and Inter-Group Relations	15 hours
	Module 4: Fatigue: Concept, Causes and Remedies. Monotony and Boredom: Concept, Causes and Effects. Work Stress and its Management	15 hours
Pedagogy:	Lectures, role play, case studies, discussions and interaction with experts.	
Recommended Readings	Brown, J.A.C. (1954). The Social Psychology of Industry. U.K.: Penguin. Buchanan, David A. (Ed.) (2016). Organizational Behaviour (9th edition). U.K.: Boffin Cooper, Cary L. (Ed.) (2000). Industrial and Organizational Psychology: Linking Theory with Practice. USA: John Wiley and Sons Ganguli, H.C. (1983). Structure and Process of Organization. Mumbai: Asia Publishing House. Katz and Kahn.(1979). Social Psychology of Organizations. USA: Wiley. Luthans, Fred. (2010). Organizational Behavior. New York: McGraw-Hill Education McShane, Steven, Lattimore (2015); Organisational Behaviour, 5th edition; New York: Mcgraw-Hill Norman, R. F. Maier. (1970). Psychology in Industry. Oxford and IBH. Schein, Edgar. (1988). Organizational Psychology. USA: Prentice Hall.	

	Stephan P. Robbins, Seema Sanghi, Timothy Judge. (2009). Organizational Behaviour: Concepts, Controversies and Applications. New Delhi: Pearson 13th Edition. Zedeck, Sheldon (2011). APA Handbook of Industrial and Organizational Psychology (Part of the APA Handbooks in Psychology Series and APA Reference Books Collection). USA: APA.
Learning Outcomes	This course will help students understand the human and psychological aspect of organisation. In the course of the semester they will develop skill in public speaking, critical thinking, group work and presentation skills.

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Programme: M. A. Public Administration
Title of the Course: Organisational Development and Administrative Improvement
Course Code: PAOGC17
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	To promote the understanding of administrative efficiency; organisational development and administrative improvement are important aspects of administrative management. A study of the reports of the Government of India Commissions on Administrative Improvement and Reforms and the working of the O&M Division of the Government of India will link the theoretical and operational aspects of administrative improvement in public administration.	
Content:	**Module 1:** Introduction to Organisation Development: Concept, Relevance, History & Evolution; Concept of Organizational culture. The Nature of Planned Change: Theories, Models, Types & Change Agents. Challenges of Organizational Change: Cultural, Institutional and Technological	15 hours
	Module 2: Organizational Learning and Transformation; Determinants of Organizational Design. Diagnosing the Problem Intervention strategies for organization development – Individual, Group & Interpersonal Interventions. Organisational Analysis and Development of Organisational Structure	15 hours 15 hours
	Module 3: Human Resources: Systems and Processes. Role of Human Resource in Organizational Change and Development. HRM Interventions: Goal Setting, Performance Appraisal and Reward Systems. Managing Workforce Diversity	15 hours

	Module 4: Techniques of Administrative Improvement: Organisation and Methods; Qualitative and Quantitative Work Control. Innovations in Management: Quality Circles, Total Quality Management; Management by Objectives. Performance Measurement in Administration: Working of O&M Division of Government of India; Pay Commissions and Administrative Improvement	
Pedagogy:	Lectures and Discussions	
Recommended Readings	Currie, R. and Faraday. (1972). Work Study. London: Pitman. Government of India. (2008). Ministry of Personnel, Public Grievances and Pension. Government of India. (2008). Second Administrative Reforms Commission Reports. Maheshwari, S. R. (2002). Administrative Reforms in India. New Delhi: Macmillan India Ltd. Maheshwari, S. R. (2006). Indian Administration. New Delhi: Orient Longman Private Limited. Reddin, W.J. (1971). Effective Management by Objectives. New York: McGraw Hill. Srinath, L.S. (1996). PERT and CPM – Principles and Applications. New Delhi: Affiliated East-West Press. United Nations. (1972). Use of Modern Management Techniques in the Public Administration of Developing Countries. New York.	
Learning Outcomes	The students will develop an understanding of the ways in which change can be managed in an organisation at the operations and policy planning levels	

Programme: M. A. Public Administration
Title of the Course: Administrative Law
Course Code: PAOGC18
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MA Public Administration Programme	
Objective:	To develop in students an understanding of the various components of administrative law along with the principles of natural justice, rule of law, administrative legislation and adjudication. Administrative Law is an integral part of Public Administration and the basis of administrative activity and its control.	
Content:	**Module 1:** Meaning, Growth and Scope of Administrative Law. Distinction between Constitutional Law and Administrative Law (Droit Administratif). Concept of Rule of Law and Principles of Natural Justice.	15 hours

	Module 2: Delegated Legislation: Need, Classification and Safeguards. Judicial Review of Administrative Action; Principles and Modes Liability of the Administration; Contract	15 hours
	Module 3: Administrative Tribunals: Concept, Rationale and Types. Central Administrative Tribunal: Structure, Function and Role. Central Vigilance Commission: Structure, Functions, Role and Significance	15 hours
	Module 4: Institution of Ombudsman: Concept and Genesis. Lok Pal and Lok Ayukta in India: Significance, Functions and Role. Fundamentals of Departmental Proceedings: Suspension, Charge sheet, Enquiry and Penalties	15 hours
Pedagogy:	Study and analysis of case law	
Recommended Readings	Diwan, P. (2007). Indian Constitution (2nd ed.). Allahabad: Law Agency. Kagzi, M. C. J. (2008). Indian Administrative Law (2nd ed.). Delhi: Metropolitan. Massey, I.P. (2008). Administrative Law. New Delhi: Eastern Book Company. Mehta, S.M. (1990). Indian Constitutional Law. New Delhi: Deep and Deep. Sathe, S.P. (1998). Administrative Law (6th ed.). Bombay: Tripathi. Sharma, S.K. (2007). Directive Principles and Fundamental Rights. New Delhi: Deep and Deep. Swami, P.M. (1989). Swami's Manual of Disciplinary Proceedings for Central Government Employees. Madras: Swami Publishers. Upadhyaya, J.J.R. (2016). Administrative Law. Prayagraj: Central Law Agency	
Learning Outcomes	By the end of the course, a student would comprehend the significance of the rule of law, administrative law and the quasi-legislative, quasi-judicial procedures within administration	

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D 3.8 Minutes of the Board of Studies in Physics meeting held on 24.03.2022.

Annexure I

M.Sc. Physics Syllabus from Academic year 2022-23

The new structure consists of four categories of courses:

(a) Discipline Specific Core Courses – Total Credits 32
(b) Discipline Specific Optional Courses – Total Credits 8
(c) Research Specific Optional Courses – Total Credits 12
(d) Generic Optional Courses – Total Credits 12 (These courses are open to all)

In addition to these four categories,we have introduced fifth category of courses – Bridge Courses with an objective to help the non-Physics graduates seeking admission to M.Sc. Physics as well as slow learners.Bridge courses will be available as an online resource and could be taken any time before or during their MSc programme or as advised by the teachers. Further, to help Physics students without adequate background in Biology, a bridge course "Introduction to Biology and Biophysics" is also introduced.

The course codes are used in tables below are as follows:

PHB – Bridge Courses
PHDC – Discipline Specific Core Courses
PHDO – Discipline Specific Optional Courses
PHSO/PHBO/PHCO – Research Specific Optional Courses in three specializations – Solid State Physics, Biophysics and Computational Physics respectively.
PHGO – Generic Optional Courses

Code	Title	Credits	Hours
PHB100	Bridge Course in Mathematical Methods	2	30
PHB101	Bridge Course in Thermal Physics	2	30
PHB102	Bridge Course in Optics	2	30
PHB103	Bridge Course in Quantum Mechanics	2	30
PHB104	Bridge Course in Electrostatics and Magnetostatics	2	30
PHB200	Introduction to Biology and Biophysics	3	45
Semester I			
PHDC101	Mathematical Methods of Physics	4	60
PHDC102	Classical Mechanics	4	60
PHDC103	Electromagnetic Theory	4	60
PHDC104	Electronics	4	60
PHDO101	Electronics Practical	2	60
PHDO102	Computer Programming in Fortran Practical*	2	60
PHDO103	Computer Programming in C Practical*	2	60
PHDO104	Computer Programming in Python Practical*	2	60
*Any one course			
Semester II			
PHDC105	Quantum Mechanics	4	60
PHDC106	Statistical Mechanics	4	60
PHDC107	Nuclear and Elementary Particle Physics	4	60
PHDC108	Atomic Physics	4	60
PHDO105	General Physics Practical	4	120

Semester III					
PHSO201 PHCO201 PHBO201	Solid State Physics I	Advanced Quantum Mechanics	Molecular Biophysics	4	60
PHSO202 PHCO202 PHBO202	Solid State Physics II	Advanced Statistical Mechanics	Methods of Biophysics	4	60
PHGO201 PHGO211 PHGO221	Solid State Physics Practical	Numerical Techniques Practical	Biophysics Practical	4	120
PHGO2XX	Generic Optional Courses (to be chosen for Optional Set I or from any other disciplines or from SWAYAM)			8	120
Semester IV					
PHSO3xx PHCO3xx PHBO3xx	Courses worth 4 credits to be chosen from Optional Set II or from SWAYAM in consultation with Dissertation Guide			4	60
PHD400	Dissertation			16	

Suggested Optional Courses

Optional Set I – Generic Optional	Credits	Optional Set II – Research Optional	Credits
Solid State Physics Practical	4	X-ray and Nuclear Spectroscopy	2
Numerical Techniques Practical	4	Optical Spectroscopy	2
Biophysics Practical	4	Superconductivity and Superfluidity	2
Neutron Physics	2	Magnetism in Condensed Matter Physics	2
Advanced Optics	2		2
Physics of Phase transitions and Critical Phenomena	2	Introduction to Crystallography and X-ray Diffraction	
Solid State and Biomaterials	2	Particle Physics	2
Physics of Energy Materials	2	Numerical methods and Fortran parallel programming using open mp	2
Physics of Quantum Materials	2		
Physics of Ferroic Materials	2		
Nanoscience and Technology	2		
Documentation using Latex	2		
Statistical Methods and Error Analysis	2		
Laser Physics and Applications	2		

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The syllabi of the courses in first two semesters and the bridge courses are given below.

Programme: M. Sc. (Physics)
Course Code: PHB-100 **Title of the Course:** Bridge Course in Mathematical Methods
Number of Credits: 2

Effective from AY: 2022-23

Prerequisites for thecourse:	NIL	
Objectives:	This course develops problem solving capabilities of students. It also helps to revise and understand the concepts based on Integration, differentiation and such other basic topics of mathematics, which are useful in solving problems based on Physics.	
Content:	**1. Preliminary Calculus** Differentiation from first principles; products; the chain rule; quotients; implicit differentiation; logarithmic differentiation; Leibnitz' theorem; special points of a function; theorems of differentiation, Integration from first principles; the inverse of differentiation; integration by inspection; sinusoidal functions; logarithmic integration; integration using partial fractions; substitution method; integration by parts; reduction formulae; infinite improper integrals; plane polar coordinates; integral inequalities; applications of integration **2. Partial Differentiation** Definition of partial derivative; the total differential and total derivative; Exact and inexact differentials; Useful theorems of partial differentiation; the chain rule; Change of variables; Taylor's theorem for many variable functions; Stationary values of many variable functions; Stationary variables under constraints; Thermodynamic relations; Differentiation of integrals **3. Series and Limits** Series; Summation of series (arithmetic, geometric); convergence of infinite series; Operations with series; Power series; Taylor series; Evaluation of limits. **4. Vector Algebra** Scalars and vectors; Addition and subtraction of vectors; Multiplication by a scalar; Basis vectors and components; Magnitude of a vector; Multiplication of vectors; Equation of lines and planes; Using vectors to find distances; Reciprocal vectors. **5. Ordinary differential equations** Linear equations with constant coefficients; Linear equations with variable coefficients; General ordinary differential equations.	10 hours 5 hours 5 hours 5 hours 5 hours
Pedagogy:	Online lectures along with assignments	
References/Readings	1. K.F. Riley, M.P. Hobson and S.J. Bence, Mathematical Methods for Physics and engineering, Cambridge	

	University Press, Cambridge UK (Reprint 2002). 2. George B. Arfken and Hans J. Weber, Mathematical methods for Physicists, 7/e Elsevier Inc., 2012. 3. Mathematics text books of XI and XII Science prescribed by NTSE/CBSE/Goa Board.	
Learning Outcomes	1. Conceptual understanding of the meaning of the differentiation, partial differentiation, integration, ODE (Ordinary differential equations) and its application to solve the problems based on physics. 2. Understand the vector algebra, series and its application in solving the problems in physics and day to day life.	

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Programme: M. Sc. (Physics)
Course Code: PHB101 **Title of the Course: Bridge Course in Thermal Physics**
Number of Credits: 2
Effective from AY: 2022-2023

Prerequisites for the Course:	B. Sc. Levels courses on mechanics and mathematics	
Objectives:	This course aims to introduce basic concepts of thermodynamics, laws of thermodynamics, entropy its applications.	
Content:	1. **Zeroth and First Law of Thermodynamics:** Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes, Applications of First Law: General Relation between C_P and C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient. 2. **Second Law of Thermodynamics:** Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale. 3. **Entropy:** Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy. The entropy of a perfect gas. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe. Entropy Changes in Reversible and Irreversible	6 hours 8 hours 6 hours

	Processes. Principle of Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics. The unattainability of Absolute Zero. 4. **Thermodynamic Potentials:** Extensive and Intensive Thermodynamic Variables. Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties, and Applications. Surface Films and Variation of Surface Tension with Temperature. Magnetic Work, Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, ClausiusClapeyron Equation and Ehrenfest equations. 5. **Maxwell's Thermodynamic Relations:** Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) ClausiusClapeyron equation, (2) Values of Cp-Cv, (3) TdSEquations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process	5hours 5 hours
Pedagogy:	Online lectures and assignments	
References/Readings	1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill. 2. A Treatise on Heat, MeghnadSaha, and B.N.Srivastava, 1958, Indian Press 3. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill 4. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer. 5. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger. 1988, Narosa. 6. Concepts in Thermal Physics, S.J. Blundell and K.M. Blundell, 2nd Ed., 2012, Oxford University Press	
Learning Outcomes	• Basic concepts of thermodynamics • Understand the properties of pure substances • Formulate and apply the first and second laws of thermodynamics • Concepts of entropy and the third law of thermodynamics. • Understand thermodynamic potentials and their relations.	

Programme: M. Sc. (Physics)
Course Code: PHB102 **Title of the Course: Bridge Course in Optics**
Number of Credits: 2
Effective from AY: 2022-2023

Prerequisites for the Course:	B. Sc. Levels courses on mechanics and mathematics	

Objectives:	This course aims to understand the various concepts of geometric and wave optics	
Content:	**1. Geometric Optics** Brief history, Propagation of light, Scattering, Reflection and Refraction of light, Fermat's principle, Ray equations, Refraction and reflection by spherical surfaces, Paraxial optics, lenses, mirrors, prisms, optical systems, Total internal reflection, thick lenses, Aberrations. Introduction to eyepieces, Ramsden and Huygens eyepieces. **2. Wave Optics** Simple harmonic motion, vibrations, origin of refractive index, sinusoidal waves, one-dimensional wave equation, transverse and longitudinal vibrations, Huygen's principle, plane waves, spherical and cylindrical waves. **3. Interference** Superposition of Waves, Division of wavefront& division of amplitude, Formation of colors in thin film- reflected system, transmitted system, wedge shaped film, Newton's Rings and its application to determine refractive index of liquid (Normal Incidence only), Interferometry: Michelson interferometer-its principle, working and its application to determine wavelength and difference between two wavelengths, Coherence. **4. Diffraction** Fraunhofer diffraction, Single slit and Double slit patterns, Limit of resolution, Diffraction grating, Fresnel diffraction, zone-plates, Diffraction by circular discs and apertures, Holography. **5. Polarization of light** Nature of polarized light, Dichroism, Birefringence, Scattering and Polarization,Polarization by reflection, Brewster angle, Circular polarizers, Wave plates.	6 hours 6 hours 6 hours 6hours 6 hours
Pedagogy:	Online lectures and assignments	
References/Readings	1. Optics, AjoyGhatak, 7th Edition, Tata-McGraw-Hill (2020). 2. Optics, Eugene Hecht, Pearson, 5th Edition, (2019). 3. A Textbook of Optics, 25th edition, Brij Lal, M N Avadhanulu& N Subrahmanyam, S. Chand & Company (2012). 4. Fundamental of Optics, F.A. Jenkins and H.E. White, Tata McGraw-Hill (1981).	
Learning Outcomes	Students will develop a conceptual understanding of Geometrical and Wave optics	

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Programme: M. Sc. (Physics)
Course Code: PHB103 **Title of the Course: Bridge Course in Quantum Mechanics**
Number of Credits: 2

Effective from AY: 2022-2023

Prerequisites for the Course:	B. Sc. Levels courses on mechanics and mathematics	
Objectives:	This course aims to understand the various phenomena of early quantum physics and develop the essential ideas of the old quantum theory.	
Content:	1. THERMAL RADIATION AND PLANCK'S POSTULATE Thermal Radiation, Classical Theory of Cavity Radiation, Planck's Theory of Cavity Radiation, Planck's Postulate and Its Implications. 2. PHOTONS—PARTICLE-LIKE PROPERTIES OF RADIATION Introduction, The Photoelectric Effect, Einstein's Quantum Theory of the Photoelectric Effect, The Compton Effect, The Dual Nature of Electromagnetic Radiation. 3. DE BROGLIE'S POSTULATE—WAVE-LIKE PROPERTIES OF PARTICLES Matter Waves, The Wave-Particle Duality, The Uncertainty Principle, Properties of Matter Waves, Some Consequences of the Uncertainty Principle, The Philosophy of Quantum Theory 4. BOHR'S MODEL OF THE ATOM Thomson's Model, Rutherford's Model, The Stability of the Nuclear Atom, Atomic Spectra, Bohr's Postulates, Bohr's Model, Atomic Energy States. 5. SCHROEDINGER'S THEORY OF QUANTUM MECHANICS Introduction, Plausibility Argument Leading to Schrödinger's Equation, Born's Interpretation of Wave Functions, Expectation Values, the time-independent Schrödinger Equation, Required Properties of Eigen functions, Energy Quantization in the Schrodinger Theory. 6. SOLUTIONS OF TIME-INDEPENDENT SCHROEDINGER EQUATIONS Introduction, The Zero Potential, The Step Potential (Energy Less Than Step Height), The Step Potential (Energy Greater Than Step Height), The Barrier Potential, Examples of Barrier Penetration by Particles, The Square Well Potential, The Infinite Square Well Potential, The Simple Harmonic Oscillator Potential	3 hours 2 hours 2 hours 3hours 5 hours 15hours
Pedagogy:	Online lectures along with assignments	
References/Readings	1. Quantum Physics of Atoms, Molecules, Solids,Nuclei, and Particles, by Robert Eisberg and Robert Resnick, John Wiley & Sons (2006) 2. Quantum Mechanics, Theory and Applications by Ghatak and Lokanathan, Mc Millan (2004). 3. A Textbook of Quantum Mechanics, P. M. Mathews, and K. Venkatesan, 2nd Ed., 2010, McGraw Hill	

	4. Quantum Mechanics, Leonard I. Schiff, 3rd Edn. 2010, Tata McGraw Hill.	
Learning Outcomes	• Concept of the wave-particle duality of radiation and particles • Understanding of energy quantization • understanding of wave mechanics in one dimension describe the structure of the hydrogen atom and show an understanding of quantization of angular momentum	

Programme: M. Sc. (Physics)
Course Code: PHB104 **Title of the Course: Bridge Course in Electrostatics and Magnetostatics**
Number of Credits: 2
Effective from AY: 2022-2023

Prerequisites for the Course:	B. Sc. Levels courses on mechanics, mathematics, and vector algebra	
Objectives:	This course is aimed at revising the electrostatics and magnetostatics	
Content:	**1. Electrostatics** Coulomb's law, Electric field and potential, Gauss's law, Application of Gauss's law, the electric field in various circumstances, Electrostatic energy, dielectrics. **2. Magnetostatics** Electric current, the magnetic field, the magnetic force of a current, Ampere's law, magnetic field of a straight wire and of a solenoid, atomic currents, the relativity of magnetic and electric fields, the magnetic field in various situations, the vector potential, induced currents, the Maxwell equations.	15 hours 15 hours
Pedagogy:	Lectures/tutorials/assignments. Sessions shall be interactive in nature to enable peer group learning	
References/Readings	1. The Feynman lectures on Physics, Vol-2, Pearson (2013) 2. University Physics with modern Physics, Young and Freedman, Pearson (2016) 3. Concepts of Physics, vol-2, H. C. Verma, BharatiBhawan Publishers & Distributors (2019).	
Learning Outcomes	Students will develop a conceptual understanding of Electrostatics and Magnetostatics and their applications.	

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Programme: M.Sc (Physics)(Biophysics)

Course Code: PHB-200 **Title of the Course: Introduction to Biology and Biophysics**

Number of Credits: 4

Effective from AY: 2022-23

Prerequisites for the course:	Understanding of basic concepts in biology, chemistry and physics	
Objective:	This is a bridge course for the students for introducing them to the concepts in biology and biophysics.	
Content:	**Introduction to Biology** Origin and evolution of life, prokaryotic cells, photosynthesis, eukaryotic cells, elementary building blocks of life **Biochemistry I** Chemical components of the cell, energy, catalysis and biosynthesis, cellular membranes, transport across membranes, energy generation in cells, cytoskeletons, cell division, **Biochemistry II** Proteins-structure and function, DNA, RNA and chromosomes, Genes, genetics, carbohydrates, lipids and enzymes **Biophysics** Biological motion, free energy transduction, chemochemical machines, pumps and motors as chemochemcial machines, flux force dependence, molecular motors, mechanochemistry of molecular motors, biomolecular forces, biomechanics of muscle contraction and cardiovascular system.	5 hours 15 hours 15 hours 10 hours
Pedagogy:	Online Lectures/Assignments/Self Study Interactive sessions will be conducted to enable peer group learning.	
References/Readings	1. The Cell: A Molecular Approach, Geoffrey M. Cooper and Robert E. Hausman, Seventh Edition, Oxford University Press (2018). 2. Essential Cell Biology, Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander D. Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter, Fourth Edition Garland Science (2013). 3. Molecular Biology, David Clark Nanette Pazdernik Michelle McGehee, Third Edition, Elsevier (2019). 4. Introduction to Molecular Biophysics, Jack A Tuszynski and Michal Kurzynski, First Edition, CRC Press, (2003). 5. Biophysics: An Introduction, Rodney Cotterill, Wiley (2002). 6. Applied Biophysics, A Molecular Approach for Physical Scientist, Thomas A Weigh, First Edition, Wiley, (2007).	

	7. Molecular & Cellular Biophysics, Mayer & Jackson, Cambridge Press (2006).	
Learning Outcomes:	1. The students will be familiarized with the basic concepts of molecular biophysics 2. The students will have gained sufficient knowledge in the structure and functioning of molecular processes 3. The students will be exposed to the recent developments in biomechanics and molecular motion.	

Programme: M.Sc. (Physics)
Course Code: PHDC – 101 **Title of the Course:** Mathematical Physics
Number of Credits: 4

Effective from AY: 2022-23

Prerequisites for thecourse:	Should have studied the courses in Physics at graduation level.	
Objective:	Students will get exposed to necessary mathematical skills that are essential to understand different phenomena in physics. The course also helps students to understand the theoretical background of other core courses in physics.	
Content:	**1. Ordinary Differential Equations** Second order homogeneous and inhomogeneous equation, Wronskian, General Solutions, Ordinary and Singular points, Series Solutions. Polynomial solutions, Legendre's equation, Bessel's equation, Gamma function **2.Functions of Complex Variable** Limits, Continuity, Analyticity of Functions of a Complex Variable, Taylor and Laurent Series, Isolated and Essential Singularities, Branch Cuts, Cauchy Formula, Contour Integration, Application of Residue Theorem. **3. Linear Vector Spaces** Linear Operators, Matrices, Coordinate Transformations, Eigenvalue Problems, Diagonalization of Matrices, Infinite Dimensional Spaces, Elements of Group Theory. **4. Integral Transforms** Fourier Series, Fourier Transforms, Laplace Transforms, Applications of Integral Transforms. **5. Boundary Value and Initial Value Problems** Vibrating String in one Dimension, Heat Conduction, and Wave Equation.	14 hours 15 hours 9 hours 12 hours 10 hours
Pedagogy:	Lectures/ tutorials or a combination of these. Sessions shall be interactive in nature to enable peer group learning.	
References/Readings	1. George B. Arfken and Hans J. Weber, Mathematical methods for Physicists, 7/e Elsevier Inc., 2012. 2. K.F. Riley, M.P. Hobson and S.J. Bence, Mathematical	

	Methods for Physics and engineering, Cambridge University Press, Cambridge UK (Reprint 2002) 3. J. Mathew and R. L. Walker, Mathematical Methods for Physics, Benjamin Publishers (1973). 4. James W. Brown and R. V. Churchill Complex Variables and Applications, 6th Edition (international), McGraw - Hill (1996**).** 5. L. A. Pipes, Applied Mathematics for Engineers and Physicists, 3rd Edition, McGraw-Hill (1971). 6. W. W. Bell, Special Functions for Scientists and Engineers, D. Van Nostrand Company Ltd (2004). 7. Charlie Harper, Introduction to Mathematical Physics, PHI. 8. Murray R. Spiegel, Theory and problems in Complex Variables by (Schaum' series) (2009). 9. Murray R. Spiegel, Theory and problems of advanced Mathematics for Engineers and Scientists by (Schaum's series) (1980).	
Learning Outcomes	1. Develop sufficient mathematical skills and apply them in other courses of physics. 2. Develop understanding of the mathematical background of various concepts in physics.	

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Programme: M. Sc. (Physics)
Course Code: PHDC-102 **Title of the Course:** Classical Mechanics
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Should have studied basic courses in mechanics in B.Sc. and Mathematics.	
Objective:	This course is aimed at understanding intermediate to advanced classical mechanics and to build the necessary framework for other topics that requires classical mechanics such as quantum mechanics, statistical mechanics and electromagnetism.	
Content:	**1. Newton's Laws of Motion** Mechanics of a single particle, Mechanics of a system particles, Constraints and their classification, Principle of virtual work, D'Alembert's principle. **2. Lagrangian Formulation** Degrees of Freedom, Generalized Coordinates, Calculus of variations, Hamilton's principle, Euler-Lagrange's equations of motion, Application to non-holonomic systems, Advantages of a variational principle formulation, Conservation theorems and symmetry properties.	6 hours 10 hours 8 hours

	3. Rigid Body Dynamics Eulerian angles, Inertia tensor, Angular momentum of rigid body. Free motion of rigid body, Motion of symmetric top. **4. Hamilton's equation of motion** Legendre transformation and the Hamilton equations of motion, cyclic coordinates and conservation theorems, Routh's procedure and oscillation about steady motion, Derivation of Hamilton's equations from a variational principle, Principle of least action. **5. Canonical Transformations** Equations of canonical transformations, Examples of canonical transformations, Poisson brackets and other canonical invariants, Equations of motion, Infinitesimal canonical transformation theorems in Poisson bracket formulation, Angular momentum, Poisson brackets relations, Lagrange brackets. **6. Hamilton - Jacobi Theory** H-J equation for Hamilton's principal function, Harmonic oscillator problems, H -J equation for characteristic function, Action angle, Kepler's problem. **7. Two-body Central Force Problem** Equations of motion and first integrals, Classification of orbits, virial theorem, Differential equation and integrable power law potentials, Kepler's problem. **8. Small Oscillations** Simple Harmonic Oscillations, Damped Oscillations, Forced Oscillations without and with damping, Coupled Oscillations.	10 hours 8 hours 6 hours 7 hours 5 hours
Pedagogy:	Lectures/ tutorials/ assignments. Sessions shall be interactive in nature to enable peer group learning.	
References/Readings	1. H. Goldstein, Classical Mechanics; McMillan, Bombay.1998. 2. N. C. Rana, and P. S. Joag; Classical Mechanics, Tata Mcgraw-Hill;1991. 3. J. C. Upadhyaya, Classical Mechanics, Himalaya, Publishing House, Mumbai;1991. 4. P. V. Panat; Classical Mechanics; Alpha Science International Ltd; 2004. 5. M. G. Calkin, Lagrangian and Hamiltonian Mechanics, World Scientific, 1996.	
Learning Outcomes	1. Study basic principles of classical mechanics. 2. Apply different techniques to solve mechanical problems.	

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Programme: M. Sc. (Physics)
Course Code: PHDC-103 **Title of the Course:** Electromagnetic Theory
Number of Credits: 4

Effective from AY: 2022-23

Prerequisites for thecourse:	Should have studied electrostatics and magnetostatics at the graduation level.	
Objective:	The aim of this course is to develop understanding of time varying scalar and vector electromagnetic fields and relativity. To inculcate fundamental concepts related to electromagnetic waves, their transmission via wave guides, radiation and plasma.	
Content:	**1. Maxwells Equations:** Displacement current, Maxwell's equations, Vector and Scalar potentials, Gauge transformation, Lorentz and Coulomb gauge, Poynting's theorem, Conservation of energy and momentum for charged particles and fields. **2. Electromagnetic Waves** Plane electromagnetic waves and their propagation in non- conducting and conducting media, Frequency dispersion in conductors **3. Electromagnetic Radiation** Retarded Potentials, Fields and radiation by localized dipole, LienerdWeichert potentials, Power radiated by an accelerated charge. **4. Physics of Plasmas** Electrical neutrality in a plasma, Particle orbits and drift motion in a plasma, Magnetic mirrors, The hydro-magnetic equations, The pinch effect, Plasma oscillations and wave motion, Reflection from a plasma (ionosphere). **5. Wave Guides** Propagation of Waves between conduction planes, Wave guides in arbitrary cross-section, Wave -guides in Rectangular Cross-section, Coaxial Wave guide, Resonant Cavities, Dielectric wave guides. **6. Relativistic Electrodynamics** Lorentz transformation as four dimensional orthogonal transformation, Lorentz matrix, four vectors in mechanics and electrodynamics, Lorentz covariance of Maxwell equations, field tensor, transformation of fields, field due to a point charge in uniform motion.	10 hours 9 hours 10 hours 9 hours 10 hours 12 hours
Pedagogy:	Lectures/ tutorials/ assignments. Sessions shall be interactive in nature to enable peer group learning.	

References/Readings	**Text Books / References:** 1. J. B. Marion, Classical Electromagnetic Radiation, Academic Press, New York (1980). 2. J. R. Reitz and F. J. Milford, Foundations of Electromagnetic theory, Addison – Welsey, Reading (1960). 3. B. B. Laud, Electromagneties, Wiley Eastern Ltd., New Delhi (1983). 4. S. P. Puri, Classical Electrodynamics, Tata McGraw-FEII Publishing Co. Ltd. New Delhi (1997). 5. David J. Griffiths, Introduction to Electrodynamics, Prentice - Hall of India Pvt. Ltd., New Delhi (1995). 6. J. D. Jackson, Classical Electrodynamics, Wiley, New York (1995). 7. W. H. Panofsky and M. Philips, Classical Electricity and Magnetism, Addison-Wesley Publication, 1962.	
Learning Outcomes	1. Apply Maxwell's equations and their application to time-harmonic fields, boundary conditions, wave equations, and Poynting's power-balance theorem. 2. Describe the properties of plane waves in unbounded space, and understand such concepts as wavelength, phase velocity, and attenuation.	

Programme: M. Sc. (Physics)
Course Code: PHDC-104 **Title of the Course:** Electronics
Number of Credits: 4

Effective from AY: 2022-23

Prerequisites for the course:	Should have studied the Electronics courses in Physics at graduation level.	
Objective:	The aim of the course is to introduce students to wide range of electronic circuits and their applications in Physics such as OP-AMPs. They also get basic understanding of opto-electronic devices, modulation, signals, microprocessor and memories.	
Content:	1. **OP-AMP Applications** OP-AMPS with negative feedback, Voltage controlled voltage source (VCVS), Current controlled voltage source (ICVS), Voltage controlled current source (VCIS), Current controlled current source (ICIS), Inverting and noninverting amplifier circuits, Open-loop frequency and phase response, Closed-loop frequency response, Differential amplifier, Instrumentation amplifier, DC and AC amplifiers, Summing, scaling and averaging amplifier, Voltage to current converter, Current to voltage converter. 2. **Opto-electronic devices**	15 hours 15 hours

	Radiative and non-radiative transitions, Characteristics of LED, Photoconductor, Photo diode, Photo transistor, Photo detector, Solar cell, Semiconductor laser; Optical fiber, Optical fiber waveguides, Fundamentals of optical communication 3. **Communication Electronics** Analog and digital signals, Modulation, Types of modulation, Basic principles of amplitude, frequency and phase modulation, Simple circuits for amplitude modulation and demodulation, Digital modulation and demodulation, Microwave Oscillators, Cavity resonators, Standing wave detector. 4. **Digital Electronics** Types of signals, Digital signal processing (DSP) basics, A/D and D/A conversion methods, DSP applications; Introduction to Microprocessors, Elements of 8-bit Microprocessors (INTEL 8085); Memory and storage, RAM, ROM, PROM and EPROM, Flash memories, Magnetic and optical storage.	15 hours 15 hours
Pedagogy:	Lectures/tutorials/assignments. Sessions shall be interactive in nature to enable peer group learning.	
References/Readings	1. Millman, J. and Halkias, C. C., Integrated Electronics, Analog and Digital Circuits and Systems, McGraw – Hill Book Co. Tokyo (1997) 2. Boylestad, R. L. and Nashelsky L., Electronic Devices & Circuit Theory, XI Edn. Prentice-Hall of India (2015). 3. Floyd, T. L., Electronic Devices, V Edn. Pearson Education Asia (2001). 4. Gayakwad, R, A., Op-Amps and Linear Integrated Circuits, IV Edn. Prentice-Hall of India (2002). 5. Chen, Chin-Lin, Elements of Optoelectronics and Fiber Optics, McGraw-Hill Book Co. New Delhi (2014). 6. Kennedy, G., Electronics Communication Systems, IV Edn, Tata McGraw-Hill Book Co. New Delhi (2003). 7. Shrader, R., Electronic Communication, Glencoe Division of MacMillan (1993). 8. Kasap, S. O., Optoelectronics and Photonics: Principles and Practices, Dorling Kindersley India (2009) 9. Floyd, T. L., Digital Fundamentals, VII Edn. Pearson Education (2002). 10. Smith, S. W., Digital Signal Processing, Elsevier India (2006).	
Learning Outcomes:	1. Understanding the principles and circuits in electronics and use them in various applications. 2. Students acquire knowledge about working principles of opto-electronic devices and communication electronics.	

	3. Students get exposure to microprocessor and memory devices.	

Programme: M. Sc. (Physics)
Course Code: PHDO-101 **Title of the Course:** Electronics Practical
Number of Credits: 2
Effective from AY: 2022-23

Prerequisites for thecourse:	Nil	
Objective:	This course provides laboratory training in designing, and constructing electronics circuits commonly used in a Physics laboratory.	
Content:	Experiments are to be performed on following topics (minimum 8) with emphasis on designing and constructing the circuit on a bread board. 1. Operational Amplifier parameters 2. Design and Construction of Wien Bridge Oscillator 3. Design and Construction of phase shift oscillator 4. Design and Construction of AstableMultivibrator 5. Design and Construction of MonostableMultivibrator 6. Schmitt Trigger circuit and its use as a zero crossing detector and squaring circuit 7. Voltage Regulator 8. Constant Current Source 9. Design and Construction of DC differential amplifier using op-amps 10. Design and Construction of Function generator 11. Design and construction of Negative nonlinear resistor 12. J. K. flip-flop counter: Scale of 16 and 10 using IC 13. Adder and Subtractor Circuits	60hours
Pedagogy:	Laboratory Experiments	
References/Readings	1. J. Millman and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Mc Graw Hill International Student Ed. (1972). 2. LM317 – 3 Terminal Adjustable Voltage regulator datasheet Rev. X, Texas Instruments 3. Wikibooks – Negative resistance, Negative differential resistance. https://en.wikibooks.org/wiki/Circuit_Idea 4. D. P. Leach, A. P. Malvino and G. Saha, Digital Principles and Applications, Tata Mc Graw Hill 7e (2011).	

Learning Outcome	1. The student should be able to prepare for laboratory work, by reading from books / laboratory manual / datasheet. 2. Should be able to design and construct electronic circuits by identifying and fetching different components. 3. Should be able to record observations from different measuring instruments and record them neatly. 4. Plot graphs and analyze the results. 5. Demonstrate the ability to maintain a laboratory notebook. 6. Prepare lab reports in standard scientific format.	

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Programme: M. Sc. (Physics)
Course Code: PHDO-102 **Title of the Course**: Computer Programming in Fortran 95
Number of Credits: 2

Effective from AY: 2022-23

Prerequisites for thecourse:	Nil	
Objective:	This course develops concepts of computer programming in general and introduces programming language FORTRAN 95.	
Content:	**1. Fundamentals of Computer Programing** Programming Languages, Fortran Evolution, Character Set, Intrinsic Types, Numeric Storage, Literal Constants, Names, Significance of Blanks, Implicit Typing, Numeric and Logical Type Declarations, Character Declarations, Initialisation, Constants (Parameters), Comments, Continuation lines, Expressions, Assignment, Intrinsic Numeric Operations, Relational and Intrinsic Logical Operators, Intrinsic Character Operations, Operator Precedence, Mixed Type Numeric Expressions, Mixed Type Assignment, Integer Division, Formatting input and output, WRITE Statement, READ Statement, Prompting for Input, Reading and writing to a file, How to Write a Computer Program, Statement Ordering, Compiling and Running the Program, Practical Exercise 1 **2. Logical Operations and Control Constructs** Relational Operators, Intrinsic Logical Operations, Operator Precedence, Control Flow, IF Statement, IF ... THEN ... ELSE Construct, IF ... THEN ELSEIF Construct, Nested and Named IF Constructs, SELECT CASE Construct, The DO construct, Conditional Exit Loop, Conditional Cycle Loops, Named and Nested Loops, Indexed DO Loops, Practical Exercise 2	15 hours 15 hours 15 hours

	3. Arrays Declarations, Array Element Ordering, Array Sections, Array Conformance, Array Syntax, Whole Array Expressions, WHERE statement and construct, COUNT, SUM, MOD, MINVAL, MAXVAL, MINLOC and MAXLOC functions, Array I/O, The TRANSPOSE Intrinsic Function, Array Constructors, The RESHAPE Intrinsic Function, Named Array Constants, Allocatable Arrays, Deallocating Arrays, Vector and Matrix Multiplication, Practical Exercise 3. **4. Procedures** Program Units, Introduction to Procedures, Intrinsic Procedures, Intrinsic statement Mathematical Intrinsic Function Summary, Numeric Intrinsic Function Summary, Character Intrinsic Function Summary, Main Program Syntax, Functions, Subroutine and Functions, Practical Exercise 4	15 hours
Pedagogy:	Lectures/ Laboratory work/self-study	
References/Readings	1. V. Rajaraman, Computer Programming in FORTRAN 90 and 95, Prentice-Hall of India, New Delhi 1999. 2. Martin Counihan, Fortran 95, UCL Press Limited University College London (1996). 3. Stephen Chapman, Fortran 95/2003: for Scientists and Engineers, McGraw-Hill (2007).	
Learning Outcomes	1. Understand programming in general; 2. Understand FORTRAN programming language; 3. Understanding how to write and run simple programs. 4. Understanding how to do plotting, regression analysis and error analysis	

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Programme: M. Sc. (Physics)
Course Code: PHDO-103 **Title of the Course:** Computer programming with C
Number of Credits: 2

Effective from AY: 2022-23

Prerequisites for thecourse:	Nil	
Objective:	This course develops concepts of computer programming in general and introduces programming language C.	

Content:	**1. Introductory Concepts** Introduction to computers, Introduction to Linux OS, Linux basics, Introduction to C, writing a C Program, Compiling and Executing the Program, Error Diagnostics, Some simple C Programs, Desirable Program Characteristics. **2. C Fundamentals** The C character set, Identifiers and Keywords, Data types, Constants, variable and Arrays, Declarations, Expressions, Statements, Symbolic Constants **3. Operators and Expressions** Arithmetic Operators, Unary Operators, Relational Logical Operators, Assignment Operators, the Conditional Operators, Library Functions. **4. Data Input and Output** Preliminaries, Single character input and output, entering Input data, writing output data, Opening and closing data file, format statements. **5. Control Statements** Preliminaries, Branching statements, Looping statements, nested control structure, switch, break, continue, go to statements. Practical Exercise **6. Functions** Defining functions, accessing functions, Passing arguments to a function. Practical Exercise **7. Arrays** Defining an array, processing an array, passing arrays to functions, multidimensional arrays. Practical Exercise	7 hours 10 hours 10 hours 7 hours 10 hours 8 hours 8 hours
Pedagogy:	Lectures/ Laboratory work/self-study	
References/Readings	1. Byron Gottfried, Programming with C, Tata McGraw-Hill (1996).	
Learning Outcomes	1. Understand programming in general; 2. Understand C programming language; 3. Understanding howto write and run simple programs. 4. Understanding how to do plotting, regression analysis and error analysis	

Programme: M. Sc. (Physics)
Course Code: PHDO-104 **Title of the Course:** Computer programming with Python
Number of Credits: 2

Effective from AY: 2022-23

Prerequisites for thecourse:	Nil	

Objective:	This course develops concepts of computer programming in general and introduces programming language Python.	
Content:	1. Fundamentals of Python: Introduction to programming in Python, installation and writing, and running Python programs on Windows and Linux	8 hours
	2. Handling data: Data types and variables, user input and output, mathematical operators	8 hours
	3. Decision making and looping: Logical expressions and operators, conditional operators, lists, for loop, while loop	12 hours
	4. Arrays and Functions: Lists, tuples, sets, special arrays, writing and calling user-defined functions,	12 hours
	5. Data plotting and fitting: scattered plots, bar plots, histograms, reading data and plotting, linear or quadratic least square fitting	10 hours
	6. Error analyses: Propagation of errors, significant figures, Gaussian distribution, mean, median, standard deviation, variance, weighted average.	10 hours
Pedagogy:	Lectures/ Laboratory work/self-study	
References/Readings	1. "Python Cookbook: Recipes for Mastering Python 3" by by David Beazley and Brian K. Jone, O'Reilly Media (2013) 2. "Python: The Complete Reference" by Martin C. Brown, McGraw Hill (2018)	
Learning Outcomes	1. Understand programming in general 2. Understand Python programming language; 3. Understanding howto write and run simple programs. 4. Understanding how to do plotting, regression analysis and error analysis	

Programme: M. Sc. (Physics)
Course Code: PHGC-105 **Title of the Course:** Quantum Mechanics
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Studied Physics, including an introductory course on Quantum Mechanics at graduate level	
Objective:	1. To develop basic formalisms of non-relativistic Quantum Mechanics. 2. To illustrate the concepts for analyzation of simple quantum mechanical systems	
Content:	**1. Schrodinger's Equation and Hermitian operators** (a) Time-dependent Schrodinger equation, continuity equation, expectation values, Ehrenfest's theorems, time-independent Schrodinger equation and stationary states. (b) Hermitian operators, eigenvalues and eigenstates of Hermitian operators, momentum eigenfunctions, orthogonality and completeness of wave functions, Computability and compatibility of observables, parity operation. **2. The Schrodinger equation in three dimensions** Separation of the Schrodinger equation in Cartesian coordinates, Central potential, separation of the Schrodinger equation in spherical polar coordinates, The free particle, The three-dimensional square well potential, The hydrogen atom, The three-dimensional isotropic oscillator. **3. Vector space formulation of quantum mechanics** Dirac Notation, representation of states and observables, bra and ket vectors, linear operators, relation with wave mechanics, algebra of Hermitian operators, matrix representation, unitary operators, Schrodinger and Heisenberg representations, linear harmonic oscillator problem by operator method. **4. Angular Momentum theory** Angular Rotations in Classical and Quantum Mechanics, Rotational Symmetry and conservation of angular momentum, Treatment of general angular momentum by operator method, eigenvalues and eigenvectors, Eigen values and eigenfunctions of L^2 and Lz operators, ladder operators L^+ and L^-, spin angular momentum, algebra of Pauli matrices, Pauli representation of angular momentum operators. Addition of two angular momenta, spin-orbit interaction, Clebsch Gordon coefficients. **5. Approximation methods for stationary problems** Time-independent perturbation theory for a non-degenerate energy level, Time-independent perturbation theory for a degenerate energy level, The variational	8 hours 12 hours 5 hours 10 hours 8 hours 7 hours

	method, The WKB approximation. **6. Approximation methods for time-dependent problems** Time-dependent perturbation theory, General features, Time-independent perturbation, periodic perturbation, The adiabatic approximation, The sudden approximation **7. Quantum Collision Theory** Scattering experiments and cross-sections, potential scattering and general features, the method of partial waves, Application of the partial-wave method, the integral equation of potential scattering, The Born approximation, Collision between identical particles, Collision involving composite systems.	10 hours
Pedagogy:	lectures/ tutorials/ assignments. Sessions shall be interactive in nature to enable peer group learning.	
References/Readings	**Text Books / References** 1. A. K. Ghatak and S. Lokanathan, Quantum Mechanics: Theory and Applications, Springer (2004) 2. P. M. Mathew and K. Venkatesan, A Text Book of Quantum Mechanics, 2/e, Tata McGraw Hill (2017) 3. L. I. Schiff and JayendraBandhyopadhyay, Quantum Mechanics, 4/e, McGraw-Hill (2017). 4. V. K. Thankappan, New Age International Publishers (2012)). 5. V. Devanathan, Quantum Mechanics, 2/e Narosa Publishing House (2015). 6. David J. Griffiths, Introduction to Quantum Mechanics 2/e, Cambridge India, (2016). 7. J. J. Sakurai Modern Quantum mechanics, Addition-Wesley Publishing Company, (1994). 8. R. Eisberg and R. Resnick, Quantum Physics of atoms, molecules, solids, nuclear and particles, 2/e, John Wiley and Sons, (1985). 9. W. Greiner, Introductory Quantum mechanics, Springer Publication, (2001). 10. R. L. Liboff, Introductory Quantum Mechanics, 4e, Pearson Education Ltd (2003). 11. NouredineZettili, Quantum Mechanics: Concepts and Applications 2/e, Wiley India (2016)	
Learning Outcomes	1. Students will be able to solve wave equations for simple three dimensional system 2. Students will have the knowledge and skills to describe the structure of the hydrogen atom and show an understanding of quantisation of angular momentum and spin as well as the rules for quantisation and addition of these. 3. Students will learn the concepts of approximation	

	methods for solving Schrodinger equations 4. Students will gain the knowledge about fundamental scattering of quantum particles.	

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Programme: M. Sc. (Physics)
Course Code: PHDC-106 **Title of the Course:** Statistical Mechanics
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Should have studied Physics or Mathematics at graduation level. It is assumed that students have a basic working knowledge of classical and quantum mechanics, including Hamiltonian formulation and density matrices.	
Objective:	This course develops concepts in classical laws of thermodynamics and their application, postulates of statistical mechanics, statistical interpretation of thermodynamics, microcanonical, canonical and grant canonical ensembles; the methods of statistical mechanics are used to develop the statistics for Bose-Einstein, Fermi-Dirac and photon gases.	

Content:	**1. Kinetic Theory and Equilibrium state of Dilute Gas** Formulation of problem, binary collisions, Boltzmann transport equation, Boltzmann's H theorem, Maxwell-Boltzmann distribution, Method of the most probable distribution, analysis of the H theorem, recurrence and reversal paradoxes, Validity of the Boltzmann transport equation. **2. Classical Statistical Mechanics** Review of laws of thermodynamics, Entropy, Thermodynamic Potentials, Postulate of Classical Statistical Mechanics, Microcanonical ensemble, derivation of thermodynamics, equipartition theorem, Classical ideal gas, Gibbs paradox. **3. Canonical and Grand Canonical Ensembles** Canonical ensemble, energy fluctuations in canonical ensemble, grand canonical ensemble, density fluctuations in grand canonical ensembles, equivalence of canonical and grand canonical ensembles, behaviour of W(N), meaning of Maxwell construction. **4. Quantum Statistical Mechanics** Postulates of quantum statistical mechanics, density matrix, ensembles in quantum mechanics, third law of thermodynamics, ideal gases in microcanonical and grand canonical ensembles, foundations of statistical mechanics. **5. Ideal Fermi Gas** Equation of state of Ideal Fermi Gas, theory of white dwarfs, Landau diamagnetism, deHass-Van Alphen effect, Pauli paramagnetism. **6. Ideal Bose Gas** Photons, phonons, Bose-Einstein condensation.	12 hours 12 hours 12 hours 8 hours 8 hours 8 hours
Pedagogy:	Lectures/ tutorials/assignments. Sessions shall be interactive in nature to enable peer group learning.	
References/Readings	1. Statistical Mechanics, Kerson Huang, 2/e, Wiley India 2008.	

	2. Fundamentals of Statistical Mechanics, B. B. Laud, New Age International Ltd. New Delhi 1998. 3. Fundamentals of Statistical and Thermal Physics, F. Reif, Waveland Press 2009. 4. Statistical Mechanics L. D. Landau and E. M. Lifshitz, Pergamon Press 1969. 5. Statistical Physics, R. P. Feynmann, The Benjamin Cummings Publishing Co 1981. 6. Introduction to Statistical Physics, S. K. Sinha, Narosa Publishing House, New Delhi 2007. 7. Statistical Physics, Tony Guenault, New Age International Ltd. New Delhi 2007. 8. Francis W. Sears , Gerhard Salinger, Thermodynamics, Kinetic Theory, and Statistical Thermodynamics, Addison- Wesley Principles of Physics Series, 1975.	
Learning Outcomes	1. Explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics. 2. Apply the principles of statistical mechanics to selected problems. 3. Apply techniques from statistical mechanics to a range of situations.	

Programme: M. Sc. (Physics)
Course Code: PHDC-107 **Title of the Course:** Nuclear and Elementary Particle Physics
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Concepts like Radioactivity, Nuclear fission, and knowledge of solution of 1 dimensional Schrodinger Equation	
Objective:	To introduce students to the fundamental principles and concepts governing nuclear and particle physics and have a working knowledge of their application to real-life problems.	
Content:	**1. Basic Properties of Nuclei:** a. Nuclear mass, charge, radius, binding energy, nuclear spin, and parity. b. Magnetic moments and electric quadrupole moments. **2. Two-BodyProblem:** a. Brief review of quantum mechanics tools, properties of deuteron, theory of the ground state of deuteron, magnetic moment, and electric quadrupole moment of deuteron. b. Theory of nucleon-nucleon scattering at low energy, phase shift and scattering length, effective range theory, experimental determination of low energy	8 hours 12 hours

	parameters. c. Nature of nuclear forces and Meson theory of nuclearforce. **3. NuclearModels:** a. Liquid drop model, Weizsacker's mass formula, stable and unstable nuclei, massparabolas. b. Nuclear shell model, energy levels in a three dimensional harmonic oscillator well potential, spin orbit interaction, prediction of magic numbers, ground state spinsandparities, c. Magneticmoments,Schmidtlines, nuclear quadrupole moments, and collective model. **4. Nuclear Transformations:** a. Alpha decay, barrier penetration problem, Gamow's theory of alpha decay, Geiger-Nuttal law, alpha spectra and nuclear energylevels. b. Beta decay, experiments in beta spectra, neutrino hypothesis, Fermi's theory of beta decay, Kurie plots, ft values, allowed and forbidden transitions, selection rules, electron capture, parity violation in beta decay, experimental verification, measurement of neutrino helicity. c. Gamma transitions, multipole radiations, quantum theory of the transition probability, selection rules, angular correlation, calculations of transition rates and comparison with experiments, internalconversion. **4. NuclearReactions:** a. Rutherford scattering, cross-sections, decay rates, resonances,Breit-Wigner formula, nuclear fission and fusion processes. **6. Elementary Particles:** a. Classification of elementary particles; properties of quarks and leptons, properties of mesons and baryons. Classification of fundamental forces; Strong, Weak and Electromagnetic interactions. b. Introduction to Feynman diagrams, relativistic kinematics, quark model and eightfold way. c. Particle quantum numbers; charge, isospin, strangeness and parity, Gell-Mann Nishijima formula, conservation laws and symmetries. 7. **Particle accelerators and detectors:** a. Introduction to modern accelerators, event rates and luminosity. Large detector systems at electron-positron, electron-proton and hadron colliders. b. Interaction of particles with matter, principle of gas chambers, silicon detectors, scintillators, time-of-	10 hours 10 hours 4 hours 10 hours 6 hours

	flight detectors, and calorimetry.	
Pedagogy:	Lectures / tutorials/assignments. Sessions shall be interactive in nature to enable peer group learning.	
References/Readings	1. H. Enge, Introduction to Nuclear Physics, Addison- Wesley (1974). 2. E. Segre, Experimental Nuclear Physics, John Wiley (1960). 3. V. Devanathan, Nuclear Physics, Alpha Science International Ltd, (2011). 4. S. N. Ghoshal, Nuclear Physics, S. Chand and Co. (2019)	
Learning Outcomes	Student will be able to 1. Apply the models describing the basic nucleon and nuclear properties. 2. Describe the properties of strong and weak interaction. 3. Explain the different forms of radioactivity and account for their occurrence. 4. Classify elementary particles and nuclear states in terms of their quantum numbers.	

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Programme: M. Sc. (Physics)
Course Code:PHDC108 **Title of the Course:** Atomic Physics
Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites for the Course:	Knowledge of concepts like Bohr model of atom, Electronic transition in atoms and atomic spectra.	
Objectives:	This course is aimed at understanding the atomic structure and atomic spectra	
Content:	**1. Early Atomic Physics** Atomic spectra of hydrogen, The Bohr's theory, Relativistic effects, Moseley and atomic number, Radiative decay, Einstein A and B coefficients, The Zeeman effect. **2. One-electron atoms**: The Schrödinger equation for one-electron atoms, energy levels, the Eigen functions of the bound states, expectation values. Transitions, selection rules, parity, spin of the electron, the spin-orbit interaction, Fine structure of hydrogenic atoms, The Lamb shift, transitions between fine-structure levels. **3. Two-electron atoms:** The Schrödinger equation for two-electron atoms, The ground state of two-electron atoms, Excited states of two-electron atoms. Doubly excited states of two electron atoms. **4. Many-electron atoms**: Shell structure and the periodic table, The central field approximation, The Hartree-Fock method and the self-	6 hours 12 hours 12 hours 15 hours

	consistent field, Corrections to the central field approximation. Correction effects, *L-S* coupling and *j-j* coupling. Fine structure in the alkalis. **5. Interaction of atoms with electromagnetic radiation and with static and magnetic field:** Many electron atoms in an electromagnetic field, selection rules for electric dipole transitions, Oscillator and line strengths, Retardation effects, Magnetic dipole and electric quadrupole transitions, The spectra of the alkalis, Helium and the alkaline earths, Atoms with several optically active electrons, Multiplet structure, X-ray spectra, The stark effect, The Zeeman effect.	15 hours
Pedagogy:	Lectures/tutorials/assignments. Sessions shall be interactive in nature to enable peer group learning	
References/Readings	1. Atomic Physics, C. J. Foot, Oxford Master Series in Physics (2005) 2. Physics of Atoms and Molecules, B. H. Bransden, C. J. Joachain, Pearson (2004) 3. Atomic Physics, D. C. Jones, CRC Press/Sarat Book House (2018) 4. Atomic Physics, S. N. Ghoshal, S. Chand Publishing (2007)	
Learning Outcomes	Students will understand about 1. atomic structure 2. the optical and x-ray spectra of atoms 3. the interaction of atoms with electric and magnetic fields.	

Programme: M. Sc. (Physics)
Course Code: PHGO-105 **Title of the Course:** General Physics Practical
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Nil	
Objective:	This course provides laboratory training in performing experiments that verify important physical laws and using modern and novel techniques of measurements.	
Content:	Short Lecture Course on – Theory of errors, Treatment of Errors of observation, linear least squares fitting and Data analysis. The experiments on the following topics (any 12) are to be performed with emphasis on the estimation and calculation of errors. 1. Types of Statistical Distributions 2. Analysis of Sodium Spectrum – Quantum defect and Effective quantum number 3. Michelson Interferometer/Fabry-Perot Interferometer 4. Diffraction experiments using laser– single slit,	120 hours

	double slit, grating 5. Polarization experiments using laser –linearly and elliptically polarized light 6. Statistical Distribution of radioactive decay 7. Verification of Inverse Square Law using GM counter 8. Linear Absorption Coefficient of Aluminium using GM counter 9. Verification of Debye Relaxation Law and measurement of thermal relaxation of serial light bulb 10. Thermal diffusivity of Brass 11. Thermometry – measurement of thermoemf of Iron-Copper (Fe-Cu) thermocouple as a function of temperature and verification of law of intermediate metals 12. Calibration of Lock-in Amplifier 13. Measurement of mutual inductance of a coil using lock-in amplifier 14. Measurement of low resistance using lock-in amplifier 15. X-ray Emission – characteristics lines of a W target 16. Experiments using Strain Gauge 17. Ultrasonic Interferometer 18. Nonlinear dynamics – Feigenbaum circuit 19. Nonlinear dynamics – Chua's circuit 20. Verification of Percolation phenomena 21. Measurement of electrical resistance of Ni wire to verify para to ferromagnetic phase transition 22. Measurement of electrical resistance of NiTi based shape memory alloy 23. Measurement of Young's modulus of Brass by Flexural vibrations	
Pedagogy:	Lectures and Laboratory Experiments.	
References/Readings	1. P. R. Bevington and D. K. Robinson, Data Reduction and Error Analysis for the Physical Sciences, McGraw Hill (Indian Edition) 2015. 2. R. Srinivasan, K. R. Priolkar and T. G. Ramesh, A Manual on Experiments in Physics, Indian Academy of Sciences, 2018.	
Learning Outcomes	1. Employ proper techniques when making scientific measurements 2. Demonstrate the ability to use selected pieces of measuring devices including the multimeter, oscilloscope, and AC and DC power supplies, Lock-in Amplifier 3. Demonstrate the ability to use the computer as a data analysis tool 4. Demonstrate the ability to maintain a laboratory	

	notebook 5. Apply the appropriate physics to the physical situation presented 6. Quantitatively analyse experimental data 7. Estimate and translate errors and report quantities up to last significant digit 8. Formulate and report scientific conclusions based on data analysis 9. Prepare lab reports in standard scientific format	

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D 3.9 Minutes of the Board of Studies in History meeting held on 25.04.2022.

Annexure I

MA History Syllabus

Sl. No.	Course Code	Title of the Course	Number of credits
		SEMESTER – I	
1	HSCC 100	Debates in Indian History (up to 18th century)	4
2	HSCC 101	Issues and Debates in Goan History	4
3	HSCC 102	History and Theory	4
4	HSCC 103	Early Modern Europe (1300–1750)	4
5	HSOC 100	Imperialism, Nationalism and Decolonisation in Africa	4
6	HSOC 101	Tribal and Peasant Movements in India (1818-1947)	4
		SEMESTER – II	
1	HSCC 104	Indian National Movement (1857-1947)	4
2	HSCC 105	Imperialism, Nationalism and Decolonization in Asia	4
3	HSCC 106	"Doing History": An Introduction to Historical Methods	4
4	HSCC 107	India and the Indian Ocean	4
5	HSOC 102	Trade and Urbanization in India	4
6	HSOC 103	Makers of Modern India	4
7	HSOC 104	Women in Indian Religion	4
		SEMESTER – III	
1	HSRC 100	Archaeology: Principles and Methods	4
2	HSRC 101	Historiography of India	4
3	HSRC 102	Readings in Primary Sources: Texts and Inscriptions	4
4	HSRC 103	Oral History	4
5	HSGC 100	The History of Indian Diaspora	4
6	HSGC 101	History of India (1947-2019)	4
7	HSGC 102	History of Indian Cinema	4
		Semester – IV	
1	HSRC 104	Museology	4
2	HSRC 105	Theorising Culture: An Interdisciplinary Approach	4
3	HSRC 106	Academic Writing (SWAYAM Course)	4
4	HSD	Dissertation	16

Note:
HSCC: History Discipline Specific Core Course
HSOC: History Discipline Specific Optional Course
HSRC: History Research Specific Optional Course
HSGC: History Optional Generic Course

SEMESTER I

Programme: M.A. (History)
Course Code: HSCC 100
Title of the Course: Debates in Indian History **(**up to 18th century**)**
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	None for the students of M.A. History at Goa University as it is a Core Course.	
Objectives:	It aims to provide information to the students concerning the issues such as the nature of Harappan civilization, nature of state in ancient and medieval India, and debates such as Indo-Aryan, feudalism, early medieval urbanization, segmentary state in south India, and vernacularisation debate.	
Content:	**I. Early India: Harappan and Indo-Aryan Debate** a. Harappan Civilization: Indian and non-Indian origin; nature of state and society; Pasupati debate; Harappan and Saraswathi civilization. b. Indo-Aryan Debate: i. Standard view: Theories of original homeland of the Aryans; T.R. Trautmann, R.S. Sharma; the horse problem. ii. Alternative view: Aryans as indigenous people; Invasion vs. migration. B.B. Lal. **II From Ancient to Medieval: Continuity or Change?** a. The Mauryan State Debate. b. The Gupta and Post-Gupta phase: R.S. Sharma: Indian Feudalism thesis c. Alternative view: D.C. Sarcar and Harbans Mukhia d. Alternative view: B.D. Chattopadhyaya and Hermann Kulke e. Urban decay debate f. Kali age crisis g. Feudalism debate in Karnataka: R.N. Nandi, Y. Dayma. **III The Medieval State** a. South Indian state as Segmentary State; Herman Kulke. N. Karashima: Chola and Vijayanagara. Subbarayalu: the Chola State. Feudalism: Kesavan Veluthat. b. Delhi Sultanate: Theocratic or secular? c. The Mughal state i. Oriental Despotism and Asiatic Mode of Production i. Centralization: Irfan Habib and Athar Ali ii. Decentralization: C.A. Bayly and Revisionist historiography iii. Decline of the Mughals and 18th century debate **IV Vernacularisation debate**	13 17 17

	a. Death of Sanskrit b. Sheldon Pollock thesis: Vernacularisation; Daud Ali; Manu Devadevan c. Alternative views: B.D. Chattopadhyaya, B.P. Sahu, Shonalika Kaul, Andrew Ollett	13
Pedagogy:	lectures/ tutorials/assignments/self-study	
References/ Readings	1. Ali, D. *Courtly Culture and Political Life in Early Medieval India*. Cambridge: Cambridge University Press, 2014. 2. Ali, M. A. "The Mughal polity - a critique of revisionist approaches." *Modern Asian Studies* 27, no. 4 (1993): 699-710. 3. Champakalakshmi, R. *Trade, Ideology and Urbanization: South India 300 B.C. to A.D. 1300*. Delhi: Oxford University Press, 1996. 4. Chattopadhyaya, B. D. *Making of Early Medieval India*. Delhi: Oxford University Press, 2006. 5. Chaudhury, T. and I. Habib, eds. *Cambridge Economic History of India, Vol. I c. 1200 - c. 1750*. Cambridge: Cambridge University Press, 1982. 6. Karashima, N. *Ancient to Medieval: South Indian Society in Transition*. Delhi: Oxford University Press, 2011. 7. Karashima, N. *A Concise History of South India: Issues and Interpretations*. Delhi: Oxford University Press, 2014. 8. Kulke, H. *The State in India, 1000-1700*. Delhi: Oxford University Press, 1998. 9. Lal, B. B. "Rigvedic Aryans: The debate must go on." *East and West* 48, nos. 3–4 (December 1998): 439–48. 10. Mukhia, H. *The Feudalism Debate*. Delhi: Manohar, 2000. 11. Ollett, A. *Language of the Snakes: Prakrit, Sanskrit and the Language Order of Pre-Modern India*. Oakland: University of California Press, 2017. 12. Pollock, S. *The Language of the Gods in the World of Men: Sanskrit, Culture and Power in Pre-Modern India*. Berkeley, CA: University of California Press, 2009. 13. Possehl, G. L. *The Indus Civilization: A Contemporary Perspective*. New Delhi: Vistar Publications, 2006.	

	14. Prakash, O. *The New Cambridge History of India*, *II. 5: European Commercial Enterprise in Pre-Colonial India*. Cambridge: Cambridge University Press, 1998. 15. Roy, T. *A Business History of India: Enterprise and Emergence of Capitalism from 1700*. Cambridge: Cambridge University Press, 2018. 16. Sahu, B. P. *Interrogating Political Systems: Integrative Processes and States in Pre-Modern India*. New Delhi: Manohar, 2015. 17. Sahu, B. P. and Kesavan Veluthat, eds. *History and Theory: The Study of State, Institutions and Making of History*. Hyderabad: Orient Blackswan, 2019. 18. Sharma, R. S. *Indian Feudalism*. Delhi: MacMillan, 1981. 19. Stein, B. *Peasant, State and Society in Medieval South India*. Delhi: Oxford University Press, 1985. 20. Stein, B. *The New Cambridge History of India: Vijayanagara*. New York: Cambridge University Press, 1989. 21. Subbarayalu, Y. *South India under the Cholas*. Delhi: Oxford University Press, 2014. 22. Sullivan, H. P. "A re-examination of the religion of the Indus Civilization." *History of Religions* 4, no. 1 (1964): 115–25. 23. Thakur, V. K. "The essence of feudal economy and the perspective of third urbanisation in India." *Indian Anthropologist* 16, no. 2 (December 1986): 175–84. 24. Trautmann, T. R. *The Aryan Debate*. New Delhi: Oxford University Press, 2005. 25. Veluthat, K. *The Political Structure of Early Medieval South India*. New Delhi: Orient Longman, 1993.	
Learning Outcomes	1. Reflect on the debates such as Indo-Aryan, feudalism and segmentary state. 2. Have an understanding regarding the relationship between state and society in the pre-modern period. 3. Explain the nature of the pre-modern economic growth. 4. Apply the theories and models in research at the post-graduate and doctoral levels.	

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Programme: M.A. (History)
Course Code: HSCC 101
Title of the Course: Issues and Debates in Goan History
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	There are no prerequisites for this course.	
Objectives:	The course endeavours to equip the students with an in-depth understanding of the dominant politico-administrative, economic, and socio-cultural themes and issues pertaining to the history of Goa. It intends to: • provide a brief geo-political and ethno-historical introduction to Goa along with a socio-cultural profile of its society up to 1510. • assess the impact of the politico-administrative and economic changes introduced by the Portuguese and review the local reaction to the same. • critically examine the colonial policies of acculturation and their contribution to the structuring of the Goan identity. • present a gender audit of the colonial contacts • review the main issues affecting postcolonial Goa.	
Content:	**I. From Pre-historic times to 1510 C.E.** • Sources for the study of history of Goa: Archaeological, Literary, Oral. • Etymological roots. The land and its people. The *Gaunkari* system and the *Khazan* ecosystems. • The Dudhsagar-Kushavati-Mhadei Material Culture: Problems of Dating and Identification. • Political History of Goa (4th to 15th C.E.): Administration, Statecraft. Maritime Trade. • Religion and Society, Cultural Developments. **II. Colonisation of Goa** • Portuguese Conquest: Motives, Phases. • Colonial State: Principles, Policies, and Institutions. • Colonial Construction of Goa: Christianisation and Lusitanisation: Denationalisation or Syncretism? • Economic policies and structures. Indigenous inputs to colonial commerce. • Anglo-Portuguese Treaty of 1878. • Remittance-based economy. Mining.	15 15

	• Goan Diaspora. • Impact of colonialism on society, language, literature and education. • Codification of Family Laws. • Status of women. **III. Local Resistance to Liberation** • Resistance to Conversion Policy: Mhall Pai, Chorão, Colla, Assolna, Velim, Cuncolim. • Priestly Protests. • Rane Revolts. Military Mutinies. • Constitutionalism. Liberalism. Nationalism. • Struggle towards Freedom, 1946-1961: Causes, Role of Satyagraha, Armed Resistance, Role of Women. • Government of India's Policy towards Liberation, Operation Vijay. **IV. Goa since 1961** • Issues of Integration. • Role of Regional and National Parties. • Merger issue. • Language politics. • Dilemma of Development. • Goan identity. Image of Goa and its Bollywood representation.	15 15
Pedagogy:	Lecture method/project-based learning/collaborative learning/visits to archives, museums/fieldwork/self-study	
References/Readings	1. Alvares, Claude, ed. *Fish, Curry and Rice: A Citizen's Report on the Goan Environment*. Mapusa: The Other India Book Press, 2001. 2. Angle, P. *Goa: Concepts and Misconcepts*. Bombay: The Hindu Association, 1994. 3. Axelrod, Paul, and Michelle A. Fuerch. "Flight of the Deities: Hindu Resistance in Portuguese Goa." *Modern Asian Studies* 30, no. 2 (May 1996): 387–421. 4. Boxer, C. R. "A Glimpse of the Goa Archives." *Bulletin of the School of Oriental and African Studies* 14, no. 2 (June 1952): 299–324. 5. Bragança Cunha, Tristão. *Goa's Freedom Struggle*. Bombay: T.B. Cunha Memorial Committee,1961.	

6. Bragança Pereira, A. B. de. *Ethnography of Goa, Daman and Diu*. Translated by Maria Aurora Couto. New Delhi: Penguin, 2008.

7. Dantas, Norman. *The Transforming of Goa*. Mapusa: The Other India Press, 1999.

8. da Silva Gracias, Fatima. *Kaleidoscope of Women in Goa, 1510-1961*. New Delhi: Concept Publishing Company, 1996.

9. de Souza, Teotonio R. "Is There One Goan Identity, Several or None?" *Lusotopie* 7, no. 1 (2000): 487-495.

10. de Souza, Teotonio R. *Goa to Me*. New Delhi: Concept Publishing Company, 1994.

11. de Souza, Teotonio R. *Medieval Goa: A Socio-Economic History*. Panaji: Goa 1556 and Broadway Book Centre, 2009.

12. de Souza, Teotonio R. *Goa Through the Ages. Vol. II: An Economic History*. New Delhi: Concept Publishing Company, 1990.

13. Frenz, Margret. "Global Goans. Migration Movements and Identity in a Historical Perspective." *Lusotopie* 15, no. 1 (2008): 183–202.

14. Kamat, Pratima. *Farar Far: Popular Resistance to Colonial Hegemony in Goa, 1510-1961*. Panaji: Institute Menezes Braganza, 1999.

15. Kamat, Pratima. *'Tarini' and 'Tar-Vir': The Unique Boat Deities of Goa*. Panaji: GOINCARH, 2008.

16. Kamat, Pratima. *Goa: Its Tryst with Trade*. Panaji: GCCI, 2009.

17. Kamat, Pratima. "The Petroglyphs of Pansaimol, Goa." *History Today*, no. 6 (2005-06): 75-80.

18. Kamat, Pratima. "From conversion to the civil code: Gender and the colonial state in Goa, 1510-1961." *Indian Historical Review* 27, no. 2 (July 2000): 61-86.

19. Moraes, George. *The Kadamba Kula.* Bombay: B. X. Furtado and Sons, 1931.

	20. Parobo, Parag. *India's First Democratic Revolution: Dayanand Bandodkar and the Rise of Bahujan in Goa*. New Delhi: Orient BlackSwan, 2015. 21. Pereira, Gerald. *An Outline of Pre-Portuguese History of Goa*. Vasco da Gama: Gerald Pereira, 1973. 22. Pinto, Celsa. *Trade and Finance in Portuguese India*. New Delhi: Concept Publishing Company, 1986. 23. Pinto, Celsa. *A Revolt of the Natives of Goa, 1787: The Forgotten Martyrs*. Panaji: Broadway Book Centre, 2013. 24. Shastry, B. S. *Socio-Economic Aspects of Portuguese Colonialism in Goa: 19th and 20th centuries*. Belgaum: Yarbal Printers, 1990. 25. Xavier, P. D. *Goa: A Social History, 1510-1640*. Panaji: Rajhauns Vitaran, 2010.	
Learning Outcomes	Upon successful completion of this course, the student will be able to: • identify and assess the importance of sources for the study of the history of Goa. • think critically about the themes and issues in Goan history through the ages. • identify and analyse the principal debates in Goan history. • acquire competencies to conduct historical research related to the history of Goa.	

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Programme: M. A. (History)
Course Code: HSCC 102
Title of the Course: History and Theory
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	No prerequisites for the course.	
Objectives:	The rationale for this course is to draw out the theoretical basis upon which the past has been engaged by the discipline of history and the ways in which knowledge is both pursued and argued. This combines the more philosophical questions of epistemology and leads the way in exploring 'What is History'. Starting from the speculative to critical philosophy of history, historians pose different questions, devise a theoretical context to account for, develop different methods, write different narratives and at times challenge accepted ways of doing history. The course will, in other words, enable students to see how theories developed out of arguments and historical interpretations. At the same time, it will introduce the students to a series of seminal texts by philosophers and historians. It combines theory with practice to illuminate the practical implications of theory for the writing of history.	
Content:	1. **Idea of history** What is philosophy of history? Speculative and Critical Philosophy of history. Classical Greek and Roman Historiography: From 'myth' to history. Faith and history. 2. **On 'progress', 'rationality' and method** Vico and the question of true knowledge. Enlightenment and the philosophy of history. Hegel's philosophy of history. Ranke: historicism, historical method, objectivity and hermeneutics. Collingwood: Historical authority and historical imagination. The *Annales* School. Beyond Annales. End of history? 3. **Marxism and history** Historical Materialism; Base and superstructure. Gramsci's contribution. Thompson and the making of class. Bourdieu and forms of capital. 4. **Margins and the writing of history** Women and philosophy of history: Simone de Beauvoir. Subaltern School. Postmodernism and history: objectivity, subjectivity and	13 17 16 14

	political engagement; key concepts: deconstruction, power, discourse, emplotment, orientalism.	
Pedagogy:	Lectures (traditional, problem-based, discussion-based); tutorials; assignment-based; seminars; problem solving-based discussions; cooperative learning; close reading of text and self-study.	
References/ Readings	1. Arnold, J. H. *History: A Very Short Introduction*. Oxford: Oxford University Press, 2000. 2. Arnold, J. H. "Responses to the Postmodern Challenge; or, what Might History Become?" *European History Quarterly* 37, no, 1 (2007): 109–32. 3. Bentley, Michael. *Modern Historiography: An Introduction*. New York: Routledge, 1999. 4. Bhagwat, Vidyut. *Feminist Social Thought: An Introduction to six key thinkers*. Jaipur: Rawat Publications, 2004. 5. Bourdieu, Pierre. "The Forms of Capital." In *Handbook of Theory and Research for the Sociology of Education*, edited by J. G. Richardson, 241–58. Westport, CT: Greenwood, 1986. 6. Budd, Adam, ed. *The Modern Historiography Reader: Western Sources*. New York: Routledge, 2009. 7. Burns, Robert, and Hugh Rayment-Pickard, eds. *Philosophies of History: From Enlightenment to Postmodernity*. Oxford: Blackwell, 2000. 8. Carr, E. H. *What is History?* Basingstoke: Palgrave, 2001. 9. Chakrabarty, Dipesh. "Subaltern Studies and Postcolonial Historiography." *Nepantla: Views from South* 1, no. 1 (2000): 9–32. 10. Chaturvedi, Vinayak, ed. *Mapping Subaltern Studies and the Postcolonial*. New York: Verso-New Left Review, 2012. 11. Collingwood, R. G. *The Idea of History*. Revised edition. Oxford: Oxford University Press, 1994. 12. de Beauvoir, Simone. *The Second Sex*. Translated and ed. by H. M. Parshley. Harmondsworth, Middlesex: Penguin, 1987. 13. Donnelly, Mark, and Claire Norton. *Doing History*. New York: Routledge, 2011.	

	14. Evans, R. J. *In Defense of History*. New York: W.W. Norton & Co., 1999. 15. Fukuyama, Francis. "The End of History?" *The National* Interest, no. 16 (Summer 1989): 3–18. 16. Hughes-Warrington, Marnie. *Fifty Key Thinkers on History*. 2nd ed. New York: Routledge, 2008. 17. Lemon, M. C. *Philosophy of History*. London: Routledge, 2003. 18. Marwick, Arthur. *The New Nature of History: Knowledge, Evidence, Language*. Basingstoke: Palgrave, 2001. 19. Munslow, Alan. *The Routledge Companion to Historical Studies*. 2nd ed. New York: Routledge, 2006. 20. Perry, Matt. *Marxism and History*. New York: Palgrave Macmillan, 2002. 21. Sreedharan, E. *A Textbook of Historiography, 500 BC to AD 2000*. New Delhi: Orient Blackswan, 2011. 22. Thompson, Willie. *Postmodernism and History*. New York: Palgrave Macmillan, 2004. 23. Tosh, John. *The Pursuit of History: Aims, Methods and New Directions in the Study of History*. 6th ed. New York: Routledge, 2015. 24. Tucker, Aviezer, ed. *A Companion to the Philosophy of History and Historiography*. Oxford/Boston: Wiley-Blackwell, 2009.	
Learning Outcomes	• A critical awareness of the theories and concepts utilised by practitioners of history to account for continuity and change in history. • Understanding of how theory informs our understanding of history. • Recognise theoretical frameworks and how they are deployed in writing history. • Substantial understanding of key debates and issues in historical research. • To make informed and relevant theoretical and methodological choices for historical research. • Strengthening analytical skills relating to historical research.	

	• Construct evidence-based arguments by application of theory for 'the present past'.	

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Programme: M. A. (History)
Course Code: HSCC 103
Title of the Course: Early Modern Europe (1300–1750)
Number of Credits: 4
Academic Year: 2022-2023

Prerequisites for the course:	No prerequisites for the course.	
Objectives:	The European history from the fourteenth to eighteenth centuries is a crucial phase in the history of the modern world. The course aims to provide a comprehensive understanding of European history from the Renaissance to the beginning of the Industrial Revolution. The objective is to analyse the major developments that influenced the making of modern Europe and shaped the modern world, particularly the European colonies in the Americas, Africa, and Asia.	
Content:	1. **'Renato', Explorations, Colonial Empires and Economies of Europe** Renaissance – Special conditions in Italy and the role of Florence – Major Thinkers - Humanism – Art and Literature – The Old Faith – The Reformation Challenge – Counter-Reformation. Explorations - Portugal takes the lead – Spain and the Americas – Commercial Revolution – Price Revolution – Crisis of the Seventeenth Century. 2. **The Rise of Absolutism** Origins of Absolutism – Louis XIV - Mercantilism: Ideas and Practice – Nature of Absolutist States – English Revolution – Glorious Revolution. 3. **The Age of Reason** Old beliefs and rise of modern science from the Renaissance to the seventeenth century – Leading Scientists – Causes for the Age of Enlightenment - Enlightenment and its impact on society, politics and religion – Important Philosophers – Art and Literature. Enlightened Absolute Monarchs. 4. **Transition** Agrarian Revolution – Enclosure – Crop Rotation – Mechanisation. Industrial Revolution –Transportation – Living and working conditions. From Feudalism to Capitalism.	20 16 12

		12
Pedagogy:	Lectures (traditional, problem-based, discussion-based); tutorials; assignment-based; seminars; cooperative learning and self-study.	
References/Readings	1. Allen, R. C. "Why the industrial revolution was British: commerce, induced invention, and the scientific revolution." *The Economic History Review* 62, no. 2 (2011): 357- 84. 2. Armstrong, Alastair. *The European Reformation, 1500–1610*. Oxford: Heinemann, 2002. 3. Bonney, Richard. *The European Dynastic States 1494–1600*. Oxford: Oxford University Press, 1991. 4. Boxer, Charles R. *The Portuguese Seaborne Empire*. New York: Alfred A. Knopf, 1969. 5. Cameron, Euan, ed. *Early Modern Europe: An Oxford History*. New Delhi: Oxford University Press, 2001. 6. Cipolla, Carlo M. *Before the Industrial Revolution: European Society and Economy 1000–1700*. 3rd ed. New York: Routledge, 1993. 7. Davies, Norman. *Europe: A History*. New York: Oxford University, 1996. 8. Dear, Peter. *Revolutionising the Sciences: European Knowledge and its Ambitions, 1500–1700*. Basingstoke: Palgrave, 2001. 9. Elliott, J. H. "A Europe of Composite Monarchies." *Past & Present* 137, no. 1 (November 1992): 48-71. 10. Elton, G. R. *Reformation Europe, 1517-1559*. Oxford: Blackwell Publishers, 1999. 11. Gilmore, Myron Piper. *The World of Humanism, 1453-1517*. New York: Harper and Row, 1952. 12. Henry, John. *The Scientific Revolution and the Origins of Modern Science*. London: Palgrave– Macmillan, 1997. 13. Kumin, Beat, ed. *The European World, 1500–1800: An Introduction to Early Modern History*. New York: Routledge, 2009. 14. O'Connell, Marvin R. *The Counter Reformation, 1559-1610*. New York: Harper & Row, 1974.	

	15. Overton, Mark. *Agricultural Revolution in England: The Transformation of Agrarian Economy, 1500–1850*. Cambridge: Cambridge University Press, 1996. 16. Phukan, Meenaxi. *Rise of the Modern West: Social and Economic History of the Early Modern Europe*. New Delhi: Macmillan, 1998. 17. Scammel, G V. *The First Imperial Age: European Overseas Expansion, 1400-1715*. New York: Routledge, 1997. 18. Sinha, Arvind. *Europe in Transition: From Feudalism to Industrialisation*. New Delhi: Manohar, 2017. 19. Treasure, Geoffery. *The Making of Modern Europe, 1648–1780*. New York: Routledge, 2003. 20. Wiesner–Hanks, Merry E. *Early Modern Europe, 1450–1789*. Cambridge: Cambridge University Press, 2006.	
Learning Outcomes	• Understand how historians have interpreted and explained the transformation of Europe from feudalism to capitalism. • Relate the history of early modern Europe to the questions of cultural, social, political and economic changes. • Recognise the theoretical and empirical approaches that historians take to study the history of early modern Europe. • Identify key processes and debates in early modern European history.	

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Programme: M.A. (History)
Course Code: HSOC 100
Title of the Course: Imperialism, Nationalism and Decolonisation in Africa
Number of Credits: 4
Effective from AY: 2022-23

Pre-requisites for the course:	None	
Objectives:	• Analyse the genesis of the ideology of empire and recipient colonial society in the context of ruler and ruled relation. • Understand the process of decolonization in British, French and Portuguese Africa. • Comprehend how African people tackled the issue of colonisation leading to the rise of nation-states.	
Content:	**I. Imperialism and Colonialism**: Theories of imperialism- Economic and political, forms and stages of imperialism. Colonialism: Meaning, motives, mechanism and expansion in Africa. Modes of colonial control- its manifestations and legitimization. **II. Establishment of Colonial Control in Africa:** European colonialism. Colonial governments (British, French and Portuguese) as system of power - political subjugation, administrative apparatus, colonialism and economy. Plantations and colonial policies, foreign investments and local economy. Social challenges- idea of race, racial domination *vis-à-vis* "colonial consciousness"- Apartheid. **III. Nationalist ideology in Africa**: African identity and "Cultural Consciousness"-Frantz Fanon and "Colonial Consciousness." Idea of Nationalism and "National Consciousness" views of Anthony Smith. Pan-Africanism and its impact on the National Movement in Africa. **IV. Decolonisation Struggle:** Understanding Decolonisation; Nationalist stirrings and struggle for freedom. Role of leaders. Political parties: aims, objectives and challenges. Influence of international events - End of British- French rule in Africa, Liberation of Portuguese Africa.	15 15 15 15
Pedagogy:	lectures/tutorials/seminar-presentation/self-study/book review/movie review	

References/Readings	1) Bannerjee, Brojendra. *Apartheid: Crime against Humanity*. New Delhi: B. R. Publishing Corporation, 1987. 1) Benedict, Anderson. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. London: Verso, 1983. 2) Boahen, A. Adu. *African Perspectives on Colonialism*. Baltimore, London and Accra: Johns Hopkins University Press, James Currey and Sankofa, 1989. 3) Bulmer, Martin, and John Solomos, eds. *Nationalism and National Identities*. London: Routledge, 2014. 4) Duffy, James. *Portugal in Africa*. Cambridge, Massachusetts: Harvard University Press, 1962. 5) Efimov, Dmitri. *World War II and the Destinies of Asian and African People*. New Delhi: Sterling Publishers, 1985. 6) Elies, Olawale. *Government and Policies in Africa*. New Delhi: Asia Publishing House, 1963. 7) Fanon, Frantz. *The Wretched of the Earth*. Translated by Constance Farringdon. Harmondsworth: Penguin, 1982. 8) Gellner, Ernest. *Encounters with Nationalism*. Oxford: Blackwell Publishers, 1997. 9) Gunter, John. *Inside Africa*. London: Hamish Hamilton, 1955. 10) Hallete, Robin. *Africa Since 1875*. New Delhi: Surjeet Publications, 1989. 11) Hardgreaves, J. D. *Decolonisation in Africa*. London: Longman, 1988. 12) Hobsbawn, E. J. *Nation and Nationalism since 1780: Programme, Myth and Reality*. Cambridge: Cambridge University Press, 1990. 13) Hyam, Ronald. *Understanding the British Empire*. Cambridge: Cambridge University Press, 2010.	

	14) Mackenzie, John. *The Participation of Africa 1880-1900 and the European Imperialism in the Nineteenth Century*. London: Methuen and Company, 1983. 15) Maddox, Gregory, ed. *Conquest and Resistance to Colonialism in Africa*. Abingdon: Routledge, 2019. 16) Maya, D. *Narrating Colonialism: Post-Colonial Images of the British in Indian English Fiction*. New Delhi: Prestige Books, 1997. 17) Meredith, Martin. *Diamonds, Gold and War*. London: Simon and Schuster, 2007. 18) Nandy, Ashis. *The Intimate Enemy: Loss and Recovery of Self Under Colonialism*. New Delhi: Oxford University Press, 1983. 19) Smith, Anthony. *State and Nation in the Third World: The Western State and African Nationalism*. Sussex: Sussex Wheetsheef Books, 1983. 20) Smith, Anthony. *The Ethnic Origins of Nation.* Oxford: Oxford Basil Blackwell, 1989.	
Learning Outcomes	• Analyse African response to imperial conquest and colonial rule. • Learn to put African nationalism into historical context. • Understand African history from African perspective and learn how political independence was regained by Africans.	

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Programme: M. A. (History)
Course Code: HSOC 101
Title of the Course: Tribal and Peasant Movements in India (1818-1947) **Number of Credits:** 4
Effective from AY: 2022-23

Prerequisites for the course:	There are no prerequisites for this course.	
Objectives:	Course has the following objectives: • Acquainting the students with the nature, magnitude, and significance of tribal and peasant movements in British India. • Examining the historiographical aspects, colonial background to the peasant movements, particularly the nature of colonial revenue policy, its impact on agriculture and the agrarian relations. • Analysing the main issues, forms, phases and consequences of the tribal and peasant movements.	
Content:	**I. Introduction** • Importance and Scope. Historiography. Sources. • Colonial Revenue Policy and its Impact on Agriculture and Agrarian Relations. **II. Nature of the Movements** • Issues and Forms. • Phases and Consequences. • Role of Women. **III. Case Studies: Tribal Movements** • Uprising of the Bhils (1818-31) • Kol Uprising (1831-32) • The Santal Rebellion (1855-56) • Birsa Munda Revolt (1895-1901) • Devi Movement in Gujarat (1922-23) • The Rampa Rebellion of the Koyas (1922-24) **IV. Case Studies: Peasant Movements** • The Indigo Revolt (1860) • The Pabna Revolt (1873) • The Deccan Riots (1875) • The Peasant Movements in Awadh (1920-21) • The Mapilla Rebellion (1921) • The Bardoli Satyagraha (1928)	10 10 20 20
Pedagogy:	Lectures/ tutorials/assignments/self-study/seminars.	

References/ Readings	1. Baden Powell, B. H. *The Land Systems of British India*. New York: Johnson Reprint Corporation, 1972. 2. Bhattacharya, Sabyasachi. ed. *Essays in Modern Indian Economic History*. Delhi: Munshiram Manoharlal, 1987. 3. Dale, Stephen Frederic. *Islamic Society on the South Asian Frontier, The Mappilas of Malabar: 1498-1922*. New York: Oxford University Press, 1980. 4. Dale, Stephen Frederic. *Islamic Society on the South Asian Frontier, The Mappilas of Malabar: 1498-1922*. Oxford: Clarendon Press, 1980. 5. Desai, A. R., ed. *Peasant Struggles in India*. New Delhi: Oxford University Press, 1985. 6. Dhanagare, D. N. *Peasant Movements in India 1920-1950.* New Delhi: Oxford University Press, 1983. 7. Dutt, R. C. *The Economic History of British India*. New Delhi: Government of India, 1976. 8. Frykenberg, R. E., ed. *Land Control and Social Structure in Indian History*. New Delhi: Manohar Publications, 1979. 9. Frykenberg, R. E., ed. Land *Tenure and Peasant in South Asia*. Delhi: Orient Longman, 1977. 10. Guha, Sumit. *The Agrarian Economy of the Bombay Deccan, 1818-1941*. Delhi: Oxford University Press, 1985. 11. Guha, Ranajit. *Elementary Aspects of Peasant Insurgency in Colonial India.* New Delhi: Oxford University Press, 1983. 12. Guha, Ranajit, ed. *Subaltern Studies,* Vol. I. New Delhi: Oxford University Press, 1982. 13. Hardiman, David, ed. *The Peasant Resistance in India, 1858-1914*. Delhi: Oxford University Press, 1992.	

14. Kumar, Dharma, and Meghnad Desai, eds. *The Cambridge Economic History of India, Vol. 2: (c. 1757 – c. 1970)*. Cambridge: Cambridge University Press, 1983.

15. Kumar, Kapil. *Peasants in Revolt: Tenants, Landlords, Congress and the Raj in Oudh 1886-1922*. New Delhi: Manohar, 1994.

16. Ludden, David, ed. *Agricultural Production and Indian History.* Delhi: Oxford University Press, 1994.

17. Raj, K. N., Neeladri Bhattacharya, Sumit Guha, and Sakti Padhi, eds. *Essays on the Commercialisation of Indian Agriculture.* Delhi: Oxford University Press, 1985.

18. Ray, Ratnalekha. *Change in Bengal Agrarian Society*, *(C. 1760 – 1850)*. New Delhi: Manohar, 1979.

19. Ray, Ratnalekha. *Change in Bengal Agrarian Society*, *c. 1760–1850*. Delhi: Manohar, 1979.

20. Robb, Peter, ed. *Rural India: Land, Power and Society under British Rule*. New Delhi: Oxford University Press, 1993.

21. Rothermund, D. *Government, Landlord and Peasant in India: Agricultural Relations under British Rule, 1865-1935.* Wiesbaden: Franz Steiner Verlag Gmbh, 1978.

22. Saravanan, Velayutham. *Colonialism, Environment and Tribals in South India,1792-1947*. New York: Routledge, 2017.

23. Sarkar, Sumit. *Modern India 1885-1947.* Delhi: Macmillan India Ltd., 1983.

24. Stokes, Eric. *The Peasant and Raj: Studies in Agrarian Society and Peasant Rebellion in Colonial India.* New Delhi: CUP along with S. Chand & Co., 1980.

25. Stokes, Eric. *The Peasant and Raj: Studies in Agrarian Society and Peasant Rebellion in Colonial India.* New York: Cambridge University Press, 1978

Learning Outcomes	● Understand the nature, scope and importance of tribal and peasant uprisings. ● Analyse the colonial policies, their impact on agriculture and the agrarian relations. ● Understand the issues, forms and phases of tribal and peasant uprisings. ● Comprehend the role of tribal and peasant uprisings in the Indian national movement and thereafter.	

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D 3.10 Minutes of the Board of Studies in Biochemistry meeting held on 22.04.2022.

Annexure I

M.Sc. Biochemistry Part-I revised syllabus (SEM I and SEM II)

SEM I			
Sl. No.	**Course code**	**Course title**	**Credits**
1.	**BCC 411**	Biomolecules and Bioenergetics **(DSCC)**	4
2.	**BCC 412**	Analytical Biochemistry-I **(DSCC)**	4
3.	**BCC 413**	Molecular Biology **(DSCC)**	4
4.	**BCC414**	Cell and Developmental Biology **(DSCC)**	4
5.	**BCO 411**	Laboratory Course in Biochemistry-I **(DSOC)**	4
	BCO 412	Biochemical Methods of Analysis **(DSOC)**	4
SEM II			
1.	**BCC 415**	Enzymology **(DSCC)**	4
2.	**BCC 416**	Analytical Biochemistry-II**(DSCC)**	4
3.	**BCC 417**	Immunology and Immunotechniques**(DSCC)**	4
4.	**BCC 418**	Industrial Biochemistry **(DSCC)**	4
5.	**BCO 413**	Laboratory Techniques and Applications of Biochemistry **(DSOC)**	4
	BCO 414	Plant Biochemistry (**DSOC)**	4

Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 411**
Title of the course: **Biomolecules and Bioenergetics**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**
Programme: **M.Sc. Part-I (Biochemistry)**

Prerequisites for the course:	Students should have graduate level knowledge either in chemical or life sciences or should have qualified change of discipline test.
Course Objective:	1. To develop concepts about structures and functions of different biomolecules. 2. To understand the reactivity of biomolecules and their role in metabolic pathways. 3. To understand the metabolism of biomolecules and their regulation in living cells.
Course Outcome:	1. Students will be able to classify different biomolecules based on their structure and explain their 3-dimensional arrangement and biological functions. 2. Students will be able to write the metabolic pathways for major macromolecules and recognize the chemical changes occurring at each step based on the functional groups involved. 3. Students will be able to compute the energetics involved in metabolic pathways in terms of number of ATPs and describe the different regulatory mechanisms. 4. Students will be able to relate certain common diseases to the malfunctioning of respective metabolic pathways.

Content	*Hrs*
1. Introduction to Biomolecules a. Origin, aim and scope of Biochemistry. b. Introduction to various classes of major biomolecules.	1
2. Structure and properties of water a. Structure and physico-chemical properties of water, Ionic product of water. b. Importance of water in biological systems.	2
3. Chemical bonding, Stereochemistry and Reactions a. Properties of covalent bond, non-covalent bonds and their importance in biological systems. b. Brief revision of configurational nomenclature: R & S; D & L; E & Z; cis & trans and syn& anti nomenclature with respect to biomolecules. c. Types of biochemical reactions: oxidation-reduction, condensation, rearrangement, addition, elimination, group-transfer, resonance bond, electrophilic and nucleophilic substitution reactions .	7
4. Structure and Biological functions of biomolecules a. Amino acids, Peptides and Proteins i. Amino acids: Structure, Classification, physico-chemical properties of amino acids	20

and role of non-protein amino acids. ii. Peptides: peptides of physiological significance, peptide bond. iii. Proteins: primary (importance of primary structure), secondary (alpha-helix, β – structure, β-helix, super secondary structure), tertiary (stabilizing forces, unfolding/ refolding) and quaternary structures (e.g.; Haemoglobin). b. Nucleotides and Nucleic acids i. Structure and properties of nucleotides, nucleosides, purine (Adenine, Guanine) and pyrimidine (Cytosine, Thymine, Uracil) bases. ii. Structural features of nucleic acids (DNA & RNA) and their biological functions. c. Carbohydrates i. Structure, stereochemistry, reactions and functions of monosaccharides, disaccharides, polysaccharides. ii. Complex carbohydrates; amino sugars, proteoglycans and glycoproteins. d. Lipids Classification, structure and function of major lipid subclasses - Triacylglycerols, Phospholipids, Sphingolipids, glycolipids, Lipoproteins, chylomicrons, LDL, HDL and VLDL, steroids, prostaglandins and bile acids, rancidity.	
5. **Bioenergetics and Oxidative Phosphorylation** a. Thermodynamics: laws of thermodynamics, mechanism of exergonic and endergonic reactions, redox potential, high energy compounds, ATP structure and significance. b. Aerobic electron transport and oxidative phosphorylation, redox enzymes of ETC, ATP synthase and mechanism.	6
6. Metabolism of Biomolecules: a. Carbohydrate metabolism Regulatory mechanisms, bioenergetics and significance of central pathways of carbohydrate metabolism: Glycolysis, TCA, Pentose phosphate pathway, Entner-Doudoroff pathway, glycolate cycle, Gluconeogenesis, gluconeogenesis from TCA intermediates/ amino acids / acetyl-CoA, glucuronic acid pathway, Utilization of sugars such as lactose, galactose, maltose and of polysaccharides such as starch, glycogen. Biosynthesis of polysaccharides and sugar interconversions. b. Lipid metabolism Oxidation of fatty acids and its energetics: oxidation of saturated and unsaturated (mono and polyunsaturated fatty acids (PUFA), Peroxisomal oxidation of fatty acids (Phytanic acid), Refsum's disease, ketone body formation and their clinical significance, diabetic ketoacidosis, Biosynthesis of fatty acids and regulation, Biosynthesis of triglycerides, cholesterol and phospholipids. c. Amino acid metabolism	24

General reactions of amino acid metabolism - Transamination, decarboxylation, oxidative and non-oxidative deamination of amino acids. Special metabolism of methionine, histidine, phenylalanine, tyrosine, tryptophan, lysine, valine, leucine, isoleucine and polyamines. Urea cycle and its regulation. Overview of biosynthetic pathways of amino acids and their regulation; Assimilation of ammonia, biosynthesis of essential and non-essential amino acids, regulation of glutamine synthetase and aspartate family of amino acids. d. Nucleotides and nucleic acids metabolism Purine and pyrimidine nucleotides: biosynthesis and its regulation. Deoxyribonucleotides: biosynthesis and regulation. Biosynthesis of nucleotide coenzymes. Catabolism of purine and pyrimidine nucleotides.	
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Nelson, D. L.; Cox, M. M.; Lehninger Principles of Biochemistry, W.H. Freeman; 2017, 7th Edition. 2. Voet, D.; Voet, J. G.; Pratt, C. W.; Fundamentals of Biochemistry, John Wiley & Sons Inc., 2016, 5th Edition. 3. Berg, J. M.; Stryer, L.; Tymoczko, J. L.; Gatto, G. J.; Biochemistry; W.H Freeman; 2019, 9th Edition. 4. Kuchel, P.; Easterbrook-Smith, S.; Gysbers, V.; Guss, J. M.; Hancock, D.; Johnston, J.; Jones, A.; Matthews, J.; Schaum's Outline of Biochemistry, McGraw-Hill Book Co., 2009, 3rd Edition.

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Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 412**
Title of the course: **Analytical Biochemistry-I**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have graduate level knowledge either in chemical or life sciences or should have qualified change of discipline test.
Course Objective:	1. To introduce various bioanalytical techniques for separation and purification of biomolecules. 2. To develop concepts in techniques used for routine biochemical work such as chromatography, spectrophotometry, centrifugation, microscopy, electrophoresis. 3. To evaluate the utility of various analytical techniques as a qualitative and quantitative tool.
Course Outcome:	1. Students will be in a position to differentiate between various analytical techniques for separation and purification of biomolecules based on their principles

	2. Students will be able to explain the principles of various separation techniques and apply the knowledge of these techniques for designing various experiments in research and development

Content	*Hrs*
1. General principles of analytical biochemistry a. Selection of valid methods for analysis, Instrumental methods, physiological methods, assessment of analytical methods. b. Quality assurance in analytical biochemistry: quality control and quality assessment, c. Accreditation of laboratories: standard operating procedure and good laboratory practice, sampling for analysis, calibration and graphical representation of data.	4
2. Acid, bases and buffers a. Units used in quantitative biochemical measurements: molarity, normality, parts per million and percentage by weight/ volume, concept of pH using pH electrode and other ion selective electrodes., Eh, acid-base associations. b. Buffers, buffering capacity, measurement of pH, mechanism of dissociation of macromolecules, dissociation constants, pKa, pI, solvents (eluotropic series), peroxide values, solubility and affinity constants.	10
3. Colligative Properties a. Definitions, Factors affecting and Physiological Applications of Osmosis. b. Measurement of osmotic pressure, Osmoregulation, Adsorption, Colloids, Surface Tension and Viscosity. c. Numerical Problems based on above concepts.	4
4. **Centrifugation:** a. Principle of centrifugation, concepts of RCF, different types of instruments and rotors. b. Preparative, differential and density gradient centrifugation, analytical ultra-centrifugation. c. Determination of molecular weights and other applications, subcellular fractionation.	8
5. Electrophoretic techniques: a. Principles of electrophoretic separation, Types of electrophoresis including paper, cellulose, acetate/nitrate and gel (introduction to concepts of slab gel, tube, continuous and discontinuous, etc). b. Gel electrophoresis - types of gel, Agarose GE, Polyacrylamide gel electrophoresis PAGE, SDS- PAGE, Isoelectric Focusing and ampholytes, 2-D, native, gradient gels, PFGE, DGGE, TGGE. c. Capillary electrophoresis - instrumentation, sample introduction in CE, types of CE, electrophoretic mobility and electroosmotic mobility, total mobility, efficiency and resolution in CE column. d. Separation of neutral molecules by MEKC. e. Staining strategies and procedures: Coomassie Brilliant blue R/G 250, Silver, Fluorescent stains Flamingo, Oriole, SYPRO-Ruby; Stain-free gels. f. Examples of separation of biomolecules by electrophoresis.	10
6. Solvent extraction	5

a. Basic principle, types of extractions and application. b. Separations based on a partitioning between phases based on chemical nature and polarity of analyte. c. Introduction to Soxhlet apparatus, solid phase extraction, microwave assisted extraction, ultrasound assisted extraction, counter current extraction.	
7. Dialysis a. Principles and applications of equilibrium dialysis and ultrafiltration. b. Dialysis and Concentration, reverse dialysis. c. Artificial membranes, semi-permeable membranes, Donnan membrane equilibrium. d. Biological significance of osmosis and micelles.	5
8. Chromatographic techniques: a. Introduction to chromatography: definitions, theories, principle of chromatographic technique, terms and parameters used in chromatography, classification of chromatographic methods, concept of mobile phases; gradient elution (concave, convex and linear) and stationary phases. b. Basic principles, instrumentation and application of thin-layer, paper chromatography, column chromatography, HPLC, GC, ion-exchange chromatography, affinity chromatography, molecular exclusion chromatography and adsorption chromatography. c. Special chromatographic techniques for nucleic acids: DNA cellulose chromatography, MAK hydroxyl-apatite chromatography. d. Introduction to Supercritical-Fluid Chromatography and hyphenated techniques like LCMS, GCMS.	14
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments/ presentations /self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Wilson K., Walker J; Principles and Techniques of Practical Biochemistry; Cambridge University Press; 2010, 7th Edition. 2. Christian G. D., Dasgupta P. K, Schug K. A; Analytical Chemistry; John Wiley & Sons; 2013, 7th Edition. 3. Parakhia M. V., Tomar, R. S., Patel S., Golakiya B. A.: Molecular Biology and Biotechnology: Microbial Methods; New India; 2010. 4. Homes D. J., Peck H; Analytical Biochemistry; Pearson education Limited; 1998. 5. Douglas A. Skoog, F. James Holler, Stanley R. Crouch, Principles of Instrumental Analysis; Cengage Learning 2016, 7th Edition. 6. David. J. Holme., Hazel Peck.; Analytical Biochemistry; Prentice Hall 1998, 3rd Edition.

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Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 413**
Title of the course: **Molecular Biology**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have graduate level knowledge either in chemical or life sciences or should have qualified change of discipline test.
Course Objective:	1. To introduce the students to the structure of nucleic acids, their folding and packaging inside living cells and viruses. 2. To acquaint the students to concepts of damage to DNA, the repair mechanisms initiated by the cell and the expression and regulation of genes in prokaryotes and eukaryotes.
Course Outcome:	1. The student will be able to outline and explain the fundamental concepts of genetics like structure and packaging of nucleic material. 2. The student will be able to illustrate and explain the mechanisms of DNA damage, repair and recombination. 3. The student will be able to describe and discuss the process of expression of genes in prokaryotes and eukaryotes.

Content	*Hrs*
1. Mendelian Genetics a. Basic concepts of Mendelian genetics: Mendel's Principles, Mendel's experiment, allele, wild-type and mutant alleles, dominant and recessive allele, homozygous and heterozygous , genotype, phenotype. b. Laws of inheritance: Mendel's law of inheritance, Law of segregation, monohybrid cross, test cross, Law of independent assortment, incomplete dominance and codominance, multiple alleles. c. Prediction, expression and probability: predicting blood groups of progeny, lethal alleles, penetrance and expressivity, Probability: predicting outcome of genetic crosses.	10
2. Structure and properties Nucleic acids a. DNA as genetic material: Structure of DNA and RNA, Types of DNA based on their structure and their importance in cell (A-DNA, B-DNA, Z-DNA), Types of DNA based on the functionality and their importance in cell (Satellite DNA, Palindrome DNA, Repetitive DNA). b. RNA: Types of RNA (mRNA, antisense mRNA, rRNA, tRNA), their structure and functions. c. Functions and properties of DNA: Fundamental functions of DNA, Buoyant density, melting temperature (Tm), DNA reassociation kinetics (Cot curve analysis), DNA methylation and epigenetic effects(Agouti gene methylation, maternal diet and offspring coat colour).	12
3. Genome organization and Packaging a. Viruses (icosahedral capsid and helical capsids) b. Prokaryotes (supercoiling, nucleosomes and nonhistone proteins) c. Eukaryotes (supercoiling, nucleosomes, histones, chromatin and chromosome). d. Heterochromatin and euchromatin, Importance of structural features of chromosome (telomere, centromere and repetitive sequences), Functions of the chromosomes.	6
4. Model organisms and Mechanisms of gene transfer a. *Escherichia coli as* a model prokaryotic organism. b. Yeast as a model eukaryotic organism.	5

c. Mechanisms of Gene Transfer: transformation, transduction, conjugation, plasmids (natural, artificial), episomes.	
5. Mechanisms of DNA damage, repair and recombination a. Mutations and mutagenic agents: Types of mutations (point mutations, frameshift mutations, forward mutations, reverse mutations, suppressor mutations, transitions and transversions), Role of Mutagenic agents (spontaneous and induced mutagenic agents). b. DNA repair mechanisms/ pathways: (Base excision repair, Mismatch repair, SOS repair, Photoreactivation repair, recombination repair. c. Mechanisms of Genetic recombination: Homologous and site-specific recombination, Role of synaptonemal complex, lamp brush chromosomes, chi sequences, Rec BCD system, Role of Rec A, Ruv C, Holliday junctions.	12
6. Flow of genetic information and expression of genes in prokaryotes and eukaryotes, **Concept of Central Dogma** a. Replication: replication of DNA, Semi conservative nature of DNA replication. b. Transcription: transcription factors and machinery, formation of transcription initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation, and termination, RNA to proteins (reverse transcription). Post transcriptional modifications: attenuation, riboswitches, alternate splicing, RNA interference, RNA processing, RNA editing, and polyadenylation, RNA transport. c. Translation: structure of Ribosome (eukaryotes and prokaryotes), formation of translation initiation complex, initiation factors and their role in regulation of initiation of translation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Post translational modification of proteins in prokaryotes and Eukaryotes.	11
6. Control of gene expression at transcription and translation level a. Regulation of gene the expression of phages, viruses, prokaryotic and eukaryotic genes. b. Role of chromatin in gene expression and gene silencing. c. Role of Recognition sequences or motifs of gene regulatory proteins, Genetic switches and their role in gene expression.	4
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Lodish, H., Berk, A., Matsudaira, P., Kaiser, C.A., Krieger, M., Scott, M.P., Zipursky, L., & Darnell, J.;Molecular cell biology; W.H. Freeman; 2008, 5th Edition. 2. Watson, J. D., Molecular Biology of the Gene; Pearson/Benjamin Cummings; 2013, 7th Edition. 3. Craig, N., Cohen-fix, O., Green, R., Molecular Biology: Principles of Genome function, Oxford University Press, 2014, 2nd Edition. 4. Alberts B., Johnson, A., Molecular biology of cell, Garland Science, 2014, 6th Edition.

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Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 414**
Title of the course: **Cell and Developmental Biology**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have graduate level knowledge either in chemical or life sciences or should have qualified change of discipline test.
Course Objective:	1. The objective is to offer detailed knowledge about cell biology, various cellular organelles, the communication pathways associated with cellular processes. 2. Introduction of the fundamental concepts of organismal developmental biology. 3. The course aims to provide the students insights on basic cell culture techniques and their current applications.
Course Outcome:	1. Students will be able to describe the cell structure, cell division and cell cycle mechanisms, various cellular organelles and their functions. 2. Students will be able to explain the processes of transport across cell membranes, various cellular communication pathways along with their significance and understand the fundamentals of developmental biology. 3. The students will be able to apply the basic cell culture techniques needed to work in a biological research laboratory. 4. The students will be prepared for advanced courses in life science such as Cancer biology, Neurochemistry, etc.

Content	*Hrs*
1. Structural organization of the cell a. Prokaryotic and eukaryotic cells. b. Animal and plant cells. c. Structure and functions of cellular and subcellular organelles.	10
2. Biological membrane structure and function a. Structure and functions of membrane. b. Transport across cell membrane. i. Passive and active transport of molecules across biological membranes. c. membrane pumps.	5
3. Cell division and cell cycle a. Mitosis. b. Meiosis. c. Regulation of the cell cycle.	5
4. Cellular communication and Cell signalling a. Signal transduction pathway. b. Signaling molecules and their receptors. c. G-Protein Coupled receptors. d. Receptor Tyrosine Kinases. e. MAP kinase pathway and JAK-STAT pathway. f. Light signaling in plants. g. Bacterial chemotaxis and quorum sensing. h. Programmed cell death (Apoptosis).	10
5. Fundamentals of organismal development	6

a. Potency, commitment, specification, induction, competence. b. Determination and differentiation, morphogenetic gradients. c. Cell fate and cell lineages. d. Stem cells, genomic equivalence. e. Cytoplasmic determinants, imprinting and mutants.	
6. Early organismal development a. Gametogenesis. b. Cell surface molecules in sperm-egg recognition in animals. c. Embryo sac development and double fertilization in plants. d. Zygote formation, cleavage, blastula formation, embryonic fields gastrulation. e. Formation of germ layers in animals, embryogenesis. f. Establishment of symmetry in plants. g. Seed formation.	6
7. Plant tissue culture: techniques and applications a. Introduction to plant tissue culture and various requirements. b. Preparation for tissue culture. i. Surface sterilization of plant tissue material. ii. Basic procedure for aseptic tissue transfer. c. Tissue culture methodologies. i. Callus Culture. ii. Cell Suspension Culture, protoplast culture and hybridization. iii. Organogenesis. iv. Plant micropropagation. v. Somatic Embryogenesis. vi. Incubation and maintenance of culture. d. Applications of PTC.	6
8. Animal tissue culture: techniques and applications a. Introduction to animal tissue culture and various requirements. b. Typical cell lines, growing mammalian cells and general maintenance of cells. c. Applications of ATC.	6
9. Microbial culture techniques a. *In vitro* culture techniques. b. Nutrient requirements. c. Applications in industry.	6
Pedagogy	Mainly lectures and tutorials. Seminars /term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Karp, G.; Cell and Molecular Biology: Concepts and experiments; John Wiley and Sons Inc., 2015; 8th Edition. 2. Lodish, H.; Berk A.; Kaiser, C. A; Krieger, M.; Bretscher, A.; HiddePloegh, Amon A.; Martin, K. C.; Molecular Cell Biology; W.H. Freeman and Company; 2016; 8th Edition. 3. Freshney, I.; Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications; Wiley-Blackwell; 2016; 7th Edition. 4. DeRobertis, E.D.P.; DeRobertis Jr. E.M.F; Cell and Molecular Biology; Saunders; 2017; 8th Edition.

	5. Pelczar, M.; Reid, R.D.; Chan E.C.S.; Microbiology. MacGraw-Hill; 2001; 5th Edition. 6. Smith, R.H.; Plant tissue culture: technique and experiments; Academic Press; 2012; 3rd Edition. 7. Gilbert, S.F.; Barresi M. J.; Developmental Biology; Oxford University Press; 2020; 12th Edition.

Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCO 411**
Title of the course: **Laboratory course in Biochemistry-I**
Number of Credits: **04** Total Hours: **120** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have graduate level knowledge either in chemical or life sciences or should have qualified change of discipline test.
Course Objective:	1. To understand principles, theory and calculations of each experiment. 2. To gain hands on preparation of all the solutions and to standardize solutions individually. 3. To develop basic understanding and skills of various instruments and techniques used for analysing biomolecules.
Course Outcome:	1. After learning the biomolecules and bioenergetics unit of the practical students will be able to skilfully handle biomolecules. Students will be able to quantify biomolecules with appropriate methods. 2. With Analytical Biochemistry-I part of this practical, students will be able to choose between the separation techniques and carry out separation and purification of biomolecules. 3. Molecular Biology unit of the practical will train the students in techniques involved in genomic DNA isolation and PCR amplification for its use in molecular research. 4. In the Cell Biology part of the practical, the students will be able to demonstrate the various cell culture techniques needed to work in a biological research laboratory.

Content	*Hrs*
1. Biomolecules and Bioenergetics (Any six) a. Estimation of reducing sugars by DNSA method. b. Colorimetric methods for protein estimation by Biuret method. c. Colorimetric methods for protein estimation by Folin-Ciocalteau methods. d. Estimation of total sugars by anthrone method. e. Estimation of amino acids (ala, tyr, trp) and protein by UV-Vis spectroscopy. f. Estimation of nucleic acid by UV-Vis spectroscopy. g. Estimation of DNA by diphenylamine method. h. Estimation of RNA by orcinol reaction.	30
2. Analytical Biochemistry-I (Any six) a. Calibration of pH meter using standard buffer solutions and determination of pH of given unknown solution b. Preparation of acetate and phosphate buffer of different pH values using calibrated pH meter.	30

c. Separation of mixtures of compounds (organic compounds including biomolecules) based on their chemical nature using solvent extraction. d. Separation of lipids by thin layer chromatography. e. Separation of mixtures of compounds (organic compounds including biomolecules) by thin layer chromatography. f. Column chromatographic separation of mixtures of compounds (organic compounds including biomolecules). g. Separation of amino acids by paper chromatography. a. Separation of mixtures of compounds (organic compounds including biomolecules) by HPLC. b. Separation of amino acids by Ion Exchange chromatography. c. Separation and detection of plant pigments by using thin layer chromatography.	
3. Molecular Biology (Any six) a. Preparation and maintenance of microbial culture. b. Isolation of genomic DNA of bacterial cells. c. Estimation of quantity and purity of DNA by spectrophotometry. d. Agarose gel electrophoresis of bacterial DNA. e. PCR amplification of a specific gene using genomic DNA as a template. f. Agarose gel analysis of PCR product to determine amplicon size. g. Isolation of plasmid DNA from microbial cells. h. Agarose gel electrophoresis of plasmid DNA.	30
4. Cell Biology (Any six) a. Use of aseptic techniques of sterilization and disinfection in microbial culture. b. Isolation of microbial species from an environmental sample such as soil/water. c. Cell counting and viability of fungal/bacterial cells via spread plating. d. Primary identification and characterization of bacterial/ fungal cells via colony characterization on solid media. e. Determining the Gram character of a bacterial species via Gram's staining technique. f. Isolation of tissue, culturing and maintenance of cell lines. g. Microscopic examination and cell counting, viability testing using a haemocytometer. h. Surface sterilization of plant material, excision, aseptic tissue transfer i. Induction of callus using plant explant and micropropagation.	30
Pedagogy	Mainly lectures and tutorials. Seminars /term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Wilson K, Walker J; Principles and Techniques of Practical Biochemistry; Cambridge University Press; 2010; 7th Edition 2. Sawhney, S. K., Singh, R.; Introductory Practical Biochemistry; Narosa Publishing House; 2005. 3. Freshney, I. R.; Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications; Wiley-Blackwell; 2016; 7th Edition. 4. Kumar, D. K.; Plant tissue culture; New Central Book Agency; 2008; 1st edition.

	NOTE: Apart from the references cited above, references given under respective theory courses (BCC 411, BCC 412, BCC 413, BCC414) may be referred.

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Programme: **M.Sc. Part-I (Chemistry)**
Course Code: **BCO 412**
Title of the course: **Biochemical Methods of Analysis**
Number of Credits: **04** Total Hours: **120** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared the change of discipline entrance test.
Course Objective:	1. To provide basic knowledge of environmental pollution, effects of environmental pollutants and control measures. 2. To introduce various experimental techniques for analysis of environmental samples. 3. To impart skills in isolation and analysis of bioactive compounds in plants 4. To acquaint the students with various food adulterants, food safety and methods of their analysis.
Course Outcome:	1. Students will be able to extract a bioactive compound from plants and perform a quantitative analysis. 2. Students will be in position to use different techniques for qualitative and quantitative analysis of environmental samples. 3. Students will be able to identify adulterants and pathogens in food. 4. Students will be able to explain the origin and harmful effects of toxic chemicals in the environment.

Content	*Hrs*
1. Microbial Techniques (Any six) a. Laboratory safety protocols and Preparation of media and sterilization techniques. b. Isolation and enumeration of bacterial and fungal cultures from various environmental samples. c. Identification of microbial isolates: Morphological and biochemical identification technique d. Gram staining in bacteria. e. Determinations of total viable count. f. Determination of efficacy of cell disruption by sonication. g. Density gradient separation of cell biomolecules. h. Study of bacterial growth curve.	30
2. Analysis of bioactive compounds from plants (Any six) a. Extraction and estimation of betacarotene from fruits. b. Extraction and estimation of folic acids from vegetables. c. Extraction and estimation of lycopene from tomatoes. d. Extraction and estimation of astaxanthene from grapes. e. Separation of plant pigments using column chromatography. f. Steam distillation for extraction of essential oils.	30

g. Determination of starch in plant tissues. h. Estimation of mineral contents in pulses by ashing method.	
3. Environmental analysis (Any six) a. Estimation of acidity, alkalinity of environmental water samples using titrimetry. b. Estimation of nitrate and total organic carbon using UV-Vis spectrophotometry. c. Estimation of total dissolved solids (TDS) by gravimetric determination. d. Estimation of nitrate using cadmium reduction column method. e. Estimation of total phosphorus using spectrophotometric method. f. To estimate total suspended solids (TSS) using the filter paper method. g. Isolation of xenobiotic degrading bacteria by selective enrichment. h. Calcium analysis by ethylenediaminetetraacetic acid (EDTA) titration.	30
4. Food safety analysis. (Any six) a. Study of sterilization techniques used in food safety. b. Screening and enumeration of spoilage bacteria from food samples. c. Study of spoilage fungi isolated from fruit samples. d. Assessing the quality of raw milk *via* MBRT test. e. Determination of total viable count in prepared (ready to eat) food sample. f. Determination of adulterants in food (turmeric- metanil yellow/ chilli powder- congo red) g. Testing the adulteration/ rancidity in oils. h. Assessment of surface sterilization using swab and rinse Method	30

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Wilson K, Walker J; Principles and Techniques of Practical Biochemistry; Cambridge University Press; 2010; 7th Edition. 2. Sawhney, S. K., Singh, R.; Introductory Practical Biochemistry; Narosa Publishing House; 2005 3. SMT. B. Poornima B., Food Science & Quality Control, Centrum Press First ,2014, 1st Edition. 4. Sathe, A.Y., A first course in Food Analysis, New Age International Pvt. Ltd., 1999, 1st Edition.

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Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 415**
Title of the course: **Enzymology**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied biochemistry at M.Sc. semester I level. It is assumed that students have a basic knowledge of fundamentals in biochemistry.

Course Objective:	1. To introduce enzymes and the important role they play in metabolism 2. To develop knowledge regarding basic concepts of enzyme such as enzyme activity, kinetics and mechanism of action. 3. To develop understanding about techniques used for purification of enzymes.
Course Outcome:	1. The students will be able to classify and discuss enzymes, their mechanism of action, regulation and kinetics. 2. The students will be able to determine and choose biochemical techniques for purification of enzymes.

Content	*Hrs*
1. Introduction to enzymes a. Types of enzymes: Simple enzymes, conjugated enzymes. b. Cofactors and prosthetic groups: Coenzymes and cofactors and their role in enzyme activity, prosthetic group, metalloenzymes. c. Nomenclature and classification of enzymes. d. Structure and specific sites: Enzyme structure, enzyme-substrate complex, binding sites, concept of active site, stereo-specificity. e. Enzymes as catalysts: lock and key model, induced fit model, role of enzymes to increase reaction rates: transition state theory and activation energy.	10
2. Enzyme Kinetics and Enzyme-substrate interactions a. Enzyme activity, Enzyme Assay, specific activity (Definition and units). b. Enzyme kinetics: Michaelis-Menten Equation: formula and derivation, Line-Weaver Burk plot for one substrate reactions. c. Significance of Vmax and Km. d. Kinetics of bi- or multi reactant system. e. Effect of pH, temperature on enzymes. f. Enzyme inhibition: reversible (competitive, uncompetitive, mixed inhibition) and irreversible inhibition. g. Enzyme turnover: Ks, Kd and measurement of enzyme turnover. h. Correlation between the rates of enzyme turnover and structure and function of enzymes, significance of enzyme turnover. i. Mechanism of enzyme degradation.	16
3. Mechanism of Enzyme Action and Enzyme regulation a. Mechanism of Enzyme catalysis, Determination of active centre. b. Identification of functional groups, Factors affecting catalytic efficiency: proximity, orientation, strain, Enzyme catalytic strategies: covalent, acid - base catalysis, metal ion catalysis. c. Enzyme Regulation: control of enzyme activity, control of enzyme availability, inhibitor or enhancer molecules. d. Mechanisms of enzyme regulation and their significance in metabolism: i. Allosteric regulation (aspartate transcarbamylase). ii.Reversible covalent modification (glycogen phosphorylase,glutamine synthetase). iii.Feedback inhibition and feedback repression.	14
4. Enzyme systems a. Zymogens and Isozymes.	12

b. Multienzyme systems: disassociated system (catabolic enzymes), multienzyme complex (pyruvate dehydrogenase) membrane-bound system (electron carrying enzymes). c. Nucleic acid as catalysts: Ribozyme, DNAzyme; Abzyme. d. Mechanism of action of lysozyme, chymotrypsin, aspartate protease, RNase A.	
5. Enzyme purification techniques a. Isolation of intracellular and extracellular enzymes from plant and animal tissues and microbial cells. b. Separation and purification of enzymes by differential centrifugation, salt precipitation, dialysis, ultrafiltration, molecular exclusion chromatography, affinity chromatography, ion exchange chromatography. c. Determination of Enzyme activity, Specific activity and fold purification as criteria of purity of enzymes. d. Zymograms. e. Molecular weight determination by PAGE, SDS-PAGE.	8
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Berg, J.M., Stryer, L., Tymoczko, J., Gatto, G., Biochemistry, WH Freeman, 2019, 9th edition. 2. Nelson, D. L. and Cox, M. M. Lehninger Principles of Biochemistry, WH Freeman 2017, 7th edition. 3. Price, N. and Stevens, L., Fundamentals of Enzymology, Oxford University Press, 1999, 3rd edition. 4. Plummer, D.T., An introduction to practical biochemistry, TATA McGraw Hill, 2006, 3rd edition. 5. Oktore R.O, Essentials of Enzymology, Xlibris-US, 2015. 6. Bugg T.D.H, Introduction to enzymes and coenzyme chemistry, Wiley, 2012, 3rd Edition.

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Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 416**
Title of the course: **Analytical Biochemistry-II**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied biochemistry at MSc. semester I level. It is assumed that students have a basic knowledge of fundamentals in biochemistry and certain basic techniques in routine laboratory analysis.
Course Objective:	1. To Introduce various electro-analytical, imaging and spectral characterisation techniques for analysis. 2. To evaluate the utility of various analytical techniques as a qualitative and quantitative tool. 3. To develop concepts in techniques and instruments required for macromolecule structure determination and other techniques such as tracers for metabolic pathways.
Course Outcome:	1. Students will be able to differentiate between various analytical techniques based on their theory and sensitivity achieved. 2. Students will be able to choose between various techniques of structure elucidation based on the information desired and interpret the data obtained to a fair level. 3. Students will be in a position to explain the principles of various techniques and apply the knowledge of these techniques for designing experiments in research and development.

Content	*Hrs*
1. Automation in biochemistry a. Definition and history. b. Discrete analysers and flow analysis. c. Advantages and disadvantages of automation.	4
2.Electroanalytical methods a. Introduction to ion selective and gas sensing electrodes and their applications. b. Introduction to potentiometry, conductometry, coulometry and voltammetry. c. Introductions to biosensors.	7
3. Optical methods of analysis a. Theory, instrumentation and application of nephelometry. b. Theory, instrumentation and application of turbidimetry. c. Theory, instrumentation and application of UV-visible spectrophotometry. d. Theory, instrumentation and application of fluorometric analysis. e. Theory, instrumentation and application of flame emission photometry and Atomic absorption spectrophotometry.	12
4. Microscopy and Bioimaging a. Imaging living cells and tissues and measuring cellular dynamics. Theory of microscopy, basic aspects of compound microscope. b. Light microscopy: Theory, instrumentation and applications of bright field, dark field,	11

phase-contrast, inverted microscopy. c. Principle and application of fluorescence microscopy, confocal scanning microscopy, epifluorescence and immuno-fluorescence microscopy. d. Electron microscopy: Theory, instrumentation and applications of atomic force microscopy (AFM), scanning electron microscopy (SEM), transmission electron microscopy (TEM). Optical tweezers, photography.	
5. Radioisotope techniques a. Nature of radioactivity and its detection, measurement of radioactivity, Disintegration kinetics. b. Radio-activity counters and radioanalysis – GM Counter, Scintillation Counter, Isotope dilution analysis. c. Theory and application of Autoradiography. d. Theory and application of radiorespirometry. e. Tracer techniques for metabolic pathways. f. Safety measures in handling radioisotopes.	8
6. Spectroscopic techniques for structure determination of biomolecules: a. Principles, application and profile analysis of: FTIR, NMR, ESR, Single crystal X-ray diffraction, optical rotatory dispersion, circular dichroism. b. Structure elucidation of metabolites using combined spectroscopic data.	12
7. Mass Spectrometry: a. Principle, components, working and applications of mass spectrometer. b. Different types of ionization methods used in mass spectrometer (CI, EI, ESI, FAB). c. Different types of mass analysers used in mass spectrometers (magnetic sector, quadrupole), MALDI-MS, MALDI-TOF-MS, ICP-MS. d. Structural information by tandem mass spectrometry.	6
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1.Wilson, K.; Walker, J.; Principles and Techniques of Practical Biochemistry; Cambridge University Press; 2010,7th Edition. 2. Christian, G. D.; Dasgupta, P. K.; Schug, K. A.; Analytical Chemistry; John Wiley & Sons; 2013, 7th Edition. 3. Skoog, D. A.; Holler, F. J.; Crouch, S. R. Principles of Instrumental Analysis; Cengage Learning; 2016,7th Edition. 4. Parakhia, M. V.; Tomar, R. S.; Patel, S.; Golakiya, B. A.; Molecular Biology and Biotechnology: Microbial Methods; New India, 2010. 5. Homes, D. J.; Peck, H.; Analytical Biochemistry; Pearson Education Limited; 1998, 3rd Edition. 6. de Hoffmann, E.; Stroobant, V.; Mass Spectrometry: Principles and Applications; John Wiley & Sons Ltd; 2007, 3rd Edition.

Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 417**
Title of the course: **Immunology and Immunotechniques**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied biochemistry at MSc.semester I level. It is assumed that students have a basic knowledge of fundamentals in biochemistry.
Course Objective:	1. The objective of the course is to provide an insight into the components of the immune system, their development, their functions and their mechanisms of action and various Immunological techniques. 2. This course will enable students to understand the role of the immune system in eliciting immune response.
Course Outcome:	1. Students will be able to visualize the importance of the immune system in the human body to fight pathogens. 2. Students will be able to schematize mechanisms of Immunological response. 3. Students will be able to illustrate the importance of antigen-antibody interactions and various serological techniques for immunological research. 4. Students will be able to devise strategies in designing immunological experiments based on their understanding about immunological processes.

Content	*Hrs*
1. Cells and Organs of the Immune system a. Cells of the immune systems. i. Hematopoiesis; Lymphocytes and Antigen presenting cells (APCs). ii. T cells: Maturation; Activation and Proliferation; T cell subsets and their functions; T cell receptor; structure and organization. iii. B cells: Maturation, Activation and Proliferation; Functions; T cell receptor, Structure and Organization. b. Organs of the immune systems. i. Primary and secondary lymphoid organs: Structure and function.	10
2.Innate Immune response a. Mechanical barriers to infection. b. Physiological factors contributing to innate immunity. c. Inflammatory response: Mechanism and mediators involved. d. Phagocytic system: Activation of macrophages and mechanism of phagocytosis. e. Complement system: Components; Properties; function; Activation of complement pathways (Classical, Alternative and lectin pathways); Consequences of complement activation; Complement fixation test.	8
3.Adaptive immune response a. Cell-mediated and Humoral immunity: primary and secondary immune response. b. Major Histocompatibility Complex: Molecular organization of MHC molecules (H-2, HLA); Structure of MHC molecules; Class I MHC-peptide and Class II MHC-Peptide interactions; self MHC restriction of T cells; Gene	8

organisation and concept of MHC polymorphism; MHC expression and its regulation. c. Antigen processing and presentation pathways: Cytosolic and Endocytic pathways.	
4.Antigens and Antibodies a. Antigens: Chemical complexity and molecular property of Antigens; Immunogens; Haptens; Epitopes; Antigenicity and Immunogenicity. b. Antibodies: i. Structure and function of various classes of immunoglobulins. ii. Antigenic determinants on immunoglobulins. iii. Monoclonal and Polyclonal antibodies: their production by hybridoma technology and clinical uses.	6
5. Immunogenetics a. Theories of antibody formation. b. Generation of antibody diversity. c. Class switching among constant-region genes.	4
6. Immune effector mechanisms a. Cytokines: properties; Receptors and Functions. b. Immunological tolerance. c. Hypersensitivity reactions: Classification and mechanisms. d. Autoimmunity: Pathogenesis; Classification (Organ-specific autoimmune disease and Systemic Autoimmune diseases).	6
7.Immune system in health and disease: a. Immunodeficiencies: Primary and secondary immunodeficiencies. b. Transplantation immunology: Definition; Immunologic Basis of Graft Rejection; Allograft rejection; Clinical features of graft rejection; Graft v/s host reaction; Immune tolerance to allograft; Immunosuppressive therapy for prevention of graft rejection. c. Concepts of vaccines: whole-organism vaccines; recombinant vaccines; DNA vaccine; synthetic peptide and multivalent subunit vaccines.	8
8. Immunotechniques: a. Antigen – antibody reactions: General features of Ag-Ab reactions, Stages of Ag-Ab reactions (primary and secondary). b. Principles and techniques: *in vitro* precipitation; agglutination; immunofluorescence; immunodiffusion; immunoelectrophoretic; ELISA; RIA; Avidin-Biotin complex (ABC) method; Western blotting; Immunohistochemistry; flow cytometry.	10

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Owen, J.; Punt,J.; Stranford, S.; Patricia, J.; Kuby Immunology, WH Freeman and Company, 2012, 8th Edition. 2. Martins, S.J.; Burton,D.R.; Roitt, I.M.;Delves,P.J.; Roitt's Essential Immunology;Wiley Blackwell; 2017; 13th Edition. 3. Abbas,A.; Lichtman, A.; Pillai, S.; Cellular and Molecular Immunology; Ed. Saunders; Elsevier; 2014; 8th Edition. 4. Parija, S.C.; Textbook of Microbiology and Immunology; Elsevier; 2012; 2nd Edition.

	5. Hay, F.C.; Westwood, O.M.R; Practical Immunology; Cold spring Harbour; 2002; 4th Edition.

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Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCC 418**
Title of the course: **Industrial Biochemistry**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied biochemistry at M.Sc. semester I level. It is assumed that students have a basic knowledge of fundamentals in biochemistry.
Course Objective:	To develop the concepts and principles for handling, pr ocessing and managing biomolecules at commercial scale.
Course Outcome:	1.Students will be able to understand and apply the principles of tools and techniques of biochemistry in various settings of industrial processes. 2. Students will be able to develop strategies for production of various types of biomolecules.

Content	*Hrs*
1. Fermentation and bioreactors a. Introduction to Fermentation: Industrial fermentation and its range, advantages of industrial fermentations over chemical manufacturing process, types of fermentation processes: submerged and solid-state fermentation, modes of fermentation: batch, fed-batch and continuous, microbial growth curve and its use in designing modes of fermentation. b. Fermenters: Basic components of a fermenter, types of fermenters with their advantages and disadvantages, solid state fermentation, anaerobic fermentation. c. Significance and control of various fermentation parameters: Maintenance of aseptic conditions, methods of sterilisation, aeration and agitation, Industrial media and the nutrition of industrial organisms, Scale up and scale down of a fermentation process, rheological properties of fermenter, Online and offline monitoring, computerization of fermenter operation. D. Downstream processing: Steps of downstream processing: Details of removal of insolubles, disruption of cell, isolation/extraction/purification, recovery and final product isolation of fermentation products.	16
2. Food technology a. Characteristics of industrial microorganisms; strain improvement; use of auxotrophic mutants; cultivation of microorganisms. b. Introduction to processed foods: Introduction about different food industries, general properties and microorganisms involved in it	16

c. Industrial production of few food products; i. Production of foods made from milk: Cheese, Probiotics – yoghurt/ curd. ii. Production of alcohol-based fermentation products: wine, beer, vinegar. iii. Production of oriental fermented foods: Soy sauce, tofu, tempeh. iv. Production of Indian fermented foods: Idli, dosa, dokhla. v. Production of ethnic fermented foods and beverages of Goa.	
3.Industrial production of biochemically important products a. Production of industrially important proteins. i. Industrially important enzymes - amylase / protease / pectinase / lipase. b. Production of industrially important carbohydrates. i. Manufacturing and refining of cane sugar, pectin/cellulose ii. Manufacturing of polysaccharides. Plant polysaccharide (Gum Arabic), microbial polysaccharides, modified carbohydrates – modified starches, modified celluloses c. Production of industrially important lipids. i. Extraction and refining of vegetable oils and animal fats in general. ii. Extraction and applications of chlorophyll, carotene, lycopene, curcumin, and essential oils.	9
4.Production of pharmaceuticals, nutraceuticals and biochemicals a. Production of Antibiotics: penicillins/streptomycins. b. Production of Vitamins: B12/ascorbic acid. c . Production of Amino acids: lysine/glutamine. d. Production of Alcohol: ethanol. e. Production of Organic acid: citric acid/ lactic acid.	9
5.Microbial cells as fermentation products: a. Production of Baker's yeast. b. Single cell proteins/Spirulina. c. Bacterial insecticides. d. Mushrooms.	5
6. Immobilized Biocatalysts: Enzymes and Cells a. Rationale for immobilizing enzymes and whole cells. b. Methods for enzyme and whole cell immobilization, supports and their selection. c. Properties of immobilized biocatalysts. d. Industrial applications of immobilized biocatalysts.	5
Pedagogy	Lectures/ tutorials/ seminars/ term papers/assignments/ presentations. Sessions shall be interactive in nature to enable peer group learning. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.

Text Books/ References / Readings	1. Okafor N.,*Modern* Industrial Microbiology and Biotechnology,Science Publishers, 2007, 4th Edition. 2. Frazier W. C. and Westhoff D. C., Food Microbiology –Tata McGraw Hill Publishers, 1995. 3. Stanbury P. F., Whitakar A. and Hall S.; Principles of fermentation technology, Butterworth-Heinemann, 1995, 2nd Edition. 4. Casida, JR L. E.; Industrial Microbiology, New Age International Publishers, 2019, 2nd Edition. 5. Clarke, W.; Biotechnology: Industrial Microbiology a Textbook, CBS Publishers and distributers, 2016. 6. Kuila, A., Sharma, V.; Principles and Applications of Fermentation Technology, Wiley-Scrivener Publishing, 2019, 1st Edition. 7. Tamang J P., Ethnic Fermented Foods and Beverages of India: Science History and Culture. Springer Nature,2020.

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Programme: **M.Sc. Part-I (Biochemistry)**
Course Code: **BCO 413**
Title of the course: **Laboratory techniques and Applications of Biochemistry**
Number of Credits: **04** Total Hours:**120** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied biochemistry at MSc.semester I level. It is assumed that students have a basic knowledge of fundamentals in biochemistry.	
Course Objective:	This course develops basic understanding and skills of various techniques and instruments in biochemistry research, Immunology and Environmental science.	
Course Outcome:	1. Enzymology part of this practical will impart skills on isolation of enzymes from living cells, their purification and understanding their substrate interactions. 2. From the Analytical Biochemistry-II part of this practical, students will be able to explain the principle and working of basic instruments in analytical laboratories and interpret spectral data to elucidate structures of certain secondary metabolites. 3. From the Industrial Biochemistry part of this course, students will develop the skills required for production and analysis of various industrially important metabolites. 4. From the Immunology and Immunotechniques unit of this practical students will be able to evaluate and design various techniques in Immunological research.	
Content		*Hrs*

1. Enzymology (Any six) a. Assay of enzyme activity, rate of reaction. b. Optimization of parameters for enzyme activity. c. Determination of specific activity of enzyme. d. Determination of Km, Vmax. e. Screening of microbes for production of enzymes (amylases, cellulases). f. Purification of enzyme by salting-out using ammonium sulphate. g. Dialysis of the precipitated enzyme. h. Purification of enzyme by Gel filtration. i. Determination of fold purification, percentage recovery of protein. j. Molecular weight determination of the enzyme by SDS-PAGE.	30
2. Analytical Biochemistry – II (Any six) a. Visualization of cells by Light microscopy. b. Visualization of cells by Phase contrast microscopy. c. Verification ofBeer lambert law using biomolecules or organic compounds. d. Qualitative analysis of any one of the given amino acids or organic compounds using calorimetry. e. To perform UV-Visible spectroscopic studies to determine extinction coefficient of different organic compounds including biomolecules. (Tryptophan, Tyrosine, Methionine, Proline, Arginine, Cysteine, Cystine, Histidine). f. Calibration ofspectrofluorometer using quinine sulphate. g. Analysis of biomolecule/ organic molecule using GC. h. Analysis of biomolecule/ organic molecule using IR. i. Analysis of biomolecule/ organic molecule NMR. j. Analysis of biomolecule/ organic molecule LC-MS. k. Elucidation of structure of cellular metabolites using IR, NMR and Mass profiles.	30
3. Immunology and Immunotechniques (Any six) a. Agglutination assays. i. Haemagglutination: Determination of ABO and Rh blood group. ii. Latex bead agglutination: Rheumatoid Arthritis factor determination. b. Immunodiffusion assays. i. Single Immunodiffusion. ii. Double Immunodiffusion: Ag-Ab pattern and Antibody titration. c. VDRL test. d. Widal test: Slide and tube method. e. Rapid tests. i. Malarial antigens Pv/Pf. ii. Dengue IgM and IgG antibodies. iii. Hepatitis HBsAg. f. ELISA: Dot-ELISA method. g. Immunoelectrophoresis. h. Determination of Immunoglobulins. i. Precipitation of antibodies with $(NH_4)_2 SO_4$. ii. Determination of antibody concentration. iii. Separation and visualization of immunoglobulins by SDS-PAGE.	30

4. Industrial biochemistry (Any six) a. Production of wine and monitoring of sugar reduction during the fermentation b. Production of wine and monitoring of alcohol production during fermentation c. Production of vinegar and estimation of acetic acid d. Isolation and screening of probiotics e. Study of fermentation process of milk to curd by microscopic observation and monitoring of pH. f. Study fermentation of dosa batter and monitor pH and microbial load in given dosa batter samples g. To perform comparative study of rheology of substrate solutions and fermentation broth (any Indian fermentation productsIdli/ dosa)	30
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Berg, J.M., Stryer, L., Tymoczko, J., Gatto, G., Biochemistry, WH Freeman, 2019, 9th Edition. 2. Prescott, H. Laboratory exercise in Microbiology, MacGraw-Hill Companies, 2002, 5th Edition. 3. Vogel's Text book of Quantitative Inorganic Analysis, Pearson Education, Asia, 2000, 6th Edition. 4. Owen, J.; Punt,J.; Stranford, S.; Patricia, J.; Kuby Immunology, WH Freeman and Company, 2012, 8th Edition. NOTE: Apart from the references cited above references given under respective theory courses (BCC 415, BCC 416, BCC 417, BCC 418) may be referred.

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Programme: **M.Sc. Part-I (Chemistry)**
Course Code: **BCO 414**
Title of the course: **Plant Biochemistry**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared the change of discipline entrance test.
Course Objective:	1. To acquaint students with biochemistry of plants and the mechanisms of photosynthesis. 2. To introduce to students the details of pigment production, toxin production, antioxidative and stress tolerance mechanisms in plants.
Course Outcome:	1. The students will be able to describe and outline the mechanisms of plant photophosphorylation, photosynthesis and functions of plant pigments. 2. The students will be able to explain mechanisms of pigment production, stress tolerance and antioxidant production by plants.

Content	*Hrs*
1. Electron transport system in plants a. Oxidative phosphorylation in plants (cyclic and non-cyclic photo-phosphorylations) b. Mitochondrial respiratory complexes c. Order and organization of electron carriers d. Electrochemical gradient e. Chemiosmotic theory f. ATP synthase and mechanism of ATP synthesis g. Generation of NADPH	10
2. Nitrate assimilation a. Structural features of nitrate reductase and nitrite reductase b. Incorporation of ammonia into organic compounds c. Regulation of nitrate assimilation d. Nitrogen fixing plants	8
3. Photosynthesis a. Photosynthetic apparatus, pigments of photosynthesis, the role of carotenoids b. Photosystems I and II, their location c. Hill reaction, complexes associated with thylakoid membranes d. Light-harvesting complexes, e. Path of carbon in photosynthesis: C3 and C4 pathway of carbon, reduction and its regulation, Photorespiration.	10
4. Special features of secondary plant metabolism a. Terpenes (classification, biosynthesis), lignin, tannins, pigments, phytochrome, waxes, alkaloids, b. Biosynthesis of nicotine c. Functions of alkaloids, d. Cell wall components.	8
5. Toxins of plant origin a. Phytohemagglutinins, lathyrogens, nitriles, protease inhibitors, glycosides, proteinaceous toxins, tannins, oxalates, anti-vitamins, volatile oils, furocoumarins, lectins, solanins and chaconines b. Mechanism of toxin action c. Toxicological effects of plant toxin	8
6. Stress metabolism in plants a. Environmental stresses, salinity, water stress, heat, chilling, anaerobiosis, pathogenesis, heavy metals, radiations and their impact on plant growth and metabolism b. Criteria of stress tolerance.	10
7.Antioxidative defence system in plants a. Reactive oxygen species and their generation b. Enzymic and non-enzymic components of antioxidative defence mechanism.	6

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. Taiz, L. and Zeiger, E. 2010. Plant Physiology. 5th edition. Sinauer Associates Inc., U.S.A. 2. Hopkins, W.G. and Huner, N.P. 2009. Introduction to Plant Physiology. 4th edition. John Wiley & Sons, U.S.A. 3. Campbell, M.K. 2012. Biochemistry. 7 th edition. Cengage Learning, Boston. 4. Campbell, P.N. and Smith, A.D. 2011. Biochemistry Illustrated. 4 th edition. Churchill Livingstone, London. 5. Berg, J.M., Tymoczko, J.L. and Stryer, L. 2011. Biochemistry. W.H. Freeman and Company, New York. 6. Nelson, D.L. and Cox, M.M. 2008. Lehninger Principles of Biochemistry. 5th edition. W. H. Freeman and Company, New York.

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D 3.11 Minutes of the Board of Studiesi in Political Science meeting held on 25.04.2022.

Annexure I

Department of Political Science

GOA UNIVERSITY

Taleigao Plateau, Goa 403 206

MA (Sem I and II) Syllabus based on Choice Based Credit System as per the NEP 2020
Total Credits 80

List of PG. Papers revised and approved by the BOS in Political Science on 25/04/2022

The course and credit distribution

Courses	Course Code	SEM I	SEM II	SEM III	SEM IV	Total Credits
Discipline Specific Core Courses	DSCC	16	16			32
Discipline Specific Optional Courses	DSOC	4	4			8
Research Specific Optional Courses	RSOC			8	4	12
Optional Generic Course	OGC			12		12
Discipline Specific Dissertation	DSD				16	16
Total Credits	20	20	20	20	20	80

One credit is 15 contact hours
Discipline Specific Core Courses:

Sr. No	Course Code	Course Title	Credits
1	PSDSCC101	Political Theory: Concepts and Perspectives	4
2	PSDSCC102	International Relations	4
3	PSDSCC103	Public Administration: Theories and Concepts	4
4	PSDSCC104	Political Economy of India	4
5	PSDSCC105	Modern Indian Political Thought	4
6	PSDSCC106	Constitutional Government in India	4
7	PSDSCC107	Comparative Politics	4

8	PSDSCC108	Political Economy of Goa	4

Discipline Specific Optional Courses: (1 paper)

Sr. No	Course Code	Course Title	Credits
1	PSDSOC201	State & the Marginalized	4
2	PSDSOC202	India's Foreign Policy: Structures and Processes	4
3	PSDSOC203	International Political Economy	4
4	PSDSOC204	Key Texts in Indian Political Thought	4
5	PSDSOC205	Politics in the Developing World	4

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Discipline Specific Core Courses

Programme: M. A (Political Science)
Course Code: PSDSCC101
Title of the Course: Political Theory: Concepts and Perspectives
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students should have studied B.A. in Social Sciences or other disciplines with interest and knowledge of political concepts. It is assumed that students have a basic knowledge of Political Thought and Political Concepts.	
Objective:	The paper has two sections. The first deals with concepts that are both normative and explanatory and the second with perspectives that are very much part of the tradition of political argumentation. The paper intends to present the student with a map of the field of Political Theory and develop argumentative skills.	
Content:	**Unit-1:** Political Theory: Role and need **Unit-2:** Power, Authority &Legitimacy **Unit-3:** Liberty, Equality, Rights and Justice **Unit-4:** Nation, Nation-State and Civil Society **Unit-5:** Liberalism, Socialism and Feminism **Unit-6:** The End of an Ideology, Postmodernism **Unit-7:** Identity Politics: Consociationalism and Multiculturalism	2 hours 6 hours 10 hours 10 hours 14 hours 8 hours 10 hours
Pedagogy:	lectures/ tutorials/assignments/self-study (dialogic and participatory discussion, collective teaching and learning)	

References/Readings	Bhargava, Rajeev and Acharya, Ashok. (eds) (2008), *Political Theory: An Introduction*, New Delhi: Pearson Bhargava, Rajeev. (2012), *What is Political Theory and Why Do We Need It?* New Delhi: Oxford University Press. Gauba, O.P. (2010), *An Introduction to Political Theory*, New Delhi: Macmillan. Heywood, Andrew. (2007*), Political Ideologies: An Introduction,* New York: Palgrave Macmillan Heywood, Andrew. (2013), *Politics,* New York: Palgrave Macmillan Heywood, Andrew. (2015), *Political Theory: Introduction*, New York: Palgrave Macmillan Heywood, Andrew. (2018), *Essentials of Political Ideas,* New York: Palgrave Macmillan. Kymlicka, Will. (2005), *Contemporary Political Philosophy,* New Delhi: Oxford University Press. Ramaswamy, Sushila. (2015), *Political Theory: Ideas and Concepts,* New Delhi: Prentice Hall Vinod, M.J and Deshpande, Meena (2013), *Contemporary Political Theory*, New Delhi: PHI Learning	
Learning Outcomes	1. Students will be able to understand theoretical and practical world of national and international politics with the help of political theories and their key concepts and arguments. 2. Students will be able to apply political concepts and ideas in their future course of political research and political action in the form of real politics.	

Programme: M. A. (Political Science)
Course Code: PSDSCC102
Title of the Course: International Relations
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students may have studied at the undergraduate level in social sciences or other disciplines with interest and understanding of contemporary international politics.	
Objective:	The course intends to introduce students to a more advanced understanding of international institutions and processes by exposing them to both theoretical and practical concerns in the conduct of International Relations	
Content:	**Unit 1: Introducing International Relations:** Meaning, Evolution and scope of International Relations, Major Debates in IR (Classical-Scientific/ Realist-Idealist/Neo- Debate) Critique of mainstream theories of IR	10 hours

	Unit 2: Actors in International Relations: State and Non-State, State and Globalization, Multilateral Institutions, Transnational Corporations, International NGOs.	10 hours
	Unit 3: War and Conflict: Changing Nature of War, Non- Conventional War and Low Intensity Conflicts, Peace- making and Peace Building	10 hours
	Unit 4: Information Order and International Relations: Information and IR, Information Revolution, Information warfare, New social media and its impact.	10 hours
	Unit 5: Contemporary Global Concerns: Global Terrorism, Human Rights and Humanitarian intervention, Climate Change, Global Ethics	10 hours
	Unit 6: Global Order and Power Politics: Major Powers and Global Realignments with reference to United States, Europe, Russia and China	10 hours
Pedagogy:	lectures/assignments/self-study	
References/Readings	Baylis, John (2017), "*Globalization of World politics: An Introduction to International Relations*", Oxford University Press, London. Clarke, Ian (1999), "*Globalization and International Relations Theory*", Oxford University Press, Oxford. Goldstein, Joshua (2016), "*International Relations",* Pearson Education, New Delhi. John Vogler and Mark Ingle reds. *The Environment and International Relations*, Routledge, London, 1996 Nicholson, Michael (1998),"*International Relations: A Concise Introduction*", Palgrave, New York. Nicholson, Michael (1989), "*Formal Theories in International Relations*", Cambridge University Press, Cambridge. Oye, Kenneth (1986), "*Cooperation Under Anarchy*", Princeton University Press, Princeton. Teriff, Terry et. al (1999), "*Security Studies Today"*, Polity Press Cambridge. Vogler, John and Mark Ingle reds (1996), "*The Environment and International Relations*", Routledge, London.	

	Whittaker, David (1996), "*United Nations in the Contemporary world*", Routledge, London.	
Learning Outcomes	Students must be able to understand the manner in which international system works by relating theories and concepts with actual processes in international relations.	

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Programme: M. A. (Political Science)
Course Code: PSDSCC103
Title of the Course: Public Administration: Theories and Concepts
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied at the undergraduate level in social sciences or other disciplines having an interest in the subject. It is assumed that students have a basic working knowledge of public institutions, public policy and governance	
Objective:	Over a period of time Public Administration has moved from administrative centered view to public policy perspective. The course intends to introduce students to the basic concepts, theories and recent developments in the subject with an intention to enhance their understanding and ability to analyse recent trends in the field.	
Content:	**Unit 1: Public Administration:** Meaning, Nature & Scope; Evolution of Public Administration; New Public Administration; New Public Management **Unit2: Theories:** Classical; Human Relations; Bureaucratic; Public Choice **Unit 3: Approaches:** Scientific Management; Behavioural; Systems; Structural Functional; Decision- Making **Unit 4: Organization:** Modern & Post-Modern Theories; Leadership; Role of Bureaucracy; Administrative Reforms **Unit 5: Good Governance:** Meaning, Principles; Citizen Charter; RTI; e-Governance **Unit 6: Public Policy & Analysis:** Meaning & approaches; Formulation; Implementation; Evaluation of public policy	10 hours 10 hours 10 hours 10 hours 10 hours 10 hours
Pedagogy:	lectures/assignments/self-study	
References/Readings	Bhattacharya, Mohit (2013), *New Horizons of Public Administration,* New Delhi: Jawahar Publishers Chakrabarty, Bidyut & Bhattacharya, Mohit (2008), *The Governance Discourse: A Reader*, OUP, New Delhi Chakrabarty Bidyut (2003), *Public Administration*, New Delhi: Oxford University Press	

	Chakrabarty Bidyut (2007), *Reinventing Public Administration*, New Delhi: Orient Longman Cox Raymond, Buck Susan, & Morgan Betty (2011), *Public Administration: Theory and Practice*, New York: Routledge Fredrickson George (2008), *Public Administration Theory Primer*, New Delhi: Rawat Publication Herbert Simon (2010), *Public Administration*, US: Transaction Publisher Hyden G. (2005), *Making Sense of Governance*, New Delhi: Vikas Books Pvt. Ltd., Nicholas Henry (2015), *Public Administration & Public Affairs*, (12th edition), New York: Routledge Peters, Guy & Pierre John (2005), *Handbook of Public Administration*, London: Sage Publication Peters Guy (2013), *Public Administration*, New York: Routledge Prabhy C.S.R, (2004), *e-Governance*, PHI, Sage Publication Sharma Laxmi (2010), *Bureaucracy in Public Administration: Theory& Challenges*, Jaipur: Prateeksha Publication	
Learning Outcomes	1. To enhances the ability of students to understand the theoretical base of public institutions. 2. To examine the recent issues in public administration in the light of theories and approaches learnt. 3. To make students understand formulation, 4. Implementation of public policy and how to analyse public policy.	

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Programme: M. A. (Political Science)
Course Code: PSDSCC104
Title of the Course: Political Economy of India
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied at the undergraduate level in social sciences or other disciplines with interest and knowledge of contemporary Indian politics. It is assumed that students have a basic understanding of major issues confronting India's political and economic system.	
Objective:	The course intends to introduce students to some of the key issues relating to state and economic development in India from the independence period to the contemporary phase. It looks at both the aggregate and the sectoral spaces in India's public policy and performance with reference to the role of state, market and peoples' movements and concerns.	

Content:	**Unit 1: Understanding Political Economy:** Meaning Scope and Definition of Political Economy, Classical and Contemporary Approaches to Political Economy, New Political Economy **Unit 2: State in India:** Historical Evolution of State, Planning, Public Sector, State in the Contemporary Sphere. **Unit 3: Agriculture:** Agrarian Relations and Land Reforms, New Agricultural Strategy and Green Revolution, Agrarian Crisis **Unit 4: Industry:** Inward Oriented /Import Substituting Industrialization and Licence Permit Raj, Industrial Policy Reforms, Economic Liberalization, Impact on Labour **Unit 5: Social Movements in India:** Tribals, Women, Dalits, Environment **Unit 6: Contemporary Concerns:** Conflicts over Water, Food Security, Digital Divide, Banking Crisis	10 hours 10 hours 10 hours 10 hours 10 hours 10 hours
Pedagogy:	lectures/assignments/self-study	
References/Readings	Brass, Paul R. (1992), "*The Politics of India Since Independence"*, Cambridge University Press, Cambridge.	
	Byres, Terence, J. (Ed) (1994), "*The State and Development Planning in India"*, Oxford *University Press, Delhi.* *Caporaso, James A, (1992), "Theories of Political Economy*", Cambridge University Press. Chatterjee, Partha (1997), "*A Possible India: Essays in Political Criticism*", Oxford University Press, Delhi. Das, Arvind N. (1994), "*India Invented: A Nation in the Making"*, Manohar, New Delhi. Frankel, Francine R (2009), "*India's Political Economy: 1947 – 2004",* The Gradual Revolution, Princeton University Press, Princeton. Khilnani, Sunil (1997), "*The Idea of India,* Hanush Hamilton", London. Kohli, Atul (1990), "*Democracy and Discontent: India's Growing Crisis of Governability*", Cambridge University Press, Cambridge. Kohli, Atul (2012),"*Poverty amid Plenty in India*", Cambridge University Press, Cambridge. M, McCartney (2009), "*India - The Political Economy of Growth, Stagnation and the State", 1951-2007*, Routledge. Nayyar, Deepak (1996), "*Economic Liberalisation in India: Analytics, Experience and Lessons*", in *R.C.* Dutt Lectures on Political Economy, Orient Longman. Panagariya, Aravind (2008), "*India the Emerging Giant*", Oxford University Press. Rudolph, L. l and S.H. (1987), "*In Pursuit of Lakshmi: The Political Economy of the Indian State*", University of Chicago Press, Chicago. Vanaik, Achin (1990),"*The Painful Transition: Bourgeois Democracy in India*", Verso, London.	

Learning Outcomes	Students must be able to understand India's economic evolution from the prism of state and market interaction since Independence and should be in a position to critically evaluate India's contemporary problems.	

Programme: M. A (Political Science)
Course Code: PSDSCC105
Title of the Course: Modern Indian Political Thought
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students should have studied B.A in Social Sciences or any other disciplines with interest and knowledge of Indian thinkers. It is assumed that students have a basic knowledge of Modern Indian Political thinkers and their ideas and understandings.	
Objective:	The paper seeks to acquaint students with the Western impact on Indian society and intellectual traditions and the Indian response to the same. The Indian response to the Western impact is understood by examining the thought of social reformers, liberals, cultural nationalists, Dalit-Bahujan thinkers, Muslim revivalists and indigenous socialists.	
Content:	**Unit-1:** Nature and Importance of the Study of Modern Indian Political Thought, Western Impact on Indian society and Intellectual Tradition.	8 hours
	Unit-2: Social Reformers: Raja Ram Mohan Roy, Dayanand Sarswati	6 hours
	Unit-4: Liberal Constitutionalists: Dadabhai Naoroji, M. G. Ranade, G. K. Gokhale	6 hours
	Unit-5: Cultural Nationalism and Hindu Assertion: Vivekananda, B. G. Tilak, Aurobindo Ghosh, M. M. Malviya. M. S. Golwalkar	10 hours
	Unit-6: Muslim Assertion: Sir Syed Ahmed, Muhammad Iqbal and Muhammad Ali Jinnah,	8 hours
	Unit-7: Dalit-Bahujan Perspectives: Jyotiba Phule and B.R. Ambedkar	8 hours
	Unit-8: Indigenous Socialism: M. K. Gandhi, Jawaharlal Nehru, Rammanohar Lohia, and J. P. Narayan	8 hours
	Unit-9: Radicalism: M. N. Roy and E. V. Ramasamy (Periyar)	6 hours

Pedagogy:	lectures/ tutorials/assignments/self-study (dialogic and participatory collective learning and teaching)	
References/Readings	Chakrabarty, Bidyut. and Pandey, Rejendra Kumar. (2009), *Modern Indian Political Thought: Text and Context*, New Delhi: Sage Doctor, Adi. (1997), *Political Thinkers of Modern India*, New Delhi: Mittal Publications. Guha, Ramachndra. (2012), *Makers of Modern India,* New Delhi: Penguin India Jaffrelot, Christophe. (2009), *Hindu Nationalism: A Reader,* Princeton University Press. Mehta, V.R. (1996), *Foundations of Indian Political Thought*, New Delhi: Manohar Pantham, Thomas and Deutsch, Kenneth L. (1986), *Political Thought in Modern India,* New Delhi: Sage Rathore, Akash Singh. (2017), *Indian Political Theory: Laying the Groundwork for Swaraj,* New Deli: Routledge. Roy, Himanshu &Singh, M.P. (eds) (2017), *Indian Political Thought: Themes and Thinkers,* New Delhi: Pearson Verma, V.P. (1961), *Modern Indian Political Thought,* Agra: Laxmi Narayan Agarwal Publications V. R. Mehta, V.R. and Pantham, Thomas. (2006), *Political Ideas in Modern India: Thematic Explorations,* New Delhi: Sage.	
Learning Outcomes	1. Students will be able to understand the both negative and positive side of the narratives of Modern India. 2. Students demonstrate the ability to understand the aspirations of Modern Indian Political thought and the reality.	

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Programme: M. A. (Political Science)
Course Code: PSDSCC106
Title of the Course: Constitutional Government in India
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Students should have studied at the undergraduate level in social sciences or other disciplines having an interest in the subject. It is assumed that students have a basic knowledge of constitution, forms of government & democracy	
Objective:	The course intends to introduce the student to the basic philosophy of the Constitution. It seeks to examine various provisions of the Constitution in the context of India. The course will also discuss recent constitutional amendments.	

Content:	**Unit 1.** Constitutionalism and Constitutional Government; Indian Constitutionalism, Constitution as Indian Identity **Unit 2.** Constitution and Democracy, Secular Constitution, Consociational and Multicultural interpretation of Indian Constitution **Unit 3.** Individual & Group Rights, Equality, Liberty& Privacy: Feminist Critique, Public Interest Litigation, Social Justice, Constitutional Justice **Unit 4.** Citizenship, Language, Elections, **Unit 5.** Separation of Powers: Legislature, Executive and Judiciary, Centre – State Relations, Decentralization and Local Government, **Unit 6.** Working a Democratic Constitution, Constitutional Amendments, Constitutional Reforms, Constitution and Beyond	10 hours 10 hours 10 hours 08 hours 10 hours 12 hours
Pedagogy:	lectures/assignments/self-study	
References/Readings	Austin Granville (2003), *Working a Democratic Constitution*: *A History of the Indian Experience*, New York: Oxford University Press Austin Granville (2000), *The Indian Constitution: Cornerstone of a Nation,* New York: Oxford University Press Basu D.D. (2007), *Introduction to the Constitution of India,* (22nd edition), Nagpur: Wadhawa and Company law Publisher Bhargava, Rajeev (2009), *Politics and Ethics of Indian Constitution,* New Delhi: Oxford University Press Choudhari S., Kosla M., and Mehta P., (2016), *The* Oxford Handbook *of the Indian Constitution*, New Delhi: Oxford University Press Kashyap, Khann and Kueck (2000), *Reviewing the Constitution,* Delhi: Shipra Publication Noorani A. (2000), *Constitutional Questions in India,* New Delhi: Oxford University Press Sridharan E., Hasan Z., & Sudarshan R.(ed.,),(2004), *India's Living Constitution: Ideas, Practices, Controversies,*, Delhi: Anthem Press	
Learning Outcomes	1. To enhances the ability of students to understand evolution and philosophy of Indian Constitution. 2. To enhance the ability of the students to analyse working of Indian Constitution.	

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Programme: M. A. (Political Science)
Course Code: PSDSCC107
Title of the Course: Comparative Politics
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students should have training in social sciences or other disciplines at undergraduate level. It is assumed that a student have a basic understanding of the political models existing in different parts of the world.	
Objective:	This course seeks to introduce the students to the methodologies of comparative politics to critically compare and analyse the political systems operating in different parts of the globe. The course studies the regional dynamics shaping political system of the advanced, developing and underdeveloped nations. This course combines theoretical and empirical dimensions of comparative politics. By using the comparative methodology this course studies, the processes and institutions that shape the contemporary politics.	
	Unit 1: Introduction to Comparative Politics : Comparative Inquiry and Comparative Methods, Assessment of Old Methods and New Directions **Unit 2: Theories and Approaches of Comparative Politics:** Institutional Approach, Structural-Functional Approach, System Theories, Theories of State, Dependency Theories **Unit 3: Key Concepts of Comparative Politics:** Political Modernization, Political Socialization, Political Culture, Political Communication **Unit 4: Constitutionalism:** Meaning, Evolution, Models of Constitutions, Problems and Prospects of Constitutionalism **Unit 5: Processes of Political Mobilization:** Emergence and Development of Party System, Typologies of Electoral System, Political Clientelism, Political Activism **Unit 6: Governance in Comparative Politics:** Social Policy Development in Advanced Democracies, Comparative Corporate Governance, Political Accountability and Government Stability in New Democracies	06 hours 12 hours 10 hours 12 hours 10 hours 10 hours
Pedagogy:	Lectures/Assignment/Quizzes/Group debates/ Group discussion/ Self Study	
References/ Reading	BOIX , C., & STOKES , S. C. (2007). *The Oxford Handbook of Comparative Politics .* New York: Oxford University Press. Claessens, S. (2006). Corporate Governance and Development. *The World Bank Research Observer*, 91-122. Rasch , W., & Knodt, E. M. (1994). Systems Theory and the System of Theory. *New German Critique ,*, 3-7. Skocpol, T., & Amenta, E. (1986). States and Social Policies. *Annual Review of Sociology* , 131-157.	

Adrian, C., & Apter , D. (1995). *Political Protest and Social Change: Analyzing Politics.* New York: New York University Press.

ALmond, G., & Verba, S. (1963). *The Civic Culture.* Princeton: Princeton University Press.

Beck, , T., Clarke, , G., Groff , A., Keefer , P., & Walsh, P. (2001). New Tools in Comparative Political Economy: The Database of Political Institutions. *The World Bank Economic Review*, 165-176.

Blondel, J. (1968). Party Systems and Patterns of Government in Western Democracies. *Canadian Journal of Political Science*, 180-203.

Chandhoke , N. (1996). Limits of Comparative Political Analysis. *Economic and Political Weekly*, PE2-PE8.

Chilcote , R. (2018). *Theories of Comparative Politics.* New York: Routledge.

David, E. (1957). An Approach to the Analysis of Political Systems. *David Easton*, 383-400.

Heywood, A. (2011). *Global Politics.* London: Palgrave Macmillan.

Johari, J. C. (2011). *Comparative Politics .* New Delhi: Sterling Publishers Pvt. Limited.

Katz, R. (1997). *Democracy and Elections.* New York: Oxford University Press.

Keefer , P., & Vlaicu, R. (2008). Democracy, Credibility, and Clientelism. *Journal of Law, Economics, & Organization*, 371-406.

Keefer, P. (2007). Clientelism, Credibility, and the Policy Choices of Young Democracies. *American Journal of Political Science*, 804-821.

Lijphart , A. (1971). Comparative Politics and the Comparative Method. *The American Political Science Review*, 682-693.

Radoslaw , M. (2006). Political Accountability and Institutional Design in New Democracies. *International Journal of Sociology*, 45-75.

Sartori, G. (1969). From the Sociology of Politics to Political Sociology. *Government and Opposition*, 195-214.

Terence, C. (2016). *Constitutionalism.* Johannesburg: South African Institute of International Affair.

Teubner , G., & Beckers, A. (2013). Expanding Constitutionalism. *Indiana Journal of Global Legal Studies*, 523-550.

Valenzuela , S., & Valenzuela, A. (1978). Modernization and Dependency: Alternative Perspectives in the Study of Latin. *Comparative Politics*, 535-557.

Weale, A. (2011). New Modes of Governance, Political Accountability and Public Reason. *Government and Opposition*, 58-80.

Learning Outcome:	1. Students will learn to use comparative method to conduct critical inquiry to study the different aspect of political system followed in different parts of the world. 2. Students will be familiarized with the similarities and differences of the different models of political system which enable them to solve the key debates of public policy.	

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Programme: M. A. (Political Science)
Course Code: PSDSCC108
Title of the Course: Political Economy of Goa
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Students should have studied undergraduate degree. It is assumed that students have a basic knowledge of political, social and economic aspects of Goa. The students are expected to have knowledge of contemporary issues of Goa.	
Objective:	The course intends to introduce students to brief political history of Goa. It also provides knowledge about political economy of Goa by examining the recent issues related to politics and economy.	
Content:	**Unit 1:** Goa: A Political Economy Framework, Late Colonial Goa, Gaunkari/ Communidade System, Early Migration, The Struggle for Liberation, **Unit 2:** Government Formation under MGP, Opinion Poll, Development Planning in the Pre-Statehood Period, Land Reforms, Coalition and Power Sharing in the Post- Statehood Period, **Unit 3:** Post- Liberation Planning & Development: Town and Country Planning Act, Regional Plans of Goa, Outline Development Plans, Coastal Regulation Zones **Unit 4:** Economic Transition in Goa: Industrialisation, Tourism, Mining. Peoples' Movements: Tribals, Mahadei, Language, Womens', Ramponkars agitation. **Unit 5:** Land Use and Contestation, Regional Plan Movement, SEZs, PDAs, Mopa, Demand for Special status **Unit 6:** Local Empowerment and Development: Local Institutions and Participatory Planning, Issues and Challenges to the State.	10 hours 10 hours 10 hours 10 hours 10 hours 10 hours
Pedagogy:	lectures/assignments/self-study	

References/Readings	Angle Prabhakar (1983). *Goa-An Economic Review*, Mumbai, Goa, Hindu Association. Almeida J.C. (2013), *Goa: Administration &Economy Before and After 1962,* Panjim- Goa, Broadway Publishing House. De Souza Teotonioa (1989), *Goa Through the Ages,* New Delhi, Concept Publishing Company Fernandes Aureliano (2003) Elections 1999 a yes vote for defectors in Goa? in Wallace, Paul & Ramashray Roy(eds). India's 1999 elections and 20th Century Politics, New Delhi, Sage. Fernandes Aureliano (2000), Political Transition in Post-Colonial Societies in Messiant, Christian(ed).Lusotopi, p341-358. Fernandes. Aureliano (2003). Goa's Democratic becoming and the absence of mass political violence Goirand, Camille(ed). Lusotopi. Gomes Olivinho (2004), *Goa,* New Delhi, National Book Trust. Gaitonde P (1987), *The Liberation of Goa,* Delhi, Oxford University Press. Kamat Pratima (2009), *Goa,* Goa Chamber of Commerce & Industry, Goa Pareira Rus (1981), *Goa-Gaunkari,* A Gomes Pereira, Goa Parobo Parag (2015), *India's First Democratic Revolution,* Orient Blackswan, New Delhi. Salgaonkar, Seema (2006) Women Political Power and the State in Goa, New Delhi, Abhijeet Publications, Savio, Abreu and Rudolf Heredia, (eds) (2011), Goa 2011: Reviewing and Recovering fifty Years, New Delhi, Concept Publishing Company Pvt. Ltd. Shirodkar P. (1988), *Goa's Struggle for Freedom,* Ajanta Publication, Delhi. Economic Surveys Reports of Government of Goa 1987-2020 Budgets Speeches/Budget of Government of Goa – 1990-2020	
Learning Outcomes	1. To introduce students to the developments (political & economic) that has taken place in the post- liberation period. 2. To help students understanding development planning. 3. To enhance their knowledge about contemporary issues concerning Goa.	

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Discipline Specific Optional Courses

Programme : M. A. (Political Science)
Course Code: PSDSOC201
Title of the Course: State and the Marginalized
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students should have a basic knowledge of Indian society. The students are expected to have knowledge of contemporary social issues concerning India.	
Objective:	This course seeks to enhance students understanding of certain sections of society which have remained marginalized in term of employment and economic empowerment, education and other opportunities which have further constrained their participation in mainstream of society.	
Content:	**Unit 1**: Concept of Marginalisation, The Indian State & Liberal Ethos, marginalsations and Democratic Politics, dimensions of marginalisation (Caste, Class & Gender), Marginalisation and Political Representation. **Unit 2**: Caste and Politics, Caste in Census, Reservation Policy, Dalit women in India **Unit 3**: Industrial Labour, Agrarian Classes and Tribals, Common property resources **Unit 4**: Religion and Indian Constitution, Affirmative action as inclusion. Religious Freedom and Minority rights. **Unit 5**: The Welfare State. Markets, Globalisation and the poor. **Unit 6**: The Secular state and the religious minorities, the Developmental State and the marginalised.	10 hours 10 hours 10 hours 10 hours 10 hours 10 hours
Pedagogy:	lectures/assignments/self-study	

References/Readings	Chandra G. (2006), *Tribal Development in India*, New Delhi, Sage Publication. Hasa Zoy (2011), *Politics of Inclusion*, New Delhi, OUP. Hasan Zoya (2014), *Democracy and the Crisis of Inequality*, Delhi, Primus Books. Kothari Rajni (2010), *Caste in Indian Politics*, New Delhi, Orient Longman. Mahajan Gurpreet (1998*), Identities and Rights: Aspects of Liberal Democracy in India*, Delhi, OUP. Seth D. (1999), *Minority Identity and Nation State*, New Delhi, OUP. Shah Ghanshyam (2002), *Dalits and State,* New Delhi, Concept Publishing Company. Shah Ghansyam (2002), *Caste & Democratic Politics in India*, New Delhi, Permanent Black. Shah Ghansyam (2002), *Social Movements &State*, New Delhi, Sage Publication. Sharma Trilok (2011), *Dalit Women*, New Delhi, Sonali Publication.	
Learning Outcomes	1. The students should be able to understand marginalization and issues of marginal sections in India. 2. The students should be able to understand various constitutional provisions and response of the state towards marginals in India.	

Programme: MA Political Science
Course Code: PSDSOC202
Title of the Course: India's Foreign Policy: Structures and Processes
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Open to all undergraduate students. A basic understanding of the major foreign policy issues is expected.	
Objective:	The course is intended to familiarize students with both the structural and functional dimensions of India's Foreign Policy since its evolution to the present. It shall acquaint them with the nuances of foreign policy making as well as the manner in which India has dealt with complex foreign policy issues since independence.	

Content:	**Unit 1:** India's Foreign Policy: Origin and Evolution: Historical Understanding of India's Foreign Policy, Post-Independence Evolution, Determinants and Structures, Role of Ministry of External Affairs (MEA) and Think Tanks	10 hours
	Unit 2: Non-Alignment to Multi Alignment: Ideological Changes and Continuities in India's Foreign Policy, Nehruvian Impact and its critical appraisal, Pragmatic transition since the 1990s.	10 hours
	Unit 3: National Security and Foreign Policy: Interface of Security and Foreign Policy, India's Strategic Culture, Internal and External markers of India's Security, Nuclear Dimension and debate in India's Foreign Policy.	10 hours
	Unit 4: India and her Extended Neighbourhood: India and South Asian Subcontinent, India and South East Asia, India and West Asia	10 hours
	Unit 5: India and Major Powers: Change and Continuity in India's foreign Policy with United States of America, Russia, China and Japan.	10 hours
	Unit 6: India and Global Political Economy: India's positions on Global Trade, Climate Change, SDGs, Multilateral Financial Institutions, BRICS.	10 hours
	Lectures/Tutorials/Assignments/Self-Study/Discussions/Audio-Visual	
References/Readings	Bandyopadhyaya. J, (1970), *The Making of India's Foreign Policy: Determinants, Institutions, Processes, and Personalities*, Bombay: Allied Publishers. Bajpai, Kanti and Harsh Pant (2013), *India's Foreign Policy: A Reader*", Oxford: Oxford University Press. C. Raja Mohan, (2005), *Crossing the Rubicon: The Shaping of India's New Foreign Policy*, New Delhi: Penguin Books. Chopra, V. D, (2006), *India's Foreign Policy in the 21st Century*, New Delhi: Kalpaz Publications. Ganguly, Summit (2011), *India's Foreign Policy: Retrospect and Prospect*, Oxford: Oxford University Press. Ghosh. Anjali, Tridib Chakrobroti, Anindyo Jyoti Majumdar and Shibashis Chatterjee ed. (2009), *India's Foreign Poli*cy, New Delhi: Pearson Publishers. Jaishankar, S. (2020), *The India Way: Strategies for an Uncertain World*, New Delhi: Harper Collins. Kanwal, Gurmeet (2016), *The New Arthashastra: A Security Strategy for India*, New York: HarperCollins. Kumar, Yogendra, (2015), *Diplomatic Dimensions of Maritime Challenges for India in the 21st Century*, New Delhi: Pentagon Press. Kumar, Yogendra, (2017), *Whither an Indian Ocean Maritime Order", Contributions to a Seminar on Narendra Modi's SAGAR Speech*. New Delhi: KW Publishers.	

	Menon, Shiv Shankar, (2016), *Choices: Inside the Making of India's Foreign Policy*, New Delhi: Penguin Random House. Pande, Aparna (2017), *From Chanakya to Modi: The Evolution of India's Foreign Policy*, New York: HarperCollins. Saran, Shyam (2017), *How India Sees the World: From Kautilya to the 21st Century, New* Delhi. Juggernaut Publishers. Sikri, Rajiv (2013), *Challenge and Strategy: Rethinking India's Foreign Policy*, New Delhi: Sage India Publishers.	
Learning Outcomes	A comprehensive understanding of India's Foreign Policy and its predicaments.	

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Programme: MA Political Science
Course Code: PSDSOC203
Title of the Course: International Political Economy
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Open to all students who have a B.A. in social sciences or related disciplines. A basic understanding of the major international economic issues is expected.	
Objective:	The course seeks to familiarize the students with the evolution, concepts and issues pertaining to International Political Economy, as a very dynamic field of enquiry within international relations. It helps the students to locate intersections between global power politics and economic interdependencies that shape not just bilateral, but regional and multilateral global relations, with an appropriate mix of theories and case studies.	
Content:	**Unit 1: International Political Economy:** Definition and Theories (Liberalism, Realism, Marxism and their contemporary contexts), Critical IPE, Feminist IPE; Evolution and Schools of IPE. **Unit 2: Multilateral Economic Institutions and Problems**: World Trade Organization (WTO); IMF and World Bank, Structures, Evolution and Problems. **Unit 3: Political Economy of Regionalism**: Theorizing Regionalism and its variants, European Union, ASEAN, NAFTA, RCEP, BRICS, Regionalism versus Globalism **Unit 4: Non-State Actors in International Political Economy:** Transnational Corporations (TNCs); Non-Governmental Organizations (NGOs)—National and International; Protest Movements. **Unit 5: Transnational Issues:** Migration, Climate Change;	10Hours 10Hours 10Hours 10Hours 10 Hours

	Human Rights, Poverty, Food Security, Energy Security. **Unit 6: Contemporary Debates in IPE:** Globalization and its discontents, Global Financial Crisis, Digital Technology and impact on IPE (Virtual Communities, Artificial Intelligence, Crypto-currencies)	10 Hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self- Study /Discussions/Audio-Visuals	
References/Readings	Adams, N.B. (1993), *Worlds Apart: The North-South Divide and the International System*, London: Zed. Baldwin, D. ed. (1993),*Neorealism and Neoliberalism: The Contemporary Debate,* New York: Columbia University Press. Barker, D. and J. Mander (1996), *Invisible Government: The World Trade Organisation: Global Government for the Millennium*, San Francisco, CA: International Forum on Globalisation. Borzel, T. LukasGoltermann and Kei Striebinger (2016), *Roads to Regionalism: Genesis, Design, and Effects of Regional Organizations*, London: Routledge. Boyer, R and D. Drache Eds. (1996), *States Against Markets: The Limits of Globalisation,* New York: Routledge. Cavahagh. J et al. Eds. (1994), *Beyond Bretton Woods: Alternatives to the Global Economic Order*, London: Pluto Press. Cox, R.W. Ed. (1997), *The New Realism: Perspectives on Multilateralism and World Order*, New York: St.Martins. Frieden, J,David Lake and J. Lawrence Broz, (2017), *International Political Economy: Perspectives on Global Power and Wealth*, New York: W.W. Norton &Co. Halperin, Sandra (2013) *Re-envisioning Global Development: A Horizontal Perspective*, London: Routledge. Li Xing, Li (2014), *The BRICS and Beyond: The International Political Economy of the Emergence of a New World Order*, London: Routledge. Mitchell Seligson, John T and Passe Smith eds., (2013), *Development and Underdevelopment: The Political Economy of Global Inequality*, Boulder: Lynne Rienner Publishers. Pettman, Ralph (2012), *Handbook on International Political Economy*, Singapore: World Scientific Publishing Co. Ravenhill, John (2011), *Global Political Economy*, Oxford: Oxford University Press. Shaw, Timothy and Emmanuel Fanta Eds. (2013), Comparative *Regionalisms for Development in the 21st Century: Insights from the Global South*, London: Routledge. Thorsten Olesen, Helge Pharo and Kristian Paaskesen (2013), *Saints and Sinners: Official Development Aid and its Dynamics*	

	in Historical and Comparative Perspective, Bergen, Norway: Fagbokforlaget Publishers. Veltmeyer, Henry, (2016), *New Perspectives on Globalization and Antiglobalization: Prospects for a New World Order*?, London: Routledge.	
Learning Outcomes	The students should be able to understand the inter-linkages between international relations and international economics with appropriate use of theory and basic empirical data.	

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Programme: M. A (Political Science)
Course Code: PSDSOC204
Title of the Course: Key Texts in Indian Political Thought
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for thecourse:	Students should have studied B.A. Political Science or B.A. in any Social Sciences. It is assumed that students have a basic knowledge of Indian Political thinkers and important texts written by them.	
Objective:	The Course intends to present the students content and context of the key literature on Indian Political Thought penned by the Indian political thinkers. The core rationale of this paper is to make students to be well versed in the major socio-political debates of India which have their ontological and epistemological roots in these texts.	
Content:	**Unit-1:** Manu: Manusmriti **Unit-2:** Kautilya: Arthshastra **Unit-3:** M.K. Gandhi: Hind Swaraj **Unit-4:** Jyotiba Phule: Gulamgiri **Unit-5**: B.R Ambedkar: Annihilation of Caste **Unit-6:** Pandita Ramabai Saraswati: The High-Caste Hindu Woman **Unit-7:** M. S. Golwalkar: Bunch of Thoughts **Unit-8:** Jawaharlal Nehru: The Discovery of India	8 hours 8 hours 8 hours 8 hours 8 hours 8 hours 6 hours 6 hours
Pedagogy:	lectures/ tutorials/assignments/self-study (dialogic and participatory collective teaching and learning)	

References/Readings	Ambedkar, B.R. (2014), *Annihilation of Caste*, New Delhi: Navayana. Deshpande, G.P. (2002), *Selected Writings of Jotirao Phule*, New Delhi: Left Word Books Doniger, Wendy. (1992), "Rationalizing the Irrational Other: "Orientalism" and the Laws of Manu", *New Literary History* Vol. 23, No. 1, Versions of Otherness, pp.25-43 Doniger, Wendy. (2000), *The Laws of Manu,* New Delhi: Penguin Fasana, Enrico. (1976), "BHIMRAO RAMJI AMBEDKAR AND THE CASTE SYSTEM: The Social Thought of an Indian Political Leader", *Politico*, Vol. 41, No. 4, pp.747-759. Gandhi, M.K. (2010), *Gandhi: Hind Swaraj and other writings*, New Delhi: Cambridge University Press. Golwalakar, M.S. (2000), *Bunch of Thoughts*, Bangalore: Sahitya Sindhu Prakashana. Heredia, Rudolf, C. (1999), 'Interpreting Gandhi's Hind Swaraj', *Economic and Political Weekly*, Vol.34, No.24. Kautilya (1992), *The Arthshastra,* New Delhi: Penguin Kosambi, Meera. (1988), "Women, Emancipation and Equality: Pandita Ramabai's Contribution to Women's Cause", *Economic and Political Weekly*, Vol. 23, No. 44, pp. WS38-WS49. Modelski, George. (1964), 'Kautilya: Foreign Policy and International System in the Ancient Hindu World', *The American Political Science Review,* Vol. 58, No. 3 pp.549-560 Nehru, J.N. (2008), *The Discovery of India*, New Delhi: Penguin India. Omvedt, Gail. (1971), "Jotirao Phule and the Ideology of Social Revolution in India", *Economic and Political Weekly*, Vol. 6, No. 37, pp. 1969-1979. Ramabai, Pandita. (1981), *The High-Caste Hindu Women*, Bombay: Maharashtra State Board for Literature and Culture.	
Learning Outcomes	1. Students will be able to understand the importance of reading of the texts written by thinkers. 2. Through construction and deconstruction, students, demonstrate the ability of narrating the text for their contemporary relevance.	

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Programme: M.A Political Science
Title of the Course: Politics in the Developing World
Number of Credits: 4

Course Code: PSDSOC205
Effective from AY: 2022-23

Prerequisites for the course	Students who have completed the undergraduate degree. It is assumed that students have a basic knowledge of International Relations and paradigms of the Developed, Developing and Least Developing Countries (LDCs).	
Objective	This paper will focus on different trajectories of development among the developing nations and assess the challenges of the globalization process. It will introduce students to the alternative discourse in International Relations which focuses on the politics revolving around developing countries of regions such as Africa, Asia, Latin America and Middle East and enable students to develop analytical skills to identify the key political, economic, social, cultural and ethnic factors that affect their developmental process and also differentiate between Developed and LDCs.	
Content:	**Unit 1: Developing World in International Politics:** Introduction, issues in developing States, difference between developed and developing States. **Unit 2: Theorising the State:** International politics, inequality, institutionalism, global economy, south-south relations. **Unit 3: Ethno-politics and Nationalism:** Colonialism, post-colonial development, state-building, nation-building. **Unit 4: State and Civil Conflict:** The modern state, violent conflict, civil war, failed state. **Unit 5: Democratization and Human Rights:** Social movements, fragile vs. strong state, regime change and human rights. **Unit 6: Policy Issues:** Poverty and hunger, migration and internal displacements, environment, health.	06 hours 10 hours 08 hours 08 hours 10 hours 06 hours
Pedagogy:	Lectures/Assignments/Self-Study	

Learning Outcome:	Acemoglu, Daron, James Robinson and Simon Johnson (2001), *The Colonial Origins of Comparative Development: An Empirical Investigation*, American Economic Review, 91(5): 1369-1401. Banerjee, Abhijit and Esther Duflo (2014), *Under the Thumb of History? Political Institutions and the Scope for Action*, *Annual Review of Economics* 6: 951-971. Burnell Peter and Vicky Randall (2005), *Politics in the Developing World*, Oxford, Oxford University Press. Bose, Sumantra (2004), *De-Colonization and State Building in South Asia*, Journal of International Affairs, 58(1): 95-113. Broad, Robin; and Christina Melhorn Landi (1996), *Whither the North-South Gap?* Third World Quarterly *17(1): 7*-17. Calvert and S. Calvert (2003), *Politics and Society in the Third World, Harlow*, Pearson Education. Flores, Thomas Edward; and Irfan Nooruddin (2009), *Democracy Under the Gun: Understanding Post Conflict Economic Recovery*", Journal of Conflict Resolution, 53(1): 3-29. Gosovic, Branislav (2016*), The Resurgence of South-South Cooperation*, *Third World Quarterly*, 37(4): 733-743. Huntington, Samuel P. (1991), *The Third Wave: Democratization in the Late Twentieth Century*, University of Oklahoma Press. Huysmans Jef (2006), *The Politics of Insecurity*, London: Routledge. Pogge T., (2002), *World Poverty and Human Rights*, Cambridge Press. Payne, Anthony (2005), *The Global Politics of Unequal Development*, Hampshire, Palgrave-Macmillan. Ravenhill, John (1990), *The North-South Balance of P*ower, International Affairs 66(4): 731-748.	
Learning Outcome:	1. Students will understand the political realities of the developing world and will be able to assess the major challenges that developing nations face in the contemporary global environment. 2. Students will be able to analyse nuances of politics and economics in developing nations and the role of external interference on the process of development in the developing nations.	

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Annexure II

Title of the Course: Human Rights and Vulnerable Groups
Programme: Post-Graduation
Course Code: CSSEIPOGC**201**
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the Course:	Students of any discipline can choose this Optional Generic Course	
Objective:	The course aims to provide an introduction to basic human rights instruments with special reference to the vulnerable groups in India. This course aims to explore some aspects of diverse and increasingly complex body of international law of human rights that has both national and international applications.	
Content:	1.Human Rights and Duties: Concept and Nature: Meaning and Concept of human rights; Evolution and Development of Human Rights; Different Generations of Human Rights; Human Values: Humanity, Compassion, Virtues Human Dignity, and Human Duties; Gandhian Perspective; Ambedkar Perspective; Human Rights movement in India.	15 hours
	2. International Human Rights Standards :Magna Carta (1215); Bills Of Rights 1689; American Declaration (1776); French Declaration (1789); Geneva Convention (1864); Universal Declaration of Human Rights 1948; International Covenant on Civil and Political Rights 1966; International Covenant on Economic, Social and Cultural Rights 1966; UN Convention on the Political Rights of Women, 1952; Convention on Elimination of Discrimination against Women (CEDAW); UN Convention on Rights of Child; UN Declaration on the Rights of Persons belonging to Minorities 1992; UN Convention on the Rights of Persons with Disabilities (CRPD); UN Convention on the Rights of Older Persons;the Convention on the Elimination of All Forms of Racial Discrimnation1965; the Declaration on the Elimination of All Forms of Intolerance and of Discrimination Based on Religious or Belief (1981); United Nations; Convention on Elimination of all Forms of Discrimination against women 1979; Convention on Rights of the Child 1989; Right to Development and UN and rights of persons with disability; ILO Convention No.169-Indigenous; Tribal peoples Convention 1989.	15 hours
	3.Human Rights of socially and Economically Disadvantaged Group: Meaning and Concept of Vulnerable and Disadvantaged Groups, Customary, Socio-Economic and Cultural Problems of Vulnerable and Disadvantaged Groups; Stateless Persons; Sex Workers; Migrant Workers; HIV/AIDS Victims; Scheduled castes/Scheduled Tribes; Women and Children; Minorities; Peasants; Landless Labour; Bonded Labour; Refugees; Displaced Persons; Disability; Prisoner; Mentally ill; Aged; Transgender;	15 hours

	4.Inclusive Processes for Development of Human Rights: Constitutional and Statutory Provisions; National and State Commissions for Human Rights; National and State Commission for SCs and STs; National and State Commissions for Women; SC/ST Prevention of Atrocities (POA) Act; Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition), Act 1999; Role of Judiciary; Role of NGOs; Civil Society; Media.	15hours
Pedagogy:	(Lectures, discussions, seminars, and assignments).	
References/Readings:	1. *Alston. Philip & Goodman. Ryan,* (2012), International *Human Rights, Oxford* 2. *Agarwal H.O*. (2020), Human *Rights,* Central Law Publications 3. *Ahuja V.K*. (2019), *Human Rights: Contemporary Issues*, Eastern Book Company 4. Bhargava, (2001.), *Human Rights of Dalits – Societal Violation.* New Delhi: Gyan Publishing House. 5. Choudhary, S. (2005). *Human Rights and Poverty in India – Theoretical issues & empirical evidence – Volume, I, II, III-IV, and V.* New Delhi: Concept Publishing Company. 6. Godara, I. (2012). *Human Rights and International Politics.* Jaipur: Adi Publication. 7. Gupta, A. (2005). *Human Rights of Indigenous Peoples – Protecting the Rights of Indigenous Peoples, Volume I,* New Delhi: Isha Books. 8. Gupta, A. (2005). *Human Rights of Indigenous Peoples - Comparative Analysis of Indigenous Peoples, Volume II.* New Delhi: Isha Books. 9. Gupta, J.(2004)). *The Human Rights: Convention and Indian Law.* New Delhi: Atlantic Publishers and Distributors. 10. Harish K Thakur, & Chauhan, R. S. (2007). *Globalization and Human Rights.* New Delhi: Radha Publication. 11. *Joseph Sarah & McBeth Adam. (2010),Research Handbook on International Human Rights Law*, Edward Elgar Publishing Limited 12. *Joshi K.C.* (4th*Edition, 2019*), *International Law And Human Rights*, *Eastern Book Company* 13. *Karimova.Tahmina* (2016), *Human Rights and Development in International Law,*Routledge 14. O'Halloran Kerry, (2019), *Human Rights, Religion and International Law,*Routledge 15. O'Halloran Kerry, (2019), *Sexual Orientation, Gender Identity and International Human Rights Law Common Law Perspectives,*Routledge 16. O'Halloran Kerry, (2018), *Adoption Law and Human Rights International Perspectives,* Routledge 17. *Pushpavalli. K,* (2016), *Human Rights: An Overview*, S Chand & Co Ltd. 18. Saksena, K. (2003). *Human Rights and the Constitution Vision and the Reality.* New Delhi: Gyan Publishing House.	

	19. Thomas, J. K. (2005). *Human Rights of Tribal – Empowerment, and Protection of the Rights of Tribal's, Volume II.* New Delhi: Isha Books. 20. Thomas, J. K. (2005). *Human Rights of Tribal's – Status of Tribal's in India-Volume I.* New Delhi: Isha Books.	
Learning Outcomes:	Students will be able to explain the basic concept of Human Rights and vulnerable groups. Students will be able to understand and apply various International Human Rights Standards	

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Title of the Course: Indian Constitution and the Marginalized
Programme: Post-Graduation
Course Code: CSSEIPOGC**202**
Number of Credits:4
Effective from AY: 2022-23

Prerequisites for the Course:	Students of any discipline can choose this Optional Generic Course	
Objective:	The course seeks to introduce the students to understand the provisions of the Constitution of India for providing safeguards and promoting the interests of marginalized groups. It also examines the issue in the Indian context. The course will focus on the different aspects of the rights of underprivileged groups.	
Content:	1. Indian Constitution – Philosophy and Objectives: Philosophy of the Constitution; Nature of Indian Constitution; Preamble; Salient Features; Colonial Impact; Movement and History of Reservation policy; Constituent Assembly Debates on Reservation Policy	15 hours
	2.Constitutional provisions and the Marginalized: Defining the Scheduled Castes and Scheduled Tribes; Social Safeguards; Economical Safeguards; Political Safeguards; Cultural Safeguards; Minorities Rights; Constitutional Amendments on Reservation policy; Report of Backward Class Commission on Reservation Policy; Five-year plans and Tribal development; Schemes; PESA 1996; Fifth Scheduled; Sixth Scheduled; Forest Rights Act 2006; National Policy for Scheduled Tribes 2006; Ministry for Tribal Affairs; SC and ST Prevention of Atrocities Act 1989 and Rules 1995;	15 hours
	3. Laws pertaining to women and Children: Crimes against women; Gender injustice; Women's Commission; Empowerment of women as a Constitutional Right; Children and the Law; Child labour; Sexual exploitation; Children and education; Crimes	15 hours

	Against Children; Free legal Aid; Directive principles of state policy; Right against Exploitation; Prohibition of Trafficking & Forced Labour	
	4.Dimension of Social justice and Directive principle for vulnerable groups: Meaning of social justice; the concept of social justice; Economic justice; Political justice; Industrial justice; Judicial Justice; Distributive justice; Gandhian Concept of social justice; Pandit Nehru's Vision of social justice; Dr. B. R. Ambedkar's views on social justice; justice V. R. Krishna Iyer's view on Relationship between Fundamental rights; Directive Principles and concept of social justice	15hour
Pedagogy:	(Lectures, discussions, seminars and assignments).	
References/Readings:	1. Chaudhary, P. N. (2017), *Dr.B.R.Ambedkar's Vision of Social Justice in Indian Constitution.* New Delhi: Regal publication 2. Bakshi. P.M., (13th Edition 2016), *The Constitution of India,* Haryana: Universal Law Publishing. 3. Bakshi, P. (2017), *The Constitution of India,* India: Universal Law Publishing. 4. Bakshi, P. (18th Edition 2021), The Constitution of India, New Delhi: Wadhwa and Company Law Publisher. 5. Bakshi. P.M., (13th Edition 2016), *The Constitution of India,* Haryana: Universal Law Publishing. 6. Bakshi, P. (2017), *The Constitution of India,* India: Universal Law Publishing. 7. Bakshi, P. (18th Edition 2021), The Constitution of India, New Delhi: Wadhwa and Company Law Publisher. 8. Jain. P. M., (2018), *Indian Constitutional Law*, Lexis Nexis 9. Makwana, M., & Pais, R. (2011), *Backward classes and Social Justice.* New Delhi: Prem Rawat 10. M.S.Seervai,(2015), *constitutional Law of India*: Universal Law Publishing, Lexis Nexis: 11. Prasad, A., & Pratap Singh, C., (2016), Reservation: Policy, Practice and its Impact on Society: Scheduled caste New Delhi, Kalpaz publication. 12. Pylee V. M, (2017), *Constitutional Amendments in India*, Universal Law Publishing - An Imprint of Lexis Nexis: 13. Shukla N.V, (2015), *Constitution of India*, Eastern Book Company 14. Singh Avtar, (2019), *The Constitution of India*, Central Law Publications.	
Learning Outcomes:	Students will be able to understand the Various Constitutional Provision related to the Rights of Marginalized Groups. Students will be able to think independently on various issues related to marginalized groups.	

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Annexure I

M.A. Philosophy syllabus (SEM I)

SEM I			
1.	PYC-111	History of Western Philosophy **(DSCC)**	4
2.	PYC-112	Classical Indian Philosophy **(DSCC)**	4
3.	PYC-213	Logic **(DSCC)**	4
4.	PYC-215	Contemporary Indian Philosophy **(DSCC)**	4
5.	PYO-117	Environmental Ethics **(DSOC)**	4
	PYO-217	Schools of Vedanta (**DSOC)**	4

Programme: M. A. Philosophy
Course Code: PYC-111 **Title of the Course**: History of Western Philosophy
Number of Credits: 4
Effective from AY:2022–23

Prerequisites for the course:	NIL	
Objectives:	To inculcate in the student a critical appreciation of the history of Western philosophical ideas from its origin in Greek Philosophy to modern times.	
Content:	1. **Early Greek Philosophy:** a. Socrates: Philosophy as Dialogue. b. Plato: Dialectic, Theory of Existence/ Physics, and Moral Theory. c. Aristotle: Logic, Metaphysics, and Ethics. 2. **Rationalism:** a. Descartes: Method of understanding; Method of doubt – The Cogito as intuition and inference. The role of God – Descartes' proofs for the existence of God. Mind-Body Problem. b. Spinoza: Substance, Attitude, and Mode. Mind-Bodyproblem – Parallelism. c. Leibniz: Substance as the centre of activity, Monadology, Distinction between truths of reason and truths of fact; The Principles of Non-contradiction and Sufficient Reason, The Doctrine of Pre-established Harmony. 3. **Empiricism:** a. Locke: Origin and validity of knowledge, Representative theory of knowledge, Ideas and their classification, Primary and Secondary qualities.	5 hours 15 hours 15 hours

	b. Berkeley: Rejection of materialism, *Esseestpercipi*; Berkeley's Idealism and the problem of Intersubjectivity; The centrality of the notion of God. c. Hume: Distinction between ideas and impressions; Distinction between statements of relation of ideas and statements of matters of fact – Rejection of metaphysics; scepticism regarding the external world and the self; Hume's critique of causality. 4. **Kant:** The Critical Philosophy: Classification of judgment, How are synthetic a priori judgments possible? Copernican Revolution; Forms of intuition (space and time) categories of understanding; Ideals of metaphysics; Ideas of Practical Reason; Soul; God; Freedom and Immortality. 5. **Hegel:** The points of departure from Kant; His conception of Geist (Spirit): Dialectic method; thesis, antithesis, and synthesis; His conceptions of Being, Non-being, and Becoming, Absolute Idealism.	15 hours 10 hours
Pedagogy:	Lectures, discussions, and tutorials.	
References/ Readings:	1. D.J. O'Connor: *A Critical History of Western Philosophy*, New York: The Free Press, 1964. 2. W. Windelband: *History of Philosophy I and II*, New York: Harper Torch Books, 1958. 3. Bertrand Russel: *A History of Western Philosophy*, London: George Allen and Unwin Limited, 1971. 4. Philip Wiener: *Dictionary of the History of Ideas* (Relevant Articles), New York: Charles Scribner and Sons, 1973. 5. Paul Edwards: *Encyclopaedia of Philosophy* (Relevant Articles), New York: The Macmillan Company, 1967. 6. Anders Wedberg: *A History of Philosophy (Vol. I and II)*, NewYork: Harper Torch Books, 1958. 7. M. Mandelbaum, F.W. Gramach, A.R. Anderson, and J.B. Schnecwin (Eds.): *Philosophical Problems*, New York: The Macmillan Company, 1967. 8. Frederick Copleston: *History of Philosophy* (Relevant Chapters), New York: Image Books, 1965. 9. Frederick Copleston: *A History of Philosophy, Volume VI, Modern Philosophy: From the French Enlightenment to Kant*, New York: Image Books, 1964. 10. G.H.R. Parkinson (Ed.): *An Encyclopaedia of Philosophy* (Relevant Articles), London: Routledge, 1988. 11. Jonathan Bennett: *Locke, Berkeley, and Hume: Central Themes*, Oxford: Clarendon Press, 1971. 12. Roger Scruton: *A Short History of Modern Philosophy fromDescartes to Wittgenstein (Second Edition)*, London: Routledge, 1995.	

	13. Anthony Kenny: *A New History of Western Philosophy Volume III: The Rise of Modern Philosophy*, New York: Oxford University Press, 2006. 14. Stephen Korner:*Kant*, United States: Yale University Press, 1982. 15. Charles Taylor: *Hegel*, Cambridge: Cambridge University Press, 1975.	
Learning Outcome:	1. Enhanced abilities of analytic thinking. 2. A critical appreciation of the tradition of Western philosophical ideas.	

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Programme: M.A. (Philosophy)
Course Code: PYC- 112 **Title of the Course**: Classical Indian Philosophy
Number of Credits: 4
Effective from AY: 2022–23

Prerequisites for the course:	NIL	
Objectives:	To have an understanding of the philosophical tradition of India from the ancient to the classical period.	
Content:	1. **Introduction:** Darśana, Śruti and Smrti, āstika and nāstika General Presuppositions of Indian Philosophy, Phases of Indian Philosophy. 2. **Carvaka**: Epistemology – Pratyaksa as the only pramana, critique of anumana and sabda. Metaphysics – The concept of the world, Non-existence of soul, non-existence of God. 3. **Jainism**: Jaina Theory of Knowledge, Dravya, Guna, Paryaya, Jiva and Ajiva, Anekantvada, Syadvada, Nayavada. 4. **Buddhism:** Four Noble Truths – Astangamarga, Nirvana. Pratityasamutpada, Ksanika-vada, Anatmavada Schools of Buddhism – Vaibhasika, Sautrantika, Yogacara, Madhyamika. 5. **Nyaya:** Definition and classification of knowledge. Pramanas: Pratyaksa, Anumana, Upamana, Sabda. Individual self and its liberation, Concept of God and arguments for the existence of God. 6. **Vaisesika**: Concept of Padarthas (Categories) – Dravya, Guna, Karma, Samanya, Samavaya, Visesa, AbhavaParamanuvada or Atomic Theory, Asatkaryavada – theory of causation.	5 hours 5 hours 7 hours 10 hours 7 hours 7 hours 7 hours

	7. **Samkhya:** Theory of knowledge, Satkaryavada – Theory of causation. Prakrti, Purusa, arguments for plurality of purusa, Evolution of the world. The Doctrine of Liberation, The Problem of God. 8. **Yoga**: Psychology – Citta and Citta-vrtti, Eightfold path of yoga. Place of God in yoga. 9. **PurvaMimamsa**: The nature and sources of knowledge Metaphysics – Theory of Potential energy – Sakti and Apurva, Concept of soul. Religion and Ethics – The place of Vedas, The Conception of Duty, The Highest Good, Atheism of PurvaMimamsa. 10. **Vedanta**: Sankara – Concept of Brahman, God and World. Ramanuja – Concept of Brahman, God, and World. Madhva – Concept of God and World.	7 hours 5 hours
Pedagogy:	Lectures, discussions, and tutorials.	
References/ Readings:	1. M. Hiriyanna: *Outlines of Indian Philosophy*, Bombay: Blackie & Son, 1983. 2. S.N. Dasgupta: *A History of Indian Philosophy, Vols. I to V*, Delhi: MotilalBanarsidass, 2000. 3. S. Radhakrishnan: *Indian Philosophy, Vols. I & II*, New Delhi: Oxford University Press, 2008. 4. K. Mittal: *Materialism in Indian Thought*, Delhi: MunshiramManoharlal Publishers, 1974. 5. D. Chattopadhyaya: *Lokayata: A Study in Indian Materialism*, Delhi: Peoples Publishing House, 2008. 6. T.R.V. Murti: *Central Philosophy of Buddhism*, London: George Allen &Unwin, 1955. 7. S. Stevenson: *The Heart of Jainism*, London: Oxford University Press, 1915. 8. P. Chakravarti: *Origin and Development of the Samkhya System of Thought*, Delhi: MunshiramManoharlalPublishers, 1975. 9. SatishchandraChatterjee: *The Nyaya Theory of Knowledge*, Delhi: Rupa Publishers, 2015. 10. GanganathJha: *Prabhakara School of PurvaMimamsa*, Delhi: MotilalBanarsidass, 1978. 11. K. SatchidanandaMurty: *Revelation and Reason in AdvaitaVedānta*, Bombay: Asia Publishing House, 1959. 12. P.N. Srinivasachari: *The Philosophy of Visitadvaita*, Madras: Adayar Library, 1943.	

	13. B.N.K. *Sharma: Philosophy of Sri Madhvacarya*, Delhi: MotilalBanarsidass, 2014. 14. JadunathSinha: *Indian Philosophy,Vols. 1–3*, New Delhi: MotilalBanarsidass Publishers, 2006. 15. Paul Williams: *Buddhist Thought:A Complete Introduction to the Indian Tradition*, London: Routledge, 2000.	
Learning Outcome:	Familiarity with the problems and approaches of various schools of thought in Indian Philosophy.	

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Programme: M. A. (Philosophy)
Course Code: PYC-213 **Title of the Course:** Logic
Number of Credits: 4
Effective from AY: 2022–23

Prerequisites for the course:	NIL	
Objective:	To develop an understanding of the various methods, namely Truth Tables, Shorter Truth Tables, Truth Trees, and Formal Proofs.	
Content:	1. **Truth Tables:** Classification of statements into Tautology, Contingency and Contradiction. Determining the validity of arguments. 2. **Shorter Truth Tables:** Determining whether the statement is a tautology or not. Determining the validity of arguments. 3. **Truth Trees:** Rules used in Truth Trees. Determining the validity of arguments. 4. **Formal Proof of Validity:** Rules of Inference. Rules of Replacement. Proving the validity of arguments.	15 hours 10 hours 15 hours 20 hours
Pedagogy:	Lectures, tutorials, and assignments.	
References/ Readings:	1. I. M Copi: *Symbolic Logic*, New Jersey: Pearson Publications, 2005. 2. William Gustafson and Dolph E. Ulrich: *Elementary Symbolic Logic*, U.S.A.: Waveland Press, 1989. 3. I.M.Copi, C. Cohen, and McMahon: *Introduction to Logic,* New York: Macmillan, 2012.	
Learning Outcomes:	1. Use of the methods of Truth Table, Shorter Truth Table, and Truth Trees for testing arguments and statements 2. Application of formal proofs for testing arguments.	

Programme: M. A. (Philosophy)

Course Code:PYC -215 **Title of the Course**: Contemporary Indian Philosophy
Number of Credits: 4
Effective from AY: 2022–23

Prerequisites for the course:	NIL	
Objective:	To have an understanding of the continuity and change in the philosophical tradition of India during the modern period.	
Content:	1. Introduction: Locating Contemporary Indian Philosophy 2. Gandhi: Non-violence, Truth 3. S. Radhakrishnan: Idealistic view 4. Sri Aurobindo: Integral Advaita 5. Swami Vivekananda: Universal Religion 6. Rabindranath Tagore: Notion of Surplus 7. Kalidas Bhattacharya: Indian concept of Man 8. M.N. Roy: New Humanism 9. Mohammed Iqbal: Religious Thought in Islam 10. B.R. Ambedkar: Navayana Buddhism 11. JidduKrishnamurty: Truth and Reality 12. K.C. Bhattacharya: Concept of philosophy 13. Daya Krishna: Three conceptions of Indian philosophy 14. B.K. Matilal: Idea of Indian philosophy 15. J.N. Mohanty: Rationality in Indian Philosophy	4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours 4 hours
Pedagogy:	Lectures, discussions, and tutorials.	
References/ Readings:	1. NaliniBhushan and Jay L. Garfield: *Minds Without Fear: Philosophy in the Indian Renaissance*, New York: Oxford University Press, 2017. 2. Judith M. Brown: *Mahatma Gandhi: The Essential Writings*, Oxford: Oxford University Press, 2008. 3. Krishna Kripalani (Ed.): *All Men are Brothers*: *Life and Thoughts of Mahatma Gandhi as Told in His Own Words,* Ahmedabad: NavjivanMudranalaya, 1960. 4. AkeelBilgrami: "Gandhi's Integrity: The Philosophy behind the Politics," *Postcolonial Studies: Culture, Politics, Economy*, Vol. 5, No.1, pp. 79–93, 2002. 5. P.A.Schilpp (Ed.): *The Philosophy of SarvepalliRadhakrishnan*, New York: Tudor Publishing Co., 1952. 6. S. Radhakrishnan and J.H. Murihead (Eds.): *Contemporary Indian Philosophy,* \London: George Allen &Unwin, 1958. 7. Santosh Chandra Sengupta (Ed.): *Sri Aurobindo: Homage from Visva-Bharati*,Santiniketan: Viswa-Bharati University, 1977.	

8. Sri Aurobindo: *The Life Divine* (Relevant Chapters), Pondicherry: Sri Aurobindo Ashram, 2005.
9. Swami Vivekananda: *Selections from Swami Vivekananda*, Calcutta: AdvaitaAshrama, 1957.
10. GoutamBiswas (Ed.): *Special Issue on Rabindranath Tagore: Journal of Indian Council of Philosophical Research*, Vol. XXVIII, No. 1, 2011.
11. Kalidas Bhattacharya: *Philosophical Papers*, Santiniketan: Viswa-Bharati University, 1969.
12. M.N. Roy: *Politics, Power and Parties* (Relevant Chapters), Calcutta: Renaissance Publishers, 1960.
13. Mohammad Iqbal: *Reconstruction of Religious Thought in Islam* (Relevant Sections), Delhi: New Taj Office, 1980.
14. Marietta Stepanyants: "Muhammad Iqbal as an Islamic Reformer" in Marietta Stepanyants (Ed.): *Russia Looks at India: A Spectrum of Philosophical Views*, New Delhi: DK Printworld, 2011.
15. B.R. Ambedkar, *The Buddha and His Dhamma,* New Delhi: Oxford University Press, 2011.
16. Pradeep P. Gokhale: "Universal Consequentialism: A Note on B.R. Ambedkar's Reconstruction of Buddhism with Special Reference to Religion, Morality and Spirituality" in SurendraJondhale and Johannes Beltz (Eds.): *Reconstructing the World: B.R. Ambedkar and Buddhism in India,* New Delhi: Oxford University Press, 2004.
17. JidduKrishnamurti: *On Truth* (Relevant Sections), London: Harper Collins, 1995.
18. J. Krishnamurti and David Bohm: *The Limits of Thought* (Relevant Sections), London: Routledge, 1999.
19. Krishna Chandra Bhattacharya: *Studies in Philosophy* (Relevant Chapter), Delhi: MotilalBanarsidass, 1983.
20. Daya Krishna: *Indian Philosophy: A Counter Perspective* (Relevant Chapters), New Delhi: Oxford University Press, 1991.
21. B.K. Matilal: "Indian Philosophy: Is There a Problem Today?" in S.S. Rama RaoPappu and R. Puligandla (Eds.): *Indian Philosophy: Past and Future*, Delhi: MotilalBanarsidass, 1982.
22. J.N. Mohanty: "Phenomenology and Indian Philosophy: The Concept of Rationality" in D.P. Chattopadhyaya et al. (Eds.): *Phenomenology and Indian Philosophy*, New Delhi: Indian Council of Philosophical Research, 1992.

	23. T.M.P. Mahadevan and G.V. Saroja: *Contemporary Indian Philosophy*, New Delhi: Sterling, 1981.	
Learning Outcomes:	Familiarity with the debates and discussions in Contemporary Indian Philosophy.	

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Programme: M. A. Philosophy
Course Code: PYO- 117 **Title of the Course**: Environmental Ethics
Number of credits: 4
Effective from AY: 2022–23

Prerequisites for the course:	NIL	
Objectives:	This course aims at giving an understanding of the various approaches and issues in environmental ethics.	
Content:	1. Nature of environmental ethics; Ethics, applied ethics and environmental ethics. 2. Land ethic, ecological conscience. Land Pyramid. 3. Anthropocentrism, Eco-centrism, Deep Ecology. 4. Nature of value; Intrinsic value and extrinsic value; Environmental ethics and Animal rights. 5. Environmental Ethics and Human Rights; Feeding people and saving nature. 6. Eco-feminism and environmental justice.	10 hours 10 hours 10 hours 10 hours 10 hours 10 hours
Pedagogy:	Lectures, discussions, and tutorials.	
References/ Readings:	1. John Passmore: *Man's Responsibility for Nature*, New York: Charles Scribner's Sons, 1974. 2. Robin Attfield: *Environmental Philosophy*, Cambridge: Polity Press, 2014. 3. Paul W. Taylor: *Respect for Nature: A Theory of Environmental Ethics*, Princeton: Princeton University Press, 1986. 4. Vandana Shiva: *Staying Alive: Women, Ecology and Development*, New Delhi: Kali for Women, 1989. 5. Andrew Light and Holmes Rolston III (Eds.): *Environmental Ethics: An Anthology*, Malden, Massachusetts: Wiley-Blackwell, 2002. 6. Ronald Sandler: *Environmental Ethics: Theory in Practice*. Oxford: Oxford University Press, 2017. 7. Dale Jamieson: *Ethics and Environment: An Introduction*, New York: Cambridge University Press, 2008. 8. Holmes Rolston: *A New Environmental Ethics: The Next Millennium for Life on Earth*, New York: Routledge, 2012.	
Learning Outcome:	1. Better appreciation of the environment and nature. 2. Familiarity with various ethical arguments about the human-nature relationship.	

Programme: M.A. (Philosophy)
Course Code:PYO -217 **Title of the Course**: Schools of Vedānta
Number of Credits: 4

Effective from AY: 2022–23

Prerequisites for the Course:	NIL	
Objectives:	To introduce the students to the Vedānta tradition.	
Content:	1. **Introduction to the Vedas and Major Upanishads** 2.**Advaita**: Avidyā, Adhyāsa, Antaḥkaraṇa, jīva, Sākṣin, States of Consciousness; jāgrat, svapna, suṣupti, turīya. Pramāṇas: Role of Śabda in knowledge of Brahman, Māyā, Saguṇa Brahman, Grades of Satya, Theory of Causation, Karma, Jñāna, Jīvanmukti. 3. **Viśiṣṭādvaita**: Saguṇa Brahman, Jīva and its kinds, God, Śarīra-Śarīrisambandha, Apṛthaksiddhi, Refutation of Māyā (Saptavidhānupapattiḥ), Pariṇāmavāda, Dharmabhūtajñāna, nityavibhūti, Satkhyātivāda, Doctrine of Pañcīkaraṇa (quintuplication), Jñāna, Bhakti, Prapatti, Videhamukti. 4. **Dvaita**: Nature of Brahman, the concept of Bheda, Concept of Viśeṣa, Jīva, Sākṣin, Sadasadkāryavāda, Abhinava-anyathākhyativāda, Parādhīnaviśeṣāptiḥ; Bhakti; importance of God's grace, Aparokṣajñāna, kinds of Mukti. 5. **Bheda-abheda**: Anirvacaniya and Brahman. 6. **ShuddhaAdvaita**: Brahman and Maya Co-existence.	8 hours 20 hours 17 hours 15 hours
Pedagogy:	Lectures, discussions, and tutorials.	
References/ Readings:	1. SwāmīGambhīrānanda (Tr.): *BrahmasūtraBhāṣya of Śaṅkara*, Calcutta: AdvaitaAshrama, 1977. 2. SwāmīVireśwarānanda (Tr.): *Brahma Sūtras (ŚrīBhāṣya of Rāmānuja)*, Calcutta: AdvaitaAshrama, 1978. 3. B.N.K. Sharma (Tr.): *Brahma Sutras and their Principal Commentaries*, New Delhi: MunshiramManoharlal Publishers, 1986. 4. K. Narain: *An Outline of Madhva Philosophy (Dvaita),* Delhi: Motilal UK Books of India, 1986. 5. T.M.P. Mahadevan: *The Philosophy of Advaita*, Madras: Ganesh & Co., 1957. 6. K.T. Pandurangi: *DvaitaVedāntaDarśana of ŚrīMadhvāchārya*, New Delhi: Rashtriya Sanskrit Sansthan, 1995. 7. M. Hiriyanna: *Outlines of Indian Philosophy*, Delhi: MotilalBanarsidass, 2005. 8. S. Radhakrishnan: *Indian Philosophy (Vols. I and II)*, London: George Allen and Unwin, 1958.	

	9. N.K. Devaraja: *An Introduction to Śaṅkāra's Theory of Knowledge*, Delhi: MotilalBanarsidass, 1972. 10. Swami Nikhilananda: "The Three States of Consciousness," *Philosophy East and West*, Vol. I, No. 1, April 1952. 11. JadunathSinha: *Indian Philosophy,Vol. 2*, New Delhi: MotilalBanarsidass Publishers, 2006. 12. A.C. Das: "Brahman and Māyā in Advaita Metaphysics," *Philosophy East and West*, Vol. II, No. 2, July 1952. 13. A.C. Das: "AdvaitaVedānta and Liberation in Bodily Existence," *Philosophy East and West*, Vol. IV, No. 2, July 1954. 14. Andrew O. Fort: "The Concept of Sākṣin in AdvaitaVedānta," *Journal of Indian Philosophy*, Vol. 12, 1984. 15. Roy W. Perrett: "Self-refutation in Indian Philosophy," *Journal of Indian Philosophy*, Vol. 12, 1984. 16. Mrudula I. Marfatia: *The Philosophy of Vallabhācārya*, MunshiramManoharlal, Delhi: Oriental Publishers & Book Sellers, 1967. 17. G.H. Bhatt: *Sri Vallabhacharya and His Doctrines*, Delhi: ShriVallabha Publications, 1984. 18. P. NagarajaRao: *The Epistemology of DvaitaVedānta,* Madras: The Adyar Library and Research Centre, 1976. 19. D.N. Shanbhag: *Sri Madhvacarya and His Cardinal Doctrines*, Dharwad: Bharat Book Depot &Prakashan, 1990.	
Learning Outcomes:	To comprehend the nuances of various vedāntic positions.	

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Annexure II

M.A. Philosophy syllabus (SEM II)

SEM II			
6.	PYC-125	Introduction to Phenomenology **(DSCC)**	4
7.	PYC-214	Introduction to Analytic Philosophy **(DSCC)**	4
8.	PYC-216	Meta-Ethics **(DSCC)**	4
9.	PYC-218	Indian Logic and Epistemology **(DSCC)**	4
10	PYO-118	Bio Ethics **(DSOC)**	4
	PYO-312	Symbolic Logic (**DSOC)**	4

Programme: M. A. (Philosophy)
Course Code: PYC- 125 **Title of the Course:** Introduction to Phenomenology
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	NIL	
Objective:	To introduce students to Edmund Husserl's Philosophy and the Phenomenological Method.	
Content:	1. The Background of Phenomenology: The Legacy of Brentano; Subjectivity of the Mental, The Concept of Intentionality.	5 hours
	2. The Phenomenological Method; Natural attitude and the Phenomenological attitude,	5 hours
	3. The Transcendental Turn in Husserl: Transcendental Reduction and Transcendental Idealism, Presuppositionless Philosophy, Husserl's Cartesian Meditations, The Concept of Constitution.	10 hours
	4. Perception of Transcendent objects, Sides, Aspects and Profiles, Relation between Parts and Wholes, Identity in the manifold, Presence and Absence.	10 hours
	5. Memory and Imagination, Symbols, Pictures and Words, Categorial intention.	10 hours
	6. The Body and Perspectivity, Body as Subject and as Object; The Problem of Intersubjectivity, The Experiencing of the Other.	10 hours
	7. Phenomenology of Inner Time Consciousness; Horizon and Presence; Absolute Consciousness	5 hours
	8. The Life-world and the world of idealizations, Origin of Geometry, the Crisis of Science.	5 hours

Pedagogy:	Lectures, Discussions and tutorials	
References/Readings	1. Herbert Spiegelberg: *The Phenomenological Movement: A Historical Introduction* (Relevant Chapters), Dordrecht: MartinusNijhoff, 1971. 2. Dermot Moran: *Introduction to Phenomenology*, London: Routledge, 2000. 3. Edmund Husserl: *Ideas: General Introduction to Phenomenology*(Selected Sections), Translated by W.R. Boyce Gibson London: Routledge, 2012. 4. Edmund Husserl: *Phenomenology and the Crisis of* Philosophy,Translated by Quentin Lauer, New York: harper Torch Books, 1965. 5. Edmund Husserl: *Cartesian Meditations*(Selected Sections), Translated by Dorion Cairns, Dordrecht: Kluwer Academic publishers. 1999. 6. Edmund Husserl: *The Crisis of European Sciences and Transcendental Phenomenology* (Selected Sections). Translated by David Carr, Evanston: Northwestern University Press, 1970. 7. Dan Zahavi: *Husserl's Phenomenology*, Stanford: Stanford University Press, 2002. 8. Robert Sokolowski: *Introduction to Phenomenology*, Cambridge: Cambridge University Press, 2000.	
Learning Outcomes	Familiarity with the phenomenological style of philosophising. Appreciation of alternative methods of philosophising.	

Programme: M. A. (Philosophy)
Course Code: PYC -214 **Title of the Course:** Introduction to Analytic Philosophy
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Should have completed the paper on the History of Western Philosophy	
Objective:	To understand the developments in the 20th Century Analytic Philosophy as espoused by the pioneers of Contemporary Western Philosophy like G.E.Moore and Bertrand Russell to present day analytic philosophers like Quine and Kripke.	
Content:	1. General Introduction to Analytic Philosophy, Language as the window to metaphysics; Logic and language,Different kinds of philosophical analysis, Frege on Sense and Reference. 2. G.E. Moore :Conceptual analysis, Defense of Common Sense.	6 hours 6 hours

	3. B. Russel: Logical Atomism, Theory of Descriptions. 4. Early Wittgenstein: Language and logic; Picture theory of Meaning. 5. Later Wittgenstein: Attack on essentialism, the family resemblance, language games, meaning as use, forms of life 6. A.J. Ayer: Logical Positivism, Rejection of Metaphysics, Principle of Verification. 7. J.L. Austin: Performative Utterances, Locutionary, Illocutionary and Perlocutionary acts. 8. G. Ryle: Systematically Misleading Expressions. 9. W.V.O. Quine : Two Dogmas of Empiricism. 10. S.A. Kripke: Identity and Necessity.	6 hours 6 hours 6 hours 6 hours 6 hours 6 hours 6 hours 6 hours
Pedagogy:	Lectures, Discussions and Tutorials	
References/ Readings	1. Milton K. Munitz, *Contemporary Analytic Philosophy*, London: Macmillan, 1981. 2. G.E. Moore: "A Defense of Common Sense."In*G. E. Moore: Selected Writings*. Ed. Thomas Baldwin, New York: Routledge, 1993. 3. B. Russell: "Logical Atomism (1924)." In Bertrand Russell: *The Philosophy of Logical Atomism*, New York: Routledge, 2010. 4. L. Witgenstein: *TractatusLogico-Philosohicus*. (Selected Sections). Translated by D. F. Pears and B. F. McGuinness, New York: Routledge, 2002. 5. L.Wittgenstein: *Philosophical Investigations* (Selected Sections). Translated by G.E. M. Anscombe, Oxford: Basil Blackwell, 1986. 6. A.J. Ayer: *Language, Truth and Logic* (Relevant Chapters). London: Penguin Books, 2001. 7. J.L. Austin: *How to do Things with Words*. (Selected lectures). Oxford: Clarendon Press, 1962. 8. G. Ryle: "Systematically Misleading Expressions" ,*Proceedings of the Aristotelian Society*, New Series, Vol. 32 (1931 - 1932): 139-170. 9. W.V.O. Quine: "Two Dogmas of Empiricism", *The Philosophical Review*, Vol.60 (1951): 20-43. 10. S.A.Kripke: "Identity and Necessity."In Milton K. Munitz (Ed.): *Identity and Individuation*, New York: New York University Press, 1971. 11. Anthony Keny: *Wittgenstein*, London: Penguin Books, 1972. 12. Isaiah Berlin et.al (Ed.): *Essays on J.L. Austin*, Oxford: Oxford University Press, 1973. 13. John Passmore: *A Hundred years of Philosophy*, London: Gerald Duckworth & Co, Ltd., 1917. 14. Saul .A. Kripke: *Naming and Necessity*, Cambridge, Massachusetts: Harvard University Press, 1972.	

	15. R.R. Ammerman (Ed.): *Classics of Analytic Philosophy,* New York: McGraw-Hill, 1965.	
Learning Outcomes	Enables one to participate in contemporary philosophising in the Anglo-Saxon tradition. Familiarity with the analytical method of philosophising.	

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Programme: M. A. (Philosophy)
Course Code: PYC-216 **Title of the Course:** Meta-Ethics
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	NIL	
Objectives:	1. This course aims at understanding the nature of meta-ethics and distinguishing it from normative ethics. 2. It deals with the theories of meta-ethics, is-ought relation, concept of freedom and law of karma and dharma.	
Contents:	1. Meta-ethics:Normative ethics; Relation between meta-ethics and Normative ethics 2. Naturalism and Non-naturalism: Intuitionism and Emotivism 3. Post-emotivist development with special reference to S.E. Toulmin, R.M. Hare and P.H. Nowell Smith 4. Neo-naturalism/Descriptivism of Geach and Foot 5. The Nature of moral reasoning – The Is-ought relation 6. Moral error, weakness and wickedness. 7. Moral Realism 8. Problems for Moral Realism: Evolutionary debunking	6 hours 7 hours 8 hours 8 hours 8 hours 8 hours 7 hours 8 hours
Pedagogy:	Lectures/ tutorials/ assignments/ self-study	
References/Readings:	1. Garner & Rosen: *Moral Philosophy*, U.S.A.: Collier Macmillan Ltd., 1967. 2. Richard Brandt:*Ethical Theory: The Problem of Normative and Critical Ethics,* New Jersey: Prentice Hall Inc., 1959. 3. G.E. Moore: *Principia Ethica*, England: Cambridge University Press, 2012. 4. J.O. Urmson: *The Emotive Theory of Ethics*, London: Hutchison University Library,1968. 5. 5.S.E. Toulmin:*The Place of Reason in Ethics*, England: Cambridge University Press,1950 6. R.M. Hare: *The Language of morals*, Oxford: Clarendon Press,1986. 7. NowellSmith:*Ethics*, England: Penguin Books, 1969	

	8. Philippa Foot (ed.): *Theories of Ethics*, London: Oxford University Press, 1967. 9. W.D. Hudson:*Is -ought Question*, London: Macmillan & Co. Ltd.,1969. Vavova's: "Evolutionary Debunking of Moral Realism, **Oxford St** **Metaethics** *9:76-101*, 2014. Sharon Street: A Darwinian Dilemma for Realist Theories of Val *ophical Studies: An International Journal for Philosophy in the Ar* *Tradition, Vol. 127, No. 1*, 2006.	
Learning Outcomes:	1. Distinguishing between various theories of metaethics,. 2. Analysing the possibility of deriving ought from is. 3. Understanding the relation between freedom and the doctrine of Karma.	

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Programme: M.A. (Philosophy)
Course Code: PYC 218 **Title of the Course:** Indian Logic and Epistemology
Number of Credits: 4
Effective from AY: 2022–23

Prerequisites for the course:	A course in Classical Indian Philosophy.	
Objectives:	This Course studies the contrasting epistemological views represented by Gotama, Kanada, and Dinnaga in *NyāyaSūtra*, *VaiśeṣikaSūtra, and**Pramāṇasamuccaya*respectively. Whereas the above texts deal mainly on the theory of *anumana,* in the fourth text, namely, *Nyāyabindu-tīka* an analysis of perception is also undertaken. The course will focus on issues such as the definition, nature, factors (*pramā*, *prameya*, *pramaṭr*, *pramāṇa*, and *pramāṇaphala*), process, kinds, linguistic-psychological, syllogistic characteristics, criteria (*rūpa*) of reason or sign (*liṅga*, *hetu*), and sign(*liṅga*)-signified (*liṅgin*) relation while discussing the inferential means of knowledge (*anumāna-pramāṇa*).	
Content:	1. *Nyāya-sūtra* *Nyāya-sūtra*of Gautama (original in Sanskrit) *Anumāna-khaṇḍa*with translation by GanganathaJha, 1939. 2. *Vaiśeṣika-sūtra* *Vaiśeṣika-sūtra*, *Anumāna-khaṇḍa*with Praśastapāda's*Bhāṣya*and Śrīdhara's*Nyāyakandalī*, Benares, (1895). 3. *Pramāṇasamuccaya* *Pramāṇasamuccaya*of Dignāga, *Anumāna-pariccheda*(Sanskrit text not available), translated by Richard Hayes from Tibetan version, *Dignāga on the Interpretation of*	15 hours 15 hours 15 hours

	Sign, "Chapter 6: On Reasoning," Dordrecht: Kluwer Academic Publishers, 1988. 4. *NyāyabinduTika* *NyāyabinduTika* by Dharmottara, *Pratyaksa* and *Anumāna*as translated in Th, Stcherbatsky. *Buddhist Logic*, Vol. 2, New York: Dover Publications, 1962.	15 hours
Pedagogy:	Lectures, discussions, and tutorials.	
References/Readings:	1. A. B. Keith: *Indian Logic and Atomism* (Chapter I 1–2,pp. 9–40), Delhi: MunshiramManoharlal Publishers, 1977. 2. Annambhatta: *Tarkasamgraha*, Translated by Virupakshananda (Chapter IV& notes, pp. 1–24 &7–87,161–96), Mylapore: Ramakrishna Math, 2008. 3. B. K. Matilal and Robert D. Evans: *Buddhist logic and epistemology: Studies in the Buddhist analysis of inference and language*, Dordrecht: D. Reidel Publishing Company, 1986. 4. B. K. Matilal: *Logic, language, and reality*, Delhi: MotilalBanarsidass Publishers, 1985. 5. B. K. Matilal: *Perception: An essay on classical Indian theories of knowledge,* Oxford: Clarendon Press, 1986. 6. B. Kar: *Indian theories of error*, Delhi: Azanta Books International, 1990. 7. C. S. Vyasa: *Buddhist Theory of Perception with Reference to PramānaVārthika of Dharmakirti,* New Delhi: Navrang Publishers, 1991. 8. Claus Oetke: "Ancient Indian logic as a theory of non-monotonic reasoning," *Journal of Indian Philosophy* (24), 1996*,* 447–539. 9. D. C. Guha: *NavyaNyāya System of Logic*, New Delhi: MotilalBanarsidass Publishers, 1979. 10. D. M. Datta: *The six ways of knowing*, Calcutta: MunsiramManoharlal Publishers, 1998. 11. Douglas Walton: *The new dialectic: Conversational contexts of argument*, Toronto: University of Toronto Press, 1998. 12. Ernst Prets: "Theories of debate, proof and counter-proof in the early Indian dialectical tradition," in *Essays in Indian Philosophy, Religion and Literature* (Piotr Balcerowicz, MarekMejor (eds), Delhi: MotilalBanarsidass Publishers, 2000, pp. 369–382.	

	13. H. T. Colebrooke: "On the philosophy of the Hindus: [Part II]: On the Nyāya and Vaiśeṣika Systems," *Transactions of the Royal Asiatic Society*, 1824, pp. 92–118. 14. H. S. Prasad: Understanding Buddhist epistemology. *The centrality of ethics in Buddhism* (Chapter 10). Delhi: MotilalBanarsidass Publishers, 2007, pp. 397–429. 15. JonardonGaneri: *Indian Logic: A Reader*, Surrey: Curzon Press, 2001. 16. Jwala Prasad: *History of Indian Epistemology,* Delhi: MunshiramManoharlal Publishers, 1958. 17. Karl Potter (ed.): *Encyclopedia of Indian philosophies,* Introduction to Vols. II & VI (Nyāya-Vaiśeṣika), Delhi: MotilalBanarsidass, 1993. 18. KuppuswamiSastri: *A Primer of Indian Logic* (Chapter Introduction, pp III–XLIII). Madras: Kuppu Swami Sastri Research Institute, Mylapore, 1968. 19. Pradumna Kumar Jain: *Jaina and Hindu Logic: A Comparative Study,* Delhi: Research Books, Yamuna Vihar, 2009. 20. S. C. Chatterjee: *Nyāya theory of knowledge*: *A critical study of some problems of logic and metaphysics*, Calcutta: MunsiramManoharlal Publishers, 2017. 21. S. C. Vidyabhusana: *History of India Logic*, Delhi: MotilalBanarasidas Publishers, 1971. 22. S. C.Vidyabhusana: *A History of Indian Logic*, New Delhi: MotilalBanarsidass Publishers, 1970. 23. Stephen Philips and RamanujaTatacharya: *Gangesa on Upadhi*, New Delhi: ICPR, 2002.	
Learning Outcomes:	Thecourse studies the classical issues in reference to *pramā*, *prameya*, *pramaṭṛ*, *pramāṇa*, *pramāṇaphal,* and explores their philosophical significance to Indian Thought.	

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Programme: M. A. (Philosophy)
Course Code: PYO -118 **Title of the Course:** Bio Ethics
Number of Credits: 4
Effective from AY: 2022–23

Prerequisites for the course:	NIL	
Objective:	This course aims at understanding the distinction between ethics and applied ethics, the religious foundations of Bioethics. It deals with concepts such as euthanasia, abortion, in vitro fertilization, and mental illness. It also aims at understanding the ethics of Ayurvedic medical practice and ethics in the times of the pandemic besides the ethical issues in animal experimentation.	
Content:	1. Distinction between ethics and applied ethics. 2. Religious foundations of bioethics. 3. Death, euthanasia, abortion, and suicide. 4. Issues in reproductive technologies: In vitro fertilization, prenatal diagnosis, organ transplantation, and genetic engineering. 5. Ethics of Ayurvedic medical practice. 6. The use of animals in biomedical experimentation. 7. Eugenics. 8. Vaccination hesitancy and COVID mandates. 9. Suffering and pandemic triage.	8 hours 8 hours 12 hours 12 hours 8 hours 3 hours 3 hours 3 hours 3 hours
Pedagogy:	Lectures, tutorials, and assignments.	
References/Readings:	1. H. T. Engelhardt: *The Foundations of Bioethics*, Oxford, Oxford University Press, 1996. 2. James M.Brown: "On Applying Ethics," in J.D.G. Evans (ed.), *Moral Philosophy and Contemporary Problems*, Cambridge, Cambridge University Press,1987. 3. Ronald M. Green: "Method in Bioethics: A Troubled Assessment," *The Journal of Medicine and Philosophy*, Vol.15, No.2,1990. 4. Katherine K.Young: "Hindu Bioethics," in Paul F.Camenisch (ed.), *Religious Methods and Resources in Bioethics*, Dordrecht, Kluwer Academic Press,1994. 5. Katherine K.Young: "Euthanasia," in Harold G. Coward, Julius J. Lipner and Katherine K. Young (ed.), *Hindu Ethics*, New York, State University of New York Press,1989. 6. P. Billimoria: "The Jaina Ethic of Voluntary Death," *Bioethics*,Vol.6, No.4,1992.	

7. S. Domer: "What is a Right?" *The Journal of Value Inquiry*,Vol.30, No.3,1996.
8. V. Cosculluela: "The Right to Suicide," *The Journal of Value Inquiry*,Vol.30, No.3,1996.
9. Jane English: "Abortion and the Concept of a Person," *Canadian Journal of Philosophy*,Vol.5, 1997.
10. Kusum: "The Use of Pre-natal Diagnostic Techniques for Sex Selection: The Indian Scene,"*Bioethics*,Vol.7, No.2/3, 1993.
11. Laura M. Purdy: "The Morality of New Reproductive Technologies," *Journal of Social Philosophy*,Vol.18, No.l, 1987.
12. John Harris: "In Vitro Fertilization: The Ethical Issues (I)," *The Philosophical Quarterly*,Vol.33, No.132, 1983.
13. Mary Warnock: "In Vitro Fertilization: The Ethical Issues (II)," *The Philosophical Quarterly*,Vol.33, No.132, 1983.
14. Edmund L. Erde: "Studies in the Explanation of Issues in Biomedical Ethics: (II) On Play(ing) God", Etc.," in *The Journal of Medicine and Philosophy*, Vol. 14,No.6,1989.
15. David Lamb: "Organ Transplants, Death,and Policies for Procurement," *The Monist*, Vol. 76, No.2,1993.
16. Prakash N. Desai: "MedicalEthicsinIndia," *The Journal of Medicine and Philosophy*,Vol.13, No.3,1988.
17. Shankar Vedantam (host) with Peter Singer ,"Justifying the Means: What it Means to Treat All Suffering Equally [Audio, 54:48],"in *Hidden Brain Podcast*, National Public Radio, 2020https://www.npr.org/2020/06/01/866768837/justifying-the-means-what-it-means-to-treat-all-suffering-equally. Accessed on 25 April 2022.
18. Ryan C. Maves et al.: "Triage of Scarce Critical Care Resources in COVID-19: An Implementation Guide for Regional Allocation," *Chest*, Vol. 158, Issue 1, 2020.
19. Amy Solnica et al.: "Allocation of Scarce Resources During the COVID-19 Pandemic: A Jewish Ethical Perspective," *Journal of Medical Ethics*, Vol. 46, No. 7, 2020
20. Chiara Mannelli: "Whose Life to Save? Scare Resources Allocation in the COVID-19 Outbreak," *Journal of Medical Ethics*, Vol. 46, No. 4, 2020
21. Maya J. Goldenberg: "The Coronavirus Vaccines are Here. Now What?"*ImpactEthics*, December 2020. https://impactethics.ca/2020/12/18/the-coronavirus-vaccines-are-herenow-what. Accessed on 25 April 2022.

	22. Carissa Lawrence et al.: "Vaccine Hesitancy is No Excuse for Systemic Racism," *The Hastings Center*, February 2021. https://www.thehastingscenter.org/vaccine-hesitancy-is-no-excuse-for-systemic-racism. Accessed on 25 April 2022. 23. Chris Kaposy: "Is There a Duty to Get Vaccinated?" *Impact Ethics*, August 2021. https://impactethics.ca/2021/08/02/is-there-a-duty-to-get-vaccinated/. Accessed on 25 April 2022. 24. Peter Singer: "Why Vaccination Should be Compulsory," *Project Syndicate*, August 2021. https://www.project-syndicate.org/commentary/why-covid-vaccine-should-be-compulsory-by-peter-singer-2021-08. Accessed on 25 April 2022. 25. Julian Savulescu: "Procreative Beneficence: Why We Should Select the Best Children," *Bioethics*, Vol. 15, No. 5/6, 2001. 26. Michael J. Sandel: *The Case against Perfection: Ethics in the age of Genetic Engineering*, Cambridge, Cambridge University Press, 2007. 27. Leon R. Kass, "Ageless Bodies, Happy Souls: Biotechnology and the pursuit of Perfection," *The New Atlantis*, No. 1, Spring 2003 28. Peter Singer: *Animal Liberation*, New York, Harper Perennial, 2009. 29. Carl Cohen: "The Case for the Use of Animals in Biomedical Research," *New England Journal of Medicine,* Vol. 315, No. 14, 1986. 30. Leslie P. Francis and Richard Norman: "Some Animals are More Equal than Others," *Philosophy*, Vol. 53, No 206, 1978.	
Learning Outcomes:	1. Analysing abortion, euthanasia, suicide, in vitro fertilization, and use of animals in experimentation from an ethical perspective. 2. Understanding the ethical issues involved in Ayurvedicmedical practice. 3. Exploring the key assumptions of the Eugenics Movement, and examining their own attitudes and reactions to these ideas. 4. Ethics of Triage.	

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Programme: M. A. (Philosophy)
Course Code: PYO-312 **Title of the Course:** Symbolic Logic
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	A course in Logic	
Objective:	To understand the method of conditional proof and indirect proof as well as the principles of quantification.	
Content:	1. Conditional Proof and Indirect Proof 2. Proof of Tautologies 3. Testing of quantified arguments 4. Demonstrating logical truths involving quantifiers.	15 hours 10 hours 20 hours 15 hours
Pedagogy:	Lectures/ tutorials	
References/ Readings	1. I.M. Copi, *Symbolic Logic*, New Jersey, Pearson Publishers, 2005. 2. I.M. Copi& C. Cohen, *Introduction to Logic*, USA, Macmillan , 2012 3. P. Suppes, *Introduction to Logic,*New York , Dover Publications, 1999. 4. William Gustafson &Dolph E Ulrich*, Elementary Symbolic Logic*, USA, Waveland Press, 1989.	
Learning Outcomes	1. Testing of arguments and tautologies by conditional proof and indirect proof. 2. Applying the principles of quantification to prove arguments and logical truths.	

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D 3.13 Minutes of the Board of Studies in Library and Information Science meeting held on 16.05.2022 and 30.05.2022.

Annexure I

GOA UNIVERSITY
Taleigao Plateau, Goa 403 206

D.D. Kosambi School of Social Sciences and Behavioural Studies
LIBRARY AND INFORMATION SCIENCE PROGRAMME

Bachelor of Library and Information Science (B.L.I.Sc.)
AND
Master of Library and Information Science (M.L.I.Sc.)
Syllabus based on Choice Based Credit System as per the NEP 2020

List of revised courses in Bachelor of Library and Information Science (B.L.I.Sc.) and Master of Library and Information Science (M.L.I.Sc.) Programme approved by the BOS in the meetings held on 16/05/2022 and 30/05/2022

The Course and Credit Distribution:

Courses	Course Code	BLISc SEM I	BLISc SEM II	MLISc SEM I	MLISc SEM II	Total Credits
Discipline Specific Core Courses	DSCC	16	16			32
Discipline Specific Optional Courses	DSOC	4	4			8
Research Specific Optional Courses	RSOC			8	4	12
Optional Generic Course	OGC			12		12
Discipline Specific Dissertation	DSD				16	16
Total Credits	**20**	**20**	**20**	**20**	**20**	**80**

Bachelor of Library and Information Science
One Credit is 15 Contact Hours. Total Credit - 20.

Discipline Specific Course (DSCC) & Discipline Specific Optional Courses (DSOC): Semester I

Sr. No	Course Code	Course Title	Credits	Page. No
1	BLC-DSCC-101	Library, Information and Society	4	3-5
2	BLC-DSCC-102	Knowledge Organisation: Library Classification (Theory and Practice)	4	5-7
3	BLC-DSCC-103	Management and Functional Operations in Libraries	4	7-9
4	BLC-DSCC-104	Reference and Information Sources	4	9-11
ANY ONE COURSE				
5	BLC-DSOC-105	Information and Communication Technology (ICT) - (Theory & Practice)	4	12-14
6	BLC-DSOC-106	Preservation and Digitization	4	14-16
7	BLC-DSOC-107	Industrial Information System	4	16-17

Discipline Specific Course (DSCC) & Discipline Specific Optional Courses (DSOC): Semester II

Sr. No	Course Code	Course Title	Credits	Page No
1	BLC-DSCC-201	Information Services and Systems	4	18-19
2	BLC-DSCC-202	Knowledge Organisation: Library Cataloguing (Theory and Practice)	4	20-21
3	BLC-DSCC-203	Library Automation, Databases and Networking (Theory & Practice)	4	22-24
4	BLC-DSCC-204	Information Retrieval	4	24-26
ANY ONE COURSE				
5	BLC-DSOC-205	Communication Skills in LIS	4	26-28
6	BLC-DSOC-206	Data Mining and Knowledge Discovery	4	28-30
7	BLC-DSOC-207	Scholarly Communication	4	30-32

Research Specific Optional Course (RSOC) & Optional Generic Courses (OGC): M.L.I.Sc Semester I

Sr. No	Course Code	Course Title	Credits	Page No
1	MLC-RSOC-101	Research Methodology	4	33-35
2	MLC-RSOC-102	Research Publication and Ethics	4	35-37
ANY THREE				
3	MLC-OGC-103	Digital Library Systems	4	37-39
4	MLC-OGC-104	History of Books and Reading	4	39-41
5	MLC-OGC-105	Information Literacy	4	41-43
6	MLC-OGC-106	Academic Libraries System	4	43-45
7	MLC-OGC-107	Marketing of Library Information Products and Services	4	45-47

Discipline Specific Dissertation (DSD) & Research Specific Optional Courses (RSOC): MLISc Semester II

Sr. No	Course Code	Course Title	Credits	Page No
1	MLC-DSD-201	Dissertation	16	47
ANY ONE COURSE				
2	MLC-RSOC-202	Technical Writing	4	47-49
3	MLC-RSOC-203	Intellectual Property Rights	4	49-51
4	MLC-RSOC-204	Bibliometrics and Related Metrics	4	51-53
5	MLC-RSOC-205	Library Use and User Studies	4	53-55
6	MLC-RSOC-206	Web Technology	4	56-57
2	MLC-RSOC-207	Public Libraries System	4	57-59
2	MLC-RSOC-208	Specialist Libraries System	4	60-61

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First Semester

BLC-DSCC-101: Library, Information and Society

(4 Credits/100 Marks)

Course Description:

This Course will guide the students to know about the history and background regarding the establishments of libraries since ancient times and also develop a strong understanding into the functioning of the same at various levels.

Objectives:

To familiarise the students with the basic philosophy of Library and Information Science.
To differentiate types of libraries, their functions and their role in the society.
To educate the students about the Five Laws of Library and Information Science.
To familiarise with the status of library legislation in India with special reference to Goa library legislation.
To understand the role and functions of various professional bodies in the development of libraries and information centres.

Course Outline

Unit – I: Library and Society **20 hours**

Evolution of Knowledge Society, Components, Dimensions, and Indicators of Knowledge Society.
Knowledge based Institutions: Different kinds; Objectives and functions; Library as a social and knowledge institution.
Development of Library Movement in India
Individual Contribution of Maharaja Sayajirao Gaekwad III
Types of Libraries: Features, Functions, Characteristics, Objectives, and Activities.
Public Libraries Services: By age group - Children, Teens and youth, Senior citizens, For rural citizens
Other services: Door delivery of literature at hospitals, places of work, waiting rooms, etc.; Friends of libraries movement; Collaboration for joint programmes; Database of events and places of local importance (text and photos)
Academic / Specialists Libraries
Information, Information Science, Information as a resource/commodity, Information society, Contributions of Belkin, Robertson, Derwin, Ingwersen,
Information Transfer Cycle-Generation, Collection, Storage and Dissemination.
Communication Theories and Models. Barriers to communication. Levels of communications – Intrapersonal, Interpersonal and Mass Communication.

Unit – II: Laws of Library Science **20 hours**

Dr. S.R. Ranganathan: His contribution to Library Science, Five Laws of Library Science and their implications.
Development of Libraries in India with special reference to Goa
Library Legislation: Need, Purpose and Factors, Public Library Acts in Indian States, Detailed study of Goa Public Library Act 1993.
Delivery of Books and Newspapers Act; Right to Information Act; IPR, Copyright and Plagiarism, LIS education

Unit – III: Library Associations **20 hours**

Library Profession: Librarianship as a profession, Professional Skills and Competencies, Professional ethics.

Library Promoters, Public Relations, and Extension Activities: National level promoters – RRRLF, UGC. International level- UNESCO
Library Associations - ILA, IATLIS, IASLIC; International Library Associations – IFLA, FID, ALA, SLA, and LA, ASLIB
National Knowledge Commission: Role, Functions, Services.

Learning Outcomes:
At the end of this course the students will be getting detailed knowledge about the growth in library movement and different types of libraries along with their functionalities.

References/Readings:

1. Bala, H. (2010). *Towards building a knowledge Society.* USA: Author press.
2. Bhatt, R. (1995). *History and development of libraries in India.* New Delhi: Mittal Publications.
3. Buragohain, A. (2000). *Various aspects of librarianship and information science.* New Delhi: Ess Ess Publications.
4. Issac, K. (2004). *Library legislation in India: A critical and comparative study of state acts.* New Delhi: EssEss Publications.
5. Prajapati, R. (2013). *Foundations of library and information science.* New Delhi: Discovery Publishing House.
6. Ranganathan , S. R. (1999). *The Five Laws of Library Science.* Bangalore: Sarada Ranganathan Endowment for Library Science.
7. Rout, R. (1986). *Library legislation in India: Problems and prospects.* New Delhi: Reliance.
8. Rowley, J., & Hartley, R. (2017). *Organizing knowledge: an introduction to managing access to information.* Routledge.
9. Venktappaiah , V., & Madhusudhan, M. (2006). *Public library legislation in the new millennium.* New Delhi: Bookwell.
10. Webster, F. (2014). *Theories of the information society.* (4th ed.). Routledge.
11. Wiegand , W. A. (1994). *Encyclopedia of Library History.* New York: Garland Publishing.

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BLC-DSCC-102: Knowledge Organisations: Library Classification Theory and Practice
(4 Credits/100 Marks)

Course Description:
The course is designed to develop an understanding of the concepts, theories and importance of library classification. The coursework provides students with a solid foundation in theoretical and practical aspects of library classification.

Learning Objectives:
To introduce students to the basic concept and aspects of classification. The course will highlight salient features of major classification schemes.

Course Outline:

Unit I - Knowledge Organization – Basics of Classification 10 Hours

Concepts of Classification: Definition, need, and purpose. Notation. Species of Library Classification. Universe of Knowledge - Concept, Meaning and Definitions; Groups and Class, Attributes, Characteristics. Modes of formation of subjects.

UNIT - II: Theory and Development of Library Classification 05 Hours

Developments in Library Classification.

Description and Dynamic Theory. Classification Research Group.

Contribution of Dr S. R. Ranganathan - Postulates, Canons, and Principles. Fundamental categories, Facet analysis, Facet sequence, Phase Relations, Devices in library classification, Arrays, Chains.

UNIT – III: Methods of Knowledge Organization 05 Hours

Notation: Types and functions. Mnemonics, Concept of call number, Book number, and Collection number.

Devices and indicator digits. Common Isolates and Auxiliary Tables.

UNIT – IV: Study of Universal Schemes of Library Classification and Current Trends 10 Hours

Salient features of Dewey Decimal Classification, Universal Decimal Classification, Colon Classification, and Library of Congress Classification.

Current Trends in Library Classification – Web Dewey, Classification in online systems, Taxonomies, Folksonomy.

Unit V- Book Classification Practice 30 Hours

Classifying the documents according to Dewey Decimal Classification (Latest Edition). Classification of simple documents. Classification of documents using common and special auxiliary tables. Classification of complex documents.

Learning Outcomes:

After completing the course, the students will understand the basic principles of library classification and techniques in organizing documents in the library and develop knowledge and skills relating to library classification.

References/Readings:

1. Bately, S. (2005). *Classification in Theory and Practice.* Oxford: Chandos.
2. Broughton, V. (2004). *Essential Classification.* London: Facet.
3. Dewey, M. B. (2011). *Dewey Decimal Classification and Relative Index .* Dublin, Ohio : OCLC Online Computer Library Center.
4. Hunter, E. J. (1998). *Classification Made Simple.* London: Clive Bingley.
5. Kumar, K. (2018). *Theory of Classification.* New Delhi: Vikas.
6. Mills, J. (1973). *A modern outline of library classification.* London: Chapman & Hall.
7. Philip, H. W. (1955). *A Primer of Book Classification.* London: Association of Assistant Librarians.
8. Ranganathan, R., S., & Gopinath, M. A. (2006). *Prolegomena to library classification.* New Delhi: ESS ESS Publications.
9. Ranganathan, S. R. (2006). *Philosophy of Library Classification.* New Delhi: ESS Publications.
10. Ranganathan, S. R. (2007). *Colon Classification* (6th ed.). New Delhi: Ess Ess Publications.
11. Ranganathan, S. R., & Gopinath, M. A. (2006). *Prolegomena to library classification .* New Delhi: Ess Ess Publications.

12. Rodriguez, R. D. (1984). Hulme's Concept of Literary Warrant. *Cataloguing and Classification Quarterly, 5*(1), 17-26. doi:10.1300/J104v05n01_02
13. Satija, M. P. (1993). *Colon classification, 7th edition: Some perspectives.* New Delhi: Sterling Publishers.
14. Satija, M. P. (2004). *A Dictionary of Knowledge Organization.* Amritsar: Guru Nanak Dev University.
15. Satija, M. P. (2007). *The Theory and practice of Dewey Decimal Classification scheme.* Oxford: Chandos.
16. Satija, M. P. (2013). *The Theory and Practice of the Dewey Decimal Classification System.* Elsevier Science.
17. Satija, M. P. (2021). *DEWEY DECIMAL CLASSIFICATION : edition 19 1979 to webdewey 2018.* New Delhi: ESS ESS Publications.
18. Wynar, B. S. (2004). *Introduction to Cataloguing and Classification.* Colorado: Libraries Unlimited.

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BLC-DSCC-103: Management and Functional Operations in Libraries

(4 Credits/100 Marks)

Course Description:

The course is to introduce and to acquaint the student with management concepts and issues from within and outside of Library and Information Science and to create an environment which will be used for professional settings and situations in the libraries.

Learning Objectives:

The course is designed to understand the basics of library management theories, terminology and methods along with current issues relevant to the management of libraries and information centres and to learn the leadership and team dynamics in managing the libraries.

Course Outline

Unit -I: General Principles of Management 20 Hours

Management: Meaning and Definitions. Role, Functions and Principles of Management. Schools of Thought in Management. Levels of Management.

Personnel Planning and Participative Management: Meaning, Need & Purpose of Personnel Planning, Elements of Personnel Planning, Methods and Techniques of Personnel Planning Participative Management, Leadership, Organisational Style, Total Quality Management (TQM), Implementation of TQM and its barriers.

Management Information System (MIS), Meaning and Definition of MIS. Scope, Objectives and Purpose of MIS, Characteristics of MIS, Benefits of MIS, Problems in developing MIS.

Unit – II: Human Resource Developments (HRD) 10 hours

Meaning, Need and Purpose; Components of HRD-Strategic and Operational Planning.

Human Resource Management: Staffing Standards, Job Analysis and Description, Job Evaluation.

Staff selection and recruitment; Motivation, Delegation, Decision Making; Education, Training and Development; Job evaluation and Performance Appraisal; Cost effectiveness and Cost Benefit Analysis (PERT & CPM) Leadership Qualities, Interpersonal Relations.

Unit -III: Financial management: 15 Hours

Sources of finance, Mobilisation of financial resources.
Budgeting - Methods and Techniques. Budgetary Control, Outsourcing.
Functions and Principles of Financial Management; Application to Library and Information Centers, Surveys and feedback, Organisational structure.

Unit- IV: Physical Planning of Libraries **05 hours**

Library Building, Library furniture, Library equipment, Standard specification, Sign display boards; Ventilation, Lights, Interior decor.

Unit - V: Functional operations in Libraries. **10 hours**

Selection Principles, Selection Tools and their importance, Acquisition Procedure for books and non-book material (Accession Register, Periodical Registers) and Technical Processing and Circulation. Stock Verification, Weeding Policies, Performance Evaluation of Library and Information Centres, Library committee. Library Rules and Regulations, Library Statistics, Annual Reports.

Learning Outcomes:

After completion of the course the student will be able to develop critical thinking skills to articulate a professional identity, gaining leadership qualities and effective team work.

References/Readings:

1. Agrawal, O. (1993). *Preservation of Art, objects and Library Materials.* New Delhi: National book Trust.
2. Burge, R. H. (2017). *Financial Management of Libraries and Information Centers* . California: Libraries Unlimited.
3. Chapman, L. (2001). *Managing Acquisitions in Library and Information Resources.* London: Library Association.
4. Kumar, K. (1982). *Library Manual* . New Delhi: Vikas Publishing House.
5. McDonald, A. (2016). *Management of libraries.* New York: Magnum Publications.
6. Mittal, R. (1984). *Library Administration.* New Delhi: Metropolitan .
7. Ranganathan, S. (1960). *Library Management.* Bombay: Asia.
8. Sharma, P. &. (2013). *Collection development and management in libraries and information centres in digital scenarios.* New Delhi: SSDN Publishers.
9. Singh, R. (1993). *Conservation of Documents in Libraries, Archives and Museums.* New Delhi: Aditya.
10. Taylor, S. (2018). Management of Libraries And Information Centres. US.

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BLC-DSCC – 104: Reference & Information Sources
(4 Credits/100 Marks)

Course Description:

This course aims to provide awareness on the different types of information sources acquired by the libraries, the information contained in them and how these sources can be utilised to satisfy the information needs of the users.

Learning Objectives:

This paper highlights the characteristics of different information sources and aims to teach to identify the different types of information sources available and how these sources can be used to satisfy the various types of information needs of the users. It also intends to impart skills to critically examine and evaluate the various types of print and e-resources before acquiring them in the library.

Course Outline

Unit – I: Information Sources **15 hours**

Information sources**:** Meaning, Definition, Nature, Evolution, Characteristics, Functions, Importance. Types of sources and Criteria for evaluation

Unit – II: Documentary sources (Print and Digital) **15 hours**

Primary Sources: Journals and Newspapers; Patents; Technical Reports, Standards and Specifications; Conference proceedings; Trade literature; Theses and Dissertations.

Secondary Sources: Dictionaries, Encyclopaedias, Yearbooks and Almanacs, Biographical sources, Geographical sources, Bibliographical sources, Abstracting and Indexing periodicals, Handbooks and Manuals, Statistical information sources and Databases.

Tertiary Sources: Monographs, Textbooks, Directories, Guides to reference sources, Bibliography of bibliographies, Union Catalogues, etc.

Unit – III: Non-Documentary Sources **15 hours**

Human Sources: Technological gatekeepers, Invisible colleges, Information consultants, Experts/ Resource persons, Representatives of firms, Personal home pages, Common men (Priest, Village head, Postman, Receptionist, etc.) and others.

Institutional/Organizational Sources: Government, Ministries and Departments, R&D organizations, Learned societies, Publishing houses, Press, Broadcasting stations, Museums, Archives, Data banks, Information Analysis Centers, Referral Centers, Exhibitions & Trade fairs, Institutional Websites, Meta resources (Subject gateways, virtual libraries, digital libraries, institutional repositories etc.)

Unit – IV: Practice **15 hours**

Evaluating sources

Study and evaluation of documentary sources

Evaluation of print and E-sources.

Study of the features and functionality of print and electronic resources (e.g. Dictionaries, Encyclopaedias , Abstract Databases, Federated search engines, , Full Text Databases, Citation Databases, Directories, Repositories, etc.)

Learning Outcomes:

After going through this course, the students will get an in-depth knowledge about the different types of sources and how to use the different information sources to satisfy the varied information needs of the users. Since the growth of information publishing has largely increased, students will know how to evaluate information sources so that effective services can be provided.

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9. Sewasingh (2001). Handbook of International Sources on Reference and Information. New Delhi: Crest Publication.
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16. Ormes, S. and Dempsey, L. (Eds.) (1997). The Internet, Networking and the Public Library. London: Library Association.
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BLC - DSOC – 105: Information and Communication Technology (ICT) – (Theory & Practice)
(4 Credits/100 Marks)

Course Description:

The course offers the students to gain awareness of the social consequences of technology and how information and communication technology (ICT) can benefit them at home, at work, and in the wider world. Students tackle problems using a variety of standard software, such as word processors and interactive presentation software, through practical and theoretical research.

Learners will examine, create, implement, test and evaluate ICT systems to ensure that they are appropriate for their intended use. There is a strong emphasis on acquiring lifelong abilities that will be useful throughout their academic careers.

Learning Objectives:

1. To prepare the students to streamline the library processes using computer technology, and meet the information needs of the users by providing efficient services.
2. Providing hands on experience in use of application software, Integrated Library Management Software (ILMS)
3. Acquainting the learners with the different Internet search techniques.

Course Outline

Unit –I: Information Technology **10 hours**

Information Technology - Concepts, Definition, Components and Applications
Characteristics, Applications, Generations and Types of computer.
Components of a computer: Central Processing Unit, Input and Output devices, Internal and External storage devices.
Computer software: Types and Categories
Programming concepts: System Analysis, Algorithms and Flowcharts
Open source and Proprietary software
System software: Purpose, Operating systems;, Microsoft Windows, UBUNTU.
Application software: Office Applications and an overview of Integrated Library Management Systems (ILMS) Software like KOHA, NewGenlib, LibSys, e-Granthalaya etc.

Unit-II: Networking **10 hours**

Computer network: Types, and Topologies.
Internet: Evolution, Importance and Applications.
Network security. Internet browsers, Software suites, Anti-virus programs, Sharewares, Web design tools, HTML Editors. Search Engines, Interactive and Distributive Services.
Wireless and Mobile Networks. E-mail and E-Messaging, WWW, Web 2.0 tools and their Application to libraries and information centres.
AI and Cloud Computing- Introduction

Unit -III : Practical **20 hours**

Microsoft Office (Word, Excel, PowerPoint, Publisher)
Open Office / LibreOffice / G-Suite

Unit -IV: Practical **20 hours**

Installation and hands on practice ILMS (Koha, e-Granthalaya, …)
Search Techniques, Markup Language, DBMS
Installation of OS (Microsoft Windows, UBUNTU)

Learning Outcomes:

After completing the course, the students will gain knowledge in the application of information technology in libraries, using networks, computer software and library management software used in library automation.

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3. Shrivastava, R. K.(2001). A: Textbook of Information technology, Delhi: Dominant publishers.
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9. Kentie, P. (2001). Web Design Tools and Techniques. Peachpit Press
10. Manvi, S. & Kakkasageri, M. (2016) Wireless and Mobile Networks: Concepts & Protocols. Wiley
11. Beighley, L. & Morrison, M. Head first : PHP & MySQL, OREILLY Publications.
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BLC-DSOC-106: Preservation and Digitization

(4 Credits/100 Marks)

Course Description:
The course offers the basics of preservation and digitization.

Learning Objectives:

To demonstrate the student the importance of preservation and digitization along with techniques and methods.

Course Outline

Unit – I: Preservation **10 hours**

Preservation: Concept, Meaning of terms, General approach to conservation and preservation, Artifacts and Image preservation, Measures and Challenges for Preservation.

Unit –II: Preservation Methods **10 hours**

Preservation of different objects and its methods, Conservation of Museums, Library and Archival materials and Sound recordings.
Methods of Preservation- Climatic, Humidity and Temperature control, Light, Insects, Fungus and Fire.
Binding: Bookbinding, Classification of binding, Material used for casing and binding.
Binding of different types of library material: Pamphlet, Books, Journals, Periodicals, Serials, Manuscript and Maps.

Unit- III: Evolution of Library Materials **10 hours**

Evolution of Library materials – Stone, Metals, Clay tablets, Papyrus, Animal skin, Birch bark, Palm leaves, Paper – History, Production and Varieties of paper, Paper Measurement Units.

Unit – III: Techniques for Antiquities **10 hours**

Preservation Techniques for antiquity, Salient features of antiquity, Storing environment, Causes and Nature of deterioration- Manuscript, Books, Periodicals, Newspapers and Pamphlets. External causes and Human causes of deterioration, Fumigation, Repair and maintenance. Creation of Metadata for rare materials.

Unit – IV: Preservation of Non-Book Materials **10 hours**

Preservation of Non-Book Materials – Physical environment, Circulation Policy, Maintenance and upkeep of equipment, Storing and Handling, Film, Media, Magnetic and Plastic materials.

Unit – V: Digitization **10 hours**

Digitization – Meaning, Process, Digitization of print based documents, Video Digitization, Audio digitization, File format, Content criteria and Related software.

Learning Outcomes:
After completion of the course the student will know in detail the reasons for deterioration, preservation methods, strategies and digitization.

References/Readings:

1. Balloffet, N. &. (2004). *Preservation and Conservation of Libraries and Archives.* New York: ALA Editions.

2. Gerdes, L. (2013). *What is the Impact of Digitising Books?* New York: Greenhaven Publishing.
3. India, N. A. (1988). *Repair and Preservation of Records.* New Delhi: National Archives of India.
4. Kurlansky, M. (2017). *Paper - Paging through History.* New York: W.W.Norton and Company.
5. Mackay, N. (2007). *Curating Oral Histories.* California: Left Press Inc.
6. O.P., A. (1993). *Preservation of Art Objects and Preservation of Records.* New Delhi: National Book Trust.
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BLC-DSOC-107: Industrial Information System

(4 Credits/100 Marks)

Course Description:

The aim of this course is to make students familiar with the information technology support for different institutions coupled with library science profession.

Objectives:

To create awareness among learners about the economic viability of information.
To familiarise the learners with required information with reference for claiming ownership rights of trademarks, patents, and other intellectual property rights.
To make the students understand the trends in the field of library and information science education and research.

Course Outline

Unit I: Scientific and Technological Information **15 Hours**

Fundamentals pertaining to the application of science, Design principles, "how-to-do-it" information on processes, Materials handling and operation, Information on Standards and Specifications, Material properties, Scheduling and foremanship, Patent information.

Unit II: Economic Information **10 Hours**

Prices of materials and services, Rates, Marketing studies, Financial conditions, Insurance, Taxation, Competitive position, and Procurement sources.

Unit III: Legal Information **10 Hours**

Regulatory information – such as codes, ordinances, statutes, and decisions; extent of trade cooperation, taxation and legislative liaison.

Unit IV: Personnel Information and Labour Matters **10 Hours**

Personnel Information Labour Relations Matters, Management and supervision, Practices; Industrial Policies, Recreation requirements, Recruiting sources and Tests.

Unit V: Public Relations at Local and Regional Level **15 Hours**

Information and the attitude of the local or regional area towards the industry, Responsibilities of the organisation towards the local and regional level.

Learning Outcomes:

At the end of the course the learners will be able to know the industry requirements in terms of information. The learners will also study in detail about the various economic aspects of information.

References/Readings:

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2. David Baker, D., Evans, W., & Hines, S. H. (2017). *Innovation in Libraries and Information Services* . United Kingdom: Emerald.
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4. Fuchs, C., & M, A. C. (2018). *Organization, Representation and Description Through the Digital Age : Information in Libraries, Archives and Museums.* Berlin: Walter de Gruyter GmbH.
5. Gupta, B. M. (1988). *Handbook of libraries, archives and information centres in India. 6, International cooperative information systems, networks and programmes.* New Delhi : Segment Books.
6. Hakansson, C. &. (2015). *Competitive intelligence for information professionals.* Waltham: Chandos Publishing.
7. Hider, P. (2015). *Information Resource Description : Creating and managing metadata.* London: Facet Publishing.
8. Hyde, M. (1988). *Library and information services to business and industry : study on levels of service, related costs and charging systems.* London: British Library Research & Development Department.
9. Kapitzke, C. &. (2013). *Libr@ries : Changing Information Space and Practice.* Hoboken: Taylor and Francis.
10. Lemieux, V. L. (2016). *Building trust in information : perspectives on the frontiers of provenance.* Cham: Springer.
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Second Semester

BLC-DSCC – 201: Information Services and Systems

(4 Credits/100 Marks)

Course Description:

This course educates the students with the different information services that are provided by the libraries and information centres in India and the world.

Learning Objectives:

To familiarise the students with various information services provided by libraries and how information repackaging and consolidation can produce better services in the digital era.

Content:

Unit – I: Reference and Information Services **15 hours**

Reference and Information Services - Introduction to references services, Types and Needs, Trends, Reference Interview, Online reference service

Information services: Current Awareness Services (CAS): SDI, Indexing and Abstracting Service, Alerting services- ListServs and other email based services. Survey of Listserv in different disciplines, Developing FAQs, Document delivery.

Virtual Reference Desk (VRD): Management, technology and resources.

Readers Advisory Service.

Unit – II: Information Consolidation and Repackaging 15 hours

Information consolidation and repackaging: Content analysis.

Information products: Concepts, Definition, Need & Trends

Marketing concepts: Corporate mission; Marketing Strategies. Concept of marketing in Non-profit Organizations, Marketing Mix, Branding and Advertising

Marketing Plan & Research, Costing and Pricing of information products and services.

Unit – III: Information Systems 15 hours

Information systems: Basic concepts, Meaning, Objectives and Functions

Components of Information System: Structure, Functions and Services, Libraries, Documentation Centres, Information centres, Data centres, Information analysis centres, Clearing houses, Data banks, Data Curation centres, Museums, Memoirs, Institutional Repositories, Open Archives, Referral, Translation Centres, and Publishing Houses.

Information Policies and Programmes, Planning, Design and Evaluation of Information systems

Unit – IV: Documentation Centres 15 hours

Library Networks: Historical development of Library Cooperation and Networking, Functions, Activities, Advantages.
Study of National Documentation Centres, Information Systems and programmes

Study of International Information Systems and programmes

Resource Sharing and Networks: Consortia- Importance and Objectives. Study of Information networks- OCLC, INFLIBNET, DELNET.

Learning Outcomes:

At the end of the course, the students will get to know the different information services offered by the libraries, how to promote and market library services using digital tools in the digital era.

References / Readings:

1. Sunitha, Asija(1998). Documentation services in India: A review of some selected documentation centres. New Delhi: Academic Publications.

2. Guha, B. (1983). Documentation and Information: Services, techniques and systems. Calcutta: World Press.
3. Gupta, B.M. and others(1991). Handbook of Libraries, archives, Information centres in India. New Delhi: Aditya Prakshan.
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9. Singh, G (2013). Information sources, services and systems. PHI Learning.
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11. Horton, V. & Pronevits, G. (2015). Library consortia: Models for collaboration and sustainability. ALA Editions
12. Babu, T A., Ramaiah, L S & Saxena, S C. (2007). Vision of future library and information systems. Viva Books

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BLC-DSCC-202: Knowledge Organisation - Library Cataloguing (Theory and Practice)
(4 Credits/100 Marks)

Course Description:
The course is designed to equip students with theoretical and practical aspects of library cataloguing. The coursework provides students with a solid foundation in library cataloguing.

Learning Objectives:
To introduce students to the basic concept and aspects related to library cataloguing. The course will highlight salient features of major library cataloguing codes and recent trends in cataloguing.

Course Outline

Unit - I: Knowledge Organization – Basics of Cataloguing **10 Hours**

Resource Description: Concepts and definition.
Nature of Library Catalogue: Definition, Need and Purpose.
Forms of Library Catalogue: Physical and Inner forms.
Resource sharing of bibliographic data: Meaning and Importance. Trends in cataloguing – Centralised Cataloguing, Co-operative Cataloguing, Union Catalogue, Pre-natal Cataloguing, Cataloguing in Publication.
Kinds of entries, Data elements in different types of entries, Classified and Alphabetical. Filing Rules and Procedures.
Indexing Systems and Techniques: Pre-coordinate, Post-coordinate, Derived.
Choice and rendering of headings: Subject Headings, SLSH, LCSH, Chain Procedure.

Unit - II: Cataloguing codes **10 Hours**

History and Developments of Cataloguing Codes. Salient features of AACR2 and CCC.

Unit - III: Cataloguing Standards **10 Hours**

Standards of record formats and description: ISBD, MARC21, CCF, RDA, FRBR, BIBFRAME.
Standards of Bibliographic Information Interchange and Communication: ISO 2709, Z39.50, Z39.71.
Metadata Standards: Dublin Core, MARC, METS, MADS, MODE, EAD, RAD, RDF, XOBIS.

Unit - IV: Knowledge Organization - Cataloguing Practical 30 Hours

Cataloguing of a book and non-book materials according to AACR2: Works of single and shared authorship, Editorial publications, Multivolume, Pseudonyms, and Seral publications.
Creating MARC 21 records of Print documents and Electronic resources.
Cataloguing using RDA.
Preparing simple and qualified Dublin Core records.

Learning Outcomes:

After completing the course, the students will understand the basic principles of information description, subject analysis, indexing, cataloguing, and apply these methods and techniques in organising and retrieving information sources.

References /Readings:

1. Barbara, M. W. (Ed.). (1997). *Sears List of Subject Headings.* New York: HW Wilson.
2. Gorman, M. (2004). *The concise AACR2.* Chicago: American Library Association.
3. Hunter, E. J. (1998). *Classification Made Simple.* London: Clive Bingley.
4. Kumar, G., & Krishan, K. (2018). *Theory of cataloguing.* New Delhi: Vikas Publishing House.
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10. Sears, M. E., & Carmen, R. (1986). *Sears list of subject headings.* New York: H. W. Wilson.
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13. Wynar, B. S. (2004). *Introduction to Cataloguing and Classification.* Colorado: Libraries Unlimited.

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BLC - DSCC – 203: Library Automation, Databases and Networking (Theory & Practice)
(4 Credits/100 Marks)

Course Description:

The daily operations of libraries in a variety of settings rely heavily on library automation. Students will get understanding of automation and technology abilities that will enable them to work in libraries, archives, museums, and information centres. This course is meant to give students not just hands-on experience with an ILS, but also the knowledge and skills to select, deploy, test, evaluate,

and manage it. The course covers new technology and next-generation library automation tools that students should be familiar with in the profession.

Learning Objectives:

1. To have a better understanding of the historical, current, and future tendencies in library automation and technological evolution;
2. To familiarise oneself with the major companies in the library automation sector and their distinctive ILS products, both proprietary and open source;
3. To provide hands on training in the use of library software, digital library software's, web catalogues, ILMS, creating institutional repository with open source institutional repository software, effective search of online databases and search engines for academic and research work, developing skills in web page designing and use of Google tools.

Course Outline

Unit - I: Library Automation **10 Hours**

Definition, Need, Purpose, Barriers, Advantages. Historical development. Planning for library automation. Evaluation of library automation systems. Criteria for evaluation. Evaluation techniques. Standards relevant to library automation.

Automation of Library Services /operations and application of modern technologies: Acquisition, Cataloguing, OPAC's, Circulation, Serials Control, CAS, SDI, ILL, Stock Verification, Reference Service, MIS, System Administration. Cloud based and Web based library automation.

Application of Barcode and RFID Technology for Library Functions. Application of Artificial Intelligence (ML, DL), Augmented Reality, Virtual Reality, Digital Libraries Software (DSpace, Greenstone).

Unit - II: Data Communication and Computer Networks **10 Hours**

Introduction, Need for networking, Objectives, Advantages, Disadvantages. Data Communication – Components, Transmission Mode (Simplex, half duplex, full duplex), Analog and Digital Data Transmission, Data communication measurement (bandwidth). Transmission media (guided, unguided). Protocols and its functions, Communication Protocol (OSI Model). Network devices (NIC, Repeater, Hub, Bridge, Switch, Router, Gateway, Modem), File server, Workstation, Wireless networks.

Unit - III: Practical **20 Hours**

Library Management System (LMS): Koha, e-Granthalaya, NewGenLib

Webcats and WebOPAC's: LC catalogue, OCLC etc.

Database searching and Internet searching, Search Engines

Unit - IV: Practical **20 Hours**

Digital Libraries Software: DSpace, Greenstone

Website /Blog Development using WordPress, Blogger, Google Sites.

Learning Outcomes:

1. At the end of the course the students will be able to apply the concepts and new technologies of Information and Communication Technology to the various tasks in the libraries and also develop new services.
2. The students will be able to perform library related tasks using ILMS, create institutional repositories using open Digital Library Software, develop library websites and blogs, effectively

search online databases for information retrieval for academic and research purposes and use web-based tools effectively for library related tasks.

References / Readings:

1. http://www.makebarcode.com/info/info.html
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3. Jeanne, F. M. (2006). *A Librarian's Guide to the Internet: A Guide to searching and evaluating information.* Oxford: Chandos publishing.
4. Jones, R. (2006). *The Institutional Repository.* Oxford: Chandos publishing.
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3. www.sciencedirect.com
4. https://www.jstor.org/
5. https://jgateplus.com/search/
6. http://classify.oclc.org/classify2/
7. www.wordpress.com
8. www.blogger.com
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BLC-DSCC – 204: Information Retrieval

(4 Credits/100 Marks)

Course Description:

Information retrieval is a vital component in information management. There is an outburst of information and retrieving relevant and authentic information is the irrevocable role of the librarian in providing information services, therefore, this course will offer the library professional knowledge on how to retrieve information from various information sources using suitable information retrieval tools.

Learning Objectives:

The objective of this paper is to:

- Introduce the concepts of information retrieval (IR), familiarize the students with the different types of vocabulary control tools and the importance of vocabulary control tools in retrieving information.
- Acquaint the students with the various information retrieval models, and the trends in retrieval.

Course Outline

Unit – I: Information Retrieval **15 hours**

Information Retrieval: Basic concepts, Definition, Objectives, Components, Functions.

Evaluation of IRS: Purpose, Evaluation, Criteria, Steps of evaluation

Indexing: Meaning, Purpose, Need, Pre-coordinate Indexing, Post-coordinate Indexing, Automatic Indexing.

Pre-coordinate Indexing - Chain procedure, POPSI, PRECIS, Keyword Indexing.

Post-coordinate Indexing - Uniterm, Citation Indexing

Unit – II: Vocabulary Control **15 hours**

Meaning, Importance of vocabulary control, Controlled v/s Uncontrolled vocabulary

Vocabulary control tools: Subject heading, Thesauri, Thesaurofacet, Classaurus

Unit – III: **Information Retrieval Models** **15 hours**

Information Retrieval Models - Boolean Model, Vector Space Model, Probability Model.

Thesaurus construction techniques and Practice

Case study of Controlled Vocabularies/ontologies

Unit – IV: Web Information Retrieval **15 hours**

Search Engines - Definition, Functions and Components of Search Engines, Meta Search Engines, Searching and retrieval, Full Text retrieval, User Interfaces.

Evaluating Search Engines

Natural Language Processing.

Information Retrieval - Standards and Protocols.

Learning Outcomes:
At the end of the course, the students will understand the basic concept of IR and the role of indexing in IR.

- The students will gain knowledge on various IR models and how IR is useful in the development of search engines.
- The students will understand how the vocabulary control tools enhance the IR process, learn to construct the thesaurus and get familiar with the controlled vocabularies / ontologies used in various online databases.

References / Readings:

1. Alberico, R. and Micco M.(1990). Expert Systems for Reference and Information Retrieval. West Port : Meckler.
2. Atchison, J. & Gilchrist, A.(1972). Thesaurus Construction: A Practical Manual. London: Aslib.
3. Bates, M (2011). Understanding Information Retrieval Systems: Management, types and standards. Boston: Auerbach Publications.
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BLC-DSOC-205: Communication Skills In LIS

(4 Credits/100 Marks)

Course Description:
Communication skills training aims to help people learn a variety of skills that will help them communicate more successfully. Communication skills are widely acknowledged as being critical in developing high-performing employees. They are necessary for effective leadership and management, as well as sales and customer service effectiveness.

Learning Objectives:

The paper aims to inculcate potential skills in the learners to prepare them to deal with the external world in a collaborative manner, communicate effectively, take initiative, solve problems, and demonstrate a positive work ethic so as to hold a good impression and positive impact in the field of Library and Information Science.

Course Outline

Unit - I: Introduction to Communication 5 Hours

Communication: An Introduction: Definition, Nature and Scope of Communication. Importance and Purpose of Communication. Process of Communication. Types of Communication.

Unit - II: Non-Verbal Communication 8 Hours

Non-Verbal Communication: Body Language (Personal appearance, Posture, Gestures, Eye Contact, Kinesics). Paralinguistics. Proxemics. Haptics. Tips for improving Non-Verbal Communication

Unit - III: Effective Communication 7 Hours

Essentials of Effective Communication. Communication Techniques. Barriers to Communication

Unit - IV: Verbal Communication 30 Hours

Listening Skills (Purpose of Listening, Listening to Conversation (Formal and Informal), Academic Listening (Listening to Lectures), Listening to Talks and Presentations, Active Listening- an Effective Listening Skill, Benefits of Effective Listening, Barriers to listening, Note Taking Tips).

Oral / speaking Communication Skills (Phonetics, Self-development through speaking skills, Group discussions, Job interviews, Paralinguistics, Public speaking, Art of negotiation, Conversations, Dialogues and Debates).

Reading Skills (Purpose, Process, Methodologies, Skimming and Scanning, Levels of Reading, Reading Comprehension, Academic Reading Tips)

Writing Practice (The art of condensation [précis, synopsis, summary, abstract, paraphrasing], letters and resumes, reports, technical proposals, email and blog writing, circulars, minutes memos, notices, agendas, advertising, reviews)

Unit - V: Corporate Skills 10 Hours

Corporate Skills: Leadership Qualities (traits, types, leader's v/s managers). Negotiation Skills (introduction, types, processes, tips). Time management (barriers, techniques, tips). Stress management

Student Learning Outcomes:

At the end of the course the student

- will be able to orally communicate effectively with confidence and facilitate interpersonal communication.
- will be able to communicate in writing effectively.

References / Readings:

1. Kumar, S., & Lata, P. (n.d.). Communication Skills. Oxford.
2. Malhotra, P., & Haldar, D. D. (n.d.). Communication Skills: Theory and Practice. ABCI.

3. Mohan, K., & Banerji, M. (n.d.). Developing Communication Skills (2nd Edition ed.). Laxmi Publications.
4. Patil, S. (n.d.). Handbook on Presentation and Communication Skills.
5. Prasad, D. P., Kataria, S., & Sons. (n.d.). The Functional Aspects of Communication Skills.
6. Raman, M., & Singh, P. (n.d.). Business Communication (2nd Edition ed.). Oxford.
7. Sheldon, B. E. (2010). Interpersonal Skills, Theory and Practice: The Librarian's Guide to becoming a Leader. Libraries Unlimited Inc. .

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BLC-DSOC-206: Data Mining and Knowledge Discovery

(4 **Credit/100 marks)**

Course Description:
This course aims to provide search tools for data requirements with precision. Students will be able to analyse various sources of information and derive new content through data mining processes.

Course Outcome:
Through this course the students will utilise various tools in searching information from different textual sources which will lead to generation of new concepts and information.

Course Objectives:
To introduce the fundamental processes of text mining, data warehousing and data mining.
To impart knowledge on various data mining concepts and techniques that can be applied to text mining, web mining etc.
To develop the knowledge for application of data mining for information retrieval from the web.

Course Outline

Unit I: Text Mining **20 Hours**

Text Mining: Definitions, Process, Techniques and Issues, Text Mining Approaches
Document classification (text classification, document standardisation), Information retrieval (keyword search / querying and indexing), Document clustering (phrase clustering), Natural Language Processing (Spelling correction, lemmatization, grammatical parsing, and word sense disambiguation), Text Summarization, Information extraction (relationship extraction / link analysis), and Web mining (web link analysis)
Applications: Digital Libraries, Academic and Research Field, Life Science, Social media, Business Intelligence.

Unit II : Data Mining **20 Hours**

Data Mining overview, Architecture, Process, Classification of Data Mining Systems, Issues with Data Mining
Data Warehouse, Data Warehouse Models, Metadata Repository, Data Pre-processing – Data Integration and Transformation, Data Reduction, Data Mining, Methodologies of Data Mining, Data Mining Applications, Data Mining and Society.
Web Mining: Concepts, Web Content Mining, Web Usage Mining, Web Structure Mining, Mining Tools, Applications.

Unit III: Big Data **20 Hours**

Big Data: History of Big Data, Its Phases, Characteristics of Big Data, Big Data Tools
Big Data challenges and Issues, Types of Big Data- Structured Data, Unstructured Data.
Semi-Structured Data.

Knowledge Discovery in Databases (KDD): Knowledge Discovery - Introduction, Concepts.

Process of Knowledge Discovery, KDD Research Opportunities, Challenges and Trends.
Tools and Techniques in Knowledge Discovery in Databases.

References/ Readings:

1. Acharya, S. C. (2019). *Big Data and Analytics.* New Delhi: Wiley.
2. Agarwal, C. (May 2015). *Data Mining: The Textbook.* Springer Nature.
3. Bhatia, P. (2019). *Data Mining and Data Warehousing: Principles and Practical Techniques.* New Delhi: Cambridge University Press .
4. Erl, T., Khattak, W., & Buhler, P. (2016). *Big Data Fundamentals: Concepts Drivers: Concepts, Drivers and Techniques.* Noida Uttar Pradesh: Pearson Education India.
5. Han, , J., Kamber , M., & Pei, J. (2012). *Data Mining: Concepts and Techniques.* Morgan Kaufmann.
6. Kamal, R., & Saxena, P. (2019). *Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning.* New Delhi: McGraw Hill Education.
7. Liu, B. (2011). *Web Data Mining.* Berlin: Springer.
8. Russell, M. A., & Klassen, M. (2019). *Mining the Social Web* (3rd. ed.). India: O'Reilly Media, Inc.
9. Tan, P. N., Steinbach, Michael, & Kumar , V. (2016). *Introduction to Data Mining.* Noida: Pearson India Pvt. Ltd.
10. Taneja, A. (2012). *Knowledge Discovery in Databases.* New Delhi: Galgotia Publications.

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BLC – DSOC-207: Scholarly Communication

(4 Credits/100 Marks)

Course Description:

The course offers an overview of Scholarly Communication which includes basic concepts, historical perspectives, scholarly traditions, knowledge about scholarship, study of journal publication, review processes, role of social media, Open Access movement, institutional repository, Digital libraries and Copyright issues.

Learning Objectives:

To introduce the student to the foundation of science and scholarships, the importance of scientific and professional societies in journal publications, emergence of other mainstream media, ideology and philosophy of Open Access documents, software available for digital libraries, Copyright issues and scientometrics of scholarly publication.

Course Outline

Unit –I: Science and Scholarship **12 hours**

Republic of Science and Scholarship: Foundations of Science and Scholarship, Principles and paradigms of Scientific culture/scholarship: Historical perspective of scholarly communication systems, Scholarship and Scholarly traditions.

Study of journals, their functions, working and processes. The importance of scientific and professional societies in journal publishing; Peer review processes. Migration of peer reviewed journals from print to Web-based; Serial publishing crisis phenomena.

Unit –II: Internet and Scholarship 12 hours

Rise of the Internet in scholarship, Communication and daily lives. Evolution of Internet/Electronic publishing; Emergence of online information media,. E-science, Open data and Cyber infrastructure.

Unit – III: Open Access 12 hours

Open Access (OA) Movement: Understanding OA – Concept, Principles. Ideology and philosophy of Open Source Content, Open Educational Materials and Open Access to scientific literature; Green and Gold route to OA. Familiarity and Organization behind the OA movement.

Unit – IV: Open Source Software 12 hours

Study of Open Source Software for Institutional Repository and Digital Libraries. DSpace, Greenstone, EPrints, Fedora Commons; Digital Commons.

Unit –V: Copyright Issues in Digital Media 12 hours

Copyright Issues - Understanding Copyright, Creative Commons, Licensing issues. Quantitative Analysis of journals' Contents**.** Qualitative analysis of journals' websites.

Scientometrics and metrics of scholarly publication, H-index, Impact Factor.

Learning Outcomes:

After completing the course the student will be able to understand the concept of scholarly communication with publication issues, qualitative and quantitative analyses of journals and scholarly publication metrics.

References/Readings:

1. Anderson, R. (2016). Libraries, Leadership and Scholarly Communication. Chicago, USA: ALA Editions.
2. Anderson, R. (2020). *Scholarly Communication What every needs to know.* New York: Oxford University Press.
3. Gilman, I. &. (2013). *Library Scholarly Communication Programs: Legal and ethical Consideration.* New Delhi: Chandos Publication.
4. Gorman, G. (2005). *Scholarly Publication in an Electronic Era.* London: Facet Publication.
5. Morrison, H. (2009). *Scholarly Communication for Librarians.* New Delhi: Chandos Publication.
6. Mukerjee, B. (2010). *Scholarly communication in Library and Information Services.* Oxford: Woodhead Publishing.
7. Parekh, H. (2000). *Internet in the Scholarly Communication Process .* Mumbai: Knowledgeware.
8. Random, R. e. (2012). *Organization of Scholarly Communication.* New York: Association of Research Libraries.
9. Shorley, D. (2013). *Future of Scholarly Communication.* London: Facet Publication.
10. Vance, P. U. (2019). *Scientific Scholarly Communication: The Changing Landscape.* New York: Springer.

11. Wright, J. (2019). *Library Science and Scholarly Communication.* New York: Clanrye International .

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Annexure II

Master of Library and Information Science (M.L.I.Sc.)
First Semester

MLC-RSOC-101: Research Methodology
(4 Credits/100 Marks)

Course Description:

The course offers an overview of research methodology including basic concepts, types and planning of research, research design, research reporting employed in quantitative and qualitative research methods including the learning of statistical techniques and graphical presentation.

Learning Objectives:

To introduce the student to identify and discuss the role and importance of research in the library profession with the issues and concepts, salient to the research process, the complex issues inherent in selecting a research problem, along with selecting an appropriate research design and the knowledge of sampling, data collection, analysis and reporting.

Course Outline

Unit – I: Introduction to Research **10 Hours**

Definition of Research; Need and Purpose, Characteristics of research.
Basic and Applied research
Criteria for a topic to be relevant for research
Research Methods, Research Design, Research Methodology for Library and Information Science professionals.
Current trends in LIS research.

Unit – II: Research Planning **10 hours**

Planning process; Review of literature, Selection of problems for research, Mode of Selection, Process identification, Criteria of selection, Formulation of selected problem.
Hypothesis: Meaning, Types, Functions, Conceptualization. Essentials of good research design and its importance.
Ethical aspects of research.
Literature search-print and non-print and electronic sources.
Writing of research proposals.

Unit –III: Types of Research **10 hours**

Research: Types, methods and techniques. Qualitative and Quantitative methods in Library and Information Science. Descriptive, Analytical, Fundamental, Applied, Action and Exploratory research.
Research methods: Observation, Questionnaire, Interview, Experimental and Case study. Survey methods, Content analysis, Bibliometrics.
Research Design: Need and purpose, Types of research design based on nature of investigation, based on data collection, based on reference period.
Research Plan: Need, Purpose and Plan. Types and Structure, Funding and Monitoring.

Unit – IV: Research Reporting Practice **30 hours**

Research Reporting Practice: Research Reports and their types, Research Proposal, Plan outline, format and content, Drafting of Research Reports and final phase of physical production. Tools for research- Types of variables, Sampling Procedure, Types of Sampling. Data Presentation- Ordinal Data, Numerical /data.

Graphical Presentation: Line, Histogram, Frequency, Polygon, Curves, Bar diagrams and Charts.

Statistical Techniques: Measures, Central Tendency, Measures of Dispersion, Correlation, Regression analysis and Time Series Analysis.

Infographics: Open source tools, Style manuals.

Learning Outcomes:

After completing the course the student will understand the research terminology, literature search, different methods and approaches used towards research, ethical principles of research and will critically analyse any given topic in the library profession.

References and Further Readings:

1. Bell, J. &. (2018). *Doing your Research Project: a guide to first-time researchers.* London: McGraw-Hill Education.
2. Chandra, v. (2018). *Research Methodology.* Noida: Pearson India Education Services.
3. Chawla, D. (2011). *Research Methodology.* New Delhi: Vikas Publishing house.
4. Gorman, G. (2005). *Scholarly Publication in an Electronic Era.* London: Facet Publication.
5. Gupta, D. (2011). *Research Methodology.* New Delhi: PHI Publication.
6. Kothari, C. (2012). *Research Methodology: Methods and Techniques.* New Delhi: New Age International.
7. Kumar, C. R. (2012). *Research Methodology.* New Delhi: A P H Publishing Corporation.
8. Kurmar, R. (2015). *Research Methodology: A step -by –step guide for beginners.* New Delhi: Sage Publishing.
9. Oberoi, P. K. (2013). *Research Methodology.* New Delhi: Global Academic Publisher.
10. Panneerselvan, R. (2006). *Research Methodology.* New Delhi: Prentice-Hall of India.
11. Phanse, S. S. (2016). *Research Methodology Logic, Methods, and Cases.* New Delhi: OUP.
12. Taylor, B. (2008). *Research Methodology: A guide for research in Management and Social Sciences.* New Delhi: Prentice-Hall of India.

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MLC - RSOC – 102: Research Publication and Ethics

(4 Credits/100 Marks)

Course Description:

This course covers the fundamentals of science philosophy and ethics, research integrity, and publication ethics. The purpose of these sessions is to identify scientific misconduct and predatory publications. This course covers indexing and citation databases, open access publications, research metrics (citations, h-index, impact factor, and so on), and plagiarism tools.

Learning Objectives:

1. To be aware of research ethics rules, issues, options, and resources
2. To become familiar with different institutional ethical review boards/academic integrity requirements
3. To comprehend the value and purpose of ethical decision-making
4. To maintain a positive attitude toward continuing to learn about research ethics

Course Outline

Unit - I: Research-Philosophy and Ethics **5 Hours**

Introduction to Philosophy: Definition, Nature and Scope, Concept, and Branches.
Definition of Ethics, Moral philosophy, Nature of moral judgements and reactions.

Unit - II: Scientific Conduct **10 Hours**

Science and research ethics, Intellectual honesty and Research integrity.
Falsification, Fabrication, and Plagiarism (FFP).
Redundant publications: Duplicate and Overlapping publications, Salami slicing.
Data Falsification, Misrepresentation of data and Selective reporting

Unit - III: Ethics of Publication **10 Hours**

Definition, Introduction, and Significance of publication ethics
Publication Standards/Initiatives
Conflicts of Interest: Definition, Concept, difficulties that lead to unethical activity and vice versa, Types of publication misconduct
Authorship, Contributorship, and Publishing ethical violations
Detection of publication malpractice, Complaints and Appeals
Predatory journals and Publishers - Practice

Unit - IV: CC, OA, Plagiarism, RM **20 Hours**

Creative Commons (CC) Policies
Open Access (OA) Publications and Projects. Check publisher copyright and Self-archiving rules using related web portals.
Routes to Open Access, Repositories, Journals, NoteBooks
Plagiarism detection tools. Reference Management (RM) tools. Paraphrasing tools. Literature Review Grid. Journal suggestion tools.

Unit - V: Databases and Metrics **15 Hours**

Databases and research metrics.
Citation Databases. Indexing Databases. Specific Subject databases
Research metrics: Impact Factor, SNIP, SJR, IPP, Eigenfactor and Cite Score.
Author level metrics: h-index, g index, m index, i10 index
Article level metrics: Altmetrics, PlumX

Learning Outcomes:

1. At the end of the course, the students will appreciate the importance of being ethical when conducting research and publishing activities by the end of the course.
2. They will be able to distinguish between good and bad publishing procedures, as well as how to spot questionable publishing techniques and publishers.

3. More crucially, there will be a greater understanding of the term "open access," as well as contributions of research output to open access publishing platforms.
4. The students will also become familiar with the software and databases required for conducting research.

References / Readings:

1. Bird, A (2006). Philosophy of Science. Routledge
2. Dutta, D. S. (2021). *Research & Publication Ethics in Social Science.* New Delhi: Bharti Publications.
3. Gliner, J. A., & Morgan, G. A. (2000). *Research Methods in Applied Settings: An Integrated Approach to Design and Analysis.* Lawrence Erlbaum Associates.
4. Lefkowitz, J. (2003). *Ethics and Values in Industrial-Organisational Psychology.* Lawrence Erlbaum Associates.
5. Stanley, B. H., Sieber, J. E., & Melton, G. B. (n.d.). *Research Ethics: A Psychological Approach.*
6. Todorovich, M., Kurtz, P., & Hook, S. (n.d.). *The Ethics of Teaching and Scientific Research.*

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MLC-OGC-103: Digital Library Systems

(4 Credits/100 Marks)

Course Description:
This course will enable students to learn the functioning of digital libraries with respect to the services that are provided online for the users of the library.

Course Objectives:
To know what a digital library is and its functionalities.
To ascertain the process of digitization and the equipment requirements.
To study in detail the open-source digital library software.
To create an awareness on management of digital resources.

Course Outline

Unit - I: Digital Library **15 Hours**

Digital Library - Concept and Definition, Characteristics, Need for Digital Libraries, Online databases and Information Retrieval Systems (IRS), Digital Knowledge Organisation, Digital Library Services, Search Interfaces, Digital Library Software.

Unit - II: Digital Library Architecture **12 Hours**

Digital Library Architecture, Interoperability, Compatibility - Protocols and Standards. Born digital, Hosting platforms – Self hosting, Mirrored hosting/shared services. DOI, Open URL, CrossRef.

Unit - III: Digitization **18 Hours**

Digitization – Definition, Process of digitization, Problems and Challenges of Digital Preservation, Digital Preservation Strategies, Metadata Harvesting, OAI-PMH, Digital Rights Management (DRM) and Digital Preservation, Major Digital Preservation Programmes, Digital Preservation Initiatives in India, Archival Management.

Unit - IV: Open Access Initiatives **15 Hours**

Open Access Movement, Digital Library Software: Case study of digitization projects
Study of selected Digital Libraries: NDLI, NzDL.

Learning Outcome:
At the end of this course the students will learn different new ways and means of managing and handling web enabled activities such as Website management, LMS operations, IR management etc.

References / Readings:

1. Andrew, C. (2010). *Introduction to digital library management.* London: Facet Publishing.
2. Chowdhury, G. G. (2003). *Introduction to Digital Libraries.* London: Facet Publishing.
3. Ganguly, R. C. (2007). *Digital libraries: Challenges and prospects.* New Delhi: Isha Books.
4. Jones, R. e. (2006). *The institutional repository.* Oxford: Chandos Publishing.
5. Lawson, N. (2018). *Digital Library Preservation Strategies.* United Kingdom: EDTECH.
6. Purcell, A. (2016). *Digital library programs for libraries and archives: Developing, managing, and sustaining unique digital collections.* Massachusetts: MIT Press.
7. Rajasekaran, K. (2010). *Digital library basics: a practical guide.* New Delhi: Ess Ess Publications.
8. Richard, J. (2006). *The institutional repository.* Oxford: Chandos Publishing.
9. Singh, R. S. (2008). *Encyclopaedia of digital libraries.* New Delhi: Anmol Publishers.
10. Witten, L. H., Bainbridge, D., Nichols, D. M., & Fox, E. A. (2010). *How to build a digital library* (English ed.). Amsterdam: Elsevier.

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MLC-OGC-104: History of Books and Reading

(4 Credit/100 Marks)

Course Description:
The course comprises a study of books and print culture from antiquity, Middle Ages to the present with emphasis on print in Goa and India. Throughout the course, students will explore shifts from orality to literacy, from writing to printing, and finally from analogy to digital media. The creation, production, distribution, and reception of books and serials will be discussed, and aspects of humanities and scientific scholarship will be explored in relation to the development of the history of book and print culture.

Learning Objectives:
To introduce students to the study of book and print culture and to survey the literature and scholarship of this field. The students will get familiarity with book history and the connection between books and society.

Course Outline
Unit - I: Introduction **10 Hours**

Introduction: The Book, Book history. Oral culture, Early libraries and writing systems: Clay tablets, Papyrus, Palm leaf, Stone inscriptions, Manuscripts, Codex, Wax tablets, Parchment, Monastic copying. Sumerians, Egyptians, Indians, Chinese, Meso-Americans, and the Islamic world. Xylography, History of Paper. Book culture before printing. Medieval manuscripts and Bindings. History and Current trends in reading.

Unit - II: History of Printing **10 Hours**

Woodblock Printing, Movable type printing and Gutenberg's Press, Spread of printing in Europe. Impact of printing press – Religious, Social, Educational.
Library history within the context of book history.
Early modern books (1600-1800). Authorship, Copyright, Sales and Distribution methods, Piracy, Rise of public libraries, Scientific publishing.

Unit - III: Printing in Goa **20 Hours**

Books before the printing press. Demand for Printing press, Printing press in Goa - 1556
Work of Jesuit Missionaries.
Survey of Print literature in Konkani, Marathi and Portuguese.
Periodicals printed in Goa.

Unit – IV: Printing in India **10 Hours**

Tamil printing, Printing press in Bombay – Bhimjee Parekh, American Mission Press, Printing in Bengal – Serampure Press, Graham Shaw, William Carey. Printing in Karnataka, Andhra, and Kerala. Printing and publishing in the Hindi heartland.

Unit – V: Development of Printing Technology and Publishing **10 Hours**

Conventional Printing Technology – Letterpress printing, Offset printing, Rotary printing press, Inkjet printer, Digital printing, Making of Braille and Spoken-books.
Small press, Commercial publishing, Self-publishing, Vanity press, Print on Demand.

Learning Outcomes:

The students will examine how the books are produced and their impact on society. The study will demonstrate the understanding of processes by which information is created, evaluated and disseminated.

References / Readings:

1. Casson, L. (2001). *Libraries in the Ancient World.* New Haven CT and London: Yale University.
2. Chappell, W. (1970). *A Short History of the Printed Word.* New York: Alfred A. Knopf.
3. Darnton, R. (1982). What Is the History of Books? *Daedalus, 111*(3), 65-83. Retrieved April 14, 2022, from https://www.jstor.org/stable/20024803
4. Eisenstein, E. L. (2009). *The printing press as an agent of change : communications and cultural transformations in early-modern Europe : volumes I and II.* Cambridge : Cambridge University Press.
5. Eliot, S., & Jonathan Rose (Eds.). (2007). *A Companion to the History of the Book.* Malden, MA: Blackwell Publishing Ltd. Retrieved 2007
6. Finkelstein, D., & McCleery, A. (Eds.). (2006). *The Book History Reader.* London and New York: Routledge.
7. Finkelstein, D., & McCleery, A. (2012). *An Introduction to Book History.* London: Routledge.

8. Gaskell, P. (1995). *A New Introduction to Bibliography.* New Castle, DE: Oak Knoll Press.
9. Howsam, L. (2006). *Old Books and New Histories: An Orientation to Studies in Book and Print Culture.* Toronto: University of Toronto Press.
10. Hunter, D. (1978). *Papermaking: The History and Technique of An Ancient Craft.* New York: Dower Publications, Inc.
11. Katz, W. A. (1995). *Dahl's history of the book.* London: Metuchen, N.J.
12. Kesavan, B. S. (1985). *History of Printing and Publishing in India: A Story of Cultural Re-awakening* (Vol. I). New Delhi: National Book Trust.
13. Kesavan, B. S. (1988). *History of printing and publishing in India : a story of cultural re-awakening: Origins of printing and publishing in Karnataka, Andhra and Kerala* (Vol. II). New Delhi: National Book Trust.
14. Kesavan, B. S. (1997). *Printing and Publishing in India: A Story of Cultural Re-awakening (Origins of Printing and Publishing in the Hindi Heartland* (Vol. III). New Delhi: National Book Trust.
15. Mohanrajan, P. A. (1990). *Glimpses of Early Printing and Publishing in India: Their Contribution Towards Democratisation of Knowledge.* Madras: Mohanavalli Publications.
16. Pearson, D. (2011). *Books As History: The Importance of Books Beyond Their Texts.* London: The British Library and Oak Knoll Press.
17. Priolkar, A. K. (1958). *The Printing Press in India: Its Beginnings and Early Development Being A Quarter Centenary Commemoration Study Of The Advent of Printing in India (In 1556).* Bombay: Marathi Samshodhana Mandala.
18. Schramm, W. L. (1988). *The story of human communication: Cave painting to microchip.* New York: Harper and Row.
19. Steinberg, S. H., & Warde, B. (2017). *Five hundred years of printing.* Mineola: Dover Publications.

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MLC-OGC-105: Information Literacy

(4 Credits/100 Marks)

Course Description:

Information literacy is the ability to know one's information needs and to locate, retrieve and use the information in an ethical manner. This course aims to provide information literacy skills to the students that would enable them to promote lifelong learning.

Learning Objectives:

The objective of this paper is to impart information literacy skills to the students that will help them to become lifelong learners.

Course Outline

Unit – I: Information Literacy Basics **15 hours**

Information literacy: Meaning, Definition, Need, Evolution of the concept.

Historical perspective of Information literacy.

Types of Information Literacy: Technology literacy, Media literacy, Computer and Digital literacy.

Levels of Information Literacy: Entry level, Mid-level, High level, Advanced level.

Lifelong learning and its components, Implementing lifelong learning

Unit – II: Models of Information Literacy **15 hours**

Partners of Information Literacy.

Standards and Models of Information Literacy

Unit – III: Information Literacy Programmes **15 hours**

Role of Libraries in Information Literacy

Information Literacy programmes, Study of Information Literacy programmes in the world.

Information Literacy Instructions in different types of Library and Information Centers

Unit – IV: Trends in Information Literacy **15 hours**

Current trends in Information Literacy.

Challenges facing Information Literacy.

Learning Outcomes:

At the end of this course, the students will gain insights into information literacy and acquire various skills to identify their information needs, locate, retrieve and evaluate information and use the information in an ethical manner thereby making them information literate students.

References / Readings:

1. American Library Association. Final Report of Presidential Committee on Information Literacy. www.ala.org/at/nill/litt1sthtml
2. Barker, K. and Londsale, R. (Ed.) (1994). Skills for Life: The Value and Meaning of Literacy. London: Taylor Graham.
3. Bawden, D.(2001). Information and Digital Literacies: A Review of Concepts. http://gti/edu.um.es.8080/gomez/hei/intranet/bawden/pdf.
4. Eisenberg, M. B. Lowe, C. A. & Spitzer, K. L. (2004). Information Literacy: Essential Skills for Information Age. London: Libraries Unlimited.
5. Meadows, A.J. (Ed.) (1991). Knowledge and Communication: Essays on the Information Chain. London: Library Association.
6. Pantry, S. and Griffiths, P. (2002). Creating a Successful E-Information Service. London: Facet.
7. Ercegovac, Z. (2008). Information Literacy: Search Strategies, Tools & Resources for High School Students and College Freshmen. California: ABC-CLIO
8. Godwin, P & Parker, J. (2018). Information Literacy Meets Library 2.0. Cambridge University Press
9. Grassian, E.S. & Kaplowitz, J. R. (2001). Information Literacy Instruction: Theory and Practice. Neal-Schuman Publishers.
10. Bound, H., Tan, J. P. & Ying, R L W. (Ed.). (2022). Pedagogies for Future-oriented Adult Learners: Flipping the Lens from Teaching to Learning. Switzerland: Springer.
11. Field, J & Leicester, M. (2014). Lifelong Learning: Education Across the Lifespan. London: Routledge

12. Walsh, J. (2011). Information Literacy Instruction: Selecting an Effective Model. Oxford: Chandos Publishing
13. Thomas, N. P., Crow, S. R. & Franklin, L. L. (2011). Information Literacy and Information Skills Instruction: Applying Research to Practice in the 21st Century School Library. 3rd ed. California: Libraries Unlimited

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MLC- OGC-106: Academic Libraries System

(4 Credits/100 Marks)

Course Description:

This course offers an understanding of the development, current state, and future directions of school, college and university libraries. The focus will be on broad issues within a context that connects academic libraries, and their infrastructure, with their parent institutions. Such issues include managing change, scholarly communication, publishing, information technology, advocacy, evaluation and assessment, planning, budgeting, and higher education.

Learning Objectives:

1. To provide an understanding and need for library and information service support to different types of Academic Libraries.
2. To help students to understand the nature of information sources, Information users and Information services in School, College and University Libraries.

Course Outline

Unit - I: Academic Libraries **12 Hours**

Academic Libraries, Evolution of Higher Education and Libraries in India.
Meaning, Definition, Importance, Functions.
Types of Academic Libraries - School, College, University Libraries
Role of Libraries in Higher Education. - Higher Education and Libraries in India before independence and after independence. - Role of Academic Libraries in the present electronic environment. - Challenges of Academic Libraries.

Unit - II: Collection Development in Academic Libraries **12 Hours**

Policies and Guidelines
Ideal Characteristics of Academic Library collection- Meaning and Definitions of collection development.- Book selection procedure.- Collection Development Policy in the digital environment.- Problems of collection development.- Copyright issues in the digital environment.

Unit - III: Services in Academic Library **12 Hours**

Academic Library Services - Digital Reference Services (DRS), Current Awareness and SDI Service (CAS & SDI), E-mail Altering Services, Electronic Document Delivery Services (EDDS), User Education and Information Literacy.

Unit - IV: Academic Library Management **12 Hours**

Human Resource Development (HRD) and Financial Management.

HRD: Meaning, Definitions and Importance: Manpower planning and Training, Continuing Education Programmes (CEPs) for Librarians.
Financial Management: Types of Budgeting, Lumpsum Budget, Zero Based Budget (ZBB) and Program Planning Budgeting System (PPBS).

Unit - V: Networks in Academic Libraries **12 Hours**

Library Networking: Definition, Need and Importance.
Information Network Development in India

Learning Outcomes:

On completion of the course, the students will be able to;

1. Explore current and historical trends in academic libraries and critically analyse their impacts;
2. Investigate, plan, and implement academic library services and resources;
3. Analyse the role of the library within its parent institution and in relation to its patron communities and stakeholders;
4. Practice and refine communication skills in a variety of formats, leadership skills, and critical thinking within and applied to an academic library context.

References / Readings:

1. Dhiman, A. K. (2002). Academic Libraries. New Delhi: Ess Publications.
2. Flemming, H. (1990). User Education in Academic Libraries. London: The American Library Association.
3. Mathews, B. (2009). Marketing Today's Academic Library: A Bold New Approach to Communicating with Students. Chicago: American Library Association.
4. Petruzzelli, B. W. (2006). Real-Life Marketing and Promotion Strategies in College Libraries: Connecting With Campus and Community. London: Routledge.
5. Budd, J. M. (1998). The Academic Library: Its Context, Its purpose and Its operation. Englewood, Colorado: Libraries Unlimited.
6. Dayal, B. (2011). Managing Academic Libraries Principles and Practice. New Delhi: Isha Books.
7. Kumar, P. S. G. (2004). Information Sources and Services: Theory and Practice. Delhi:B. R. Publishing Corporation.
8. Mitchell, E. and Seiden, P. (2015). Reviewing the Academic Library: A Guide to Self-
9. Rajasekharan, K. and Nair, R. (1992). Academic library effectiveness. New Delhi: Ess
10. Kaul, H. K. (1999). Library resource sharing and networks. Delhi: Virgo Publication.

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MLC - OGC – 107: Marketing of Library Information Products and Services

(4 Credits/100 Marks)

Course Description:

This course provides an overview of contemporary marketing concepts and how they are applied in for-profit and non-profit companies. It examines the context in which all sorts of libraries and information services function, and it allows students to apply marketing concepts to an information

services operation of their choice. The course explores the question, "How can a library or information service understand the requirements and wishes of its target clients and go about satisfying them in such a way that it becomes (or remains) an information provider of choice?"

Learning Objectives:

1. To Understand and apply the principles of marketing
2. Analyse the market for a given library or information service
3. Develop marketing recommendations and a marketing plan for a library or information service

Course Outline

Unit - I: Information as a Resource **10 Hours**

Birth of the Information and Knowledge Societies, Understanding of information as a resource: Information as a commodity, Information Economics, Information Industry Growth, and Implications for Library and Information Services and Products

Transborder Data Flow (TBDF) Agencies, Types of TBDF, TBDF hurdles: Access, Linguistic, Legal, Economic, and Cultural (Information Consolidators, Aggregators, Consortia, etc.)

Unit - II: Theories and Strategies of Marketing **12 Hours**

Marketing Theories. Marketing Strategies; Corporate Mission

Marketing concepts: Marketing Concept in Non-Profit Organisations: Portfolio Administration Product Market Matrix; Product Life Cycle, Pricing Information; BCG Matrix Model.

Unit - III: Trends in Marketing **13 Hours**

Marketing Combination: McCarthy's Four P's; Kotler's Four C's; Marketing Mix, Packaging, Branding, and Promotion.

Unit - IV: Marketing Research **12 Hours**

Marketing Research & Plan: Marketing Research, Corporate Identity, and Marketing Plans Geographic and Demographic Segmentation; Behavioural and Psychographic Segmentation; User Behavior and Adoption; Market Segmentation and Targeting.

Unit - V: Costing and Pricing **13 Hours**

costing and pricing of Information Products and Services. Pricing influencing factors, Pricing strategies.

Learning Outcomes:

On completion of the course, the students will be able to;

1. Explain the meaning of marketing and its need for a library and information centre;
2. Discuss how marketing strategies can be applied in a library and information centre;
3. Describe the concept of marketing mix as applicable to library and information services; and
4. Elaborate customer focus approach and issues related with implementation of marketing in a library set-up.

References / Readings:

1. Cawkell, A.E., Ed. (1987). Evolution of an Information society. London: ASLIB.
2. Cronin, B(1981). Marketing of Library and Information services. London: ASLIB..
3. Eileen, E. D.S.(2002). Marketing concepts for Libraries and Information services. 2nd Ed. London: Facet Publishing.

4. Jain, A.K and others Ed. (1995). Marketing of Information products and services. Ahmedabad: IIM.
5. Kotler, P. (1975). Marketing for non-profit organisation. Prentice-Hall.
6. Saez, E.E. (1993). Marketing concepts for Libraries and Information services.
7. IASLIC. (1988). Marketing of Library and Information services (13th IASLIC Seminar papers), Calcutta: IASLIC.

Second Semester (M.L.I.Sc)

MLC-DSD-201: Dissertation

(16 Credits/400 Marks)

MLC-RSOC-202: Technical Writing

(4 Credits/100 Marks)

Course Description:

The Course offers the students an acquaintance with principles, techniques and skills required to conduct the scientific, technical or social science writing skills along with instruction for writing reports, presentations with emphasis on clarity, information design, use of graphics and accuracy of expression.

Learning Objectives:

The course introduces the student to identify and understand the facets and functions of the primary genres of technical writing, including letters, memos, emails, resumes, reports, proposals, technical descriptions, and technical definitions. The course will also allow the student to analyse and adapt to the situations for audiences, its purpose and their uses along with writing styles for clarity and concision, to produce the document collaboratively or independently.

Course Outline

Unit- I: Technical Writing-Introduction **15 hours**

Technical writing: Definition, Overview, Purpose, Types, Characteristics, Functions. Audience analysis and their requirements. Planning, Prewriting, Drafting, Revising, Editing and Producing the document. Aspects of technical writing – Researching, Mechanism and Process description. Use of editorial tools viz., Dictionaries, Style Manuals, Standards and specifications.

Unit- II: Technical Writing Process **15 hours**

Report and Proposals: Formal elements of reports, Guidelines for writing an effective report, Different types of report- Incident, Trip, Inspection, Progress report, Short investigation report, Feasibility and Recommendation report. Drafting of proposal and Project report.

Technical Writing Process: Information searching and gathering skills- Designing pages: Elements of page design, Basic design guidelines, Developing a style sheet - Using Visual aids: Tables, Graphs, Charts and Illustrations.

Unit -III: Technical Writing Style **10 hours**

Technical Writing style: Structure and format of conference papers, Journal articles, Seminar papers, Research proposals, Technical reports, Informal and Formal reports, Recommendation and Feasibility reports, Monographs, Dissertations/Theses and Review of articles.

Unit -IV: Technical Writing- Preparation and Presentation **10 hours**

Oral Presentation of scientific and technical communications: Preparation and use of multimedia facilities for presentation.

Unit- V: Trends in Technical Writing **10 hours**

Trends in technical writing – Types of technical Writing, Reasons for technical writing, Structure of article, White papers, Reference manuals, User manuals, On-line help files, Data sheet, Errata, Newsletters; Documentation support related software products.

Learning Outcomes:

At the end of this course, students will achieve the competence in terminology, concepts, theories and methodologies to communicate their ideas and reasoning, clearly and effectively in written and oral forms.

References/Readings:

1. **Alfred, G. J. (2020). *Handbook of technical writing.* Boston: Bedford.**
2. Basu, B. (2007). *Technical writing.* New Delhi: Prentice Hall of India.
3. Gerson, S. J. (2001). *Technical Writing.* New Delhi: Pearson Education Ltd.
4. Greenlaw, R. (2012). *Technical writing, presentational skills, and online communication : professional tools and insights.* Hershey: Information Science Reference.
5. Holloway, B. R. (2008). *Technical writing basics : a guide to style and form.* New Jersey: Prentice Hall.
6. Katz, M. J. (2006). *From research to manuscript : a guide to scientific writing.* Dordrecht: Springer.
7. Lannon, J. M., & Gurak, L. J. (2021). Technical communication. [Harlow, United Kingdom.
8. Morgan, K. (2015). *Technical writing process.* Sidney: Technical Writing Process.
9. Pfeiffer William S & Boogerd, J. (2004). *Technical writing : a practical approach.* Toranto: Pearson Prentice Hall.
10. Reep, D. C. (2011). *Technical writing : principles, strategies, and readings.* Boston: Longman .
11. Young, M. (2004). *Technical writer's handbook : writing with style and clarity .* New Delhi: Viva Books.

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MLC-RSOC-203: Intellectual Property Rights

(4 Credit/100 Marks)

Course Description:

The course gives the general overview of Intellectual Property and describes various issues and agenda relating to it. The course aims to examine the protection provided by the law with respect to ideas, information, inventions and other forms of creativity.

Learning Objectives:

To introduce fundamental aspects of Intellectual Property Rights to the students and to disseminate knowledge about Intellectual Property, its registration and enforcement.

Course Outline

Unit - I: Introduction to Intellectual Property Rights (IPR) **15 Hours**

Concept of Intellectual Property. Objectives of Intellectual Property Rights.

Classification of Intellectual Property Rights: Patents, Trademarks, Copyrights, Industrial Design, Geographical Indications, Plant Varieties, Trade Dress, Trade Secrets.
Moral arguments for Intellectual Property. Intellectual Property Rights Awareness.
Infringement, Misappropriation, and Enforcement**:** Patent infringement, Copyright infringement, Fair Use provisions in Copyright, Trademark infringement, Trade secret misappropriation.

Unit– II: International Agreements and Legislations 15 Hours

Intellectual Property Conventions: Paris Convention for the Protection of Industrial Property (1967); Berne Convention for the Protection of Literary and Artistic Works (1971); International Convention for the Protection of Literary and Artistic Works (1971); International Convention for the Protection of Performer, Producers of Phonograms and Broadcasting Organisations (the Rome Convention) (1961); Treaty on Intellectual Property in Respect of Integrated Circuits (1989).
World Intellectual Property Organization (WIPO) – Objectives and Functions, Cooperation with Member States.
Economic Development, Enforcement of Intellectual Property Rights. Geographic Indications. WTO, TRIPS. The U.S. Patent system.
The International Patent System. The International Trademark System, The International Design System. The International System of Geographic Indication. The International Microorganism Deposit System. Protecting State Emblems.

Unit - III: Intellectual Property Rights and India 15 Hours

Traditional knowledge of India – Need for their protection. The Copyright Act, 1957. The Patents Act, 1970. The Trade Marks Act, 1999. The Designs Act, 2000. The Semiconductor Integrated Circuits Layout Design Act, 2000. The Geographical Indications of Goods (Registration and Protection) Act, 1999. The Protection of Plant Varieties and Farmers Rights, 2001. The Biological Diversity Act, 2002. International Agreements. IP Awareness in India, Patent system in India, Registration of IPR in India. Micro Small Medium Enterprises (MSME's) and Start-ups with respect to IPR.

Unit – IV: Digital Products and Law 15 Hours

Intellectual Property Rights and Digitised world. Challenges for Intellectual Property in Cyberspace. Protection of Digital Copyright. Cyber Laws of India. Information Technology Act 2000.

Learning Outcome:

On successful completion of this course, the students are able to explain the concept, nature, objectives and significance of Intellectual Property Rights.

References/Readings:

1. Ahuja, V. K. (2017). *Law relating to Intellectual Property Rights.* India, IN: LexisNexis.
2. Bouchoux, D. E. (2017). *Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets* (5th ed.). Cengage Learning.
3. Chawla, H. S. (2016). *Introduction to Intellectual Property Rights .* New Delhi: Oxford and IBH Publishing Company Pvt. Ltd.
4. Cimoli, M., & Giovanni, D. (2014). *Intellectual property rights :legal and economic challenges for development .* Oxford: Oxford University Press.
5. Neeraj, P., & Khusdeep, D. (2014). *Intellectual Property Rights.* India, IN: PHI Learning Pvt. Ltd.
6. Nithyananda, K. V. (2019). *Intellectual Property Rights: Protection and Management.* Noida: Cengage Learning India Private Limited.
7. Satakar, S. V. (2002). *Intellectual Property Rights and CopyRights.* New Delhi: Ess Ess Publications.

8. Schechter, R. E., & Thomas, J. R. (2003). *Intellectual Property: The Law of Copyrights, Patents and Trademarks.* New York: West/Wadsworth.
9. Singh, R. K. (2022). *Intellectual Property Rights.* Hyderabad: Gogia Law Agency.
10. Wadehra, B. L. (2004). *Patents, trademarks, copyright, Designs and Geographical Judications.* Universal Law Publishing Co Ltd.

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MLC - RSOC – 204: Bibliometrics and Related Metrics
(4 Credits/100 Marks)

Course Description:
This course aims to equip students with fundamental theoretical and practical knowledge and skills in Informetrics, scientometrics and webometrics.

Learning Objectives:

1. To familiarise students with the fundamentals, concept, theories, laws and parameters of Bibliometrics, Scientometrics, Informetrics and Webometrics
2. To study various indicators of publication productivity
3. To understand the significance of scientific collaborations
4. To learn about the citation analysis operation research
5. To understand the emerging trends in informatics and Scientometrics.

Course Outline:

Unit- I: Basic Concepts **15 Hours**

Metrics and Metric Studies. Bibliometrics, Informetrics, Scientometrics, Librametrics / Librametry, Cybermetrics / Webometrics, Altmetrics – Meaning, Definitions and Scope.

Unit -II: Laws, Databases and Tools for Bibliometric Analysis **15 Hours**

Study and application of Classical Bibliometric Laws – Lotka's Law of Scientific Productivity, Bradford's Law of Scattering, and Zipf's Law of Word Occurrence. Other notable regularities: 80/20 Rule, Success-Breeds-Success Model, Law of Price Garfield's Empirical Law.
Data sources for bibliometric studies – Databases as data sources. Kinds of data sources
Software / Tools for Bibliometric analysis

Unit- III: Citation Concepts, Growth and Obsolescence of Literature and Productivity Measures 10 Hours

Study of the Citation concepts: Citation analysis, Citation network, Citation matrix, Bibliographic Coupling, Co-citation Analysis, Journal Citation Reports. Productivity measurement techniques. Impact Factor. H-index. I-index. G-index. M-index. Impact Per Paper (IPP). Source Normalised Impact per Paper (SNIP).
Growth and obsolescence of literature. Various Growth Models. The Half-life Analogy. Determination of ageing factor and Half-life. Real v/s Apparent. Synchronous and Diachronous.

Unit- IV: Science Indicators and Policy **10 Hours**

Science Indicators. Science Policy Development. Web Impact Assessment. Link Analysis. Trends in metric studies. Technology based indicators. Library-use studies. Mapping of science. Collaboration in science

Unit -V: Modern Metrics **10 Hours**

Scientometric studies and the role in Science Policy. Challenges of Bibliometric and Scientometric studies.
Webometrics, Cybermetrics, Altmetrics and Nettometrics.
Tools and techniques for enhancing academic visibility

Learning Outcomes:

After completion of the course, students will be aware of various scientometric indicators and laws, different softwares and application of metrics to draw the inferences from published literature and create academic visibility for research work done.

References / Readings

1. Egghe, L. and Rousseau, R. (2001). Elementary statistics for effective Library and Information services management. London: Aslib.
2. Garfield, E. (1979). Citation Indexing: Its theory and applications in Science, technology and humanities. New York: John Wiley.
3. Meadows, A.J. (1974). Communication in Science. London: Butterworths.
4. Neuendorf, K. (2002). The content analysis guidebook. London: Sage.
5. Nicholas D. and Ritchi, M. (1979). Literature & bibliometrics. London: Clive Bingley.
6. Ravichandra Rao, I.K. (1985). Quantitative methods for Library and Information Science. New Delhi: Wiley Eastern.
7. Thelwall, M. (2009). Introduction to webometrics: Quantitative web research for the social Sciences. Morgan and Claypool Publishers.
8. Stuart, D. (2014). Web Metrics for Library and Information Professionals. Facet publishing.

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MLC-RSOC-205: Library Use and User Studies
(4 Credits/100 Marks)

Course Description:

The ultimate goal of the library is to satisfy its users. All the activities of the library are carried out keeping in mind the requirements of the users. Therefore, the librarians need to find out whether the services provided by them are satisfying the information needs of the users. This course offers the students the methods and techniques of library user studies and the different types of programmes that can be offered to create awareness among the users.

Learning Objectives:

The objective of this paper is to teach the students the different types of users, understand their information seeking habits and describe the different methods of user education that will promote the library usage among the users.

Course Outline

Unit – I: Information- Introduction **15 hours**

Information: Definition and its nature

Information need: Meaning, definition and types of information needs

Categories of different types of information users (Students, Teachers, Scientists and Technologists, Research and Development Personnel, Planners, Policy Makers, Ethnic groups and other professionals)

Information Seeking Behaviour: Meaning, Definition, Different Models of information seeking behaviour

Unit – II: User Study- Introduction **15 hours**

User study - Meaning, Definitions and Importance

Planning and organization of user studies

User studies by types of libraries, Changing role of libraries and their information needs, Information use studies

Evaluation of user studies

User study in electronic environment

Unit – III: User Studies - Methods **15 hours**

Qualitative and quantitative research designs

Survey Methods, Techniques of data collection- Questionnaire, Interview, Observation, Diary, Record Analysis and Citation Studies

Sampling – need and types of sampling

Unit – IV: Library Use Study- Techniques and Advantages **10 hours**

Library Use Study: Meaning, Techniques and advantages

Unit -V: User Education- Concepts and Methods **5 Hours**

User education - Meaning, Definitions, Objectives and Importance

Components of User Education

Methods of conducting User Education

Evaluation of User Education Programmes

User Education in a digital environment.

Learning Outcomes:

At the end of the course, the students will understand the different types of library users, will have thorough knowledge of understanding their information habits, and the different education programmes that can be adopted to orient the users about the libraries.

References / Readings:

1. Ahuja, R. (2001). Research methods. Rawat Publishers.
2. Alvite, L. & Barrionuevo, L. (2011). Libraries for Users: Services in Academic Libraries. Oxford: Chandos Publishing.
3. Balasubramanian, P. (2011). Users and Uses of Library. New Delhi, Deep and Deep Publications Pvt. Ltd
4. Biblarz, D., Bosch, S. & Sugnet, C. (2001). Guide to Library User Needs Assessment for Integrated Information Resource Management and Collection Management. Maryaland: Scarecrow Press, Inc.
5. Devarajan, G. (1995). Library Information User and Use Studies. New Delhi: Beacon Books
6. Dewey, B. I. (Ed.). (2001). Library User Education: Powerful learning, powerful partnerships. Scarecrow Press.
7. Ford, N. (2015). Introduction to Information Behaviour. London: Facet Publishing
8. Jordan, P. (2016). The Academic Library and its Users. New York: Routledge
9. Kawatra, P. S. (1997). Library User Studies: Manual for Librarians and Information Scientists. Mumbai: Jaico Publishing
10. Kothari, C. R. & Garg, G. (2019). Research Methodology: Methods and Techniques. New Age International Publishers.
11. Kumar, P. S. G. (2004). Library and Users: Theory and Practice. Delhi: B. R. Publishing Corporation.
12. Lushington, N. (2002). Libraries Designed for Users: A 21st Century Guide. Chicago: Neal-Schuman Publishers
13. Ruthven, I. & Kelly, D. (2011). Interactive Information-seeking Behaviour and Retrieval. London: Facet Publishing.

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MLC – RSOC-206: Web Technology

(4 Credits/100 Marks)

Course Description:

This Course will guide the students to know about the history and evolution of the world wide web and how it has brought technological changes in the functioning of libraries.

Course Objectives:

To evaluate the evolution of the Internet and Web.
To discuss the functionalities and characteristics of Web browsers and Search Engines.
To differentiate the websites on the basis of operations and categorisation with reference to content.
To understand the present and future utilities of artificial intelligence in a library environment.

Course Outline

Unit - I: World Wide Web **20 hours**

Introduction to World Wide Web, Evolution of World Wide Web and its Usage in information generation, Collection and Dissemination. Web Servers, Web Clients – Distributed Information System and Services, Web 2.0 and Library 2.0, Semantic Web, Web Browsers and Services.

Unit - II: Cloud Computing **15 hours**

Cloud Computing: Concept, Benefits, Application in Libraries
Cloud Computing- Categories - Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Models- Private, Public, Hybrid, Its Components,
Practical component: Study of IIT Delhi Cloud Computing Software "Baadal"

Unit - III: Websites **10 hours**

Websites - Tools and Techniques; Types of Websites, Web Contents, Static Web Contents, Dynamic Web Contents – MySQL, PostgreSQL.

Unit - IV: Artificial Intelligence **15 hours**

Artificial Intelligence, Internet of Things - Brief history and Growth, Impact on libraries, Future of IoT in libraries.

Learning Outcome:

At the end of this course the students will learn how to utilise the web services that are required to be provided to library users.

References/Readings:

1. Bahga , A., & Madisetti , V. (2015). *Internet Of Things: A Hands-On Approach.* New Delhi: Orient Blackswan Private Limited.
2. Breeding, M. (2012). *Cloud Computing for libraries.* London: Facet Publishing.
3. Courtney , N. D. (2007). *Library 2.0 and Beyond: Innovative Technologies and Tomorrow's User.* Libraries Unlimited Inc.
4. Godbole, A. (2003). *Web Technologies:TCP/IP to Internet Application Architectures.* New Delhi: Tata McGraw Hill Education.
5. Goel, L. (2021). *Artificial Intelligence: Concepts and Applications.* Noids Uttar Pradesh: Wiley India Pvt Ltd.
6. McGrath, M. (2017). *PHP & MySQL.* New Delhi: BPB Publications.
7. Obe, R. O., & Hsu, L. S. (2017). *PostgreSQL: Up and Running.* O'Reilly Media.
8. Parkes, D., & Walton, G. (2010). *Web 2.0 and Libraries: Impacts, Technologies and Trends.* Chandos Publishing.
9. Russell, S., & Nornig, P. (2015). *Artificial Intelligence: A Modern Approach.* New Delhi: Pearson Education India.
10. Shelly, G., & M, F. (2011). *Web 2.0: Concepts and applications.* Boston: Cengage Learning.

11. White, C. (2011). *Social media, crisis communication, and emergency management: leveraging web 2.0 technologies.* Boca Raton U.S.A: CRC Press.

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MLC- RSOC-207: Public Libraries System
(4 Credits/100 Marks)

Course Description:
This course is intended to expand the concepts specific to public librarians. It provides library and information science students with knowledge of the history, organization, and function of public libraries, and the skills necessary to deliver the wide range of services unique to this challenging area of librarianship.

Learning Objectives:
1. To provide an understanding of need for library and information service support to different types of Public Libraries.
2. To help students to understand the nature of information sources, Information users and Information services in Libraries.

Course Outline

Unit- I: Public Libraries- An Introduction **10 Hours**
Public Libraries, Collection Development and Management.
Meaning, Definitions, Origin, Objectives and Functions
UNESCO Public Library Manifesto: 1972, 1994 and 2004.- Role of Public Libraries in Modern Society
Growth and Development of Public Libraries in USA, UK and India.
Steps in collection development: Selection and Acquisition of different types of documents including non-book materials.

Unit- II: HRP, Organization and Management **15 Hours**
Organization and Management of Information Resources and Services. Staff Manual, Statistics, Work Measurement and Standards.
Human Resource Planning (HRP). Nature, Size, Selection and Recruitment, Qualifications, Training and Education, Duties and Responsibilities, Service conditions, motivation and control.
Organization of Information Resources.
Planning and Organization of various types of Information services to the different types of users.

Unit- III: Library Legislation **9 Hours**
Management and Study of Library Legislation, - Library Legislation: UK, USA and India. Karnataka Public Libraries Act, 1965 and its features. Comparative and Critical Study of Public Library Acts in India.

Unit- IV: Financial Management **14 Hours**
Financial Management. Financial resources of Public Libraries, Mobilization and Estimation of Public Library Finance.
Budget: Meaning, Definitions and Functions. Different types of Budgets and Application of PPBS in Public Libraries.

Unit- V: Library Automation and Users **12 Hours**

Library Automation and Library Users. Computerization of different divisions
Networking: National and Regional Levels.
Resource sharing: Problems and Prospects.
Study of Users and their needs, User Education and Public Library Standards.

Learning Outcomes:
By the end of the course students will be able to:
1. Identify current public librarianship trends.
2. Evaluate library programmes independently and collectively to ensure that they are acceptable for people of all ages, backgrounds, occupations, and interests.
3. Connect library services and programmes to the needs that arise from information-seeking behaviours in the community.

References / Readings:

1. Beardwell, Ian and Holden, Len. Ed. (1996). Human Resource Management: Contemporary Perspective. New Delhi: McMillan.
2. Bilal, D. (2014). Library Automation: Core Concepts and Practical Systems Analysis. Ed. 3. Libraries Unlimited.
3. Iyer, V. K. (1999). Library Management of Staff Training and Development. Delhi:Rajat.
4. Krishnamurthy, R. (1997). Library Management. New Delhi: Commonwealth.
5. Kumar, M. G., & Sethunath, (2012). V S. Public Libraries. Crescent Publishing Corporation.
6. McCloven, L.R. (1951). Public Library Extension, Paris. UNESCO.
7. Mittal, R.L. (1971). Public Library Law, Delhi: Metropolitan.
8. Ranganathan, S.R. (1950). Library Development Plan: A 30 year Programme for India with Draft Library Bill, Delhi: Delhi University.
9. Venkatappaiah, Velega. (2007).Public Library Legislation in the New Millennium. Bookwell.
10. White, Carl M. Ed. (1964). Bases of Modem Librarianship. New York: Pergmon, 1964.
11. Goulding, Anne. (2012). Public Libraries in the 21st Century: Defining Services and debating the future. Ashgare. United Kingdom.

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MLC- RSOC-208: Specialist Libraries System

(4 Credits/100 Marks)

Course Description:
Within corporations, associations, other institutions, and major academic and public libraries, specialist libraries and information centres have long acted as vital information gathering and dissemination units. The service ethic that has developed inside these information centres or libraries can be applied to any library. Specialist library managers, on the other hand, must understand their businesses' corporate cultures and develop relevant services to match their clients' demands in order to be truly effective. This course will teach students about the history, organisation, and operations of several types of specialist libraries, as well as the skills needed to provide a variety of services.

Learning Objectives:
1. To study the need and importance of Specialist Libraries.
2. To study the services of Specialist Libraries.
3. To understand the Specialist Library Operation.
4. To acquaint the students with the present set up of Specialist Library System in India.

Course Outline

Unit- I: Specialist Libraries- Introduction **15 Hours**

Specialist Libraries- Concept, Role, Characteristics and Functions. Development of Specialist Libraries in India. Role of IASLIC and Library & Information Policy at National Level in India. Functions and Services. Types of Specialist Libraries; Specialist Library Management; Role of scientific organisations.

Unit- II: Organization and Administration **15 Hours**

Library Organization & Administration: Collection Development and Management of Government documents, Maps, Manuscripts, Newspaper clippings, Serials, Specifications (patents and standards), Technical reports and Theses.

Financial Management Auditing: Sources of Finance and Budgeting techniques. Accounting, Auditing and Manpower development and Recruitment: Qualifications, Job Description and Staff Manual.

Unit- III: Infrastructure and Services **15 Hours**

Library Building: Principles, Planning and Features.

Information Services: Bibliographic, Current Awareness (CAS), Digest, Documentary Delivery, Indexing, Abstracting, Referral, Selective Dissemination (SDI), Translations, Consultancy. Trend Report, Reference & Information Services.

Unit- IV: Resource Sharing and Networking **15 Hours**

Resource Sharing and Marketing of Information: Concept, Areas, and Factors of Development, Elements and Process. Resources Sharing Networks.

Networking and Marketing of Information Products & Services. Mix Marketing

Learning Outcomes:

After completion of the course, students will be in a position to manage the system and services of Specialist Library and make the users literate by providing library services.

References / Readings:

1. Burton, P. F. and Patic J. H. (1991). Information Management Technology: A Librarian's Guide. London: Chapman and Hall.
2. Clapp, V. W. (2010). Features of the research library. Urbana: University of Illinois.
3. Dhawan, K.S.(1997). Multi-media Library. New Delhi: Commonwealth Publishers.
4. Matarazzo, J. M., & Connolly, S. D. (2016). Knowledge and special libraries. London: Routledge.
5. Scammell, A. (2008). Handbook of special librarianship and information work. London: Routledge.
6. Semertzaki, E. (2011). Special libraries as knowledge management centres. Oxford: Chandos Publishing.
7. Wilkie, Chris. (2009). Managing film and video collections. London: Aslib
8. Yap, J. M., et al. (2016). Special library administration, standardisation and technological integration. Hershey, PA: Information Science Reference.

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D 3.15 Minutes of the Board of Studies in International Studies meeting held on 22.04.2022.

Annexure I

Programme: MA International Studies
Course Code: ISSCC 101 **Title of the Course:** Theories in International Relations
Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites for the course:	Open to all Master's Students of Goa University.	
Objective:	The course is designed with the view to equip students with conceptual tools necessary to efficaciously comprehend the fundamental forces, processes and actors, militating within the international system. Towards this end, the Course will endeavor to introduce students to principal theoretical debates and analytical tools, imperative to a fulsome study of International Relations. Both, mainstream theoretical traditions and pertinent critical perspectives are intended to be examined. An abiding goal of this course is to alterthe image of the study of theory, which is often disparaged by students, as abstract and outside the purview of the real world.	

Content:	**Module I: Introducing Theory-Practice Interface:** Defining Theory, Its Role and Significance; Theorizing about International Relations and System of Analysis; Major Theoretical Debates as part of Lineage and Practice of IR. **Module II: Mainstream IR Theories:** Realism (Classical & Structural; Defensive and Offensive) / Liberalism (Interdependence,Neoliberal Institutionalism, Commercial Liberalism). **Module III: Constructivism and the 'English School':** Identity, Constructivism (Social Construction of Knowledge, Construction of SocialReality). **Module IV: Global Conflict and Cooperation Theories:** Balance of Power; Security Dilemma; Anarchy vis-à-vis Regime Stability; Power Politicsvs. International Order and Cooperation. **Module V: Post-Cold-War 'IR' Theory:** Democratic Peace Theory; Hegemonic Stability Theory; Decision-Making Theories. 6. **Module VI: Critical IR Theories and Non-Western Perspectives:** Marxism, Post-Structuralism, Post-Modernism, Post-Colonialism, Feminism, and Global IR.	10 Hours 10 Hours 10 Hours 10 Hours 10 Hours 10 Hours

Pedagogy:	**Lectures/ Tutorials/Assignments/Self-Study/Discussions/Audio-Visual**	
References/Readings	1. Timothy Dunne and Steve Smith. 2007. Eds. *International Relations Theories:Discipline and Diversity*. Oxford: Oxford University Press. 2. Scott Burchill, Andre Linklater and Terry Nardin. 2009. Eds. *Theories of International Relations, 4th Edition*. London: Palgrave Macmillan Publishers. 3. Raymond Aron. 2003. *Peace and War: A Theory of International Relations*. NewBrunswick, New Jersey: Transaction Publishers. 4. Ken Booth and Steve Smith. 1995. *International Relations Today*. Pittsburg:Pennsylvania State University Press. 5. Strange Susan. 1994. *States and Markets: An Introduction to InternationalPolitical Economy*. London: Pinter Publishers. 6. David A. Baldwin. 1993. Ed. *Neorealism and Neoliberalism: The ContemporaryDebate*. New York: Columbia University Press. 7. Martin Griffiths. 1992. *Fifty Key Thinkers in International Relations*. New York:Routledge. 8. Kenneth N. Waltz. 1959. *Man, the State, and War: A Theoretical Analysis*. NewYork: Columbia University Press. 9. Kenneth N. Waltz. 1979. *Theory of International Politics*. New York: McGraw-Hill. 10. Hans J. Morgenthau. 1985. *Politics Among Nations*. Boston: McGraw Hill. 11. Robert O. Keohane. 1986. Ed. *Neorealism and Its Critics*. New York: ColumbiaUniversity Press.	
Learning Outcomes	Students are equipped with conceptual tools necessary to efficaciously comprehend the fundamental forces, processes and actors, militating within the international system through the theoretical debates in International Relations.	

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Programme: MA International Studies
Course Code: ISSCC 102 **Title of the Course:** International Relations: Concepts and Perspectives
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the Course:	Open to all Master's students of Goa University.	
Objective:	The Course beholds the following objectives: 1. Aims to acquaint students with a rudimentary conceptual understanding of the various concepts, which are integral to the study of the discipline of International Relations. 2. Disseminating knowledge and information about evolution of concepts, in historical and analytical perspectives, and delineating their linkage to the landscape of global politics and the terrain of global and regional governance. 3. Enabling a fairly detailed understanding of the concepts and their attendant perspectives from a geo-political, geo-economic	
Content:	**Module I: Introduction to International Relations:** Origins of Modern International System; World Wars I & II; The Cold War; Post Cold War; Post-Post Cold War; Post-Truth Epoch; Oriental Perspectives on Sovereignty, Nation-State, Community Building, etc.	10 hours
	Module II: 'Structural' Concepts in International Relations: Sovereignty; State System; Empire and Nationalism (European and Global); Nation-State; Great Powers; Decolonization; Capitalist-Socialist Industrial Societies; Non-State Actors and Role in International Relations; 'Third World', 'South-South', 'Global South' Perspectives.	10hours
	Module III: International Relations: 'Institutional' Concepts: Anarchy; War and Peace; Balance-of-Power (BoP); Conflict Resolution; Democratic Peace, Hegemony, Security Community and Security Dilemma; Dependency.	10 hours
	Module IV: 'Strategic Analysis' in International Relations: Strategic Culture; Foreign Policy; National Security; Geopolitics and Spheres of Influence; National Interest in Statecraft; National Development; Arms Control, Disarmament, Non-Proliferation Diplomacy and Negotiation.	10 hours
	Module V: International Relations: 'Governance' Concepts: Regions, Regionalism, Regionalisation; Geo-Economics; Globalisation; International Regimes and Norms; International Society; Global Commons; Territoriality vis-à-vis Functionality; Multilateralism, Multi-polarity, Poly-centricity.	10 hours
	Module VI: Conceptualising Modern 'Global' Concerns: Democracy and Democratisation; Human Rights, Human Security and Humanitarianism; Terrorism and Violent Radicalisation; Nuclear Non-Proliferation, Disarmament and Weapons of Mass Destruction; Sustainable Development; Climate Change and the Environment; Religion and Culture.	10 hours

Pedagogy:	Classroom Lectures, Written and Oral Assignments, Audio-Visual Presentations	
References/ Readings	**Basic Readings** 1. S. McGlinchey. Eds. 2022. *Foundations of International Relations*. Bloomsbury Academic. 2. H. Nau, et.al. 2020. *Perspectives on International Relations: Power, Institutions, Ideas.* London: Sage CQ Press. 3. A. Heywood. 2015. *Key Concepts in Politics and International Relations*. London: Palgrave Macmillan. **Additional Readings** 1. J. Bayliss. 2020. *The Globalization of World Politics: An Introduction to International Relations*. Oxford: Oxford University Press. 2. C. Brown. 2019. *Understanding International Relations*. London: Palgrave Macmillan.	
Learning Outcomes	Upon completion of instruction and pedagogy, the Course will render students, the following takeaways: 1. Acquaint and introduce them, to the latest thought-process discourse,in terms of theory and praxis, in a manner that helps internalise the conceptual phenomenon. 2. Help student stakeholders grasp the intricacies and nuances that condition the study of fundamentals of international relations through curated understanding of the structural, institutional and governance elements.	

Programme: MA International Studies
Course Code: ISSCC 103 **Title of the Course:** Evolving Dimensions of Strategic Studies
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for thecourse:	Open to all Master's students of Goa University.	
Objective:	This course examines international conflict and cooperation, forms of strategic interaction and causes of war and prevention of conflict and conditions and effortstoward attaining peace. It introduces students to the basic concepts of the State, Power, National Interest, War, Conflict, and Peace, etc., as also acquainting them with thenuances and intricacies of what constitutes such concepts and phenomena. The Course would enable students not just to understand the causes and consequences of various dimensions within the discipline of Strategic Studies, but also be able to use analytical tools and frameworks to comprehend, dissect and articulate the changing narrative and realm of Strategy.	

Content:	**Module I: Introduction:** Brief Survey of Strategic Thought (Kautilya, Clausewitz, Tsun-Tzu, Mao); Concepts of Nation, State, Nation-State; Theories of the State; Components, Dimensions & Notions of Power; Concept of National Interest. **Module II: Notions of 'Security':** National Security, Collective Security (Balance of Power vis-à-vis Balance of Terror, Arms Control and Disarmament); Regional Security, Comprehensive Security, Common Security, Human Security, Maritime Security, Economic Security; Climate Security. **Module III: 'War' & 'Conflict' in Strategic Studies:** Definition and Causes of War, Principles of War, Conventional Warfare in the Nuclear Age, Limited War, Revolutionary, Guerrilla War, Low Intensity Conflict(s), Insurgency and Counter-Insurgency Operations, War against Terror; Techniques (Conflict	10 Hours 10 Hours 10 Hours
	Prevention, Conflict Management & Resolution, Conflict Preservation, Confidence- Building Measures. **Module IV: From Peacekeeping to Peace-Building:** Epistemology and Concept, Dimensions, Approaches and Assumptions; Civil-Military Relations (Theories, Models, Empirical Studies); IGOs and NGOs in Peace-Operations (Peacekeeping, Peace-Making, Peace-Enforcement & Peace-building); Diplomacy and its Role (Genesis, Evolution, Changing Contours, New Age Approaches, Methodologies & Techniques), Peace Movements & Peace Research. **Module V: Module V. Role of Science & Technology**: Research & Development in Defence Preparedness (Revolution in Military Affairs); Military-Industrial Complex and Modernization & Indigenization in Defence Requirements, Disruptive Technologies. **Module VI: Strategic Stability: Imperatives and Challenges:** Evolving Alliance Frameworks, Defence Cooperation, Security & Strategic Dialogues; Nuclear Deterrence, Non-Proliferation, Nuclear Regimes; Problems in System ofGovernance & Human Rights, Organized Crime & Violence; Migration, Environmental Concerns, Failed States and State Collapse.	10 Hours 10 Hours 10 Hours
Pedagogy:	Lectures/Tutorials/Assignments/Self-Study/Discussions/Audio-Visuals	
References/Readings	1. Norrin Ripsman. 2016. *Peace-Making from Above, Peace from Below: EndingConflict between Regional* Rivals. Ithaca: Cornell University Press. 2. Matthew Levinger. 2013. *Conflict Analysis: Understanding Causes, UnlockingSolutions.* Washington, D.C.: United States Institute of Peace Press. 3. Oliver Ramsbotham, Tom Woodhouse and Hugh Miall. 2011. *ContemporaryConflict Resolution.* New York: Polity Press. 4. Karl Cordell Stefan Wolf. 2011. *Routledge Handbook of Ethnic*	

	Conflict. London:Routledge. 5. Saira Khan. 2009. *Nuclear Weapons and Conflict Transformation.* London:Routledge. 6. John Darby and Roger MacGinty. 2008. *Contemporary Peace-making: Conflict,Peace Processes and Post-War* Reconstruction. New York: Palgrave Macmillan. 7. Peter Wallenstern. 2008. *Understanding Conflict* Resolution. London: Sage Publications.	
	8. Colin S. Gray. 2007. *War, Peace and International* Relations. London: Routledge. 9. John Baylis, James Wirtz, Colin Gray, and Eliot Cohen. 2007. *Strategy in theContemporary World.* Oxford: Oxford University Press. 10. William I. Zartman and Glay Faure. 2005. *Escalation and Negotiation inInternational Conflicts.* Cambridge: Cambridge University Press. 11. Cynthia Arnson and William Zartman. 2005. *Rethinking the Economics of War:The Intersection of Need, Creed and Greed.* Maryland: Johns Hopkins Press.	
Learning Outcomes	A holistic understanding of peace, security and strategic studies and its importance to thestudy of International Relations.	

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Programme: MA International Studies
Course Code: ISSCC 104 **Title of the Course:** International Political Economy
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for thecourse:	Open to all Master's students of Goa University.	
Objective:	Combining the traditional and contemporary mainstream theoretical approaches, the course purports to offer meaningful insights for an understanding of recent trends in contemporary international political economy from the perspectives of developing countries. The prime objective of the course is to expose the students to the complexities and interplay of international politics and economics (rather than dynamics of current global politics and international relations).	
Content:	**Module I: Introducing International Political Economy**: Background, Definition and Approaches; Contemporary Mainstream Approaches—Institutionalist and Critical IPE. **Module II: International Economic Institutions and Problems:** World Trade Organization (WTO); Multilateral Economic Institutions, DevelopmentFinance Agencies. **Module III: Political Economy of Regionalism:** EU; North American Free Trade Area (NAFTA), Asia Pacific Economic Community (APEC), TPP, RCEP, Towards Global Integration?	10 Hours 10 Hours 10 Hours 10 Hours

	Module IV: Non-State Actors in International Political Economy: Transnational Corporations (TNCs); Non-Governmental Organizations (NGOs)—Nationaland International; Protest Movements. **Module V: Transnational Issues:** Migration; Sustainability and Climate Change; Human Rights, Poverty, Demographics,Food Security, Global Financial Crises, Energy Security.	10 Hours

	Module VI: Critical Perspectives on Contemporary IPE: New Social Movements, Protests, Feminist Critique of IPE.	10 Hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study/Discussions/Audio-Visuals	
References/Readings	1. N.B. Adams. 1993. *Worlds Apart: The North-South Divide and the International System*. London: Zed. 2. D. Baldwin. Ed. 1993. *Neorealism and Neoliberalism: The Contemporary Debate.* New York: Columbia University Press. 3. D. Barker and J. Mander. 1996. *Invisible Government: The World Trade Organisation: Global Government for the Millennium*. San Francisco, CA: International Forum on Globalisation. 4. R. Boyer and D. Drache. Eds. 1996. *States Against Markets: The Limits of Globalisation*. New York: Routledge. 5. J. Cavahagh et al. Eds. 1994. *Beyond Bretton Woods: Alternatives to the Global Economic Order*. London: Pluto Press. 6. R. W. Cox. Ed. 1997. *The New Realism: Perspectives on Multilateralism and WorldOrder*. New York: St. Martins. 7. Jeffrey Frieden, David Lake and J. Lawrence Broz. 2017. *International Political Economy: Perspectives on Global Power and Wealth*. New York: W.W. Norton & Co. 8. Tanja Borzel, Lukas Goltermann and Kei Striebinger. 2016. *Roads to Regionalism: Genesis, Design, and Effects of Regional Organizations*. London: Routledge. 9. Henry Veltmeyer. 2016. *New Perspectives on Globalization and Antiglobalization: Prospects for a New World Order?*. London: Routledge. 10. Li Xing. 2014. *The BRICS and Beyond: The International Political Economy of the Emergence of a New World Order*. London: Routledge. 11. Timothy Shaw and Emmanuel Fanta. 2013. Eds. *Comparative Regionalisms for Development in the 21st Century: Insights from the Global South*. London: Routledge. 12. Mitchell Seligson and John T. Passe-Smith. 2013. Eds. *Development and Underdevelopment: The Political Economy of Global Inequality.* Boulder: Lynne	

	Rienner Publishers. 13. Sandra Halperin. 2013. *Re-envisioning Global Development: A Horizontal Perspective*. London: Routledge. 14. Thorsten Olesen, Helge Pharo and Kristian Paaskesen. 2013. *Saints and Sinners: Official Development Aid and its Dynamics in Historical and Comparative Perspective*. Bergen, Norway: Fagbokforlaget Publishers. 15. Ralph Pettman. 2012. *Handbook on International Political Economy*. Singapore: World Scientific Publishing Co. 16. John Ravenhill. 2011. *Global Political Economy*. Oxford: Oxford UniversityPress.	
Learning Outcomes	Students should be able to understand the correlation between issues of politics (power) and economics (resources) as they shape the conduct of international relations.	

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Programme: MA International Studies
Course Code: ISSCC 105 **Title of the Course:** International Law
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Open to all Master's students of Goa University.	
Objective:	The Course is designed to give the students of International Studies, a foundational comprehension of the rudiments of International Law. Emphasis is on enabling students to understand concepts such as State, Sovereignty and Statehood, State Responsibility and Liability, etc., as also to help them get a grasp of the myriad Global Treaty Regimesin vogue, managing the harness of the Commons and regulating State behavior and inter-state transactions.	
Content:	**Module I: General Principles of International Law:** Sources of International Law; States as Subjects of International Law; Statehood; Formsof States; State Recognition; State Succession; State Responsibility, State Liability. **Module II: International Law and the Laws of Peace and Armed Conflict:** Prohibition of Force in International Relations & Peaceful Settlement of InternationalDisputes; Laws of War (Commencement & Termination of Hostilities); International Humanitarian Law & Criminal Tribunals; Legal Regime on Counter-Terrorism. **Module III: International Economic and Trade Laws:** New International Economic Order and Charter of Rights and Duties of States; Law of Sovereignty over Natural Resources vis-à-vis the Right to Development; Legal Regime onIPR; Origin and History of GATT; MFN Clause, National Treatment Clause, Codes on Anti-Dumping and Subsidies; WTO's Dispute Settlement Mechanism.	10 Hours 10 Hours 10 Hours 10 Hours

	Module IV: International Environmental Law: Overview of Environmental Problems and Efforts to meet the Challenge; Lawmaking and Institution Building Processes; 1972 Stockholm Conference, 1987 Brundtland	
	Commission Report, 1992 UN Conference on Environment and Development; Emergence of International Environmental Law; International Environmental Agencies including UNEP, Commission on Sustainable Development, Select Multilateral Environmental Agreements, Polar Regions. **Module V: International Maritime, Nuclear, Space and Cyber Law:** Legal Regime on Maritime Nuclear Weapons – PTBT, NPT & CTBT; The Laws of Outer Space (Moon Treaty, Geostationary) Cross-cutting issues in Treaty-Regimes (Equity,Liability, Access, Treaties, Community, Reforms). **Module VI: International Diplomatic Law:** 1961 Vienna Convention on Diplomatic Relations; 1946 Convention on the Privileges & Immunities of the UN; Treaties and Treaty-making; Types of Treaties, Validity and Termination of Treaties; Political Asylum; Diplomatic Asylum; Laws relating to Extradition).	10 Hours 10 Hours
Pedagogy:	Lectures/Tutorials/Assignments/Self-Study/Discussions/Audio-Visuals	
References/ Readings	1. Christine Gray. 2018. *International Law and the Use of Force: Foundations ofPublicInternational Law.* Oxford: Oxford University Press. 2. J.G Starke. 1977. *An Introduction to International* Law. Waltham, MA: Butterworth-Heinemann. 3. Malcolm Shaw. 2017. *International Law*. Cambridge: Cambridge University Press. 4. Paul Behrens. 2017. *Diplomatic Law in a New Millennium*. Oxford: Oxford University Press. 5. Laurie Blank and Gregory Noone. 2016. *International Law and Armed Conflict: Fundamental Principles and Contemporary Challenges in the Law of War.* Alphen aan den Rijn, Netherlands: Wolters Kluwer Publishers. *6.* Gary Solis. 2016. *Law of Armed Conflict: International Humanitarian Law in War.* Cambridge: Cambridge University Press. 7. Donald Rothwell and Tim Stephens. 2016. *The International Law of the Sea*.Cumnor, Oxford: Hart Publishing, 2016. 8. Shawkat Alam, Sumudu Atapattu and Carmen Gonzalez. 2016. *International Environmental Law and the Global South.* Cambridge: Cambridge University Press. 9. Matthias Herdegen. 2016. *Principles of International Economic Law.* Oxford: Oxford	

	University Press. 10. Erik J. Molenaar. 2013. *The Law of the Sea and Polar Regions: Interactions BetweenGlobal and Regional Regimes*. Leiden, Netherlands: Martinus Nijhoff. 11. Ian Brownlie. 2003. *Principles of Public International Law*. Oxford: OxfordUniversity Press. 12. Martin Dixon. 2007. *Textbook on International Law*. Oxford: OUP.	
Learning Outcomes	Introduced to International Law and understand the importance and linkages betweenInternational Law and International Relations.	

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Programme: MA International Studies
Course Code: ISSCC 106
Title of the Course: International and Regional Institutions in Global Governance
Number of Credits: 04
Effective from AY: 2022-2023

Prerequisites for the Course:	Open to all Master's students at Goa University	
Objective:	The Course beholds the following objectives: 4. Aims to acquaint students with a rudimentary conceptual understanding of the various forms of sovereign inter-state and myriad other organisations that punctuate the landscape of global politics and conditioning the terrain of global and regional governance. 5. Disseminating knowledge and information coalesced around how the mutating forms of organisations are addressing themselves to geopolitical geo-economic and geo-strategic portfolios of decision-making and policy. 6. Endeavouring to elucidate the principles and basis upon which sovereign collectivisation of functional kinds, is increasingly taking shape, consequently redefining regional and global approaches to international issues.	
Content:	**Module I: Introduction to International Organizations:** Conceptual-Construct; Typology; Historicity; Role and Significance in Evolving World Politics.	06 hours 12 hours
	Module II: The UN System and Changing Global Politics: Structure and Functions of UN Organs; Specialised Agencies and Global Commons, UN's Role Regional and Global Peace and Security, UN Peace Operations; Cooperation Framework with Regional Security Organisations.	12 hours
	Module III: Regionalism, Institutions & Global Governance: Politico-Diplomatic, Economic and Security based Regionalism; Regional Economic Communities (RECs) and Regional Security Organizations (RSOs) – Select Cases.	12 hours

	Module IV: Institutional 'Geo-Economic' Governance: Bretton Woods Regime (IMF & World Bank); Rules Based Mercantilism (GATT, WTO); Development Financing (ADB, NDB, AIIB, ADB-Africa, etc.); Structured Regional Economic Cooperation (REC) Initiatives. **Module V: 'Regionalism' Anew:** Functional Collectivisation (Multi-lateralism, Mini-lateralism, Pluri-lateralism); Re-imagined Geopolitics (BIMSTEC, EAS, SCO); Regional Trade & Investment Arrangements (USMCTA, RCEP, CPTPP, AfCFTA); Development Diplomacy. **Module VI: International and Regional Approaches to Governances Challenges:** Counter-Terrorism; Humanitarianism; Sustainable Development; Climate Change and the Environment; Maritime Security; Global Organizations (UN, IMF) Reforms; Rules and Norms for Global Commons Management; Civil Society and Institutional Governance.	12 hours 06 hours
Pedagogy:	Class Lectures, Written/Oral Assignments, A-V Presentations	
References/ Readings	**Basic Readings** 1. K. Martens. et.al. Eds. 2021. *International Organisations in Global Social Governance*. London: Palgrave Macmillan. 2. S. Park. 2018. *International Organisations and Global Problems: Theories and Explanations*. Cambridge: Cambridge University Press. 3. M. Karns et.al. Eds. 2016. *International Organisations: The Politics and Processes of Global Governance*. VIVA Books Pvt. Ltd. 4. P. Weller et.al. Eds. 2015. *The Politics of International Organisations*. London: Taylor and Francis. 5. I. Hurd. 2010. *International Organisations: Politics, Law, Practice*. Cambridge: Cambridge University Press. **Additional Readings** 1. J. Tallberg, et.al. 2014. "Explaining the Transnational Design of International Organisations". *International Organization*. 68(4): 741-774. 2. J. MacArthur, and E. Werker. 2016. "Developing Countries and International Organizations". *Review of International Organisations*. 11: 155-169. 3. F. Chidozie and A. Oluwatobi. 2017. "International Organisations and Global Governance Agendas: SDGs as a Paragon". *AUDRI*. 10(1): 43-60. 4. O. Anastassa et.al. 2019. *Authoritarian Regionalism in the World of International Organisations*. Oxford: Oxford University Press.	

	5. 'The Contribution of International Organisations to a Rule-Based International System". *OECD Report*, April 2019.	
Learning Outcomes	Upon completion of instruction and pedagogy, the Course will render students, the following takeaways: 3. Shall enable stakeholders to comprehend the latest thought-process discourse, in terms of theory and praxis, on the emergence and establishment of International and Regional Organizations, in a manner that helps internalise the conceptual phenomenon, as cross-cutting impinge on policy axes. 4. Shall expose the student genre to the newer typologies and trajectories of Regionalism, shaping new age regional institutions and their impact on complex issues of governance. 5. Will facilitate a dynamic understanding of the evolving contemporary role of the UN and its agencies in crafting the emergent global institutional architecture and strategic order. 6. Will showcase the logic and imperative of functional collectivisation in navigating fault-lines and steering inter-sovereign cooperation, towards finding representative solutions to regional and global issues.	

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Programme: MA International Studies
Course Code: ISSCC 107 **Title of the Course:** India's Foreign Policy
Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites for the course:	Open to all Master's students of Goa University.	
Objective:	The course seeks to acquaint students with the historical evolution of India's foreign policy since independence, both in terms of the conceptual underpinnings and philosophical moorings on the one hand, as also the vent of diplomatic practice, on the other. The object of the Course is to introduce students to the traditions in Indian Foreign Policy, which have defined the nation's strategic approaches to myriad themes and shaped and conditioned its perspectives, in terms of national interest, referenced to the extant. Emphasis would be on comprehending the changing contours of Indian Foreign Policy through the 21st century, amidst the broader pattern of continuity that underpins it, spanning Non Alignment 2.0	

	to the incorporation of the whole gamut of Maritime Affairs, in the nation's strategic calculus. Particular emphasis would be laid on the foundation aspects of foreign policy as also shedding light on the mechanics and dynamics of foreign policy making and implementation. Emerging aspects embodying India's interface with global and regional players and multilateral organizations and forums shall also be dealt with.	
Content:	**Module I. Making of India's Foreign Policy:** Historical Overview; Conceptual Underpinnings (Principles, Philosophical Traditions, Determinants – Domestic and International); Dynamics-Mechanics (Structure, Institutions, Processes); External Change-Agents (Role of Think Tanks, Public Diplomacy). **Module II. National Security and Strategic Autonomy in India's Foreign Policy:** Genesis, Doctrines, Trends and Patterns, Changing Dimensions, in Indian Security Framework (External/Internal, Continental vis-à-vis Nautical) and Nuclear Construct (PNE to Minimum Nuclear Deterrent).	10 Hours 10 Hours
	Module III. India's Interface with its Neighbours: Neighbourhood-First Doctrine (Blending Balanced Strategic Engagement of Geographical Neighbourhood (South Asian littorals), Geopolitical and Civilizational Neighbourhood (Continental South East Asia); Disaggregated Relationships in Himalayan South-Asia (Bhutan and Nepal), Maritime South-Asia (Sri Lanka and Maldives), Peninsular South-Asia (Bangladesh), Beachhead South Asia (Afghanistan and Myanmar). **Module IV. India's Relations with Strategic Regions and Regional and Global Powers:**Strategic Regional Engagements in South East Asia (Look East to Act-East); Persian Gulfand West Asia (Link-West); Europe (Think-West); India-Africa Summit and India-LAC Relations (Renew South-South) **Module V. Economic Diplomacy and National Development Impulses in India'sRegional and Global Engagements:** Strategic Partnerships with Global Powers (United States, China; Japan, France, Germany, Russian Federation, Israel); Interaction with Global and Regional Institutions and Groupings (UN, G20, BRICS, EAS, BIMSTEC, IORA) **Module VI. Continuity and Change in 21st Century Indian Foreign Policy and Diplomacy:** Non-Alignment to Multi-Alignment (Balance-of-Power to Power-of-Balance), Counter- Terrorism, Energy Security and Independence, Diaspora; Strategic Maritime and other Geographies (SAGAR in the IOR to QUAD in the Indo-Pacific); Strategic Infrastructure Development (AIIB, NDB, ADB, AAGC); Global and Regional Trade and Economic Communities (WTO to RCEP).	10 Hours 10 Hours 10 Hours 10 Hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study/Discussions/Audio-	

	Visual	
References/Readings	1. Aparna Pande. 2017. *From Chanakya to Modi: The Evolution of India's Foreign Policy*. New York: HarperCollins. 2. Shyam Saran. 2017. *How India Sees the World: From Kautilya to the 21st* Century. New Delhi. Juggernaut Publishers. 3. Yogendra Kumar. 2017. Ed. *Whither an Indian Ocean Maritime Order': Contributions to a Seminar on Narendra Modi's SAGAR* Speech. New Delhi: KW Publishers.	
	4. Shiv Shankar Menon. 2016. *Choices: Inside the Making of India's Foreign Policy*.New Delhi: Penguin Random House. 5. Gurmeet Kanwal. 2016. *The New Arthashastra: A Security Strategy for* India.New York: HarperCollins. 6. Yogendra Kumar. 2015. *Diplomatic Dimensions of Maritime Challenges forIndiain the 21st* Century. New Delhi: Pentagon Press. 7. Rajiv Sikri. 2013. *Challenge and Strategy: Rethinking India's Foreign* Policy.New Delhi: Sage India Publishers. 8. Kanti Bajpai and Harsh Pant. 2013. Ed. *India's Foreign Policy: A Reader*. Oxford:Oxford University Press. 9. Sumit Ganguly. 2011. *India's Foreign Policy: Retrospect and Prospect*. Oxford:Oxford University Press. 10. Anjali Ghosh, Tridib Chakrobroti, Anindyo Jyoti Majumdar and Shibashis Chatterjee. 2009. Eds. *India's Foreign Policy*. New Delhi: Pearson Publishers. 11. V.D. Chopra. 2006. Ed. *India's Foreign Policy in the 21st* Century. New Delhi:Kalpaz Publications. 12. C. Raja Mohan. 2005. *Crossing the Rubicon: The Shaping of India's NewForeign Policy*. New Delhi: Penguin Books. 13. J. Bandyopadhyaya. 1970. *The Making of India's Foreign Policy: Determinants, Institutions, Processes, and Personalities*. Bombay: Allied Publishers.	
Learning Outcomes	A comprehensive understanding of India's Foreign Policy and its predicaments.	

Programme: MA International Studies
Course Code: ISSCC 108 **Title of the Course:**
US Foreign Policy in Perspective
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Open to all Master's students of Goa University.	

Objective:	Notwithstanding the diffusion of power since the end of the Cold War, the United States and its role in shaping the 21st century global order, continues to assume significance.The course aims to acquaint and familiarize with the nature and scope of US Foreign Policy, in its evolutionary trajectory. It intends to introduce students to the changing contours of a dynamic external-policy framework, vis-à-vis different regions of the globe, not to mention its policy-response to mutating thematic challenges manifesting themselves on the horizon and delineate the undercurrents, which underpin the American policy in the global realm, highlighting the forces, institutions and actors.	
Content:	**Module I. Introduction to US Foreign Policy:** Conceptual and Historical Evolution, Unfolding Diplomatic Traditions, Fundamental Principles and Philosophical Moorings Shaping Foreign Policy Orientation (Isolationism vis-a-vis Internationalism), Dynamics of American Economic Development (Mercantilism to Capitalism), Constitutional Scheme (Congress, Presidency, Judiciary, Federal Arrangement). **Module II. Mechanics of US Foreign-Policy Making and National-Security Strategizing:** Determinants, Foreign Policy Apparatus and National Security Establishment (State Department, Defense Department, NSC, Internal and External Pressure Groups, Cross- cutting Influences). **Module III. US Strategic Involvement around the Globe:** Asia-Pacific (Cold War Alliances to Pivot-to-Asia) Middle East & West Asia (Dual	10 Hours 10 Hours 10 Hours
	Containment, Energy, Israel); AF-PAK (Radicalization to Counter-Terrorism). **Module IV. US Engagement with Major and Regional Powers:** Asia-Pacific (China, Japan, South Korea); South Asia (India, Pakistan, Afghanistan),Eurasia (Russian Federation); Middle East & West Asia (Israel, Saudi Arabia, Iran, Egypt). **Module V. United States and International Institutions:** United Nations, NATO, Regional Groupings (OAS, GCC, APEC, ASEAN-ARF, EAS, AU); G7, G20, IMF/World Bank. **Module VI. US Strategic Approaches and Responses to Global Challenges:** International Terrorism, Nuclear Non-Proliferation, Energy Security, Humanitarian Crises, Democratization, Maritime Security in the Indo-Pacific, Restructuring and Reforming of the Global Institutional Architecture, Arab-Israeli Conflict, Korean Peninsula Crisis.	10 Hours 10 Hours 10 Hours
Pedagogy:	Only open to those pursuing as Masters in International Studies.	

References/Readings	1. Andrew Bacevich. 2018. *Ideas and American Foreign Policy: A* Reader. Oxford:Oxford University Press. 2. Richard Haas. 2017. *A World in Disarray: American Foreign Policy and theCrisis of the Old Order*. New York: Penguin Books. 3. William Tow and Douglas Stuart. 2017. *The New US Strategy Towards Asia: Adapting to the American Pivot. London:* Routledge. 4. Melvyn P. Leffler. 2017. *Safeguarding Democratic Capitalism: US Foreign Policyand National Security (1990-2015)*. Princeton: Princeton University Press. 5. Victor D. Cha. 2016. *Power-Play: The Origins of the American Alliance System in* Asia. Princeton: Princeton University Press. 6. John Ikenberry. 2012. *Liberal Leviathan: The Origins, Crisis, and Transformation of the American World Order*. Princeton: Princeton University Press. 7. Bruce Jentleson. 2013. *American Foreign Policy: The Dynamics of Choice in the 21st Century*. New York: W.W. Norton & Co. 8. Kelechi Kalu and and George Kieh. 2013. Eds. *United States-Africa Security Relations: Terrorism, Regional Security and National* Interests. London:	
	Routledge. 9. Zbiegniew Brzezinski. 2013. Strategic Vision: America and the Crisis of Global Power. New York: Perseus Books Group. 10. Ole Holsti. 2006. *Making American Foreign Policy*. London: Routledge. 11. Robert J. Pauly Jr. 2005. *U.S. Foreign Policy and the Persian Gulf: Safeguarding American Interest through Selective Multilateralism.* Aldershot: Ashgate Publishing House.	
Learning Outcomes	A clear and comprehensive understanding of the role played by the United States inworld affairs.	

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Annexure II

Programme: MA International Studies
Course Code: ISSOC 101 **Title of the Course:** Geopolitics: Theory and Practice
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Open to all students of Goa University who are interested in learning about the significance of geopolitics in International Relations as an optional course.	
Objective:	This optional course is aimed at making students understand that there is a complex history and geography – both given and written- to the term Geopolitics'. The term wascoined at very end of the 19th century at the service of new forms of nationalism, colonialproject and inter-imperialist rivalry in the Europe and the World. With the complex interplay between space and power at its conceptual core, geopolitics has most often been associated with a realist and state-centric approach to international relations. But recent decades have witness the raise of a critical geopolitics that focuses on a far wider range of social actors, experiences (including non-Western) and practices. This course provides a concise survey of classical geopolitics from a critical geopolitical perspective. It draws attention to politics behind the production of geopolitical knowledge (in plural)of international relations. Illustration/cases used in this course are drawn largely from both continental and maritime Asia and the Indian Ocean Region.	
Content:	**Module I: Conceptualizing Geopolitics**: Critical Perspectives on Space–Place, Scale and Knowledge- Power. Origins, Evaluation and Legacies of Western Geopolitical Tradition: (Rudolf Kjellen)(Organic Theory of State), Friedrich Ratzel (Lebensraum), Karl Haushofer (German School of Geopolitics), Halford J. Mackinder (Heartland), Alfred Thayer Mahan (Sea Power), Nicholas J. Spykman (Rimland). **Module II: Cold War Geopolitics**: Eurocentric Visualizations of the Globe (Worlds & Blocks); Post Cold War Geopolitics and Maritime Order (Indian Ocean Region and _Indo- Pacific'). **Module III: Critical Geopolitics**: Climatic Change (Perspectives on and from Global South); Geopolitics and Geoeconomics of	10 Hours 10 Hours 10 Hours

	Connectivity in Asia and Beyond (Silk Routes: Old and New; One Belt One Road). **Module IV: Contours of Geopolitical Visions in the Contemporary World:** End of Cold War; The New Militarism, Rise of Multipoliarity in the Geopolitical Context; A Different Kind of Geopolitics? New Tensions in Geopolitical and Geostrategic Context. **Module V: Anti-geopolitics**: New Forms of Resistance, Gender and Geopolitics **Module VI: Emerging Geopolitics in the 21st Century:** Popular Geopolitics in the Era of Globalisation:US Grand Strategy: An American Empire?; The End of Eurocentrism?; Role of India in the Emerging World.	10 Hours 10 Hours 10 Hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study/Discussions/Audio-Visual	
References/Readings	1. J. Agnew. 1998. *Geopolitics: Revisioning World Politics*. London and New York: Routledge. 2. J. A. Hobson. 2015. *The Eurocentric Conception of World Politics, Western International Theory, 1761-2010*. Cambridge: Cambridge University Press. 3. G.O. Tuathail. 1996. *Critical Geopolitics: The Politics of Writing Global Space*.London and New York: Routledge. 4. Colin Flint. 2006. *Introduction to Geopolitics*. London: Routledge. 5. G.O. Tuathail, S. Dalby, and P. Routledge. 2006. (Ed.) *The Geopolitics Reader*.London and New York: Routledge. 6. Chaturvedi, S. and Doyle, T. 2015. *Climate Terror: A Critical Geopolitics of Climate Change*. London: Palgrave Macmillan. 7. R.D. Blackwill, and J. M. Harris. 2016. *War by Other Means: Geo-economics and Statecraft*. Cambridge: Harvard University Press. 8. Jean-Marc F. Blanchard and C. Flint. 2017. —The Geopolitics of China's MaritimeSilk Road Initiative‖ . *Geopolitics*. 22(2): 223-245. 9. Y. Kumar. 2017. Ed. *Whither Indian Ocean Maritime Order? Contributions tothe Seminar on Narendra Modi's Sagar Speech*. New Delhi: KWPublishers. 10. P. Routledge. 2003. —Anti-Geopolitics‖ in J. Agnew, K. Mitchell and G. Tuathail(eds.). *A Companion to Political Geography.* Oxford: Blackwell. (Chapter16) 11. L. Dowle and J. Sharo. 2001. —A Feminist Geopolitics?‖ . *Space & Polity*. 5(3): 165-176.	

Learning Outcomes	To understand the importance of geopolitical thinking on International Relations.	

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Programme: MA International Studies

Course Code: ISSOC 102 **Title of the Course:** Central Asian Politics and Society in World Affairs

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Open to all students of Goa University who are interested in learning about the significance of the Central Asian region in International Relations as an optional course.	
Objective:	The Course shall endeavour to introduce students, to a well-rounded and integrated understanding, of the geographical, geopolitical and geostrategic rudiments, of the Central Asian region, both in terms of its distinctness as also in terms of it being a regional subset within broader Asia, of critical import. The focus of the Course shall be toenable students to get a grasp of the issues, narratives, and aspects conditioning Central Asian politics, societal evolution, foreign policy and diplomatic orientation and impulses and imperatives, underpinning their National Security.	
Content:	**Module I: Mapping Central Asian Diversity:** Geographical Mapping, Survey of Historical Antecedence, Geopolitical Facets, Geo- Economic Realities, Geo-Strategic Import. **Module II: Politics, Economics and Society of 'CARs':** Political Structures, Economic Systems, Societal Profile, Politico-Economic and Socio- Economic Developments, Ethno-Cultural Narratives and Trajectory. **Module III: Foreign Policy and National Security of 'CARs':** Strategic Backdrop and Contemporary Context; Structure and Changes in Foreign Policy and Diplomatic Orientation; Dynamic Imperatives & Impulses conditioning National Security & Development. **Module IV: 'CARs' Engagements with Major, Rising and Regional Powers:**	10 Hours 10 Hours 10 Hours 10 Hours

	Russia; China; India; US; Iran; Pakistan; Turkey. **Module V: Central Asia Connected:** Eurasian Economic Union (EAEU); Shanghai Cooperation Organisation (SCO); Belt and Road Initiative (BRI); International North-South Transport Corridor (INSTC); Turkmenistan-Afghanistan-Pakistan-India (TAPI).	10 Hours

	Module VI: 21st Century Strategic Portfolios in Central Asia: **E**nergy Security & Connectivity; Terrorism & Radicalism; Democratization & Governance; Strategic Infrastructure-Based National Economic Development; State Capacity for Crime & Security Management; Intra-Region Integration; Contending Major-Power, Great-Game Politics.	10 Hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study/Discussions/Audio-Visual	
References/Readings	1. Roman Muzalevsky. 2016. *Unlocking India's Strategic Potential in Central Asia.* Carlisle, PA: SSI US Army War College. 2. Nasir Raza Khan. 2016. Ed. *India and Central Asia: Geopolitics, Economy andCulture*. Delhi*:* Primus Books. 3. Christoph Bluth. 2014. *US Foreign Policy in the Caucasus and CentralAsia:Politics, Energy and Security.* London: Macmillan*,* I.B. Tauris. 4. Stephen Blank. 2013. *Energy, Economics and Security in Central Asia: Russiaand Its Rivals*. Carlisle, PA: SSI, US Army War College. 5. Alexey Malashenko. 2013. *The Fight for Influence: Russia in Central Asia*. Washington, D.C.: Brookings Press. 6. S. Cummings. 2012. *Understanding Central Asia: Politics and Contested Transformations*. London: Routledge. 7. A. Cooley. 2012. *Great Games, Local Rules: The New Great Power Contest inCentral Asia*. Oxford: Oxford University Press. 8. Hasan Haider Karrar. 2012. *New Silk Road Diplomacy: China's Central AsianForeign Policy Since the Cold War*. Vancouver: UBC Press. 9. O. Roy. 2007. *The New Central Asia: Geopolitics and the Birth of Nations*.London: Macmillan and I.B. Tauris. 10. Elizabeth Van Davis. 2006. *Islam, Oil and Geopolitics: Central Asia after*	

	September 11. Lenham, Maryland: Rowman and Littlefield.	
Learning Outcomes	A holistic understanding of the geographical, geopolitical and geostrategic rudiments ofthe Central Asian region.	

Programme: MA International Studies
Course Code: ISSOC 103 **Title of the Course:** Israeli Polity, Economy, Society and Foreign Policy

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Open to all students of Goa University who are interested in learning about the importance ofIsrael in contemporary international affairs as an optional course.	
Objective:	The course shall endeavour to introduce students to the basics of the State of Israel, in terms ofits Jewish historical background, its historical antecedence and evolution through the annals, the contours of its economy as it has unfolded through time, its societal evolution and metamorphosis and challenges within, its foreign policy orientations, diplomatic postures, and national security imperatives, as also an in-depth interrogation of the principal issues of conflict and contention, conditioning Israel's engagement with competing regional powers and emergent and rising global powers.	
Content:	**Module I: Introduction:** Origins of Zionism; Trends in Zionist Movement; the Holocaust; Jewish Nation-Building (from Mandate to Statehood); Post-Independence Historical Antecedence. **Module II: Israel's Polity and Politics:** Political Structure; System; Political Actors; Electoral System and Voting Patterns; Multifarious Process-Interactions, in historicity and evolution; Constitutionalism, Democratization, Representation. **Module III: Israel's Economy:** The State in Israeli Economy; Socialism to Privatization to 21st Century Neoliberal Economic Growth and Development Strategies; Advancements & Innovations in Agriculture, Animal Husbandry, Industrial	10 Hours 10 Hours 10 Hours

	Manufacturing; Role of Technology and the Service Sector in Economic Remodeling; Strategic Economics of Military-Industrial Complex; Role of Hydrocarbons and Renewable Energy. **Module IV: Israeli Society:**	10 Hours
	Jewish Ethnicity and Identity; Religious-Secular Divide; Jewish Nationalism vis-a-vis Multiculturalism and Social Stratification; Conscription and Social Impact; Conflict with and Integration of Arab-Palestinian and Shia Minorities; Demographic Dynamics and Social Consequences, Role of Global Jewish Diaspora. **Module V: Foreign Policy and National Security:** Determinants **o**f Israel's Foreign Policy and National Security; Decision-making and Policymaking Structure; Role of US in Israel's Diplomacy and Security; Relations with EU-3 (UK, France and Germany), Russia; Relationships with Rising Global (China, India) and Competing Regional Powers (Saudi Arabia led GCC, Iran, Turkey). **Module VI: Israel and the West Asian Region:** Israel Palestine Conflict and Arab-Israeli Conflict (Genesis, Historicity, Issues, Future Prospects); Engagements with Regional Sovereigns (Egypt, Jordan, Syria, Lebanon); Regional Issues (Nuclear Non-Proliferation, Terrorism, Hegemony of Non-State Actors) .	10 Hours 10 Hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study/Discussions/Audio-Visual	

	1. Charles Freilich. 2018. *Israeli National Security: A New Strategy for an Era ofChange*. Oxford: OUP. 2. Brent Sasley. 2016. *Politics in Israel: Governing a Complex Society*. Oxford:OUP. 3. Alfred Knopf and Howard Sacha. 2007. *A History of Israel: From the Rise of Zionismto Our Time*. Albany, New York: NYU Press. 4. Asher Arian. 2005. *Politics in Israel: The Second Republic*. Washington, D.C.: CQPress. 5. Robert Freedman. 2009. *Contemporary Israel: Domestic Politics, Foreign Policy,andSecurity Challenges*. Boulder: Westview Press. 6. Avi Sagi and Ohad Anchtomy. 2009. Ed. *The Multicultural Challenge in Israel: Society,Culture, and History.* Brighton, MA: Academic Studies Press. 7. Zeev Maoz. 2006. *Defending the Holy Land: A Critical Analysis of Israeli Foreign andSecurity Policies*. Ann Arbor: University of Michigan Press. 8. George Gilder. 2012. *Why the World's Most Besieged Nation is a Beacon of Hope forthe World Economy*. Washington, D.C.: US Library of Congress. 9. Dan Senor and Saul Singer. 2011. *Start-Up Nation: The Story of Israel's EconomicMiracle*. Washington, D.C.: US Library of Congress.	
Learning Outcomes	A comprehensive understanding of Israel versus the region and the world.	

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Programme: MA International Studies
Course Code: ISSOC 104 **Title of the Course:** Politics, Society and Foreign Policy of Australia
Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites for the course:	This course is open to all students of Goa University who wish to opt for this course as anoptional course.	
Objective:	The major focus of the Course is to give a comprehensive insight into an introductory understanding of Australian nation, as regards its historical evolution, its political processes, its economic trajectory and its societal profile. Notwithstanding, the students would also be exposed to a substantive understanding of how Australia, as an important rising power in the South Pacific subset and the wider Indo-Pacific expanse, relates to the significant strategic developments in the region, through its foreign policy, economic engagements, security orientation and postures alike, as also how Australia leverages various facets of its national development and growing comprehensive national power towards advancing and bettering the cause of global governance.	
Content:	**Module I: Introducing Australia:** Geographical and Geopolitical Scope; Historical Antecedence, Evolution to Contemporary Nationhood; National Identity and Societal Profile (Anglo-Saxon Heritage, Indigenous Peoples', Multiculturalism), Contemporary Quasi-Republicanism to Potential Whole-Republic. **Module II: Australian Polity and Politics**: Constitutional Scheme, Political Structure, Executive Processes, Traditional Two-Party System (Liberals and Labour); Rise of Smaller Parties (Nationals, Greens, One-Nation', Nick Xenophone' Team), Recent Political Developments, Electoral System and Evolving Preferences. **Module III: Australian Foreign Policy and National Security:** Foreign Policymaking Apparatus, Diplomatic Orientation, National Security Establishment,	10 Hours 10 Hours 10 Hours

	History of Foreign Relations, Foreign Policy Frameworks of Coalition and Labour Administrations, Conceptualizing National Interest Anew, Defense White Paper(s). **Module IV: Australian Political Economy:** Basic National and Provincials Economic Profile; Demystifying the Economics of Resources; Foreign Aid to Developmental Diplomacy; Economy and the Environment. **Module V: Australia in the Region and the World:** Australia – US, ANZUS; Australia – China; Australia – India; Australia – Japan; Australia – ASEAN; Australia – South Pacific; Australia at the UN, G20, WTO; Australia in the IOR and the Indo-Pacific. **Module VI: Issues and Trends in Australia:** Immigration and Refugees; Climate Change and Environmental Sustainability; Blue Economy, QUAD and Maritime Strategy, Soft Power Instrumentalities, Economic Regionalism (TPP vis-à-vis RCEP).	10 Hours 10 Hours 10 Hours
Pedagogy:	Lectures/Tutorials/Assignments/Self-Study/Discussions/Audio-Visuals	
References/Readings	1. Gilbert Rozman and Joseph C. Liow. 2018. *International Relations and Asia'sSouthern Tier: ASEAN, Australia and India. London:* Palgrave Macmillan. 2. Allan Gyngell. 2017. *Fear of Abandonment: Australia in the World Since 1942.* LaTrobe University Press. 3. Hans Lofgren and Prakash Sarangi. 2017. Ed. *The Politics and Culture of Globalization: India and Australia.* London: Routledge. 4. Tim Barrett. 2017. *The Navy and the Nation: Australia's Maritime Power in the 21st Century*. Carltonvic: Melbourne University Publishing. 5. George Megalogenis. 2017. *The Australian Moment. New York:* Penguin Publishers. 6. Daniel Baldino. 2014. *Australian Foreign Policy: Controversies and Debates.* Oxford: Oxford University Press. 7. Yi Wang. 2012. *Australia-China Relations Post 1949: Sixty Years of Trade andPolitics*. London: Routledge. 8. Ian Mclean. 2012. *Why Australia Prospered: The Shifting Sources of EconomicGrowth.* Princeton: Princeton University Press. 9. Benjamin Schreer. 2008. *The Howard Legacy: Australian Military Strategy 1996-2007.*	

	Frankfurt, Germany: Peter Lang AG.	
	10. Allan Gyngell and Michael Wesley. 2003. *Making Australian Foreign Policy.Cambridge:* Cambridge University Press, 2003.	
Learning Outcomes	Student should be in a position to have an insight into an introductory understanding of Australian nation, as regards its historical evolution, its political processes, its economic trajectory and its societal profile.	

Programme: MA International Studies
Course Code: ISSOC 105 **Title of the Course**: 'Understanding' China
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Open to all students of Goa University interested in understanding and studying modernday China as an optional course.	
Objective:	The course exposes the students to an introductory yet well-rounded comprehension of the Chinese State and the Chinese Nation, alike. Emphasis would be on acquainting students with the historical sweep of Chinese civilization through its iconic Imperial Dynasties, leading into the Peoples Revolution and ever since. The endeavour would also be to familiarize students with the complexities, intricacies and nuances of Chinese Party-State political structure and linkages to various organs of State Power. Notwithstanding, Chinese foreign policy and national security would also be under the microscope in terms of understanding the conceptual underpinnings and the evolution to contemporary dynamics, undergirded by a historical anchored narrative. Chinese economy, which has become the most emblematic dimension of its National Power and global presence, shall be examined and elucidated, in terms of the industrial and financial heft and pelf being brought to bear on regional and global engagements and re-alignments. The element of Chinese Soft Power, returning back with a proverbial vengeance, in subtle and not so subtle ways, shall also be illuminated as a recurrent feature within this Course.	

Content:	**Module I: Introduction to China:** Geographical Contours, Continental and Maritime Geostrategic Attributes (Geopolitical Facets, Geo-Economic Realities); Historical Antecedence (Brief Overview of Imperial China,Nationalist Revolution, Post Revolution Chinese State, Contemporary Dynamics); Societal Profile (Cultural and Ethnic Dimensions); Ingress into Tibet, Cross-Strait Relations. **Module II: Understanding China's Political Economy:** Political Power Structure (CPC, Linkages with State Council, NPC, CPPCC, CMC-PLA,	10 Hours 10 Hours
	Supreme Peoples' Court; Supreme Peoples' Procuratorate); Mao's ‗Four Olds'; Deng's ‗Four Cardinal Principles'; Jiang's ‗Three Represents'; Hu's ‗Scientific Socialism' and ‗Harmonious Growth'; Xi's ‗Four Comprehensives'; Economic transition from Mao's Centralized Statist Planning to Deng's Socialism with Chinese Characteristics; Four Stages of Chinese Growth Process; Fundamentals of Contemporary Chinese Economy, Twin Centennial Goals. **Module III: Foreign Policy and National Security:** Conceptual Principles, Diplomatic Orientation & Practice; National Security Doctrine; Role of Party, State & Military in Foreign Affairs & National Security; Strategic Dimensions(Economic Diplomacy, Infrastructural Ingress, Resources-based Engagement, Military Modernization & Transformation, Maritime Territorial Disputes and Power Projection- Continental & Transcontinental Maritime Strategy, Dimensions of Strategic Rise of China asRegional Hegemon & Major Global Power). **Module IV: China's Global and Regional Ties:** Relations with the US (Strategic Dichotomy and Concordance towards G2), Japan (Pragmatic Cooperation amidst Historical Animus, Politico-Diplomatic Discord and Military Competition), India (Confrontation, Competition, Cooperation, Collaboration), Russia (Ideological Bonhomie to Estrangement to Reversed Asymmetry and Dependency). **Module V: China's Engagement with Regions and Regional Powers:** ASEAN (Continental and Maritime) East Asia Summit (EAS), South Asia (Himalayan, Peninsular and	10 Hours 10 Hours 10 Hours

	Maritime) and the Indian Ocean Region (IOR), Shanghai Cooperation Organization (SCO) and Central Asia Republics (CARs), African Continent, Latin American Region. **Module VI: Issues and Role in National and Global Governance:** National Plans & Initiatives for Chinese Economic, Industrial, Infrastructural, Urbanizing & New-Age Technological Development; Outbound Infrastructure & Capacity-Building Investment Initiatives (Belt-n-Road); ‗Go-Out' Strategy for Energy Security & Independence (Strategic Footprint across Central Asia, Africa & Latin America) and Revolution in Renewables; New Architecture for Financial Multilateralism and Minilateralism (AIIB, NDB); Chinese Foray into the Arctic.	10 Hours
Pedagogy:	Lectures/Tutorials/Assignments/Self-Study/Discussions/Audio-Visuals	

References/Readings	1. Elizabeth C. Economy. 2018. *'Xi Jinping and the New Chinese State. Oxford:* Oxford University Press. 2. Jagannath Panda. 2018. *India-China Relations: Politics of Resources, Identity andAuthority in a Multipolar World* Order. London: Routledge. 3. B.R. Deepak. 2018. Ed. *China's Global Balancing and the New Silk* Road. New York:Springer. 4. David *Brewster.* 2018. *India and China at Sea: Competition for Naval Dominancein the Indian Ocean*. Oxford: Oxford University Press. 5. Toshi Yoshihara. 2018. *Red Star over the Pacific: China's Rise and the ChallengetoUS Maritime Strategy*. Annapolis, MD: Naval Institute Press, 2018. 6. Lam Peng Er. Ed. 2017. *China-Japan Relations in the 21st Century: AntagonismDespite* Interdependency. London: Palgrave Macmillan. 7. Arthur *Kroeber. 2016. China's Economy: What Everyone Needs to Know*. Oxford:Oxford University Press. 8. Thomas Christensen. 2016. *The China Challenge: Shaping the Choices of a RisingPower*. New York: W.W. Norton & Co. 9. Margaret Myers and Carol Wise. 2016. *The Political Economy of China-Latin America Relations in the New Millennium: Brave New* World. London: Routledge. 10. Hailong Ju. 2015. *China's Maritime Power and Strategy: History, National Securityand* Geopolitics. Singapore: World Scientific Publishing Co. 11. Hong Zhao. 2015. *China and ASEAN: Energy Security, Cooperation and Competition.* Singapore: Iseas-Yousuf Ishak Institute. 12. Thomas Kane. 2014. *Chinese Grand Strategy and Maritime Power*. London: Routledge, 2014. 13. Elizabeth C. Economy. 2014. *By all Means Possible: How China's Resource Quest isChanging the World*. Oxford: Oxford University Press. 14. John Keay. 2011. *China: A History*. New York: Basic Books. 15. John Bryan Starr. 2010. *Understanding China: A Guide to China's Economy,History, and Political Culture*. New York: Hill and Wang.	
Learning Outcomes	The student should have a comprehensive understanding of the role that China plays inregional and international affairs and about is global' aspirations.	

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Programme: MA International Studies
Course Code: ISSOC 106 **Title of the Course:** Russia in World Affairs
Number of Credits: 4

Effective from AY: 2022-23

Prerequisites for the course:	Open to all students of Goa University interested to know about the politics, economics,society and foreign policy of Africa as an optional course.	
Objective:	The course exposes the students to the Russian foreign policy in the contemporary period. Russia's relations across the globe with special emphasis upon the foreign policy doctrineand making vis-à-vis global issues and challenges.	
Content:	**Module I: Introduction to Russia:** Geographical Attributes, Geopolitical Realities, Historical Antecedence (Imperial Czarist Russia, to Formative Years of Communist Soviet Russia, to Cold War Soviet Union, to the Unravelling of the Soviet State, and Vagaries of Post-Soviet Russian Federation). **Module II: Russian Polity and Economy:** Administrative Set-Up; Russian Federalism; Constitutional Framework(s); Political Executive (Presidency and Government), Parliament, Judiciary; Yeltsin and Putin Era, Politics. Russian Economy in Historical Evolution; Contours and Scope, Structural Characteristics, Reform Initiatives and Challenges, Role of Oligarchy, WTO related Issues. **Module III: Russian Foreign Policy and National Security:** Policymaking Apparatus; Diplomatic and National Security Establishment (Institutions, Structure, Processes); Evolving Foreign Policy Strategies and National Security Doctrines (1991-2017); Conceptualizing Constructs of ‗Core Areas', ‗Spheres of Influence' and the ‗Sovereign National Interest'; Coercive Diplomacy; Military Modernization & Transformation. **Module IV: Russia's Global and Regional Engagements:** Relations with the US, PRC, India, Japan, Germany, Iran, DPRK, Turkey, Israel, SaudiArabia, and Egypt.	10 Hours 10 Hours 10 Hours 10 Hours

	Module V: Russian Policy Perceptions and Postures to Global & Regional Issues: NATO Expansion, EU Enlargement; Dynamics in the Near Abroad (Central Asia & SCO), Caucuses, AF-PAK theatre; Russia's Energy Diplomacy & Strategy; Power Projection in WestAsia, the Middle East & North Africa; Aspiring Asia-Pacific Profile; Renewing Africa & LatinAmerica Engagement; Tapping New Frontiers (the Arctic), Approaches and Responses to Global Counter-Terrorism, Nuclear Non-Proliferation. **Module VI: Resurgent Russia's Global Projection in the 21st Century (Putin andBeyond):** Political Consolidation, Stability, but also Dissent; Green-shoots-cum-challenges at Economic Diversification; Demographic Bottlenecks, Growing Science and TechnologicalCapacities, Disruptive Capabilities through Information Warfare, Whither Russia as a Regional Hegemon, Major Global Power?	10 Hours 10 Hours
Pedagogy:	Lectures/Tutorials/Assignments/Self-Study/Discussions/Audio-Visuals	
References/Readings	1. Abraham Ascher. 2107. *Russia: A Short History*. London: One World Publications. 2. Daniel Treisman. 2018. Ed. *The New Autocracy: Information, Politics and Policy inPutin's Russia.* Washington, D.C.: Brookings Institution Press. 3. J. Paul Goode. 2018. *The Decline of Regionalism in Putin's Russia: Boundary Issues*.London: Routledge. 4. 2018. *Putinomics: Power and Money in Resurgent Russia*. Chappell Hill, NorthCarolina: University of North Carolina Press. 5. Bobo Lu. 2015. *Russia and the New World Disorder*. Washington, D.C.: BrookingsInstitution Press. 6. Vladimir Mau. 2017. *Russia's Economy in an Epoch of Turbulence: CrisesandLessons*. London: Routledge. 7. Nat Mosser. 2017. *Oil and the Economy of Russia: From the Late-Tsarist to the PostSoviet Period*. London: Routledge. 8. Marcin Kaczmarski. 2016. *Russia-China Relations in the Post-Crisis InternationalOrder*. London: Routledge. 9. Clifford Gaddy and Barry Aickes. 2013. *Bear Traps on Russia's Road to Modernization*.London: Routledge.	

	10. Edith Clowes. 2011. *Russia on the Edge: Imagined Geographies and Post-Soviet*	

	Identity. Ithaca, New York: Cornell University Press.	
Learning Outcomes	Students will learn the workings of the government, various institutions and other entitiesand the role played by Russia in the region and global affairs.	

Programme: MA International Studies
Course Code: ISSOC 107 **Title of the Course:** India's Maritime Security and Strategy
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Open to all students of Goa University who are interested in learning about the strategic significance of the Indian Ocean and India's Maritime Policy as an optional course.	
Objective:	The course shall endeavour to introduce students, to a well-rounded and integrated understanding, of the rudiments of Global Strategic Maritime Affairs, in terms of the prevailing, unfolding and prospective concepts and phenomena, from the comparative contrasting strands, of the normative and doctrinal realm of ideas and the ever dynamic domain of policy formulation and operative praxis. The focus of the Course shall be to enable students to get a grasp of the issues, narratives, and aspects conditioning India's Maritime Security and Strategy, as also to understand India's interaction with its immediate Maritime Neighbourhood, its Near-Abroad and the wider perceived and legitimized sphere of influence, contextualized to its political and diplomatic aspirations and economic and societal requirements**.**	

Content:	**Module I: Introduction:** Conceptual Framework of Maritime Frontiers; Maritime Security; Maritime Economy;Maritime Ecology; Maritime Connectivity; Maritime Strategy. **Module II: Dynamics and Mechanics of India's Strategic Maritime Environment:** From Indian Ocean 'Region to Indo-Pacific'; Strategic Issues, Approaches, Outcomes. **Module III: Understanding India's Maritime Sphere of Influence:** India's Naval Doctrine and Maritime Strategy; India's Naval Footprint; Role of Majorand Rising Powers (US, China, Japan). **Module IV**: **Strategic Architecture and Compact-Initiatives in India's Maritime Calculus and Worldview:** IORA, IONS, MSR vis-a-vis SAGAR, AAGC, QUAD.	10 Hours 10 Hours 10 Hours 10 Hours
	Module V: Traditional and Non-Traditional Maritime Threats: Territorial Disputes; Freedom of Navigation and Security of SLOCs; Piracy, Terrorism &Trafficking; Environmental Degradation; Initiatives for Cooperation. **Module VI: 21st Century Maritime Order:** Maritime Infrastructure, Resource-Economy (Marine Resource), Maritime Technologies,Maritime Diplomacy, Maritime Frontier Exploration, Maritime Community Construct.	10 Hours 10 Hours
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study/Discussions/Audio-Visual	

References/Readings	1. Jivanta Schottli, 2018. *Maritime Governance and South Asia: Trade, Security and Sustainable Development in the Indian Ocean*. Singapore: World Scientific Publishing Co. 2. Lee Cordner. 2017. Ed. *Maritime Risks, Vulnerabilities and Cooperation: Uncertainty in the Indian Ocean.* London: Palgrave Macmillan. 3. P.K. Roy and Aspi Cawasji. 2017. *'Strategic Vision 2030: Security and Development of the Andaman and Nicobar Islands*. New Delhi: Vij Books. 4. Dennis Rumley and Sanjay Chaturvedi. 2016. Eds. *Geopolitical Orientations, Regionalism and Security in the Indian Ocean*. London: Routledge. 5. Daniel Moran and James Russell. 2016. Eds. *Maritime Strategy and the Global Order: Markets, Resources and Security*. Washington, D.C.: Georgetown University Press. 6. Vijay Sakhuja and Kapil Narula. 2017. Eds. *Maritime Safety and Security in the Indian Ocean.* New Delhi: Vij Books. 7. Harsh Pant. 2016. Ed. *The Rise of the Indian Navy: Internal Vulnerabilities, External Challenges*. London: Corbett Centre for Maritime Policy Studies Series. Routledge. 8. Bimal Patel, Arun Kumar Malik and William Nunes. 2016. Eds. Indian Ocean and Maritime Security: Competition, Cooperation and Threat. London: Routledge, 9. Mohan Malik. 2014. Ed. *Maritime Security in the Indo-Pacific: Perspectives from China, India and the United States*. Lehman, Maryland: Rowman and Littlefield Publishers. 10. K. Suresh. 2014. Maritime Security of India: The Coastal Security Challenges and	

	Policy Options. New Delhi: Vij Books. 11. Joshua Ho and Sam Bateman. 2014. *Maritime Challenges and Priorities in Asia: Implications for Regional Security*. London: Routledge. 12. K.S. Pavithran. 2013. *Foreign Policy and Maritime Security of India*. New Delhi: New Century Publications. 13. John Garofano and Andrea Dew. 2013. *Deep Currents and Rising Tides: The Indian Ocean and International Security*. Washington, D.C.: Georgetown University Press. 14. Swati Parashar. 2007. Ed. *Maritime Counter-Terrorism: A Pan-Asian Perspective*. London: Pearson Publishers.	
Learning Outcomes	A comprehensive understanding of the importance of the Indian Ocean and maritimepolicy and strategy.	

Programme: MA International Studies
Course Code: ISSOC 108 **Title of the Course:** Society, Politics and Foreign Policy of Brazil
Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Course is open to all students of Goa University who are interested in learning and understanding about the Brazilian society, politics and foreign policy as an optional course.	
Objective:	The major focus of the course is to provide a comprehensive insight into the political,social and foreign policy developments of Brazil with the view to understand the emerging role of Brazil in world Affairs. Also an endeavour will be made to understand the role and position of Brazil in regional and global affairs.	
Content:	**Module I: Brazil Society, Polity and Culture from the Colonial Times to the End ofWWII:** Colonization, Slavery, Race, Empire, Church, Independent Brazil, Republic, Estado Novo, Getulio Vargas. **Module II: Political Structures and Processes:** Institutions, Political Parties, Constitution, Elites versus Masses, Military Rule and Politics, Democracy, Political and Economic Impact of Social	10 Hours 10 Hours

	Inclusion Policy. **Module III: The Political Economy of Brazil:** Coffee and Sugar Economy Cycles, Trade Dependence, Great Depression, the —BrazilianMiracle‖ , Debt Crisis, Restructuring and Privatization. **Module IV: Brazil in World Affairs:** Relations with the US, Europe, Japan, China, India, South East Asia and Africa; UN andMultilateral Groupings—IBSA, BRICS, G-4, G-20. **Module V: Brazil and the Region:** Bilateral Relations with Argentina, Chile, Peru, Venezuela; Regional Organisations—RioGroup, OAS, MERCOSUR, UNASUR. **Module VI: Issues and Trends in Contemporary Brazil:**	10 Hours 10 Hours 10 Hours 10 Hours
	Social Progammes and the Brazilian State: Bolsa Familia, Luz para Todos; Energy- Nuclear, Hydro and Biofuels, Environment, Narco-Trafficking, Violence, Social Movements—Land, Women.	
Pedagogy:	Lectures/Tutorials/Assignments/Self-Study/Discussions/Audio-Visuals	

References/Readings	1. Alfred Stepan. 1988. *Rethinking Military Politics: Brazil and the Southern Cone.* Princeton: Princeton University Press. 2. Bertha K. Becker and Claudio A.G. 1992. Egler, *Brazil: A New Regional Power in theWorld Economy*. Cambridge: Cambridge University Press. 3. Mario Esteban Carranza. 2000. *South American Free Trade Area Or Free Trade Area of the Americas? Open Regionalism and the Future of Regional Economic Integration in South America*. Aldershot: Ashgate. 4. Julian M. Chacel, Pamela S. Falk and David V. Fleisacher. 1988. Eds. *Brazil's Economic and Political Future*. Boulder: Westview Press. 5. Jack Child. 1988. *Antarctica and South American Geopolitics: Frozen Lebensraum*. New York: Praeger. 6. Jack Child. 1985. *Geopolitics and Conflict in South America: Quarrels Among Neighbors*. New York: Praeger. 7. Boris Fausto. 1999. *A Concise History of* Brazil. Cambridge: Cambridge University Press. 8. Frances Hagopian. 2006. *Traditional Politics and Regime Change in Brazil*. Cambridge: Cambridge University Press. 9. Jorge Batista. 1992. *Debt and Adjustment Policies in Brazil*. Boulder:WestviewPress. 10. Leslie Bethall. 1989. Ed. *Brazil: Empire to Republic, 1822-1930*. Cambridge: Cambridge University Press. 11. R. Pachauri. 1991. *Global Warming: Mitigation Strategies and Perspectives fromAsia and Brazil*. New Delhi: Tata McGraw-Hill Publishing Company Limited. 12. Riordan Roett. 1984. *Brazil: Politics of a Patrimonial Society*. New York: PraegerSpecial Studies. 13. Werner Baer. 2008. *The Brazilian Economy*. Boulder: Lynne RiennerPublishers.	

	14. Ronald M. Schneider. 1976. *Brazil: Seven Policy of a Future World Power*.Boulder: Westview Press.	
Learning Outcomes	Student will understand the political institutions and structures, the societal diversity andthe foreign policy postures of Brazil since its independence.	

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D 3.16 Minutes of the Board of Studies in English meeting held on 25.04.2022.

Annexure I

Semester wise Flow chart of M.A. English from A.Y. 2022-2023 onwards

Courses	Codes	SEM 1	SEM 2	SEM 3	SEM 4	Total CREDIT
Discipline Specific Core Course	DSCC	DSCC-EGC-103 : English Novel DSCC-EGC-104 : English Drama DSCC-EGC-107 : Literary Criticism DSCC-EGC-108: Shakespeare: Plays	DSCC-EGC-101: Linguistics DSCC-EGC-102 : English Poetry DSCC-EGC-105 : American Literature DSCC-EGC-106: Novel as a Major Form			32
Discipline Specific Optional Course	DSOC	DSOC-EGO-102 : Study of a Major Poet: P.B. Shelly or T.S. Eliot DSOC-EGO-103 : Study of a Major Novelist: Joseph Conrad DSOC-EGO-113: A Reading in Postcolonial Theory and Literature	DSOC-EGO-104 : Study of a Major Playwright: Harold Pinter DSOC-EGO-122: D.H. Lawrence DSOC-EGO-108 : Commonwealth Literature			08
Research Specific Optional Course	RSOC			RSOC-EGO-115: Goa Cultural Perspectives RSOC-EGO-114: Cultural Studies: Theory and Practice	RSOC-EGO 139: Feminism: Theory and Praxis RSOC-EGO-138	12

				RSOC-EGO-120 Translation Studies: Theory and Praxis RSOC-EGO:112: Readings in Contemporary Theory	Academic Writing in English	
Optional Generic Course	OGC			OGC-EGO 105: Indian Writing in Translation OGC-EGO-107: Creative Writing OGC-EGO-116 : Contemporary Indian English Fiction OGC-EGO-117: Regional Sensibilities in Indian Writing OGC-EGO-119: Canadian Cultural Studies OGC-EGO 137- Indian Writing in English OGC-EGO 140: Critical Disability Studies		12
Discipline Specific	DSD				DSD-EGC: Dissertation	16

Dissertation						
Total Credits		20	20	20	20	80

Goa University

Shenoi Goembab School of Languages & Literature

Syllabus for the M. A. English Programme

(Choice-Based Credit Courses implemented from the Academic Year 2022-2023
Under the New System with 80 Credits)

Programme Objectives:

The two-year post-graduate programme, Master of Arts (M. A.) in English, offered by the Shenoi Goembab School of Languages & Literature, Goa University, aims at generating qualified, competent and articulate learners capable of contributing to relevant domains of knowledge, and serving society in meaningful ways.

Programme Outcomes:

1. Learners will acquire knowledge of English language, literary theories, and texts.
2. Learners will have the knowledge of the canonical, as well as, contemporary texts, in terms of chronological development and regional criteria.
3. Students will be made familiar with tools of literary analysis, criticism, and research methodology.
4. Students will be acquainted with the use of ICT in languages and literature.
5. Students will be able to relate texts to social systems, folk studies, environment and ecology, through Culture Studies.
6. Students will adhere to ethical principles in academic research.
7. Learners will develop skills in undertaking translation, editing, journalism, and creative writing.
8. Students will be able to work in a team and share skills to foster a sense of community.
9. Students will communicate effectively in terms of writing reports and making presentations.
10. Learners will be encouraged to choose electives from other disciplines to develop interdisciplinary perspectives..

Description of the Programme:

The programme offers various Compulsory Courses that provide:

- training in Linguistics and the English language
- a grounding in the genres, eras, and movements in Literatures in English
- a hands-on acquaintance with Literary Criticism as well as Literary and Critical Theories

The programme offers various Optional Courses that involve:

- application of literary theories to texts
- related field-work
- honing their research aptitude & skills

This programme adopts a comparative, contextualized and inter-disciplinary perspective drawn from contemporary views of literatures and cultures.

Eligibility: The pre-requisite for admission to this M. A. programme is Bachelor of Arts (B. A.) preferably in English or an equivalent degree of any recognized University/Institution.

Credits: The courses offered for M. A. (English) programme are of 01 to 04 credits each. A candidate registered for this programme shall be required to complete the requisite number of credits stipulated in the relevant ordinance to qualify for the Degree.

Dissertation: A candidate offering this programme is permitted to write a dissertation in lieu of Optional Courses of a total of 08 credits.

List of Courses

DISCIPLINE SPECIFIC CORE COURSES

DSCC-EGC-101 Linguistics

[4 credits, 60 hours]

Objective:
The course is intended to familiarize the students with the principles of Linguistic studies and their application to the English Language.

Learning Outcome:
The students will be able to do linguistic analysis of the literary texts, as well as, conduct research in Linguistics.

Course Content:

1. Introduction to the study of language. [10 contact hours]
2. The nature and function of language. [10contact hours]

The theory of communication, general semiotics, linguistic sign, language and culture, Language and writing.

3. Linguistics as a scientific study of language. [10 contact hours]

Aims and applications of linguistics. Approaches to the study of language:
Historical, comparative, descriptive and transformational – generative.

4. Linguistic change and evolution of the English Language varieties- idiolect, dialect, pidgin and creole. Bilingualism, multilingualism. Psychology of language. [15 contact hours]

5. Structuralism: Elements of the structure of language – phonetic, phonemic, morphological, syntactic and semantic. [15 contact hours]

References:

Anderson, J. A. *Structural Aspects of Language Change.* Longman, 1973.
Bloomfield, L. *Language.* George Allen and Unwin, 1957.
Bolinger, D. *Aspects of Language.* Harcourt, Brace and World, 1968.
De Saussure, F. *Course in Linguistics*. Peter Owen, 1960.
Elgin, S. H. *What is Linguistics?* Prentice Hall, 1973.

Hickett, C. F. *A Course in Modern Linguistics.* MacMillan and Co. 1958.
Jesperson, O. *Language*. George Allen and Unwin, 1954.
Langacker, R. W. *Language and its Structure*. Harcourt, Brace and World, 1968.
Lyons, J. *New Horizons in Linguistics.* Penguin Books, 1970.
Martinel, Andre. *Elements of General Linguistics.* Faber and Faber, 1964.
Sapir, E. *Language.* Harcourt, Brace and Co., 1949.
Wardhough, R. *Introduction to Linguistics.* McGraw-Hill Book Co., 1972.

DSCC-EGC-102 English Poetry

[4 credits, 60 hours]

Objective:
This course in English Poetry is intended to enhance the awareness of the students about the concepts and the salient aspects of poetry and to encourage the application of such understanding to the study of English poetry in its historical and literary context.

Learning Outcome:
On completion of the course the student will be able to demonstrate the ability to appreciate and critique poetry

Course Content:
1. Introduction to Poetry: nature, features, forms, and types. [12 contact hours]
2. English Poetry upto the Age of Chaucer: a brief historical survey indicating the transition from Old English and Middle English poetic tradition to Chaucerian poetry.
3. Major genres of poetry with reference to the prescribed texts: (a) narrative: verse-tale/epic; (b) lyric: songs & sonnets: (c) dramatic: dramatic eclogue. (d) minor genres of poetry viz. elegy, hymn, ballad and parody.
4. Significant movements, modes and eras that mark the evolution of English poetry viz. Classical, Petrarchan, Renaissance, Elizabethan, Reformation, Metaphysical, Augustan, Neoclassical, Romantic, Victorian, Pre-Raphaelite, Modern and Contemporary.

Prescribed Texts:
1. Chaucer,Geoffrey.“The Prologue”. [8 contact hours]
2. Spenser,Edmund.*The Faerie Queene* [Book I] [8 contact hours]
3. Donne,John.*Songs and Sonnets*. [8 contact hours]
4. Wordsworth,William. Selections. [8 contact hours]
5. Yeats,W. B. Selections. [8 contact hours]
6. Auden,W. H. “The Age of Anxiety”. [8 contact hours]

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References:
Abrams, M. H. *The Prelude as a Portrait of the Artist.* Bicentenary Wordsworth Studies, 1970.
Alvarez, A. *The New Poetry.*Penguin, 1968.
Beaty, I. and W. H. Matchett. *Poetry from Statement to Meaning*. Oxford University Press, 1965
Bennet, H. S. *Chaucer and the Fifteenth-Century Verse and Prose.* Clarendon Press, 1990.
Chari, Jaganmohana. *Auden's Poetry: A Critical Study.*
Craik, T. W. and R. J. Craik, editors. *John Donne: Selected Poetry and Prose.* Methuen, 1986.
Dump, John D., editor. *A Critical Idiom Series.* (Relevant titles.)
Ford, Boris. *A Guide to English Literature.* (Relevant volumes.)
Hone, Joseph. *W. B. Yeats.* Palgrave Macmillan UK, 1962.
Isaacs, J. and P. Kortepeter. *The Background of Modern Poetry.* Dutton, 1952.
Jussawala, editor. *Faerie Queene Book I.* Orient Longman Private Limited, 1981.
Keast, W. R*. Seventeenth Century English Poetry.* Oxford University Press, 1962.
Ker, W. P. *Form and Style in Poetry.* Macmillan and Co, 1928.
Kitterage, *G. L. Chaucer and His Poetry*. Harvard University Press, 1951.
Malins, Edwards. *A Preface to Yeats.* Longman, 1974.
Morgan, Edwin. "A Prelude to *The Prelude*."*Essays in Criticism,* 1955.
Parker, Pauline M. *The Allegory of Faerie Queene.* Clarendon Press, 1966.
Rosenthal, M.L. *The Modern Poets.* Textbook Publishers, 2003.
Sisam, Kenneth. *Chaucer: The Clerk's Tale.* Clarendon Press, 1934.
Spearing, A. C. *Medieval to Renaissance English Poetry.* Cambridge University Press, 1985.
Stan, Smith. *W. H. Auden.* Liverpool University Press, 1990.
Waller, Gary. *English Poetry of the 16th Century.* Taylor & Francis, 2014.

DSCC-EGC-103 English Novel

[4 credits, 60 hours]

Objective:
Based on the study of representative novels of England, this course raises and discusses the seminal issues pertaining to English fictional tradition.

Learning Outcome:
On completion of the course the student will be able to demonstrate abilities to appreciate and critically evaluate English Novels.

Course Content:
Background: [20 contact hours]

1. Historical survey of the English novel – major thrusts and developments.
2. Rise of the English novel – antecedents and determinants.
3. The novel form and English bourgeois society.
4. The nature of Realism in English fiction.
5. The Novelist as a critic of the 'new' society.
6. The English novel – techniques and experiments.

Prescribed Texts:

1.	Fielding, Henry. *Joseph Andrews.*	[10 contact hours]
2.	Dickens, Charles. *A Tale of Two Cities.*	[10 contact hours]
3.	Bronte, Emile. *Wuthering Heights.*	[10 contact hours]
4.	Foster, E. M. *A Passage to India.*	[10 contact hours]

Comparative analysis of multiple cinematic versions of the texts: *Joseph Andrews* [1977], *Wuthering Heights* [1939, 1962, 1978, 1992, 2009], *A Tale of Two Cities* (1935, 1958, 1980), *A Passage to India* [1984]

References:

Allen, Walter E. *The English Novel: A Short Critical History*. Phoenix, 1954.
---. *The Modern Novel in Britain and the United States*. 1963.
Baker, Earnest A. *The History of the English Novel*. 10 vols. 1924-39.
Karl, Frederic R. *A Reader's Guide to the Development of the English Novel in the Eighteenth Century*.
Leavis, F. R. *The Great Tradition*. C. U. P., 1964.
Rockwell, John. *Fact in Fiction*. Routledge and Kegan Paul, 1974.
Stevenson, Lionel. *The English Novel: A Panorama*. 1960.
Tillyard, E. M. W. *The Epic Strain in the English Novel*. Chatto and Windus, 1963.
Watt, Ian. *The Rise of the Novel: Studies in Defoe, Richardson and Fielding*. Penguin, 1957.

DSCC-EGC-104 English Drama
[4 credits, 60 hours]

Objective:

This course proposes to introduce the student to the tradition of English drama. With the help of representative texts, it also aims at tracing the development of drama in England from the 16th to the 20th Century.

Learning Outcome:

On completion of the course the student will be able to demonstrate abilities to appreciate and critically evaluate English Drama.

Course Content:

Background: Elements of Drama. Development of English Drama. Conventions of the English Stage. [20 contact hours]

1.	Marlowe, Christopher.*Doctor Faustus.*	[10 contact hours]
2.	Congreve, William.*The Way of the World.*	[10 contact hours]
3.	Synge, J. M.*The Playboy of the Western World.*	[10 contact hours]
4.	Delany, Shelagh.*A Taste of Honey.*	[10 contact hours]

References:

Donaldson, Ian. *Jonson and Shakespeare.*Palgrave Macmillan UK, 1983.
Fermor, Ellis Una. *Jacobean Drama.* Methuen, 1973.
Potter, Robert. *The English Morality Play.* Routledge & K. Paul, 1975.
Smidt, Kristian. *Unconformities in Shakespeare's Historical Plays.*Palgrave Macmillan UK, 1982.

Tillyard, E. M. W. *Shakespeare's History Plays.* Barnes & Noble, 1969.
Williams, Raymond. *Drama from Ibsen to Brecht***.**Random House, 2013.

DSCC-EGC-105 American Literature
[4 Credits, 60 hours]

Objectives:	The major objective of the course is to introduce students to the intellectual and literary currents of America from the time of its 'discovery' to the present day. It's objective is also to expose and sensitize students to significant texts of representative authors	
Content:	**Module 1:Background** 1.The 16th-17th century Age of Puritanism 2.The 18th century Age of Enlightenment 3.The 19th century American Renaissance 4.The Jazz Age of the Roaring 1920s 5. American Modernism. **Module 2: Fiction** 1. Hawthorne, Nathaniel. *Twice-told Tales* (selections) 2. Morrison, Toni. *Sula* 3. Wilson, Diane. . *The Seed Keeper* **Module 3: Poetry** 1. Whitman, Walt. "Song of Myself" (selections) 2. Frost, Robert. "The Mending Wall," "The Road Not Taken," "After Apple Picking" 3. Hughes, Langston. "The Negro Dreams of Rivers," "Let America Be America Again" 4. Alexie, Sherman. "On the Amtrak from Boston to New York City," "Evolution" 5. Ginsberg, Alan. "America," "A Supermarket in California" **Module 4:Drama** Albee, Edward. *The American Dream*	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Lectures/assignments/seminars.	
References/ Readings:	Brown, John Russell, editor. American Theatre. Edward Arnold, 1967. Chase, Richard. *The American Novel and its Tradition, Double Day*, 1957. Gould, Jean. Modern American Playwrights. Popular Prakashan, 1969. Horton, Rod, editor. *Background of American Literary Thought*. Prentice Hall, 1974.	

	Hoffman, Daniel, editor. *Harvard Guide to Contemporary American Writing*. Oxford University Press, 1979. Matthiessen, F. O. American Renaissance. Oxford University Press, 1941. Pearce, Roy H. *The Continuity of American Poetry*. Princeton University Press, 1979. Weinberg, Helen. The New Novel in America-*The Kafkan Mode in Contemporary Fiction*. Cornell University Press, 1970. London, Routledge.	
Learning Outcomes	On completion of the course, the students will be familiarized with major American intellectual and literary movements which would enable them to understand and appreciate American history and culture.	

DSCC-EGC-106 Novel as a Literary Form
[4 credits, 60 hours]

Objective:
The course discusses issues like the theory of the Novel, the evolution of the form, the nature of Realism, techniques and narrative devices. Thus, the course not only offers an overview of world fiction, but also makes the students aware of the distinct features of the novel as a literary form.

Learning Outcome:
At the end of the course students will be able to analyse and appreciate European and American novels.

Course Content:
Background to the texts. [10 contact hours]

1. de Balzac, Honoré.*Old Goriot.* [10 contact hours]
From Romanticism to Realism,
Society after the French Revolution, La Comedie Humaine

2. Dostoyevsky,Fyodor.*Crime and Punishment.* [10 contact hours]
Dostoevsky's concepts of spirituality

3. Kafka, Franz.*The Castle.* [10 contact hours]
Existentialism

4. Camus,Albert.*The Plague.* [10 contact hours]
Existentialism, War, Authoritarianism

5. Steinbeck,John.*The Grapes of Wrath.* [10 contact hours]
Great Depression, Dust Bowl, Exodus
Comparisons of texts with available cinematic versions:
Pere Goriot[2004]*, Crime and Punishment* [1970, 2002], *The Grapes of Wrath* [1940].

References:
Booth, Wayne C. *The Rhetoric of Fiction.*University of Chicago Press, 2010.
Bree, Germaine. *Modern French Fiction.*
Brooks, Cleanth, and Robert Penn Warren. *The Scope of Fiction.* Appleton-Century-Crofts, 1960.
Davis, William. *The Novel: A Collection of Essays.*
Grossvogel, David. *Limits of the Novel.* Cornell University Press, 1968.
Steiner, George. *Tolstoy Or Dostoevsky.* Faber & Faber, 2010.
Tanner, Tony. *City of Words.* Evanston, 1971.

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DSCC-EGC-107 Literary Criticism
[4 credits, 60 hours]

Objective:
The principal objective of this course is to familiarise the students with the history of Western literary critical discourse and the various movements which have gone into its development.

Learning Outcome:
On completion of the course a student will demonstrate the ability to apply the knowledge of critical theory to literary texts.

Course Content:

1.	A Critical Survey of Classical and Romantic Criticism	[14 contact hours]
2.	Formalism	[14 contact hours]
3.	Marxism	[8 contact hours]
4.	Psycho-analysis	[8 contact hours]
5.	Structuralism	[8 contact hours]
6.	Feminism	[8 contact hours]

References:
Abrams, M. H. *Mirror and the Lamp.* O. U. P, 1971
---. *A Glossary of Literary Terms.* Cengage Heinle, 1998.
Barry, Peter. *Beginning Theory*. Manchester University Press, 1995.
Brooks,Cleanth, and Wimsatt.*LiteraryCriticism:AShortHistory.*Routledge,1957. Eagleton, Terry. *Literary Theory: An Introduction.* Blackwell,1983.
Robey, David & Jefferson, Anne. *Modern Literary Theory: A Comparative Introduction.* Batsford, 1986.
Selden, Raman. *The Theory of Criticism from Plato to the Present: A Reader.* Longman, 1988. Webster, Roger. *Studying Literary Theory: An Introduction.* Arnold, 1990.

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DSCC-EGC-108 Shakespeare: Plays
[4 credits, 60 hours]

Objective:
The course is designed to acquaint students with representative plays of Shakespeare.

Learning Outcome:
On completion of the course students will be able to identify significant aspects of Shakespearean drama and theatre.

Course Content:
Background [10 contact hours]

1. *The Merchant of Venice* [10 contact hours]
2. *Julius Caesar* [10 contact hours]
3. *Hamlet* [10 contact hours]
4. *Measure for Measure* [10 contact hours]
5. *The Tempest* [10 contact hours]

References:
Dean, Leonard F., editor. *Shakespeare: Modern Essays in Criticism.* O. U. P., 1977.
Eagleton, Terence. *Shakespeare and Society.* Chatto & Windus, 1967.
Fermor, Una Ellis. *Shakespeare's Drama.* Metheun Publications, 1980.
Gurr, Andre. *Shakespearean Stage 1574-1642.* C. U. P., 1970.
Knight, G. Wilson. *The Wheel of Fire.* Matheun, 1983.
---. *The Imperial Flame.* London; Matheun, 1985.
Knights, L. C. *Hamlet and Other Shakespearean Essays.* C. U. P., 1979.
Muir, Kenneth. *Shakespeare: Contests and Controversies.* The Harvester Press, 1985.
Speaight, Robert. *Shakespeare: The Man and His Achievements.* J. M. Dent & Sons, 1977.
Spurgeon, Caroline F. B. *Shakespeare's Imagery.* C. U. P., 1966.

DISCIPLINE SPECIFIC OPTIONAL COURSES

DSOC-EGO-102 Study of a Major Poet

[4credits, 60 hours]

Objectives:
1. This course attempts to introduce students to the nuances of poetry and the factors that influence and direct its manifestation as well as growth, with the help of the work of a major poet (either the modernist T. S. Eliot or the romanticist P.B.Shelley).
2. It also aims at analyzing the mutual relationship of the historical developments and the evolution of certain movements ofpoetry.

Learning Outcome:
In exposing the students to the cross-section of the selected poet's oeuvre, students will be able to identify the formative influences and the temperamental propensities in an individual poet and his contribution to literature and life.

Course Content (T. S. Eliot)**:**

Background [10 contact hours]
1. English poetry during the relevant age.
2. Formative influences on the poet.
3. Salient features of the school of poetry under study (modern or romantic).
4. Characteristics of the poet's mind and art.

5. Poet's view of poetry vis-à-vis tradition and contemporaneity.
6. Study of the poet's early poetry: themes, techniques and features.
7. Poet's dramatic art in relation to his poetry: approach, focus and vision.
8. Major poems: impact, reactions, and influences.
9. Assessment of the poet's contribution to poetry, society and life.

Prescribed texts:

1. "The Waste Land" [10 contact hours]
2. "Ash Wednesday" [10 contact hours]
3. Selected Shorter Poems [10 contact hours]
4. *Murder in the Cathedral* [10 contact hours]
5. "Tradition and Individual Talent" [10 contact hours]

References:

Moody, David A. *The Cambridge Companion to T. S. Eliot.* CUP, 1994
Beaty, Icrome and William H. Matchett. *Poetry from Statement to Meaning*. Oxford, 1965.
Behr, Cardene. *T. S. Eliot: A Chronology of His Life and Works.* Macmillan, 1983.
McNelly, Cleo. *T. S. Eliot and Indic Tradition.* CUP, 1987.
Pathak, R. S. *New Directions in Eliot Studies.* Northern Book Centre, 1990.
Spender, Stephen. *Eliot: Modern Masters Series.* Frank Kermode, editor. Fontana Collios, 1975. Srivastav, Narsingh. *The Poetry of T. S. Eliot: A Study in Religious Sensibility.* Sterling, 1991.

OR

Course Content (P. B. Shelley):

Background [10 contact hours]

1. English poetry during the relevant age.
2. Formative influences on the poet.
3. Salient features of the school of poetry under study (modern or romantic).
4. Characteristics of the poet's mind and art.
5. Poet's view of poetry vis-à-vis tradition and contemporaneity.
6. Study of the poet's early poetry: themes, techniques and features.
7. Poet's dramatic art in relation to his poetry: approach, focus and vision.
8. Major poems: impact, reactions, and influences.
9. Assessment of the poet's contribution to poetry, society and life.

Prescribed texts:

1. "Alastor, or The Spirit of Solitude" [10 contact hours]
2. "Epipsychidion" [10 contact hours]
3. "Prometheus Unbound" [10 contact hours]
4. Selected Shorter Poems [10 contact hours]
5. "Adonais" [10 contact hours]

References:

Barus, James E, editor. *Shelley: The Critical Heritage.* Routledge and Kegan Paul, 1975.
Bluden, Edmund: *Shelley.* OUP, 1965.

Coombs, Heather: *The Age of Keats and Shelley*. Blackie and Sons, 1974.
Holmes, Richard. *Shelley*: *The Pursuit*. Weidenfold and Nicolson, 1974.
Keach, William. *Shelley's Style.* Methuen, 1984.
King-Hele, Desmond. *Shelley: His Thought and Work*. Macmillan, 1964.
Leighton, Angela. *Shelley and the Sublime: An Interpretation of the Major Poems.* O.U.P., 1984. Ridenour, George M., editor. *Shelley: Twentieth Century Views.* Prentice-Hall, 1965.
Swiden, Patrick, editor. *Shelley: Shorter Poems and Lyrics*. *A Case Book.* Macmillian. Woodings, R. B, editor. *Shelley: Modern Judgements.* London: Macmillan, 1968.
Leavis, F. R. *Revaluation.* I. R. Dee, 1998.

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DSOC-EGO-103 Study of a Major Novelist: Joseph Conrad
[4credits, 60 hours]

Objective:
Joseph Conrad has been regarded as one of the important writers in English. Though he began writing in the last decade of the nineteenth century his writing was considered modern as it differed greatly from contemporary writers Works from his early phase are considered to be among his best. This course attempts to study the Novels/Short Stories from this early phase.

Learning Outcome:
Students taking the course will be able to identify Conrad's unique contribution to English Literature and the concepts of Conscience, Restraint and Solidarity.

Course Content:

1.	"An Outpost of Progress"	[6 contact hours]
2.	*Heart of Darkness*	[16 contact hours]
3.	"Youth: A Narrative"	[8 contact hours]
4.	"The Secret Sharer"	[10 contact hours]
5.	*The Nigger of the Narcissus – A Tale of the Sea*	[10 contact hours]
6.	*Nostromo – A Tale of the Seaboard*	[10 contact hours]
	[Films relevant to the texts will bescreened]	

References:
Allen, Walter E. *The English Novel: A Short Critical History.* Phoenix, 1954. Andreas, Osborn. *Joseph Conrad: A Study in Non-Conformity.* Archon, 1969.
Baines, Jocelyn. *Joseph Conrad: A Critical Biography:* Weidenfeld and Nicolson. 1960.
Bala, Suman. *Joseph Conrad's Fiction: A Study in Existential Humanism.* Intellectual Publishing House, 1990.
Berthoud, Jacques. *Joseph Conrad: The Major Phase.* C.U.P., 1978.
Bhagwati, Ashok. *Politics and the Modern Novelist Conrad's Conservatism.* B. R. Publishing Corporation, 1991.
Cox C., B. *Joseph Conrad: The Modern Imagination.* J. M. Dent & Sons, 1974. Land, Stephen K. *Conrad and the Paradox of Pilot.* MacMillan, 1984.
Meyer, Bernard, C. *Joseph Conrad: A Psychoanalytic Biography.* Princeton U. P., 1967. Newhouse, Neville H. *Joseph Conrad.* Evans Brothers, 1966.
Ramamurthi, Lalitha and C.T. Indra *Joseph Conrad: An anthology of recent criticism*, Delhi, Pencraft International, 1998.
Roy, V. K. *The Romance of Illusions: A Study of Joseph Conrad, with Special Reference to Lord Jim*

and Heart of Darkness. Doaba House, 1971.
Yaseen, Mohammad. *Joseph Conrad's Theory of Fiction.* Asia Publishing House, 1970.

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DSOC-EGO-104 Study of a Major Dramatist: Harold Pinter

[4credits, 60 hours]

Objective:

To introduce students to the concept of the Theatre of the Absurd.

Learning Outcome:

The students will be acquainted with the features and motifs of the Theatre of the Absurd.

Course Content:

1.	*The Dwarfs*	[10 contact hours]
2.	*The BirthdayParty*	[10 contact hours]
3.	*TheCaretaker*	[10 contact hours]
4.	*TheLover*	[10 contact hours]
5.	*TheHomecoming*	[10 contact hours]
6.	*No Man'sLand*	[10 contact hours]

References:

Baker, William. *Harold Pinter.* Continuum International Publishing Group, 2008.
Billington, Michael. *Harold Pinter.* Faber and Faber, 1996.
Chui, Jane W. Y. *Affirming the Absurd in Harold Pinter.* Palgrave Macmillan, 2013.
Wyllie, Andrew, and Catherine Rees. *The Plays of Harold Pinter.* Palgrave Macmillan, 2017.

DSOC-EGO-108 Commonwealth Literature
[4credits, 60 hours]

Objective:

The aim of this course is to acquaint the students with diverse facets of Literature / Films selectedfrom various regions of the Commonwealth.

Learning Outcome:

The students will be able to identify distinctive features of texts produced in Commonwealth Literature.

Course Content:

1.	Malgonkar, Manohar. *Combat of Shadows.*	[12 contact hours]

Commonwealth Literature other than Indian Writing in English:

2.	Achebe, Chinua. *Things Fall Apart.*	[12 contact hours]
3.	Paton, Alan. *Cry the Beloved Country.*	[12 contact hours]
4.	Soyinka, Wole. *The Road.*	[12 contact hours]

5. Tamasese, Tusi [dir.] *The Orator* [film] [12 contact hours]

References:

Iyengar, K. R. S. *Indian Writing in English*. Asia Publishing House, 1973.
Narasimhaiah, C. D. *Commonwealth Literature: Problems of Response.* Macmillan, 1981.
---. *Awakened Conscience: Studies in Commonwealth Literature.* Sterling, 1978.
Naik, M. K., S. K. Desai, and G. S. Amur. *Critical Essays on Indian Writing in English*. Macmillan, 1968.
Press, John, editor. *Commonwealth Literature*. Heinemann, 1965.
Walsh, William. *Readings in Commonwealth Literature*. Clarendon, 1973.

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DSOC-EGO-113 A Reading in Postcolonial Theories and Literatures

[4 credits, 60 hours]

Objective:

This course introduces students to the ongoing dialogues on Postcolonial literatures and theories. Postcolonial studies re-examines the legacy of colonialism and considers the way in which literary practices address and negotiate following issues:

- Imperial Ideology
- Postcolonial discourse of Oppositionality.
- Postcolonalism and Postmodernism
- Nationalism and Identity
- Centrality and marginality
- Cultural Representation
- Hybridity

Learning Outcome:

The students will be sensitized to Post-colonial issues as reflected in literature.

Course Content:

Background [10 contact hours]

Prescribed Texts:

1. Achebe, Chinua. *Things Fall Apart.* Or Wa Thiongo, Ngugi. *Petals of Blood.* [10 contact hours]

2. Narasimhaiah, C. D. *An Anthology of Commonwealth Poetry.* [10 contact hours]

3. Dangle, Arjun. *The Poisoned Bread.* [10 contact hours]

4. Mosionier, Beatrice. *In Search of April Raintree.* [10 contact hours]

5. Mascarenhas, Margaret. *Skin.* [10 contact hours]

References:

Ashcroft, Bill, Gareth Griffiths and Helen Tiffin, editors. *The Empire Writes Back: Theory and Practice in Postcolonial Literature*. Routledge, 1989.
---.*The Postcolonial Studies Reader.* Routledge, 1994. Nandy, Ashish*. The Intimate Enemy.*
Bhabha, Homi K. *The Location of Culture*. Routledge, 1990.

DSOC-EGO-122 D. H. Lawrence

[4 credits, 60 hours]

Objective:

The principal objective of the course is to familiarise the students with the fiction of D. H. Lawrence.

Learning Outcome:

To enable the students to read the fiction by D. H. Lawrence independently.

Course Content:

Background [20 contact hours]

1. Lawrence and the English fictional tradition.

2. Lawrence and his time – the social and cultural milieu.

3. A survey of Lawrence's writing – thrusts and developments.

4. Lawrence and the theme ofsex/love.

5. Lawrence and the theme of human relationship.

6. Lawrence's "worldview".

7. Lawrence as a critic of the values of industrial capitalistic society.

8. Lawrence and his critics from Middleton Murray to the present period.

Prescribed Texts:

1. *Sons and Lovers* [10 contact hours]

2. *The Rainbow* [10 contact hours]

3. *Women in Love* [10 contact hours]

4. *Lady Chatterley's Lover* [10 contact hours]

References:

Andrews, W. T. *Critics on D.H.Lawrence*: *Readings in Literary Criticism*. George Allen & Unwin Ltd, 1971.
Beal, Anthony, editor. *D. H. Lawrence*: *Selected Literary Criticism*. Heinemann Ltd, 1961. Spilka, Hobsbaum, Philip. *A Reader's Guide to D. H. Lawrence.(Thames and Hudson Ltd, London,* 1981.
Leavis, F.R. *D.H. Lawrence: Novelist*. Chatto & Windus Ltd, 1962
---. *Thought, Words and Creativity: Art and Thought in Lawrence*. Chatto & Windus Ltd, 1976.
Mark, editor. *D. H. Lawrence*: *A Collection of Critical Essays*. Prentice Hall, Inc., 1963.
Niven, Alastair. *D. H. Lawrence: The Writer and his Work*. Longman Group Ltd, 1980.
Sanders, Scott. *D. H. Lawrence: The World of the Major Novels*. Vision Press Ltd, 1973.
Spender, Stephen. *D.H. Lawrence: Novelist, Poet, Prophet*. Harper & Row, Publishers, 1973.
Swigg, Richard. *Lawrence, Hardy, and American Literature*. Oxford University Press, 1972.

RESEARCH SPECIFIC OPTIONAL COURSES

RSOC-EGO-112 Reading in Contemporary Theory

[4 credits, 60 hours]

Objectives:
The Principal objective of the course is to familiarise the students with a few trend-setting original essays which significantly contribute in shaping the contours of contemporary theory.

Learning Outcome:
The course will enable the students to have first-hand knowledge of the various articles written by critics/thinkers associated with contemporary theory.

Course Content:

The following ten essays have been prescribed for the study: (Selections from *Modern Criticism and Theory:* A Reader Edited by David Lodge)

1. de Saussure, Ferdinand. "The Object of Study." [6 contact hours]
2. Derrida, Jacques. "Structure Sign and Play in the Discourse of the Human Sciences." [6 contact hours]
3. Barthes, Roland. "The Death of the Author." [6 contact hours]
4. Foucault, Michel. "What is an Author?" [6 contact hours]
5. Abrams, M. H. "The Deconstructive Angle." [6 contact hours]

6. Jameson, Fredric. "The Politics of Theory." [6 contact hours]
7. Eagleton, Terry. "Capitalism, Modernism and Post Modernism." [6 contact hours]
8. Michell, Juliet. "Femininity, Narrative and Psychoanalysis." [6 contact hours]
9. Said, Edward. "Crisis in Orientalism." [6 contact hours]
10. Chakravorty-Spivak, Gayatri. "Feminism and Critical Theory." [6 contact hours]

References:
Belsey, Catherine. Poststructuralism: A Very Short Introduction. Oxford University Press,2002.
Culler, Jonathan. Literary Theory: A Very Short Introduction. 2d ed. Oxford University Press,2011.
Dillet, Benoit, Robert Porter, and Iain Mackenzie, editors. The Edinburgh Companion to Poststructuralism. Edinburgh University Press, 2013.
Harland, Richard. Superstructuralism: The Philosophy of Structuralism and Post-structuralism. Routledge, 2010.
Norris, Christopher. Reclaiming Truth: Contribution to a Critique of Cultural Relativism. Duke University Press, 1996.
Roudinesco, Élisabeth. Philosophy in Turbulent Times: Canguilhem, Sartre,
Foucault, Althusser, Deleuze, Derrida. William McCuaig, translator. Columbia University Press, 2008.
Williams, James. Understanding Poststructuralism. Acumen, 2005.
Young, Robert, editor. Untying the Text: A Post-structuralist Reader. Routledge and Kegan Paul, 2004.

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Title of the Course: Cultural Studies: Theory and Practice
Course Code- RSOC-EGO: 114 **Number of credits: 04**
Total Contact Hours: 60

Objectives:	i. To drive home the significance of cultural studies in understanding society, culture and literature ii. To introduce students to the key concepts of cultural studies

	iii. To demonstrate the ability of cultural studies in unravelling as well as critiquing the structures of power embedded in our socio-cultural institutions and practices.
Content:	**Module 1: Introduction** **20 hours** 1.1 The Idea of Culture 1.2 The Evolution of British Cultural Studies a. Matthew Arnold b. F R Leavis c. Raymond Williams d. Richard Hoggart e. E P Thompson f. Stuart Hall and Birmingham Centre for Contemporary Cultural Studies 1.3 Roland Barthes: *Mythologies* 1.4 Theodore Adorno: *Culture Industry* 1.5 New Historicism 1.6 Feminist Cultural Studies 1.7 Third World Cultural Studies **Module 2: Concepts & Categories** **20 hours** 2.1 Popular Culture 2.2 Multiculturalism 2.3 Race 2.4 Gender 2.5 Ideology 2.6 Hegemony 2.7 Representation 2.8 Subject 2.9 Other 2.10 Text

	Module 3: Cultural Studies in Practice 20 hours 3.1 *Reading the Romance* by Janice Radway 3.2 *Policing the Crisis* by Stuart Hall 3.3 "Reification and Utopia in Mass Culture" by Fredric Jameson 3.4"Nostalgia , Myth and Ideology : Visions of Superman at the End of American Century" by Ian Gordon 3.5 *Bond and Beyond* by Tony Bennett's and Janet Woollacott
Pedagogy:	Lectures/tutorials/assignments/seminars.
References/ Readings:	Barker, Chris. *Cultural Studies: Theory and Practice*. Sage, 2012. During, Simon.Ed. *Cultural Studies Reader*. Routledge, 1993. During, Simon. *Cultural Studies: A Critical Introduction*. Routledge, 2005. Dworkin, Dennis. *Cultural Marxism in Postwar Britain*. Duke UP, 1997. Fiske, John. *Reading the Popular*. Routledge, 1990. Inglis, Fred. *Cultural Studies*. Blackwell, 1993. Nayar, Rana et al Ed. *Cultural Studies in India.* Routledge India, 2015. Sardar, Ziauddin & Van Loon, Borin. *Cultural Studies: A Graphic Guide*. Icon Books, 2010. Turner, Graeme. *British Cultural Studies*. Routledge, 2002.
Learning Outcomes	1. Critically examine cultural practices and institutions through the prism of cultural studies. 2. Understand literary and cultural texts from the perspective of cultural studies. 3. Inculcate critical ability among students to make an independent analysis of popular cultural texts like fictional narratives/films/teleserials etc. with the help of concepts and tools of cultural studies.

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RSOC-EGO-115 Goa: Cultural Perspectives
[4 credits, 60 hours]

Objective:

This course introduces students to the complex cultural fabric of Goa. The more complex the historiography of a state, the more complex is its identity construction. The superimposition of 450 years of Portuguese colonialism over the essentially Pan-Indian social base comprising Hindus, Buddhists, Jains and Muslims has rendered the small state of Goa a unique cultural fabric

which is well reflected in many of its folk practices. The Post-Liberation scenario faced major issues such as the Opinion poll, Statehood, Language and Goan Identity.

Learning Outcome:

The outcome of the paper would be the sensitization of students to the cultural history of Goa. The students would be encouraged in conducting independent and interdisciplinary research on various cultural aspects of Goa. They would also be introduced to contemporary issues of Goa, as well as, thoughts about the future of the State.

Course Content:

I. Pre and Post Liberation Goa – Socio-cultural perspectives [12 contact hours]
ShyamBenegal's film *Trikal*
Lambert Mascarenhas' *Sorrowing Lies My Land*
The Role of the Press in Pre-Liberation Goa
Survey of select journalistic writings.

II. Cultural Syncretism [12 contact hours]
Folkloristic Practices of Goa: Study of Jagor, Sontreo and MussollKhell.
Study of Goan Folk/Popular theatre: Tiatr

III. Contemporary Issues: [12 contact hours]
Problems of Tourism industry.
Opinion Poll and Statehood
Language and Identity

IV. Contemporary Goan Writing [12 contact hours]
Selected poems of ManoharaiSardessai
Selected poems of Armando Menezes
Selected short stories of PundalikNaik
Selected short stories of DamodarMauzo

V. Goan Transcultural Experience: [12 contact hours]
Nazareth, Peter. *In the Brown Mantle.*
Rangel-Rebeiro, Victor. *Tivolem.*

References:

Angle, Prabhakar. *Concepts and Misconcepts*. Kala Vibhag, 1994.
Bhandari, Romesh.*Goa.*Lotus Publication, 1999.
Borges, Charleset. al. *Goa and Portugal: History and Development*. Other India Press.
---. *Goa and Portugal: Their Cultural Links.* Other India Press.
De Souza, Teotonio R. *Essays in Goan History.* Other India Press.
---. *Goa to Me.* Concept, 1994.
---. *Discoveries, Missionary Expansion and Asian Cultures*.Concept, 1994.
---. *Indo-Portuguese History: Old Issues, New Questions.* Concept, 1984.
Dantas, Norman. *The Transforming of Goa.*Other India Press.
Gomes, Olivinho. *Village Goa*. S Chand & Co., 1987.

Anand, Mulk Raj et al. *Golden Goa*.Marg Publication, 1980.
Gomes Pereira, Rui.*Hindu Temples and Deities*.Printwell, 1978.
Hall, Stuart. *Representation: Cultural Representations and Signifying Practices.* Thousand Oaks and Sage Publications, 1997.
Handoo, Jawaharlal. *Folklore and Discourse*.Zooni Publication, 1999.
---. *Folklore: New Perspectives*. Zooni Publication, 1999.
Hutt, Anthony.*Goa.*Scorpion Publishing Ltd., 1988.
Morenas, Zenaides. *Mussoll Dance of Chandor: The Dance of the Christian Kshatriyas.* The ClarrisaVaz e Morenas Konkani Research Fellowship Endowment Fund, 2002.
Propp, Vladimir. *Theory and History of Folklore*.AntolyLiberman, editor. Ariadna Y. Martin and Richard P. Martin, translators.Manchester University Press, 1984.
Punia, Deep. *Social Values in Folklore.*Rawat Publication 1993.
Priolkar. A. K.*The Goa Inquisition*.Voice of India, 1961.
Redfield, Robert.*Peasant Society and Culture*.The University Press of Chicago Press 1958.

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RSOC-EGO-120 Translation Studies: Theory and Praxis
[4 credits, 60 hours]

Objectives:
1. To equip the students with the art and science of translation as a valuableasset for self-navigation in multi-cultural situation.
2. To unfold the significance of translation as a supplementary tool for a mono-lingual individual to acquire knowledge and information from other language domains.
3. To demonstrate the potential of translation to enrich or extend knowledge domains throughmutual transfer of information and data across languages.
4. To reveal the latent power of translation as an influence-exertion source in literary cultural political and allied fields.
5. To tap its present-day importance in the areas of transmutation, transcription, tele-translation, interpretation, journalism and media studies among others.

Learning Outcome:
The students will be able to perceive the importance of interlingual communication in the pluralistic climate of the globalized world. The course will enhance the bi-lingual and if possible multilingual-communication process to which a large majority of Indian students are exposed.

Course Content:
1. The notion of translation: meaning and definition; nature and characteristics; and functions oftranslation. [8 contact hours]

2. Various critical positions on translation; the western andthe Indian view of translation; types of translation as per these views with special references toconcept such as “transliteration, transcreation, transmutation, chaaya, bhashantar, anuvaad,anusarjan, rupantar, prakarantar” etc
[12 contact hours]
3. Specimen translation and practice sessions: notion of Equivalence: translating prose and poetry;fiction and non-fiction, critical and scientific, literary and non-literary material.
[10 contact hours]

4. Relationship of translation with literature and culture: role of language in translation studies withinliterary and nonliterary domains. 10 contact hours]

5. Translation, trancreation and transmutation: the boundaries of demarcation and areas of contact. [10 contact hours]

6. Contribution to a selected literary/non-literary field by way of assignment. (Period, genre, form,language to be determined from time to time.) [10 contact hours]

References:

Baker, M. *In Other Words: A Course Book on Translation*. Routledge, 1997.
Bassnett, Susan and Andre Lefevere, editors, *Translation, History and Culture.*Pinter, 1990.
Basnett-McGuire, Susan. *Translation Studies*.Methuen, 1980.
Catford, J. C. *A Linguistic Study of Translation*.O.U.P., 1968.
Derrida , Jacques. *Of Grammatology.*GayatriChakravortySpivak, translator.MotilalBanaasidas Publication Pvt. Ltd., 1994
Gentzer, Edwin.*Contemporary Translation Theories,* 1993.
Newmark, Peter.*Approaches to Translation*.Pergamon, 1981.

RSOC-EGO-138 Academic Writing in English
(adapted from UGC-MOOCs)

[4 credits, 60 hours]

Objectives:
1. To refine the writing skills of students.
2. To discourage plagiarism and inculcate research ethics.
3. To introduce tools beneficial while conducting research.

Learning Outcome:

The students will be able to write in a professional and academic manner, having learnt to use the MLA style and to cite sources appropriately.

Course Content:
1. Academic and Research Writing – Introduction, Importance and Basic Rules [8 contact hours]
2. Importance of the English language in Academic Writing [6 contact hours]
3. MLA Style – Referencing and Citation [8 contact hours]
4. Research Ethics – Types of Plagiarism, Detection tools and how to avoid Plagiarism [6 contact hours]
5. Journal and Author Metrics [6 contact hours]
6. Literature Review – Process, Online databases, Tools, Review Paper Writing [6 contact hours]
7. Research Proposal and Thesis Writing – Process, Empirical and Non-Empirical Studies [6 contact hours]

8. Abstract, Conference/Research Paper, Book Chapter – Process, Team and Time Management [6 contact hours]
9. Challenges in Indian Research Writing [4 contact hours]
10. Open Educational Resources [4 contact hours]

References:

Adler, Abby. "Talking the Talk: Tips on Giving a Successful Conference Presentation." *American Psychological Association,* , April 2010,apa.org/science/about/psa/2010/04/presentation
Anson, Chris M. and Robert A. Schwegler. *The Longman Handbook for Writers and Readers*. 6th edition.
Creswell, J. W. (2008). *Educational Research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed.). Upper Saddle River: Pearson.
Gibaldi, Joseph. *MLA Handbook for Writers of Research Papers*. Modern Language Association of America, 2009. Print.
Henly, Susan."Finding the right journal to disseminate your research." Nursing Research, Wolters Kluwer Health Inc, November-December 2014, journals.lww.com/nursingresearchonline/Fulltext/2014/11000/Finding_the_Right_Journal_to_Disseminate_Your.1.aspx?WT.mc_id=HPxADx20100319xMP.
Hadley, Chris. "How to Get Started With a Research Project". *wikiHow*, 5 January 2021, wikihow.com/Get-StartedWith-a-Research-Project.
Modern Language Association. *MLA Handbook Eighth Edition. https://style.mla.org/*
"Open Educational Resources". *Wikipedia*, Wikimedia Foundation, 15 March 2021, en.wikipedia.org/wiki/Open_educational_resources.
Pappas, Christopher. "Top 10 Free Plagiarism Detenction Tolls for eLearning Professionals". *eLearning Industry*, 18 November 2013, elearningindustry.com/top-10-free-plagiarism-detection-tools-for-teachers.
Roberts J. "Plagiarism, Self-Plagiarism, and Text Recycling."*Headache,*John Wiley & Sons Inc, 26 February 2018, headachejournal.onlinelibrary.wiley.com/doi/full/10.1111/head.13276.

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Title of the Course: Feminism: Theory and Praxis
Course Code-RSO-EGO139 **Number of credits: 04**
Total Contact Hours: 60

Objectives:	1. To bring out historical and contemporary contexts of the feminist thought through the First Wave, Second Wave, Third Wave and Fourth Wave of Feminisms. 2. To show various intersectionalities of the Women's movement with Race, Class, Caste, Gender, Religion and Disability. 3. To establish feminism as a theoretical lens for exploring literary texts. 4. To show why gender is an important category in shaping identities in the material world.
Content:	**Module 1: Introduction** **15 hours**

	Tracing the evolution of the Feminist Movement through different Waves and showing the ways in which the movement has widened to accommodate various intersectionalities and its limitations. Gender as social construction Mary Wollstonecraft: *A Vindication of the Rights of Woman.* 1792 Sojourner Truth. *Ain't I a Woman*. 1851 **Module 2- Feminism and Race 15 hours** Audre Lorde: *The Master's Tools Will Never Dismantle the Master's House*. 1984.Penguin Modern 2018. (Selected) Toni Morrison: *Sula*. 1973 (Novel) **Module 3. Indian Perspectives 12 hours** Manjula Padmanabhan: *Harvest* (1998 (Play) **Module 4. Dalit Feminism 12 hours** Meena Kandasamy: *Miss Militancy*. 2010 (Poetry collection) **Module 5. Intersectional Feminism 6 Hours** Chimamanda Ngozi Adichi: *We Should All be Feminists*. 2014
Pedagogy:	Lectures/tutorials/assignments/seminars.
References/ Readings:	Adichie, Chimamanda Ngozi. *We Should All be Feminists*. Fourth Estate. 2014 Beauvoir, Simone De. *The Second Sex*. 1949 (selections) Butler, Judith. 'Subjects of Sex/Gender/Desire'. In Gender Trouble: Feminism and the Subversion of Identity. Routledge, 1990 Chakravarti, Uma. 1993. "Conceptualising Brahmanical Patriarchy in Early India: Gender, Caste, Class and State." *Economic and Political Weekly* 28 (14):579–85. Ghai, Anita. "Marginalisation and disability: Experiences from the third world". In *Disability and the life course: Global Perspectives*, ed. M. Priestley. Cambridge University Press.2001 Hooks, bell. "The Oppositional Gaze". *Black Looks: Race and Representation*. South End Press, 1992. 115-31 Kandasamy, Meena. *Miss Militancy*. Navyana. 2010

Lorde, Audre. *The Master's Tools Will Never Dismantle the Master's House*. 1984.Penguin Modern 2018.

Lughod, Lila Abu. "Do Muslim women really need saving? Anthropological reflections on cultural relativism and its others." *American Anthropologist* 104, no. 3 (2002): 783-790.

Omvedt, Gail. *We Will Smash This Prison*. Zed Books, 1980.

Padmanabhan, Manjula. *Harvest*. Kali for Women, 1998.

Rege, Sharmila. "Dalit Women Talk Differently: A Critique of 'Difference' and Towards a Dalit Feminist Standpoint Position". *Economic and Political Weekly*, Vol. 33, No. 44 (Oct. 31 - Nov. 6, 1998), pp. WS39-WS46.

Rich, Adrienne. Compulsory Heterosexuality & Lesbian Existence. Journal of Women's History. 15.3. 2003. 11-48

Sharmila Rege. *Writing Caste/Writing Gender: Narrating Dalit Women's Testimonies*. Zubaan.2006.

Spivak, G. Can the Subaltern Speak? In Cary Nelson and Lawrence Grossbrg (Eds). *Marxism and the Interpretation of Culture*. 271-314. 1988.

Thomson, Rosemarie Garland. "Integrating Disability, Transforming Feminist Theory." *Feminist Disability Studies*. NWSA Journal, Vol. 14, No. 3, Autumn, 2002. 1-32

Truth, Sojourner. *Ain't I a Woman*. 1851. Penguin Classics, 2020.

Walker, Alice. *The Color Purple*. 1982. W&N, 2014.

Wollstonecraft, Mary. *A Vindication of the Rights of Woman*. 1792. Oxford World's Classics, 2008.

Learning Outcomes:	1. Understand various feminist movements. 2. Understand the performativity of gender. 3. Ability to analyse literary texts from the theoretical lens of feminism and an interest in future research. 4. Make a critique of gender inequality and bias in the material world and discover ways to overcome the same.

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OPTIONAL GENERIC COURSES

OGC-EGO-105 Indian Writing in Translation

[4 credits,60 hours]

Objective:

The aim of this course is to acquaint the students with a representative number of Sanskrit Classics (ancient and /or medieval) as well as masterpieces produced in the various regional literatures of India. Textual explication of the classics prescribed should demonstrate that ancient and medieval literary heritage of India provides a well established tradition to modern Indian literary activities.

Learning Outcome:

The course will elucidate the continuum of Indian experience and worldview reflected in works across regional languages.

Course Content:

Background [10 contact hours]

1. Notion of godhead in ancient India: spirituality beyond religion.
2. Ancient Indian drama in the light of western drama: Bharata & Aristotle.
3. An insight into translated poetry: Tagore's themes and techniques.
4. Tradition and modernity in contemporary fiction: an analysis.
5. Female predicaments and agrarian cultures: a representative feature of Indian life.

Prescribed Texts:

1. Sri Aurobindo, translator. *Isha Upanishad* [10 contact hours]

2. Sri Aurobindo, translator. *Vikramorvasie* or *The Hero and the Nymph* by Kalidasa [10 contact hours]

3. Tagore, Rabindranath. *Gitanjali*. [10 contact hours]

4. Pillai, Tagazi Shivshankar Pillai. *Chemmeen*. [10 contact hours]

5. Pai, Vidya, translator. *Kali Ganga* by Mahabaleshwar Sail [10 contact hours]

References:

Sri Aurobindo, translator. *The Upanishads*.
Karnarkar, R. D. *Kalidasa*. Karnatak University, 1971.
Bhat, G. K. *Sanskrit Drama*. Karnatak University, 1975.
Naravane, V. S. *An Introduction to Rabindranath Tagore*. Macmillan Company of India, 1977.
Macmillan, 1977. Iyenger, K. R. S. *Indian Writing in English.* Sterling, 1983.
Budkuley, Kiran. *Musings in the Meadows*. 2012.

OGC-EGO-107 Creative Writing
[4 credits, 60 hours]

Objectives:
This course is an attempt to draw the creative talent from students having a natural aptitude to creative writing. It aims at imparting the relevant information with regard to the art and technique of writing, the use and relevance of genres, importance of critical faculty to creative writing and so on. The course involves classroom-workshops intended to hone the creative skills of participants. It also seeks to train the students in the modes of writing for multiple media.

Learning Outcome:
The course will encourage the aspirants to have a hands-on experience of writing poetry, fiction, drama and literary prose.

Course Content:
Section I [25 contact hours]

1. Study of Literary Works in progress.
2. Analysis of the Creative Writing Components (Poem, Novel, Short Story, Drama, Diary).
3. Craft of poetry: subject matter, theme, rhythm, metre, stanza forms, sub-genres of Poetry.
4. Writing for various media.
5. Editing & Proof Reading.

Section II [25 contact hours]

1. Fundamental Norms of Writing.
2. Feature Writing.
3. Composing poetry; fiction (short/long).
4. Writing for Children.

5. Writing for Radio, Theatre, Television and Films.
6. Learning to write scripts for Publishers and Copy Writing.

Section III [10 contact hours]
Assignment in Creative Writing: Either Poetry OR Fiction OR Drama

References:
Corbett, Edward P. J. *The Little Rhetoric and Handbook*.John Wiley & Sons, 1977.
Watkins, F. C. and K. E. Knight.*Write to Write: Readings on the Craft of Writing.*Houghton Mifflin, 1966.
Mullins, CarolyneJ..*A Guide to Writing and Publishing.*John Wiley & Sons, 1987.
The Writer's Manual, ETC Publications, 1977.
Baker, Sheridan. *The Practical Stylistics.*Harper and Row, 1977.
Vroomanm, Alan. *Good Writing: An Informal Manual of Style*. Atheneum, 1972.

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OGC-EGO-116 Contemporary Indian English Fiction
[4 credits, 60 hours]

Objectives:
1. To inform the student and situate him/her within the area of contemporary writing inEnglish.
2. To encourage the debate regarding India's cross cultural identity and to address issues related to the intellectual tradition associated with English studies in India.
3. To use postcolonial discourses and evolve new critical practices and indigenous criticaldiscourse.

Learning Outcome:
This course will enable the student to locate herself/himself by responding to the interrogation of local issues within a globalized scenario.

Course Content:
1. Roy,Arundhati.*The God ofSmallThings.* [15 contact hours]
2. Rushdie,Salman.*Shame* [15 contact hours]
3. Tharoor,Shashi.*The Great Indian Novel* [15 contact hours]
4. Ghosh,Amitav.*The Glass Palace* [15 contact hours]

References:
Rushdie, Salman and Elizabeth West (eds). "Introduction" to *The Vintage Book of Indian Writing.* Vintage, 1997.
Naipaul, V. S. *India: A WoundedCivilization.* Pan Macmillan, 2012.
Mukherjee, Meenakshi. *Reality andRealism.* Oxford University Press, 1994.
Nandy, Ashis. *The Intimate Enemy: Loss and Recovery under Colonialism.* Oxford University Press, 2009.

OGC-EGO-117 Regional Sensibilities in Indian Writing
[4 credits, 60 hours]

Objective:

This course intends to develop the students' tastes for indigenous writing from the various regions of India. Folk traditions, the Bhakti Cult and the history of women's writing will form the basis of developing an overall understanding of the forms and practices associated with creative writing from diverse areas of ourcountry.

Learning Outcome:
This course will introduce the student to a variety of indigenous forms of writing. It is an introduction to the rich cultural and folk heritage of India. The course will make an attempt to inculcate a comparative thinking through its diverse forms.

Course Content:
1. BhaktiTradition:
Tukaram – *Says Tuka.* Dilip Chitre, translator. [15 contact hours]

2. DalitWriting:
Dangle, Arjun. *Poisoned Bread.* [15 contact hours]

3. Women'sWriting:
Selections from Susie Tharu and K. Lalita. [15 contact hours]

4. Fiction:
Ananthamurthy, U. R. *Samskara.* [15 contact hours]

References:
Iyengar, K. R. S. *Indian Writing in English.* Asia Publishing House, 1973.
Mukherjee, Meenakshi. *Realism and Reality.*Oxford University Press, 1994.
Naik, M. K., S. K. Desai and G. S. Amur. *Critical essays on Indian Writing in English.* MacMillan, 1968

OGC-EGO-119 Canadian Cultural Studies
[4 credits, 60 hours]

Objectives:
1. The course attempts to capture the rich cultural diversity of Canadian Writing. Reading through a variety of genres, it proposes to examine works by authors from different geographical and ethnic backgrounds.
2. To acquire a fuller appreciation of contemporary Canadian cultural and literary history.
3. To introduce students to the challenges of Canadian culture and it changes overtime.
4. To enable students to appreciate the benefits of an interdisciplinary approach to understanding of Canadian culture and literature.

Learning Outcomes:
Students will be familiarised with the Canadian National Identity, First Nations, Visible Immigrants and Minority Women in Canada, Theories of Hybrid Identity and Postmodernity, Identity Politics, Cultural Appropriation and Goan Transcultural Experience.

Course Content:
Background [10 contact hours]
1. Understanding Canadian Cultural History.

2. Nation Building and The CanadianIdentity
3. Canadian Mosaic: Mapping the "FirstWorld"
4. Multiculturalism and MulticulturalLiterature
5. Transculturalism: The Goan-Canadian Experience

PrescribedTexts:

1. Grady, Wayne. *The Penguin Book of Modern Canadian Short Stories* [8 contact hours]

2. Reaney, James.*The Donnellys.* [10 contact hours]

3. Lawrence, Margaret. *A Bird in the House.* [8 contact hours]

4. Atwood, Margaret.Selectedpoems. [8 contact hours]

5. Mosionier, Beatrice. *In Search ofAprilRaintree.* [10 contact hours]

6. McGifford, Dianne. *Shakti'sWords.* [6 contact hours]

Resource material from the internet websites suchas:
goatoronto.com; goacom.com; lists.goanet.org/listinfo.cgi/goanet-goanet.org

References:

Hutcheon, Linda. *The Canadian Postmodern: A Study of Contemporary English-Canadian Fiction.* O.U.P., 1988.
Morton, Desmond. *A Short History of Canada.* Hurting Publishers, 2001.
Mukherjee, Arun. *Oppositional Aesthetics: Reading from a Hyphenated Space.* TSAR, 1994.

OGC-EGO-137 Indian Writing in English

[4 credits, 60 hours]

Objective:
The course aims at acquainting the student with the tradition of writing in English that has evolved in India over the last two centuries.

Learning Outcome:
Candidates who take the course will demonstrate knowledge of literary output arising from India's colonial encounter with Britain and contemporary Indian writing in English across historical eras, genres and regions.

Course Content:
Background: [12 contact hours]

1. India's encounter with the British and the travelogue of Dean Mohamet.
2. War of Independence 1857 and its fallout for India and Indian writing.
3. Factors that impacted India and thereby writing in English during the 19th century.
4. Developments at the turn of the Century and their relevance to Writing in English.
5. Significant milestones of this era: writers, genres and works in English.

6. Reflection of the freedom struggle and its aftermath in the 20th Century Writing in English.
7. Indian writing in post-independent India: a critique of trends, texts and issues.
8. Indian writing: changing scenario in the era of globalization.

Prescribed Texts:
1. Selected poems of Kamala Das, Jayant Mahapatra, Nissim Ezekiel, Eunice D'Souza. [12 contact hours]

2. Rao, Raja. *Kanthapura.* [12 contact hours]

3. Dattani, Mahesh. *Final Solutions.* [12 contact hours]

4. Rushdie, Salman. *Midnight's Children.* [12 contact hours]

References:
Iyengar, K. R. S. *Indian Writing in English*. Asia Publishing House, 1973.
Mukherjee, Meenakshi. *The Twice Born Fiction*. Arnold Heineman, 1974.
Naik, M. K., S. K. Desai, and G. S. Amur. *Critical essays on Indian Writing in English.* MacMillan, 1968.

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Title of the Course: Critical Disability Studies
Course Code- OGC-EGO: 140 **Number of credits: 04**
Total Contact Hours: 60

Objectives:	iv. To situate Disability as an important identity category and its relationship to culture v. To introduce students to the key concepts of Disability Studies, Medical Model, Social Model of Disability and problematizing Stigma vi. To show the intersectionality of Disability with other social categories.
Content:	**Module 1: Introduction** **8 hours** Constructions of Disability Ableism Questions of Embodiment Disability and Literary representations 'Narrative Prosthesis' Tropes of disability Intersection of Disability with Race, Gender, Caste and Class Rights-based approach to Disability **Module 2: Personal Narratives: Disability and Short Fiction** **12 hours** Alice Wong: *Disability Visibility: First- Person Stories from the Twenty First Century*. 2020

	Module3: Disability and Autobiography **10 hours** Ved Mehta: *Face to Face*. 1957 **Module 4: Disability and Theatre** **15 hours** Mahesh Dattani: *Tara.* 1995 (Play) **Module 5: Disability and Fiction** **15 hours** Sharon Bell Mathis: *Listen for the Fig Tree.* 1974 (Novel)
Pedagogy:	Lectures/tutorials/assignments/seminars.
References/ Readings:	Dattani, Mahesh. *Tara.* 1995. Penguin, 2013. Ghai, Anita. Rethinking Disability in India. Routledge, 2015. Ghosh, Nandini. *Interrogating Disability in India: Theory and Practice*. Springer, 2016. Ghosh, Nandini. *Impaired Bodies, Gendered Lives*. Primus, 2016. Mathis, Sharon Bell. *Listen for the Fig Tree.* Viking, 1974. Love, Genevieve. *Early Modern Theatre and the Figure of Disability.* Bloomsbury Publishing. 2018. Mehrotra, Nikita. *Disability, Gender & State Policy: Exploring Margins.* Rawat Publsihers, 2013. Mehta, Ved. *Face to Face*. 1957. Penguin, 2013. Mitchell T. U David & Sharon L Snyder. *Narrative Prosthesis: Disability and the Dependencies of Discourse*. University of Michigen Press, 2000. Smith, Bonnie G and Beth Hutchison, editors. *Gendering Disability*. Rutgers University Press, 2004. Wendell, Susan. *The Rejected body: Feminist Philosophical Reflections on Disability*. Routledge, 2013. Wong, Alice. *Disability Visibility: First- Person Stories from the Twenty First Century*. Vintage, 2020.
Learning Outcomes	1. Critically look at disability as an important identity category in the textual as well as the material world.

	2. Understand literary narratives from the lens of disability and the ways in which it constructs the identity of the disabled subject. 3. Familiarization with the area of Disability Studies for future interdisciplinary research.

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D 3.17 Minutes of the Board of Studies in Chemistry PG meeting held on 26.04.2022.

Annexure I

Programme: **M.Sc. Part-I (Chemistry)**
Course Code: **ACC-411**
Title of the course: **Techniques in Analytical Chemistry - I**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	1. Learning various methods of data handling in analysis. 2. Understanding the significance of sampling and calibration techniques. 3. Understanding principles and applications of various types of techniques in 4. Training the students to deduce structures based on IR, NMR, MS combined data.
Course Outcome:	1. Students will be able to analyse the role of statistical tools for determination of error and organised data management for systematic interpretation. 2. Student will be able to apply the sampling and calibration methods for obtaining reliable results. 3. Students will be able to understand basic principles and scope of different methods of Analysis 4. Students will be able to solve problems based on IR, NMR, MS combined spectral data.

Content	*Hrs*
1. Analytical Objectives and Data Handling Scope of analytical science and its literature, qualitative and quantitative analysis, ways to express accuracy and precision, types of errors and their causes; significant figures, control charts, confidence limit, test of significance, rejection of a result- the Q-test. Introduction to significant analytical procedure such as Good Laboratory Practices, Standard Operating Procedures, Quality Assurance and Quality Control.	5
2. Sampling and Calibration Techniques Sampling and sample preparation, general steps in chemical analysis, calibration of glass wares. Finding the best straight line-least square regression, correlation coefficient; Calibration curves, standard addition technique and internal standards. Chemical concentrations.	5
3. Classical methods of Analysis Gravimetry and Titrimetric methods, Principle, methodology, Advantages & Disadvantages over instrumental methods. Conditions for identifying a given reaction as method of Analysis, Classification of reactions in titrimetric analysis (Acid-Base, redox, complexometric and precipitation), Standard solutions and their preparation. Selection of Visual Indicators in titrimetric Analysis	6
4. Introduction to Electroanalytical techniques Introduction to electrochemical cell, electrode potential, Classification of electroanalytical techniques, working principles, and their applications	4
5. Introduction to Thermoanalytical techniques	5

Principle, Instrumentation and applications of Thermo Gravimetric Analysis, Differential Thermal Analysis, and Differential Scanning Calorimetry. Numericals based on TGA.	
6. Introduction to Chromatographic Techniques a. Principles of chromatography, classification of chromatographic techniques based on mechanism of retention, configuration, mobile and stationary phase. Efficiency of separation- plate theory (theoretical plate concept) and rate theory (van Deemter equation). b. Principles and applications of Paper chromatography, thin layer chromatography, HPTLC, Size exclusion and Ion exchange chromatography. Counter-current chromatography for isolation of natural products. c. Gas and Liquid Chromatography: Introduction; Instrumental Modules; The Separation System; Choice of Conditions of Analysis; Sample Inlet Systems; Detectors; Practical Considerations in Qualitative and Quantitative Analysis; Coupled Systems-introduction to GCMS, LCMS; Applicability-interpretation and numericals.	15
7. Introduction to Spectroscopic Techniques a. Interaction of Electromagnetic Radiation with Matter: Electromagnetic spectra, regions of spectrum, numericals. b. Ultraviolet and visible Spectroscopy: Electronic spectra and Molecular structure: types of electronic transition, Chromophore and auxochrome, absorption by isolated chromophore, conjugated chromophores, aromatic compounds, inorganic chelates. Calculating λmax for Conjugated Dienes, Trienes, polyenes, α,β-unsaturated carbonyl compounds, Numericals. Choices and effect of solvents on UV-Vis. Quantitative Calculations: Beer-Lambert Law; Mixtures of absorbing species-laws of additivity of absorbance; calibration curve for calculation of unknown; Spectrometric errors in measurement; Deviation from Beer-Lambert Law - chemical deviation, instrumental deviation; Numericals for quantitative analysis using UV-VIS spectroscopy. c. Infrared Spectroscopy: Infrared absorption and molecular structures, molecular vibrations, types of vibrations, IR spectra, overtones and bands-basis of NIR absorption. Spectra interpretation, Frequencies of functional group, Spectral Databases, Identification of unknown compounds. d. Spectrometric Instrumentation of UV-Vis and IR: Sources, monochromators, sample cells, detectors, instrumental wavelength and absorption calibration. e. Proton and Carbon NMR Spectroscopy: Theory of NMR, Instrumentation, Chemical shift, factors influencing chemical shift, solvents used in NMR, spin-spin splitting, coupling constant calculation, factors influencing coupling constant. f. Mass Spectrometry: Principle, Instrumentation and various fragmentation patterns. g. Conjoint spectrometry problems: Structural elucidation of organic molecules using IR, UV, NMR and MS. h. Raman Spectroscopy: Theory, Basic instrumentation and Structural analysis using Raman Spectra. (Note: Assignment based on all above spectrometric methods should be given to student. More weightage of lectures shall be given for solving IR and NMR data problems for structure elucidation)	20

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. G. D. Christian, *Analytical Chemistry*, 6th Ed.; Wiley, 2004. 2. J. H. Kennedy, *Analytical Chemistry: Principles*, 2nd Ed.; Saunders College Publishing, 1990. 3. G. W. Ewing, *Instrumental Methods of Chemical Analysis*, 5th Ed.; McGraw- Hill Int., 1985. 4. W. Kemp, *Organic Spectroscopy*, 3rd Ed.; Palgrave, 1991. 5. D. A. Skoog, D. M. West, F. J. Hollar, S. R. Crouch, *Fundamentals of Analytical Chemistry,* 9th Ed.; Cengage learning, 2014. 6. F. J. Holler, D. A. Skoog, S. R. Crouch, *Principles of Instrumental Analysis*, 6th Ed.; Thomson Books, 2007. 7. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, *Instrumental methods of Analysis,* 7th Ed.; HCBS Publishing, 2004. 8. C. N. Banwell, E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Ed.; Tata McGraw- Hill, 2006. 9. R. M. Silverstein, F. X. Webster, *Spectrometric identification of Organic Compounds,* 6th Ed.; Wiley, 1998. 10. H. Gunzler, A. Williams, *Handbook of Analytical Techniques*, 1st Ed.; Wiley, 2001. 11. P. S. Kalsi, *Spectroscopy of Organic Compounds,* 2nd Ed.; New Age International, 2000. 12. E. Pretsch, P. Buhlmann, C. Affolter, *Structural Determination of Organic Compounds*, 2nd Ed.; Springer, 2005. 13. L. D. Field, S. Sternhell, J. R. Kalman; *Organic Structures from Spectra*, 4th Ed.; Wiley, 2007. 14. R. A. Day, A. L. Underwood, *Quantitative Analysis*, 6th Ed.; Prentice Hall, 2001. 15. B. K Sharma, *Instrumental methods of chemical analysis*, Goel Publishing House, Meerut, 2004. 16. K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, 6th Ed.; Wiley, 2009. 17. P. J. Larkin, *Infrared and Raman Spectroscopy: principles and spectral interpretation*, 2th Ed.; Elsevier, 2018. 18. J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas, B. Sivasankar, *Vogel's Text Book of Quantitative Chemical Analysis,* 6th Ed.; Pearson, 2009.

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Programme: **M. Sc. Part-I (Chemistry)**

Course Code: **ACO-411**

Title of the Course: **Laboratory Course in Analytical Chemistry**

Number of Credits: **02** Total Contact Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry practical courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objectives:	1. Introduction of various experimental techniques for analysis. 2. Learning data analysis, handling and interpretation of spectra.
Course Outcomes:	1. Students will be able to explain how to determine an unknown concentration of solution. 2. Students will use statistical methods to analyse data in laboratory. 3. Students will be able to use different techniques for qualitative and quantitative estimation.

Content

This course consists of 7 units of experiments in various areas of Analytical chemistry. Minimum 13 experiments which include at least 02 experiments from unit 1-6 and 01 experiment from unit 7 shall be conducted.

Unit 1: Statistics

i. Calibration of apparatus: Volumetric apparatus (pipette, burette and standard volumetric flask).
ii. Calibration of instruments: pH meter or conductivity meter or analytical weighing balance.
iii. Preparation of standard solutions and standardisation.

Unit 2: Colorimetry

i. Estimation of Iron from Pharmaceutical sample (capsule) by thiocyanate method.
ii. Estimation of lead/nitrite in water sample.
iii. Estimation of phosphoric acid in cola drinks by molybdenum blue method.

Unit 3: Flame Spectrophotometry and UV-Visible Spectrophotometry

i. Estimation of Na in food products.
ii. Estimation of K in food supplements or cosmetic products.
iii. Estimation of KNO_3 by UV spectroscopy and $K_2Cr_2O_7$ by Visible spectroscopy
iv. Simultaneous determination and Verification of law of additivity of absorbances ($K_2Cr_2O_7$ and $KMnO_4$).

Unit 4: Ion Exchange Chromatography

i. To determine the ion exchange capacity of cation/anion exchange resin.
ii. Separation and Estimation of Zn and Cd.
iii. Separation and Estimation of chloride and bromide.

Unit 5: Volumetric Titrations

i. Estimation of Ca in pharmaceutical tablet.
ii. Estimation of Al and Mg in antacid tablet.
iii. Estimation of CaO in cement.

Unit 6:Solvent Extraction and spectrophotometry

i. Extraction of Cu as copper dithiocarbamate (DTC) using solvent extraction and estimation by spectrophotometry.
ii. Determination of Ni as Dimethylglyoxime complex by spectrophotometry.

iii. Determination of Silver as ion association complex with 1,10-Phenanthroline and Bromopyrogallol red.

Unit 7: Interpretation Exercises

i. Thermal studies: TG/DTA and Isothermal weight loss studies of various hydrated solids like $CuSO_4 \cdot 5H_2O$, $Ca_2C_2O_4 \cdot H_2O$, $Fe_2C_2O_4 \cdot 2H_2O$.
ii. X-ray powder diffractometry: Calculation of lattice parameters from X-ray powder pattern of cubic system such as $NiMn_2O_4$, $CoFe_2O_4$ etc.
iii. IR spectra of Urea, benzoic acid, Copper sulphate pentahydrate etc.

Pedagogy:	Prelab exercises / assignments / presentations / lab hand-out or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. J. H. Kennedy, *Analytical Chemistry Principles*, Saunders College Publishing, 2nd Ed., 1990. 2. G. D. Christian, *Analytical chemistry*, 5thEd., John Willey and Sons, 1994 3. J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, B. Sivasankar, *Vogel's Textbook of Quantitative Chemical Analysis,* 6thEd., Pearson Education Asia 2009. 4. A. J. Elias, *Collection of interesting chemistry experiments*, University press, 2002. 5. R.A. Day & A.L. Underwood, *Quantitative Analysis*, 6thEd., Prentice Hall, 2001. *6.* J. Kenkel, *Analytical Chemistry for Technicians*, 3rdEd., Lewis publishers, 2002.

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Course Code: **ACO-412**
Title of the Course: **Practical Course in Analytical Chemistry**
Number of Credits: **02** Total Contact Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry practical courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objectives:	1. Introduction of various experimental techniques for analysis. 2. Learning data analysis, handling and interpretation of spectra.
Course Outcomes:	1. Students will be able to standardize a material to determine an unknown concentration. 2. Students will use statistical methods to analyse data in laboratory. 3. Students will be able to use different techniques for qualitative and quantitative estimation.

Content

This course consists of 7 units of experiments in various areas of Analytical chemistry. Minimum 13 experiments which include at least 02 experiments from unit 1-6 and 01 experiment from unit 7 shall be conducted.

Unit 1: Calibration and Standardisation

i. Calibration of Volumetric apparatus (pipette, burette and standard volumetric flask).
ii. Calibration of important instruments: pH meter /conductivity meter/ analytical weighing balance.
iii. Standardisation and preparation of standard solutions from secondary standards

Unit 2: Titrimetric Analysis

iv. Standardisation and estimation of Chloride using precipitation titration (Mohr's method)
v. Analysis of commercial caustic soda by neutralisation titrimetric method
vi. Determination of sulphates by complexometric titrations using EDTA.

Unit 3: Flame Spectrophotometry and UV-Visible Spectrophotometry

v. Estimation of Ca in drinking water
vi. Estimation of Li in a sample
vii. Estimation of $K_2Cr_2O_7$ by UV-Visible spectroscopy

Unit 4: Natural product isolation, Thin layer and Ion Exchange Chromatography

iv. Isolation of cinnamaldehyde from cinnamon
v. Isolation of Caffeine from tea powder
vi. Separation of *o* and *p*-nitroanilines using TLC
vii. Separation of *o* and *p*-nitrophenols using TLC
viii. Separation and estimation of chloride and bromide

Unit 5: Conductometry

i. Determination of composition of weak acid and strong acid in a mixture using conductometry
ii. Determination of composition of weak base and strong base in a mixture using conductometry
iii. Determination of hydrolysis constant of aniline hydrochloride using conductometry

Unit 6: Solvent Extraction and spectrophotometry

i. Spectrophotometric determination of aspirin/phenacetin/ caffeine in APC tablet using solvent extraction ii. Colorimetric determination of iron with salicylic acid. iii. Determination of copper in brass sample by colorimetry. **Unit 7: Data Interpretation Exercises** iv. NMR/Mass spectra v. HPLC and GC chromatograph vi. XRD powder pattern of cubic systems vii. Thermogram of coordination compounds	
Pedagogy:	Prelab exercises / assignments / presentations / lab hand-out or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. J. H. Kennedy, *Analytical Chemistry Principles*, Saunders College Publishing, 2nd Ed., 1990. 2. G. D. Christian, *Analytical chemistry*, 5th Ed., John Willey and Sons, 1994 3. J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, B. Sivasankar, *Vogel's Textbook of Quantitative Chemical Analysis,* 6th Ed., Pearson Education Asia 2009. 4. A. J. Elias, *Collection of interesting chemistry experiments*, University press, 2002. 5. R.A. Day & A.L. Underwood, *Quantitative Analysis*, 6th Ed., Prentice Hall, 2001. *6.* J. Kenkel, *Analytical Chemistry for Technicians*, 3rd Ed., Lewis publishers, 2002.

Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **ICC-411**

Title of the course: **Fundamentals of Inorganic Chemistry**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University
Course Objective:	1. To introduce atomic structure, molecular structure, bonding, and symmetry. 2. To provide fundamental knowledge of solid state chemistry, coordination chemistry, organometallic chemistry, and bioinorganic chemistry. 3. To provide fundamental aspects of transition & inner transition elements & their compounds. 4. To introduce air and water pollution, and its treatments, follow directive of the Supreme Court in 1993 to introduce environmental education at all levels.
Course Outcome:	1.Students will be able to predict geometry and shape of different molecules, and the point group symbols.

	2.Students will be able to explain the fundamentals of atomic and molecular structure, solid state chemistry, coordination chemistry, organometallic chemistry, and bioinorganic chemistry. 3.Students should be able to describe and explain the properties and usefulness of transition & inner transition metals. 4.Students will able to explain different air and water pollutants and will be in a position to apply knowledge to treat these pollutants.

Content	*Hrs*
1. Atomic structure, molecular structure and bonding a. Atomic Structure: Structures of hydrogenic atoms: some principles of quantum mechanics, atomic orbitals. Many electron atoms: penetration & shielding, building up principle, classification of elements. Spectroscopic terms. Atomic properties: atomic radii, ionic radii, ionization energy, electron affinity, electronegativity, polarizability. b. Molecular Structure & bonding: Lewis structures: octet rule, resonance. VSEPR model: basic shapes, modification of the basic shapes. Valence bond theory: hydrogen molecule, homonuclear diatomic molecules, polyatomic molecules, promotion, hypervalence, hybridization. Molecular orbital theory: approximation, boding & antibonding orbitals. Homonuclear diatomic molecules & Heteronuclear diatomic molecules	10
2. Molecular Symmetry a. Symmetry elements and symmetry operations. b. Equivalent symmetry elements and equivalent atoms, symmetry point groups with examples, point groups of higher symmetry. c. Systematic procedure for symmetry classification of molecules and illustrative examples, dipole moment, optical activity and point groups	4
3. Solid state chemistry a. Structures of solids: crystal structures, lattices and unit cells, fractional atomic coordinates and projections, close packing of spheres, holes in closed-packed structures. b. Structures of metals & alloys: polytypism, nonclosed-packed structures, polymorphism of metals, atomic radii of metals, alloys, substitutional and interstitial solid solutions, intermetallic compounds. c. Ionic solids: characteristic structures of ionic solids, binary phases, ternary phases, rationalization of structures, ionic radii, radius ratio, structure maps, energetics of ionic bonding, lattice energy and the Born–Haber cycle, The calculation of lattice enthalpies. (numerical expected)	10
4. Chemistry of transition & inner transition elements a. Transition elements**:** IUPAC definition of transition elements, occurrence, physical and chemical properties, noble character, metal halides, oxides & oxido complexes, examples of metal-metal bonded clusters, difference between 1st row and other two rows. b. Inner transition elements: Lanthanides, occurrence, properties, oxidation states, electronic structure, colour and spectra, magnetic properties, lanthanide contraction, compounds of lanthanides. Actinoid chemistry: general trends and properties, electronic spectra, thorium and uranium.	10

5. Coordination and Organometallic Chemistry a. Coordination chemistry: Introduction, representative ligands, nomenclature. Constitution and geometry: low coordination numbers, intermediate coordination numbers, higher coordination numbers, polymetallic compounds. Isomerism & chirality in square planar and octahedral complexes, ligand chirality. Thermodynamics of complex formation: formation constants, chelate and macrocyclic effects, steric effects and electron delocalization. Electronic properties of metal complexes: CFT applied to octahedral and tetrahedral complexes, magnetic moments, CFSE. Electronic spectroscopy: basic concepts, interpretation of spectra of d^1 & d^9 ions (Orgel diagram for octahedral and tetrahedral complexes). b. Organometallic Chemistry: Introduction to organometallic chemistry, nomenclature, stability and inert gas rules (neutral atom and donor pair electron count methods). Ligands: CO & phosphines, homoleptic carbonyls its synthesis and properties, oxidation-reduction of carbonyls, metal carbonyl basicity, reactions of CO ligand, spectroscopic properties of metal carbonyls. Oxidative addition and reductive elimination.	12
6. Basic Bioinorganic Chemistry a. Macronutrients/micronutrients. Role of elements in biology. Metal ion transport role. b. Definition of metallobiomolecules, metalloporphyrins, structure of porphine and heme group, examples of metalloenzymes of Cu and Zn.	4
7. Environmental Chemistry a. Air Pollution: Classification of air pollutants and photochemical reactions in the atmosphere. Common air pollutants (e.g. CO, NOx, SO_2, hydrocarbons and particulates) (a) sources (b) physiological and environmental effect (c) monitoring, (d) various remedial & technological measures to curb pollution. Air quality standards. b. Water pollution: Importance of buffer & buffer index in waste water treatments. Chemical, physical & biological characteristics of water pollution, specific & non-specific characterization of water. DO, BOD, COD, and chlorine demand, typical water treatment & waste water treatment (Municipal). Impact of plastic pollution and its effect.	10
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/References / Readings	1. P. W. Atkins, T. Overton, J. Rourke, M. Weller, F. Armstrong, *Shriver & Atkins Inorganic Chemistry*, 5th Ed.; Oxford Publications, 2009. 2. J. E. Huheey, E. A. Kieter, R. L. Kieter, O. K. Medhi, *Inorganic Chemistry: Principles of Structure & Reactivity*, 4th Ed.; Pearson, 2011. 3. F. A. Cotton, G. Wilkinson, P. L. Gauss, *Basic Inorganic Chemistry*, 3rd Ed.; Wiley, 2008 (reprint). 4. J. D. Lee, *Concise Inorganic Chemistry*, 5th Ed.; Wiley, 2008.

	5. F. A. Cotton, *Chemical applications of group theory*, 3rd Ed.; Wiley Eastern, 2012 (reprint). 6. L. Pauling, *The Nature of The Chemical Bond*, 3rd Ed.; Cornell University Press, 1960. 7. M. C. Day, J. Selbin, *Theoretical Inorganic Chemistry*, 2ed Ed.; Van Nostrand-Reinhold, 1969. 8. H. V. Keer, *Principles of Solid state Chemistry*, 1st Ed.; New Age Intl. Ltd, 1993, (reprint 2008). 9. A. R. West, *Solid State Chemistry and Its Applications*, 1st Ed.; John Wiley & Sons, Singapore, 1984 (reprint 2007). 10. D. K. Chakrabarty, *Solid State Chemistry*, 2ed Ed.; New Age Intl. Publishers, 2010. 11. F. A. Cotton, G. Wilkinson, *Advanced Inorganic Chemistry*, 3rd Ed.; Wiley Eastern, 2001. 12. A. V. Salker, *Environmental Chemistry: Pollution and Remedial Perspective*, 1st Ed.; Narosa Publication, 2017. 13. A.K. De, *Environmental Chemistry*, 3rd Ed.; New Age Intl. Publishers, 2005. 14. A. C. Stern, R. W. Boubel, D. Bruce turner, D. L. Fox, *Fundamentals of Air Pollution*, 1st Ed.; Academic Press, 1984. 15. R. A. Horne, *Chemistry of Our Environment*, 1st Ed.; John Wiley, 1978. 16. R. S. Drago, *Physical Methods in Inorganic Chemistry*, Affiliated East West Press Pvt. Ltd., 2017 17. G. C. Miessler, D. A. Tarr, *Inorganic Chemistry*, 3rd Ed.; Pearson, 2004

Programme: **M.Sc. Part-I (Chemistry)**

Course Code:**ICO-411**

Title of the course:**Experiments in Inorganic Chemistry**

Number of Credits: **02** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry practical courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	1. Students shall acquire skills in synthetic inorganic chemistry. 2. Students will learn to prepare coordination compounds. 3. Students will learn to prepare useful potash alum from scrap aluminum. 4. Students will learn how to grow single crystals. 5. Students will acquire skills in determination of chromium, oxalate, and aluminum by redox titrations. 6. Students will be trained to fix the formula of compounds and find lattice water molecules by complexometric, redox & iodometric titrations. 7. Students shall acquire skills in determination of metal content at very low concentrations (ppm) using colorimetry / spectrophotometry.
Course Outcome:	1. Students will be in a position to synthesis coordination compounds with different metals and ligands. 2. Students will be able to grow single crystal.

	3. Students will be able to prepare potash alum compound from waste scrap Al source. 4. Students will be able to determine metal content in the synthesised inorganic compounds. 5. Students will be able to fix the formula of compounds. 6. Students will be able to use and explain the diverse methods available for estimation of the metals including colorimeters and spectrometers.

Content	*Hrs*
Minimum 13 experiments from the list shall be conducted.	
1. Preparations / Synthesis of Inorganic Compounds: i. Preparation of hexaamminenickel(II) chloride. ii. Preparation of hexaamminecobalt(III) chloride. iii. Preparation of potassium trioxalatoaluminate trihydrate. iv. Preparation of potassium hexathiocyanato-*κN*-chromate tetrahydrate. v. Preparation of potassium trioxalatochromate trihydrate. vi. Preparation of potash alum from scrap aluminum. **2. Estimations / Determinations:** i. Estimation of nickel in $[Ni(NH_3)_6]Cl_2$by complexometry or Gravimetry. ii. Estimation of cobalt in $[Co(NH)_3]Cl_3$ by complexometry. iii. Estimation of oxalate in $K_3[Al(C_2O_4)_3]\cdot xH_2O$ or $K_3[Cr(C_2O_4)_3]\cdot xH_2O$ iv. Estimation of nitrite by redox titration. v. Estimation of calcium from calcite ore. vi. Iodometric determination of Copper in gun metal alloy/Devarda's alloy. vii. Determination of chromium in chrome alum and $K_3[Cr(C_2O_4)_3]\cdot xH_2O$ and to determine degree of hydration. viii. Colorimetric/Spectrophotometric determination of nickel or chromium.	60

Pedagogy	Students will be given pre-lab and post-lab assignments on theoretical aspects of laboratory experiments prior to the conduct of each experiment. Exams will be in the form of ISA, SEA which will involve performing given experiments and conduct of viva, systematic reporting of experiments, results and observations in laboratory report. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. G. Brauer, *Handbook of Preparative Inorganic Chemistry*, Vol. 1 &2, 1963. 2. G. Pass & H. Sutcliffe, *Practical Inorganic Chemistry, Preparations, Reactions and Instrumental Methods*, 2nd Ed.; Chapman & Hall, 1974. 3. S. De Meo, *J. Chem. Ed*., Vol 80, Pg.No.796-798, 2003. 4. W. L. Jolly, *The Synthesis & Characterization of Inorganic Compounds*, Prentice-Hall, INC, 1970. 5. A. J. Elias, *General Chemistry Experiments*, Revised Ed.; University Press, 2008. 6. J. Mendham, R.C. Denney, J.D. Barnes, M.J. K. Thomas, *Vogel's Text Book of Quantitative Chemical Analysis*,6th Ed.; Pearson, 2002. 7. G. Svehla, *Vogel's Text Book of Qualitative Inorganic Analysis*, 7th Ed, Pearson, 2011. 8. G. Marr, B. W. Rockett, *Practical Inorganic Chemistry*, Van Nostrnad Reinhold London, 1972.

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Programme: **M.Sc. Part-I (Chemistry)**
Course Code: **ICO-412**
Title of the course: **Practical course in Inorganic Chemistry**
Number of Credits: **02** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry practical courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	1. Students shall acquire skills in synthetic inorganic chemistry. 2. Students will learn to prepare coordination compounds. 3. Students will learn how to grow single crystals. 4. Students will acquire skills in determination of metal present by gravimetric and titrimetric method. 5. Students shall acquire skills in determining the metal content at very low concentrations (ppm) using colorimetry / spectrophotometry.
Course Outcome:	1. Students will be in a position to synthesize coordination compounds with different metals and ligands. 2. Students will be able to grow single crystal. 3. Students will be able to determine metal content in the given sample. 4. Students will be in position to apply diverse methods available for estimation of the metals and can use colorimeters and spectrometers. 5. Students will able to detect cations and anions in the given salt.

Content	*Hrs*
Minimum 13 experiments from the list shall be conducted.	
1. Preparations / Estimation of Inorganic Compounds: (Any Nine) i. Preparation of hexaamminecobalt(III) nitrate. ii. Estimation of cobalt in hexaamminecobalt(III) nitrate by volumetric titration. iii. Preparation of Potassium Trioxalatoferrate(III) Trihydrate iv. Estimation of iron and oxalate by redox titration v. Synthesis of metal nanoparticles (Cu, Ag, Au, Ni) and determining the absorption maxima by UV-visible spectrophotometer. vi. Estimation of amount of calcium in given sample by gravimetric method. vii. Estimation of amount of nickel in given sample by gravimetric method. viii. Estimation amount of zinc present in given sample by gravimetric method. ix. Estimation of iron by colorimetric / spectrophotometry method. x. Estimation of manganese by colorimetric / spectrophotometry method. xi. Estimation of barium by complexometric titration method. xii. Estimation of manganese in presence of iron by complexometric titration method. **2. Semi-micro qualitative analysis of cation and anion in a given inorganic mixture: (Any four mixture)** Mixture containing total six cations and/or anions.	60

Cations : Pb^{2+}, Cu^{2+}, Cd^{2+}, Sn^{2+}, Fe^{2+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, $(NH_4)^+$, K^+ **Anions:** Cl^-, Br^-, I^-, NO_2^-, NO_3^-, SO_3^{2-}, CO_3^{2-}, SO_4^{2-}, PO_4^{3-}, S^{2-}	
Pedagogy	Students will be given pre-lab and post-lab assignments on theoretical aspects of laboratory experiments prior to the conduct of each experiment. Exams will be in the form of ISA, SEA which will involve performing given experiments and conduct of viva, systematic reporting of experiments, results and observations in laboratory report. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. G. Brauer, *Handbook of Preparative Inorganic Chemistry*, Vol. 1 & 2, 1963. 2. G. Pass & H. Sutcliffe, *Practical Inorganic Chemistry, Preparations, Reactions and Instrumental Methods*, 2nd Ed.; Chapman & Hall, 1974. 3. S. De Meo, *J. Chem. Ed*., Vol 80, Pg.No.796-798, 2003. 4. W. L. Jolly, *The Synthesis & Characterization of Inorganic Compounds*, Prentice-Hall, INC, 1970. 5. A. J. Elias, *General Chemistry Experiments*, Revised Ed.; University Press, 2008. 6. J. Mendham, R.C. Denney, J.D. Barnes, M.J. K. Thomas, *Vogel's Text Book of Quantitative Chemical Analysis*,6th Ed.; Pearson, 2002. 7. G. Svehla, *Vogel's Text Book of Qualitative Inorganic Analysis*, 7th Ed, Pearson, 2011. 8. G. Marr & B. W. Rockett, *Practical Inorganic Chemistry*, Van Nostrand Reinhold Company, London, 1972.

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Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **OCC-411**

Title of the course: **Fundamentals of Organic Chemistry**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	1. To study the various concepts based on molecular orbital theory. 2. To understand the concepts of topicity, prostereoisomerism and chemo-, regio- and stereoselectivity in organic reactions. 3. To understand the mechanistic aspects of various type of reactions in organic synthesis.
Course Outcome:	1. Students will be in a position to evaluate the effect of delocalization of electrons & presence or absence of aromaticity in organic compounds. 2. Students will be able to apply various concepts in stereochemistry to understand stereochemical outcome in a reaction. 3. Students shall be in a position to understand/propose plausible mechanism of organic reactions.

Content	*Hrs*
1. Molecular orbitals and delocalized chemical bonding a. Qualitative description of molecular orbitals of simple acyclic and monocyclic systems, frontier molecular orbitals. b. Conjugation, cross conjugation, resonance, hyperconjugation and tautomerism (types and examples). c. Aromaticity: Origin of Huckel's rule, examples of aromatic, non-aromatic and antiaromatic compounds; concept of Mobius aromaticity.	08
2. Structure & Reactivity a. Acidity, basicity and pKa of organic compounds; Acid and base strengths; HSAB concept & Factors affecting it, effect of structure & medium on acid and base strength. b. Concept of superacids and superbases. c. Electrophilicity & nucleophilicity, examples of ambident nucleophiles & electrophiles. (Including revision of aromatic electrophilic and nucleophilic substitution)	08
3. Stereochemistry a. Brief revision of configurational nomenclature: R & S; D & L; E & Z; cis & trans and *syn* & *anti* nomenclature. Chirality in molecules with two and more chiral centres. b. Conformational analysis of open chain compounds (Butane, 2, 3-butane diol, 2,3-dibromobutane etc.). *Erythro* and *threo* nomenclature. c. Topicity and Prostereoisomerism: Topicity of ligands and faces-homotopic, enantiotopic and Cram's rule /diastereotopic ligands and faces. d. Introduction to chemoselective, regioselective and stereoselective reactions. e. Stereochemistry of *cis*- and *trans*-decalins, conformation and reactivity of cyclohexane and substituted cyclohexanes, cyclohexene / cyclohexanone. conformational isomerism and analysis in acyclic and simple cyclic systems – substituted ethanes, cyclopentane, cyclohexane cycloheptane, cyclooctane and decalins,	14

f. optical isomerism - optical activity - molecular dissymmetry and chirality - elements of symmetry. optical isomerism in biphenyls, allenes and spirans - optical isomerism of nitrogenous compounds racemisation and resolution.	
4. Reaction Mechanism a. Brief revision of carbocations, carbanions, free radicals, carbenes, Arynes and nitrenes with reference to generation, structure, stability and reactivity; b. Types of mechanisms, types of reactions, thermodynamic and kinetic control. c. The Hammond postulate and principle of microscopic reversibility, d. Methods of determining reaction mechanisms like- i. Identification of products, ii. Determination of the presence of intermediates (isolation, detection, trapping and addition of suspected intermediate, iii. Isotopic labelling, iv. Stereochemical evidence, v. Kinetic evidence and vi. Isotope effect (at least two reactions to exemplify each method be studied)	08
5. Aliphatic Nucleophilic substitution a. Brief revision of nucleophilic substitutions with respect to Mechanism, various factors affecting such reactions; b. The Neighbouring Group Participation (NGP)/ Anchimeric assistance: General approach to various NGP processes; NGP by unshared/lone pair of electrons; NGP by π-electrons; NGP by aromatic rings (formation of phenonium ion intermediate); NGP by sigma bonds with special reference to bornyl and nor-bornyl system (formation of nonclassical carbocation)	08
6. Elimination reactions a. The E2, E1 and E1cB mechanisms. Orientation of the double bond, Saytzeff and Hofmann rule. b. Effects of changes in the substrate, base, leaving group and medium on i. Overall reactivity, ii. E1 vs. E2 vs. E1cB iii. Elimination vs substitution, Mechanism and orientation in pyrolytic *syn* elimination (various examples involving cyclic and acyclic substrates to be studied).	08
7. Selective reagents for Organic transformation a. Oxidation of organic compounds, PCC, PDC and MnO_2, ozonolysis, peracids. b. Reduction of organic compounds: $NaBH_4$, LAH, DIBAL reduction and reduction with borane and dialkylboranes. Clemmensen reduction, Birch reduction and Wolff-Kishner reduction	06
Pedagogy	Mainly lectures and tutorials. Seminars/term papers/assignments/ presentations/ self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ Referenc	1. W. Caruthers, I. Coldham, *Modern Methods of Organic Synthesis*, Cambridge University Press, 4th Ed., 2016.

es / Readings	2. M. B. Smith, *Organic Synthesis*, McGraw–HILL, New York, International Edition, 1994. 3. J. Clayden, N. Greeves, S. Warren, P. Wothers, *Organic Chemistry*, Oxford University Press, 2nd Ed., 2012. 4. R. Bruckner, *Advanced Organic Chemistry – Reaction Mechanisms*, San Diego, CA: Harcourt /Academic Press, San Diego, 2002. 5. J. Fuhrhop, G. Penxlin, *Organic Synthesis – Concepts, Methods, Starting Materials*, VCH Publishers Inc., New York, 1994. 6. H. O. House, *Modern Synthetic Reactions*, W. A. Benjamin, 2nd Ed., 1965 7. M. Nogradi, Stereoselective Synthesis, VCH Publishers, Inc., Revised and Enlarged Edition, 1994. 8. F. A. Carey, R. J. Sundberg, *Advanced Organic Chemistry*, Springer India Private Limited, 5th Ed, 2007. 9. T. Laue, A. Plagens, *Named Organic Reactions*, John Wiley and Sons, Inc., 2005.

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Course Code: **OCO-411**
Title of the Course: **Experiments in Organic Chemistry**
Number of Credits: **02**Total Contact Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course	Students should have studied chemistry practical courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	To translate certain theoretical concepts learnt earlier into experimental knowledge by providing hands on experience of basic laboratory techniques required for organic syntheses.
Course Outcome	1. Students will be in a position to understand stoichiometric requirements during organic syntheses. 2. Students will be in a position to understand Safe and good laboratory practices, handling laboratory glassware, equipment and chemical reagents. 3. Students will be in a position to apply the practical knowledge to perform experiments involving common laboratory techniques like reflux, distillation, steam distillation, vacuum distillation, aqueous extraction, thin layer chromatography (TLC) etc.

Content	*Hrs*
Minimum 13 experiments from the list shall be conducted.	
1. Introduction to laboratory equipments, apparatus and safety a. Use of common laboratory equipments like fume hoods, vacuum pumps, weighing balance etc. to be explained to the students. b. Introduction to various types of quick fit joints and apparatus to the students. c. Discussion of Safety Techniques: i) Disposal of chemicals ii) Usage of protective equipment's iii) First aid iv) Fire extinguishers, types of fire v) Hazards of chemicals	04
2. **Laboratory Techniques** a. Simple distillation (any one): i. Toluene-dichloromethane mixture using water condenser. ii. Nitrobenzene and aniline using air condenser. b. Steam distillation (anyone): i. Separation of *o*- and *p*- nitrophenols. ii. Naphthalene from its suspension in water, iii. Clove oil from cloves. c. Crystallisation: Concept of induction of crystallization (any one) i. Crystallisation of phthalic acid from hot water using fluted filter paper and stemless funnel. ii. Acetanilide from boiling water iii. Naphthalene from ethanol. iv. Decolorisation and crystallization of brown sugar (sucrose) with animal charcoal using gravity filtration. d. Sublimation: Simple or vacuum sublimation of camphor, naphthalene, anthracene or succinic acid (any one). e. Vacuum distillation (any one): o-dichlorobenzene, diphenyl ether. Also use of nomograph should be explained.	24

f. Thin layer Chromatography (any one): i. Separation of *o* and *p*-nitroanilines. ii. Separation of analgesic drugs iii. Separation of *o* and *p*-nitrophenols,		
3. Organic synthesis (Any Seven experiments) a. Aliphatic electrophilic substitution: Preparation of iodoform from ethanol & acetone. b. Aromatic electrophilic substitution (anyone): i. Preparation of p-bromoacetanilide. ii. bromination of acetophenone to phenacyl bromide iii. nitration of napthathalene to 1-nitronaphthalene iv. nitration of benzaldehyde to 3-nitrobenzaldehdye. c. Oxidation (any one) i. Benzoic acid from toluene. ii. Cyclohexanone from cyclohexanol. iii) isoborneol to camphor using Jones reagent. d. Reduction (any one) i. Reduction of *o*-nitroaniline to *o*-phenylenediamine using Sn/HCl ii. Reduction of *p*-nitro benzaldehyde to *p*-nitrobenzyl alcohol using $NaBH_4$. e. Bromination of an alcohol using CBr_4/ triphenylphosphine. f. Grignard reaction: Triphenylmethanol from benzoic acid ester or benzophenone. g. Aldol condensation: Dibenzal acetone from benzaldehyde h. Acetoacetic ester condensation: Preparation of ethyl *n*-butylacetoacetate or ethyl acetoacetate. i. Cannizzaro reaction using 4-chlorobenzaldehyde as substrate. j. Friedel Craft's reaction (any one): i. using toluene and succinic anhydride ii. Resorcinol to resacetophenone, benzene and maleic anhydride to *β*-benzoylacrylic acid k. Solvent free preparation of coumarin by the Knoevenagel condensation under MW irradiation. l. Preparation of oxidizing agent (any one): Pyridinium chlorochromate-silica, pyridinium chlorochromate-alumina, MnO_2. m. Preparation of cuprous chloride.		24
4. Isolation from natural sources (Any two) i. Caffeine from tea powder. ii. Piperine from pepper. iii. Cinnamaldehyde from cinnamon iv. Lemongrass oil from lemongrass		8
Pedagogy:	Students should be given suitable pre- and post-lab assignments and explanation revising the theoretical aspects of laboratory experiments prior to the conduct of each experiment. Each of the experiments should be done individually by the students.	
References/Readings	1. A. I. Vogel, A., R. Tatchell , B. S. Furniss, A. J. Hannaford, *Vogel's Textbook of Practical Organic Chemistry*, 5th Ed., Prentice Hall; 2011. 2. D. Pasto, C. Johnson and M. Miller, *Experiments and Techniques in Organic Chemistry*, 1st Ed., Prentice Hall, 1991. 3. L. F. Fieser, K.L. Williamson, *Organic Experiments*, 7th edition D. C. Heath, 1992.	

	4. K. L. Williamson, K. M. Masters, *Macroscale and Microscale Organic Experiments*, 6th Edition, Cengage Learning, 2010 5. R. K. Bansal, *Laboratory Manual in Organic Chemistry*, New Age International, 5th Edition, 2016. 6. S. Delvin, *Green Chemistry*, Sarup & Sons, 2005. 7. O. R. Rodig, C. E. Bell Jr. and A. K. Clark, *Organic Chemistry Laboratory Standard and Microscale Experiments*, Saunders College Publishing, 3rd edition, 2009. 8. J. Mohan, *Organic Analytical Chemistry*, Narosa Publishing House, 2014.	

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Programme: **M. Sc. Part-I (Chemistry)**

Course Code: **OCO-412**

Title of the Course: **Practical course in Organic Chemistry**

Number of Credits: **02** Total Contact Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course	Students should have studied chemistry practical courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	To translate certain theoretical concepts learnt earlier into experimental knowledge by providing hands on experience of basic laboratory techniques required for organic syntheses.
Course Outcome	1. Students will be in a position to adopt Safe and good laboratory practices, handling laboratory glassware, equipment and chemical reagents. 2. Students will be in a position to understand and calculate stoichiometric requirements during organic syntheses. 3. Students will be in a position to perform common laboratory techniques including reflux, distillation, vacuum distillation, aqueous extraction, thin layer chromatography (TLC).

Content	*Hrs*
Minimum 13 experiments from the list shall be conducted.	
1. Introduction to laboratory equipments, apparatus and safety a. Common Hazards in Chemical Laboratory b. Accidents and Emergency procedures	04
2. Laboratory Techniques (Any Two) a. Simple distillation i. Simple distillation of thionyl chloride under anhydrous condition ii. Simple distillation under Nitrogen atmosphere b. Fractional distillation i. Chloroform-dichloromethane mixture using water condenser. ii. Toluene and cyclohexane by fractionating column. c. Vacuum distillation under inert atmosphere Dry Distillation of DMF, *o*-dichlorobenzene, $POCl_3$ d. Thin layer Chromatography i. Purification and isolation of mixture of acids by using Preparative TLC. ii. Purification and isolation of mixture of phenols by using Preparative TLC. iii. Purification and isolation of pharmaceutical drugs using Preparative TLC.	08

3. Organic Synthesis (Any Four) a. *p*-Iodonitrobenzene by Sandmeyer reaction b. Pinacol- Pinacolone rearrangement c. Hydrogenation of Maleic acid (Hydrogen balloon) d. Preparation of nitrostyrene from aldehyde e. Preparation of α,β-dibromocinnamic acid f. Reduction of nitro compounds g. Synthesis of Urea from ammonium cyanate		16
3. Solvent Free Organic synthesis (Any Two) a. Reduction using ball milling technique b. Oxidation of 2° alcohol using $KMnO_4$/Alumina by grinding technique. c. Synthesis of (±)-Binol from β-naphthol d. Hunsdiecker reaction of cinnamic acid derivatives e. Beckmann rearrangement of oxime derivatives		08
4. Two-step Organic Synthesis (Any Two) a. Benzamide-Benzoic acid-Ethyl Benzoate b. Phthalic anhydride – Phthalimide – Anthranilic acid. c. Methyl benzoate- *m*-nitrobenzoate- *m*-nitrobenzoic acid d. Chlorobenzene – 2, 4 – dinitrochlorobenzene – 2,4-dinitrophenol e. Acetanilide – *p*–Bromo acetanilide – *p*–Bromoaniline f. Acetophenone – Oxime – Acetanilide		16
5. Separation, Isolation and Identification of Organic compounds (Any One) a. Separation, purification and identification of compounds of binary mixture (Solid-Solid, Solid-liquid and Liquid-liquid) using the TLC and column chromatography, chemical tests. IR spectra to be used for functional group identification.		08
Pedagogy	Students should be given suitable pre- and post-lab assignments and explanation revising the theoretical aspects of laboratory experiments prior to the conduct of each experiment.	
References /Readings	1. A. I. Vogel, A. R. Tatchell, B. S. Furniss, A. J. Hannaford, *Vogel's Textbook of Practical Organic Chemistry*, 5th Ed., Prentice Hall; 2011. 2. K. Tanaka, *Solvent-free Organic Synthesis,* Wiley-VCH, 2nd Ed., 2009 3. L. F. Fieser, K. L. Williamson "*Organic Experiments*" 7th edition D. C. Heath, 1992. 4. K. L. Williamson, K. M. Masters, *Macroscale and Microscale Organic Experiments*, 6th Edition, Cengage Learning, 2010 5. R. K. Bansal, *Laboratory Manual in Organic Chemistry*, New Age International, 5th Edition, 2016. 6. S. Delvin, *Green Chemistry*, Sarup & Sons, 2005. 7. O. R. Rodig, C. E. Bell Jr., A. K. Clark, *Organic Chemistry Laboratory Standard and Microscale Experiments*, Saunders College Publishing, 3rd edition, 2009. 8. J. Mohan, *Organic Analytical Chemistry*, Narosa Publishing House, 2014.	

Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **PCC-411**

Title of the course: **General Physical Chemistry**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	1. Introduction of various concepts on thermodynamics. 2. Introduction of electro chemistry and kinetics. 3. Learning quantum chemistry.
Course Outcome:	1. Students should be in a position to understand and explain various concepts in physical chemistry. 2. Students should be in a position to apply these concepts during the lab course in physical chemistry.

Content	*Hrs*
1. Mathematical Preparations a. Introduction to various functions and function plotting (exponential, logarithmic, trigonometric etc.), functions of many variables. Complex numbers and complex functions. b. Linear equations, vectors, matrices and determinants. c. Basic rules of differentiation and integration, Partial differentiation, location and characterization of critical points of a function, Regression methods, curve fitting. d. Introduction to series, convergence and divergence, power series, Fourier series e. Probability (permutations and combinations).	12
2. Quantum Chemistry a. Operators, Functions, Eigen value equations, Postulates. b. Schrodinger equation, application to simple system viz. free particle, particle in one dimensional, two dimensional and three-dimensional box (quantization, separation of variables, degenerate wave functions). c. Hydrogen like atoms, Schrodinger equation and its solutions, atomic orbital wave functions and interpretation. d. Hückel MO theory, Secular equations, Secular determinant, delocalization energy, charge density, π-bond order, free valence, applications to C_2H_4, C_3H_5 (radical), C_4H_6, C_4H_4, C_6H_6, C_6H_8.	20
3. Thermodynamics a. Thermodynamic properties: Gas laws, Real gasses, Boyle temperature, Critical temperature, State and path properties. Intensive and extensive properties. Exact and inexact differentials. Internal energy, enthalpy, entropy, free energy and their relations and significances. Maxwell relations. Thermodynamic equations of state b. Joule-Thomson effect. Joule-Thomson coefficient for van der Waals' gas. Joule-Thomson effect and production of low temperature, adiabatic demagnetization, Joule-Thompson coefficient, inversion temperature. c. The third law of thermodynamics. Need for the third law. Apparent exceptions to third law. Application of third law. Use of thermodynamic functions in predicting direction of chemical change. Entropy and third law of thermodynamics. d. Phase equilibria: Phase rule, Discussion of two component systems forming solid solutions with and without maximum or minimum in freezing point curve. Systems with partially miscible solid phases.	12

e. Three component systems: Graphical representation. Three component liquid systems with one pair of partially miscible liquids. Influence of temperature. Systems with two pairs and three pairs of partially miscible liquids. The role of added salts.	
4. Electrochemistry a. EMF series, The cell potential: The Nernst equation, Cells at equilibrium. Determination of thermodynamic functions. b. Decomposition potential and overvoltage, electronegativity, basic principles, completeness of deposition, Separation with controlled potentials, constant current electrolysis, composition of electrolyte, potential buffers, physical characteristics of metal deposits. c. Electroplating and electroless plating, electrosynthesis. d. Concepts of acid-base aqueous and non-aqueous solvents, hard and soft acid-base concept and applications.	8
5. Chemical Kinetics a. General introduction to various types of order of reaction including fractional order, Molecularity of the reaction. b. Introduction to reversible and irreversible reactions and reactions leading to equilibrium. Van't Hoffs equation and analysis of Gibbs free energy of equilibrium reactions. c. Collision Theory and Maxwell Boltzmann distribution of energies of colliding molecules (derivation not required). The concept of collisional cross section and reactive cross section and its significance. d. Comparative study of transition state and collision state theory (derivation not required). e. Reaction Mechanisms: elementary reactions, Consecutive elementary reactions, steady state approximation, the rate determining step and pre-equilibria f. Free radical reactions, Complex reactions such as acetaldehyde decomposition and reaction between H_2 and Br_2, Homogeneous reactions and acid-base catalysis. g. Elementary enzyme reactions. Lineweaver-Burk plot and its analysis	8

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. P. W. Atkins and J. D. Paula, *Physical Chemistry*, 8th Ed., Oxford University Press, (2007) New Delhi. 2. G. M. Barrow, *Physical Chemistry*, 5th Ed., Tata McGraw Hill, (2016) New Delhi. 3. J. E. House, *Principles of Chemical Kinetics*, 2nd Ed., Academic Press, (2007) Elsevier Burlington, USA 4. I. N. Levine, *Quantum Chemistry*, 7th Ed., Prentice-Hall, (1999) New Delhi.

Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **PCO-411**

Title of the course: **Laboratory Course in Physical Chemistry**

Number of Credits: **02** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared change of discipline entrance test conducted by Goa University.
Course Objective:	1. To develop experimental skills on basic lab techniques in physical chemistry 2. To acquire skills for data analysis and interpretation 3. To help the students to develop research skills
Course Outcome:	1. Students will able to explain various fundamental lab techniques. 2. Students should be in a position to apply the knowledge for their dissertation and research work.

Content	*Hrs*
Minimum 13 Experiments to be performed per Semester 1. To study the kinetics of hydrolysis of ethyl acetate and to determine a) Energy of activation b) Entropy of activation and c) Free energy change. 2. To determine the order of reaction between potassium persulphate and potassium iodide by graphical, fractional change and differential methods. 3. To determine the degree of hydrolysis of salt of weak base and strong acid using conductometer. 4. To determine the dissociation constants of a tribasic acid (Phosphoric acid obtain derivative plot to get equivalence point. 5. To determine formal redox potential of Fe^{2+}/Fe^{3+} and Ce^{3+}/Ce^{4+} system obtain derivative plot to get equivalence point. 6. To study the three-component system such as acetic acid, chloroform; and water and obtain tie line. 7. To determine the molecular weight of polyvinyl alcohol by viscosity measurement. 8. To study spectrophotometric titration of ferrous ammonium sulphate with potassium permanganate (or dichromate vs permanganate) 9. To study the electrodeposition of metal 10. To determine Avogadro's number by improved electroplating. 11. To determine the zeta potential of colloidal system and investigate the effect of different surfactants on stability of the colloids 12. To determine number average molecular weight of a polymer sample with an indirect titration method. 13. To measure energy content of various types of plastics using bomb calorimetry 14. To verify the Kohlrausch's law for weak electrolyte by conductometry 15. To determine the transport numbers of Cu^{2+} and SO_4^{2-} ions in $CuSO_4$	60

solution by Hittorf's method. 16. To determine the partial molal volume of ethanol-water mixture at a given temperature. 17. To study the electro-kinetics of rapid reaction between SO_4^{2-} and I^- in an aqueous solution. 18. To determine the buffer capacity of acidic buffer solution.	
Pedagogy	Mainly pre-laboratory exercises Seminars / term papers /assignments / presentations / lab hand-out /self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. A. Finlay & J.A. Kitchener, "*Practical Physical Chemistry*", Longman. 2. F. Daniels & J.H. Mathews, "*Experimental Physical Chemistry*", Longman. 3. A.M.James, "*Practical Physical Chemistry*", Longman. 4. D.P. Shoemaker & C.W. Garland, "*Experimental Physical Chemistry*", McGraw-Hill.

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Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **PCO-412**

Title of the course: **Laboratory Course in Physical Chemistry-II**

Number of Credits: **02** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied chemistry courses at graduate level or must have cleared change of discipline entrance test.
Course Objective:	1. To develop experimental skills on basic lab techniques in physical chemistry 2. To acquire skills for data analysis and interpretation 3. To help the students to develop research skills
Course Outcome:	1. Students will gain knowledge of various fundamental lab techniques. 2. Students should be in a position to apply the knowledge for their dissertation and research work.

Content	*Hrs*
Minimum 13 experiments to be conducted per Semester 1. To determine the radius of a molecule by viscosity measurements. 2. To determine the relative strength of chloroacetic acid and acetic acid by conductometry. 3. To determine ΔG, ΔH and ΔS of silver benzoate by solubility product method 4. To investigate the adsorption of oxalic acid by activated charcoal and test the validity of Freundlich and Langmuir's isotherms. 5. To determine the molecular weight of a given polymer by turbidimetry 6. To study the rate of reaction between ethyl bromoacetate and sodium thiosulphate kinetically. 7. To determine the percentage composition of a given mixture of two liquids by stalagmometer method. 8. To study the kinetics of hydrolysis of methyl acetate and to determine a) Energy	60

of activation b) Entropy of activation and c) Free energy change. 9. To study the kinetics of the reaction between Potassium per sulphate ($K_2S_2O_8$), and Potassium iodide (KI), and to determine a) Energy of activation b) Entropy of activation and c) Free energy change. 10. To determine the order of reaction for hydrolysis of ethyl acetate by graphical, fractional change and differential methods. 11. To determine the degree of hydrolysis of salt of weak base and strong acid using conductometry. 12. To determine the composition of a mixture of acetic acid, dichloroacetic acid and hydrochloric acid by conductometric titration. 13. To determine the dissociation constants of monobasic acid and dibasic acid and obtain derivative plot to get equivalence point. 14. To determine the molecular weight of polystyrene by viscosity measurement. 15. To determine the redox potential of Fe^{2+}/Fe^{3+} system by titrating it with standard $K_2Cr_2O_7$ solution. 16. To investigate basic hydrolysis of ethyl acetate at four different temperatures and find out energy of activation	
Pedagogy	Mainly pre-laboratory exercises Seminars / term papers /assignments / presentations / lab hand-out /self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	5. A. Finlay & J.A. Kitchener, "*Practical Physical Chemistry*", Longman 6. F. Daniels & J.H. Mathews, "*Experimental Physical Chemistry*", Longman. 7. A. M. James, F. E. Prichard "*Practical Physical Chemistry*", Longman 8. D.P. Shoemaker & C.W. Garland, "*Experimental Physical Chemistry*", McGraw-Hill.

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Programme: **M. Sc -I (Analytical Chemistry)**

Course Code: **ACC-412**

Title of the Course**: Chemical methods of analysis**

Number of Credits**: 4** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied analytical chemistry courses at M.Sc. Chemistry in semester I	
Course Objectives:	1. Introduction to the various chemical method of analysis, details of underlying principle of chemical methods, advantages and limitations 2. Application of chemical methods for qualitative and quantitative analysis	
Course Outcomes:	1. Students will be able to explain the basic principle and chemistry behind different conventional method of analysis. 2. Student will know the limitation of method of analysis and will be in a position to choose an appropriate chemical method for particular analysis	

Content	Hrs
1. Acid-Base Titrations a. Standard acids and Base solutions, b. Theory of acid-base indicators for Acid-Base titrations i. Colour change and range of indicator ii. Selection of proper indicator iii. Indicator errors c. Neutralization curves for strong acid-strong base; weak acid-strong base and weak base-strong acid weak acid-weak base titrations d. Polyfunctional acids and bases; titration curves for poly functional acids and bases; titration curves for amphiprotic species e. Determining the equivalence point; feasibility of acid - base titrations; magnitude of the equilibrium constant; effect of concentration f. Typical applications of acid-base titrations	10
2. Complexometric titrations a. The complex formation reactions; Stability of complexes; stepwise formation constants b. Organic complexing agents; amino carboxylic acid titration c. EDTA; acidic properties of EDTA; EDTA complexes with metal ions; equilibrium calculations involving EDTA in solution; condition of formation constants d. EDTA titration curves; effect of other complexing agents on EDTA; factors affecting the titration curves; completeness of reaction e. Indicators for EDTA titrations; Theory of common indicators f. Titration methods using EDTA- direct titration; back titration and displacement titration; indirect determinations; titration of mixtures; selectivity, masking and damasking agents g. Applications of EDTA titrations- hardness of water; magnesium and Al in antacids; magnesium, manganese and zinc in a mixture.	8
3. Precipitation titrations a. Introduction to precipitation titrations; feasibility of precipitation titrations b. Titration curves i. Effect of titrant and analyte concentration on titration curves ii. Effect of reaction completeness on titration curves iii. Titration curves for mixture of anions c. Indicators for precipitation titrations d. The Volhard, the Mohr's and the Fajan's methods e. Titration of sulfate with barium	6
4. Basic concepts in Electrochemical Titrations a. Faradic and non-Faradic currents b. Reversible and irreversible cells c. EMF series; standard electrode potential; Nernst equation; calculation ofcell potential; effect of current; ohmic potential; polarization; decomposition potential; over voltage; concentration polarization; mechanism of mass transport. d. Introduction to potentiometric methods	4

5. Redox and potentiometric titrations a. Redox Titrations: Equilibrium constants for redox reactions- electrode potentials in equilibrium systems; calculation of equilibrium constants b. Redox titration curves- formal redox potentials; derivation of titration curves c. Factors affecting the shape of titration curves concentration; completeness of reaction; titration of mixtures- feasibility of redox titrations d. Detection of end point and redox indicators i. Structural aspect of redox indicators ii. Specific and nonspecific indicators iii. Choice of indicator iv. Potentiometric end point detection e. Sample preparation: pre-reduction and pre-oxidation f. Potentiometric titrations		8
6. Gravimetric analysis a. Introduction to gravimetric method of analysis b. Properties of precipitates and precipitating reagents i. Completeness of precipitates ii. Super saturation and precipitate formation iii. Particle size and filterability of precipitates c. Colloidal precipitates and crystalline precipitates d. Purity of the precipitate; coprecipitation, post precipitation; conditions for precipitation. e. Fractional precipitation; precipitation from homogenous solution; f. Organic reagent as precipitants-dimethyl glyoxime, oxine, cupferron, salicylaldoxime g. Washing of precipitates; drying and ignition of precipitates; calculation of results from gravimetric data; h. Applications of gravimetric method		6
7. Clinical methods of analysis a. Composition of Blood; Collection and Preservation of Samples; b. Immunoassay: Radioimmunoassay; its principle and applications; instrumentation for radio bioassay c. Clinical application of the radioimmunoassay of insulin, estrogen and progesterone; receptor techniques of breast cancer d. Enzyme- linked immunosorbent assay; principles; practical aspects; applications e. Blood gas analyzer f. Trace elements in the body		10
8. Environmental Sampling and Analysis a. Acquiring meaningful Sample b. Air Sample Collection and Analysis c. Water Sample Collection and Analysis d. Soil and Sediment Sampling e. Sample Preparation for Trace Organics f. Methods and Performance-Based Analyses		8
Pedagogy:	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also	

	be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.	
References/ Readings	1. G. D. Christian, *Analytical Chemistry*, 6th Ed., John Wiley, New York, 2004. 2. D. A. Skoog, D. M. West & F. J. Holler, *Fundamentals of Analytical Chemistry*, 9th Ed., Sounders College publishing, 2014. 3. J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, *Vogel's Textbook of Quantitative Inorganic Analysis*, 6th Ed., Pearson Education Asia, 2000. 4. D. Harvey*, Modern analytical chemistry*, 1st Ed., The McGraw-Hill, 2000. 5. G. H. Jeffery, J. Bassett, J. Mendham, R C. Denney, *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed., John Wiley, New York, 1989.	

Programme: **M.Sc. Part-I (Analytical Chemistry)**

Course Code: **ACC-413**

Title of the course: **Techniques in Analytical Chemistry - II**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied analytical chemistry courses at M.Sc. Chemistry in semester I	
Course Objective:	1. Provide understanding of the principle of optical analytical techniques like Nephelometry, Turbidimetry, and Polarimetry. 2. Introduce the principles and applications of Absorption and Emission spectroscopic techniques. 3. Develop concepts in various Electroanalytical techniques such as pH metry, conductometry and Karl Fischer titration. 4. Acquaint the students to the basic principles of Radioanalytical techniques and solvent extraction techniques.	
Course Outcome:	1. Students will be able to explain the principle of Nephelometry, Turbidimetry, and Polarimetry. 2. Students will be able to describe and differentiate between the absorption and emission techniques such as AAS, AES. 3. Students will be able to illustrate the principle of Electroanalytical techniques such as voltametry, conductometry and Karl Fischer titration. 4. Students will be able to explain and apply the principles of Radioanalytical techniques and solvent extraction methods.	
Content		*Hrs*

1. Optical analytical techniques a. Nephelometry and Turbidimetry: Introduction to principle, instrumentation and application of nephelometry, turbidimetry. Factors affecting measurement; comparison between nephelometry, turbidimetry, colorimetry and fluorimetry; applications of nephelometry and turbidimetry. b. Polarimetry: Introduction, principle and Instrumentation of Polarimetry; application of optical rotation method in rate constant determination; acid-catalyzed mutarotation of glucose; inversion of cane sugar. Introduction to terms such as optical rotatory dispersion (ORD), cotton effect curves, circular dichroism, octant rule for ketones.	15
2. Introduction to Absorption and Emission Techniques Introduction, principles and applications of Atomic absorption Spectroscopy (AAS) Atomic Emission spectroscopy (AES), and Flame Emission spectroscopy (FES). Excitation techniques, electrodes and their shapes, Quantitative and qualitative application, brief introduction to ICP-MS, ICP-OES	5
3. Electroanalytical techniques a. Brief introduction to electroanalytical techniques. Voltametry and polarography, cyclic voltametry, coulometry, controlled potential coulomety and coulometric titrations, Stripping voltammetry, ion-selective electrodes and sensors; Evaluation and Calculation; Application to Inorganic and Organic Trace analysis b. Introduction to Ion selective electrodes; construction, application and selectivity coefficient of Ion selective electrode; pH measurement; buffer solution; glass electrode; instrument for pH measurement. c. Basic aspects of conductometric titration; types of conductometric titration; advantages and disadvantages of conductometric titration; Introduction; theory; instrumentation; advantages, disadvantages and applications of High frequency titrations.	15
4. Karl Fischer Titration Introduction, theory, instrumentation, advantages and disadvantages Karl Fischer reagent, determination of water content in industrial samples.	5
5. Radioanalytical techniques Theory and principles of radio analytical technique, detection of nuclear radiation, radiation detectors, pulse height analysis, counting error, analytical application of radioisotopes, neutron activation analysis and isotope dilution analysis.	8
6. Introduction to Extraction Techniques a. Liquid-liquid extraction/solvent extraction: partition coefficient, distribution ratio and percent extraction, choice of solvents, Solvent extraction of metal ions-ion association complexes and metal chelates, multiple batch extraction, Craig's counter-current distribution. b. Introduction to green analytical extraction methods: Supercritical Fluid Extraction, Pressurized Liquid Extraction, Ultrasound assisted Extraction, Microwave assisted Extraction, Enzyme assisted Extraction, Solid phase microextraction, Solid Phase Extraction.	12
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.

Text Books/ References / Readings	1. G.D. Christian, *Analytical Chemistry*, 6th Ed.; Wiley, 2004. 2. D. A. Skoog, D. M. West, F. J. Hollar, S. R. Crouch; *Fundamentals of Analytical Chemistry*, 9th Ed.; Cengage Learning, 2014. 3. F. J. Holler, D. A. Skoog, S. R. Crouch, *Principles of Instrumental Analysis*, 6th Ed.; Thomson Books, 2007. 4. J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas, B. Sivasankar, *Vogel's Text Book of Quantitative Chemical Analysis,* 6th Ed.; Pearson, 2009. 5. H. H. Willard, L. L. Merritt, J. A. Dean, F.A. Settle, *Instrumental Methods of Analysis*, 7th Ed.; CBS Publishing, 1988. 6. J. H. Kennedy, *Analytical Chemistry: Principles*, 2nd Ed.; Saunders College Publishing, 1990. 7. G. W. Ewing, *Instrumental Methods of Chemical Analysis*, 5th Ed.; McGraw-Hill, 1985. 8. R. A. Day, A. L. Underwood, *Quantitative Analysis*, 6th Ed.; Prentice Hall, 2001. 9. B. K. Sharma, *Instrumental methods of chemical analysis*, Goel Publishing House, Meerut, 2004. 10. R. D. Braun, *Introduction to Instrumental analysis*, Pharma Med Press, 2012. 11. G. R. Chatwal, S. K. Anand, *Instrumental Methods of Chemical Analysis,* 5th Ed.; Himalaya publishing House, 2019. 12. H. Gunzler, A. Williams, *Handbook of Analytical Techniques*, 1st Ed.; Wiley, 2001 13. M. A. Rostagno, J. M. Prado, *Natural Product Extraction: Principles and Applications,* RSC*,* 2013. 14. E. Scholz, *Karl Fischer Titration: Determination of Water*, Springer, 2011.

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Programme: **M.Sc. Part-I (Analytical Chemistry)**

Course Code: **ACC-414**

Title of the course: **Separation Techniques**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied analytical chemistry courses at M.Sc. Chemistry in semester I	
Course Objective:	1. Introduction of various separation techniques. 2. Evaluate the use of chromatographic techniques for chemical analysis.	
Course Outcome:	1. Students will be able to select the separation techniques for purification of analytes from interferents. 2. Students will be able to analyse data and interpret chromatogram. 3. Students will be able to perform qualitative and quantitative estimation using HPLC data.	
Content		*Hrs*

1. Basic Separation Technique: a. General aspects of separation techniques-role of separation technique in analysis; separating the analyte from interferents, general theory of separation efficiency: separation factor. b. Classifying separation techniques: Separations based on size; separations based on mass or density, separations based on complexation reactions (Masking); separations based on a change of state; separations based on a partitioning between phases. (Note: Following techniques shall be discussed as representative example) i. Basic principles of distillation; theory of vacuum, steam, azeotropic and fractional distillation. ii. Fractionation by solvent extraction: based on chemical nature and based on polarity of analyte. iii. Membrane techniques: dialysis, reverse osmosis, ultrafiltration. iv. Centrifugation techniques: Sedimentation velocity, analytical and preparative centrifugation, differential Centrifugation, density gradient centrifugation; applications in separation.	10
2. Chromatographic Methods: Introduction to chromatography: Principle of chromatographic technique, terms and parameters used in chromatography, classification of chromatographic methods, partition versus adsorption chromatography, qualitative and quantitative analysis by chromatography; a. Planar Chromatography (Paper and thin layer): i. Paper Chromatography: Principle, types (ascending, descending, circular, two dimensional paper chromatography), choice of solvent, adsorbents, multiple development, qualitative and quantitative measurement applications. ii. Thin Layer Chromatography (TLC): Principle; efficiency of thin layer plates, methodology (technique), criteria for selection of stationary and mobile phases (numerical to calculate elution strength of mixed solvents used as mobile phase), choice of adsorbents, preparation of plates, spotting (spot capacity), development of chromatogram, identification and detection using physical and chemical methods, reproducibility of Rf values and improving resolution, Two-dimensional TLC, comparison of TLC with paper chromatography and column chromatography, thin layer ionophoresis and electrophoresis, qualitative, quantitative evaluation and applications. iii. High-performance TLC (HPTLC): Introduction, theory, classification (classical, high performance, ultra, preparative HPTLC), difference between TLC and HPTLC with respects to the parameters, scanning densitometer, quantitative analysis and applications. b. Column Chromatography: Introduction, types (conventional, flash, LPLC, Dry column vacuum chromatography), principle, packing, loading, eluting and collecting eluent in the column chromatography and experimental requirements, theory of development, migration rates of solutes, band broadening, resolution and column efficiency, variables that affect column	30

efficiency, van Deemter equation, qualitative and quantitative analysis, numericals and applications. c. Gas Chromatography (GC): Instrumentation, selection of operating condition, carrier gases, stationary phases, choices of GC column, temperature selection, sampling techniques, methods to prepare derivatives of samples (silylation, acylation, alkylation), factors affecting separation, working principle of GC detectors such as TCD, ECD, FID, quantification methods such as normalizing peak area, internal std., external std, standard addition, advances in GC, hyphenated techniques; GC-FTIR, GC-MS. Analysis of data obtained using GC chromatogram, GC-MS. d. Liquid-Liquid Partition Chromatography: HPLC Introduction, selection of stationary and mobile phase, types of bonded phase chromatography-NPC and RPC and stationary phases used, reversed phase partition chromatography, steps in HPLC method development in partition chromatography, elution techniques (isocratic and gradient), ion pairing agents, buffer agents, organic modifiers, optimization of capacity factor, gradient selectivity factor and column plate numbers, numericals on method development using Snyder's polarity index, advances in LC, Preparative vs analytical HPLC, Chiral chromatography- Pirkle stationary phases, examples of enantiomer separation such as ibuprofen, calculation of enantiomeric excess. Choosing detectors- working principle of RI, UV-Vis, conductivity and ELSD, hyphenated techniques; LC-MS. Analysis of chemical data obtained using HPLC chromatogram, LC-MS. application of HPLC method development in food analysis/drugs, etc.	
3. Other Chromatographic Methods: a. Size Exclusion Chromatography: Principle, types, stationary phases in gel chromatography, physical and chemical characteristics of gel, mechanism of gel permeation chromatography (GPC), instrumentation of GPC, applications of GPC- determination of molecular weight of polymer with numericals. b. Supercritical-Fluid Chromatography: Introduction, important properties of supercritical-fluids, instrumentation and variables, SFC column vs other column, applications and data analysis. c. Affinity Chromatography: Principle, affinity matrix, ligands, mobile phase, separation mechanism, application in the separation of proteins, etc d. Ion Exchange Chromatography: Introduction, mechanism of separation, types of stationary phases, factor affecting separation; Ion exclusion chromatography; separation mechanism- Donnan theory, application in the separation of alkaloids, carboxylic acids etc.	10
4. Electrophoresis: a. Theory of electrophoresis, Types- Free solution and supporting medium electrophoresis, paper electrophoresis, capillary electrophoresis and gel electrophoresis.	10

b. Capillary electrophoresis- Instrumentation, sample introduction in CE, types of CE methodology, electrophoretic mobility and electroosmatic mobility, total mobility, efficiency and resolution in CE column, numericals. c. Gel electrophoresis - types of gel, Polyacrylamide gel electrophoresis PAGE, Agarose GE, SDS-PAGE, 2D Gel electrophoresis, factors affecting separation; d. Capillary Electrochromatography. e. Separation of neutral molecule by MEKC; Separation and determination of Vitamin B-complex by using CZE and MEKC. Staining and detecting electrophoresis band.	
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. G. D. Christian, *Analytical Chemistry*, 6th Ed.; John Wiley, 2004. 2. D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, *Fundamentals of Analytical Chemistry*, 9th Ed.; Cengage Learning, 2014. 3. David. Harvey, *Modern Analytical Chemistry*, 1st Ed.; The McGraw-Hill, 2000. 4. L. R. Snyder, J. J. Kirkland, J. W. Dolan, *Introduction to modern liquid chromatography*, 3rd Ed.; John Wiley & Sons, 2009. 5. H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, *Instrumental methods of Analysis*, 7th Ed.; CBS Publishing, 1986. 6. G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, *Vogel's Text Book of Quantitative Chemical Analysis*, 5th Ed.; John Wiley, 1989. 7. H. Gunzler, A. Williams, *Handbook of analytical techniques*, 1st Ed.; Wiley, 2002. 8. F. W. Fifield, D. Kealey, *Principles and Practice of Analytical Chemistry*, 5th Ed.; Blackwell Science Ltd., 2000. 9. A. Braithwaite, F. J. Smith, *Chromatographic methods*, 5th Ed.; Kluwer academic publishers, 1999. 10. J. Inczedy, *Analytical Applications of Ion Exchangers,* 1st Ed.; Oxford Pergamon Press, 1966.

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Programme: **M.Sc. Part-I (Analytical Chemistry)**

Course Code: **ACC-415**

Title of the course: **Instrumental Methods of Analysis**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied analytical chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. Introduction of various instrumental methods for analysis. 2. Understanding the utility of various instrumental methods as a qualitative and quantitative analytical tool.

Course Outcome:	1. Students will be able to explain theory and instrumentation of various instrumental methods of analysis. 2. Students will be able to judge suitability of different instrumental methods for qualitative and quantitative analysis.

Content	*Hrs*
1. Diffraction Techniques: X-ray and Neutron Diffraction a. Introduction to X-rays; interaction of X-rays with matter; X-ray diffraction by crystals, Bragg's law. b. Powder X-ray diffraction: instrumentation and applications. Interpretation of powder X-ray diffraction pattern. calculation of lattice parameters. c. Powder diffraction file and other crystallography databases. d. Powder Neutron diffraction: theory, instrumentation and applications.	15
2. X-ray Spectroscopic Techniques: a. X-ray spectroscopy, theory of X-ray absorption and emission. b. X-ray fluorescence (XRF) spectroscopy: introduction, instrumentation, wavelength dispersive and energy dispersive XRF, applications. c. Energy dispersive X-ray (EDX) spectroscopy and Electron probe microanalysis (EPMA): introduction, instrumentation and their applications. d. Introduction to X-ray absorption near edge structure (XANES), Extended X-ray absorption fine structure (EXAFS) and their applications.	15
3. Electron Spectroscopic Techniques: a. Introduction to Electron spectroscopy techniques. b. X-ray and UV Photoelectron spectroscopy (XPS, UPS): theory, instrumentation and their applications. c. Introduction to Auger electron spectroscopy (AES) and electron energy loss spectroscopy (EELS) and their applications.	5
4. Microscopic Techniques: a. Optical microscopy: components of microscope, different types of optical microscopy techniques; significance and applications. b. Electron microscopy: Scanning electron microscopy (SEM), Transmission electron microscopy (TEM) and Scanning transmission electron microscopy (STEM) –Principle, instrumentation and applications. c. Atomic force microscopy (AFM): theory, instrumentation, operational modes and applications. d. Sample preparation for microscopy: Sample selection, sectioning, mounting, grinding, different polishing methods; microstructure – etching, heat tinting, different etching methods, e. SEM/TEM sample preparation: TEM grids, ion milling, electropolishing etc.	10
5. Molecular Fluorescence, Phosphorescence and Chemiluminescence Spectrometry: a. Fluorescence and phosphorescence: theory; factors influencing fluorescence and phosphorescence; instrumentation; spectrofluorometer and phosphorimeter; applications of photoluminescence methods	10

b. Chemiluminescence: Introduction; instrumentation; measurement of chemiluminescence, gas phase chemiluminescence analysis, chemiluminescence titrations. Application in Organic and Inorganic Analysis. c. Electrochemiluminescence and Bioluminescence: theory and their applications.	
6. Automation of Analytical Methods: a. An overview of automated system, distinction between automatic and automated devices; advantages and disadvantages by automation. b. Process Control with automated instruments, discrete and continuous analyzers, automatic instruments. Flow and Sequential Injection Analysis, Laboratory Information Management System.	5

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. A. R. West, *Solid State Chemistry and Its Applications*, 2nd Ed.; Wiley, 2014. 2. V. K. Pecharsky and P. Y. Zavalij, *Fundamentals of Powder Diffraction and Structural Characterization of Materials*, 1st Ed.; Springer, 2003. 3. D. A. Skoog, F. J. Holler and S. R. Crouch, *Principles of Instrumental Analysis*, 7th Ed.; Cengage, 2017. 4. T. G. Rochow and E. G. Rochow, *An Introduction to Microscopy by Means of Light, Electrons, X-Rays, or Ultrasound*, 2nd Ed.; Springer, 2012. 5. Y. Leng, *Materials Characterization: Introduction to Microscopic and Spectroscopic Methods*, 2nd Ed.; Wiley-VCH, 2013. 6. A. M. Garcia-Campana, *Chemiluminescence in Analytical Chemistry*, 1st Ed.; CRC Press. 2001. 7. R. F. Egerton, *Physical Principles of Electron Microscopy: An Introduction to TEM, SEM, and AEM*, 2nd Ed.; Springer, 2016. 8. E. H. Kisi and C. J. Howard, *Applications of Neutron Powder Diffraction*, 1st Ed., Oxford Science Publications, 2008. 9. G. D. Christian, *Analytical Chemistry*, 6th Ed. Wiley, 2004.

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Programme: **M.Sc. Part-I (Inorganic Chemistry)**
Course Code: **ICC-412**
Title of the course: **Chemistry of Coordination & Organometallic Compounds**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied Inorganic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To make understand fundamentals of coordination and organometallic chemistry. 2. To gain the knowledge on structural aspects of compounds. 3. To make understand bonding using various models. 4. To correlate spectroscopic and magnetic properties with bonding models. 5. To develop a skill of interpretation of magnetic and spectroscopic properties. 6. To understand fundamental concepts of inorganic chemistry reaction mechanisms. 7. To provide knowledge on applications of organometallic compounds in homogenous catalysis.
Course Outcome:	1. Students will be able to understand the electronic structure of coordination and organometallic compounds. 2. Students will be well equipped with knowledge of CFT and MOT 3. Students will be in position to understand the magnetic and electronic properties. 4. Students will be able to acquire skill on interpretation of electronic and IR spectra of inorganic compounds 5. Students will be able understand concepts of inorganic reactions & mechanisms. 6. Students will be aware of applications of organometallic compounds in industrial processes.

Content	*Hrs*
1. Electronic structure of coordination compounds Basic introduction to bonding theories: a. Valence Bond theory & its utility, limitations of VBT. b. Crystal field theory and its uses in: i) Octahedral compounds; ii) tetrahedral compounds; iii) square-planar compounds and other geometries; iv) tetragonally distorted compounds (Jahn-TellerEffect); v) octahedral vs tetrahedral; vi) Evidences showing covalency to the M-L bonds. c. Molecular orbital theory (MOT): σ & π-bonding in octahedral, tetrahedral, square planar compounds.	12
2. Spectra and magnetic studies of coordination compounds a. (i) Electronic spectra of atoms, (ii) Electronic spectra of complexes; Orgel diagrams, correlation diagrams, T-S diagrams examples and problem solving, (iii) Charge-transfer bands; (iv) Selection rules and intensities, (v) Luminescence. b. Vibrational spectra of coordination compounds. c. Magnetic studies: cooperative magnetism, basic concepts of magnetic properties: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, temperature dependent magnetism, Curie law, Curie Weiss Law; spin cross over phenomenon.	12
3. Inorganic reaction mechanisms	12

a. The thermodynamics of complex formation: Formation constants; Trends in successive formation constants; The chelate and macrocyclic effects; Steric effects and electron delocalization. b. Ligand substitution reactions and mechanisms: Rates of ligand substitution; The classification of mechanisms; Ligand substitution in square-planar complexes: The nucleophilicity of the entering group; The shape of the transition state. Ligand substitution in octahedral complexes: Rate laws and their interpretation; The activation of octahedral complexes; Base hydrolysis; Stereochemistry; Isomerization reactions. C. Redox reactions: The classification of redox reactions; The inner-sphere mechanism; The outer-sphere mechanism. d. Photochemical reactions: Prompt and delayed reactions; d–d and charge-transfer reactions; Transitions in metal–metal bonded systems.	
4. Organometallic chemistry of d-block elements a. Stable electron configurations; Electron count preference; Electron counting and oxidation states. b. Ligands: Carbon monoxide, Phosphines, Hydrides and dihydrogen complexes, η^1-Alkyl, -alkenyl, -alkynyl, and -aryl ligands, η^2-Alkene and -alkyne ligands, Nonconjugated diene and polyene ligands, Butadiene, cyclobutadiene, and cyclooctatetraene, Benzene and other arenes, The allyl ligand, Cyclopentadiene and cycloheptatriene, Carbenes, Alkanes, agostic hydrogens, and noble gases, Dinitrogen and nitrogen monoxide. c. Compounds: *d*-Block carbonyls, Metallocenes, Metal–metal bonding and metal clusters. d. Reactions: Ligand substitution, Oxidative addition and reductive elimination, σ-Bond metathesis, 1,1-Migratory insertion reactions, 1,2-Insertions and β-hydride elimination, α-, β-, and δ-Hydride eliminations and cyclometallations. e. Catalysis: general concepts, catalytic cycle for isomerization of prop-2-en-l-ol to prop-1-en-l-ol, Alkene metathesis, hydrogenation of alkenes, hydroformylation, Wacker oxidation of alkenes, Asymmetric oxidations, Palladium catalyzed C-C bond forming reactions, methanol carbonylation (Monsanto acetic acid process).	24
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/References / Readings	1. P. W. Atkins, T. L. Overton, J. P. Rourke, M. T. Weller & F. A. Armstrong 2010, *Shriver & Atkins' Inorganic Chemistry*, 5th Ed., Oxford University Press, 2010. 2. J. E. Huheey, E. A. Keiter& R. L. Keiter, *Inorganic Chemistry: Principles of structure and reactivity*, 4th Ed.; Pearson, 2014. 3. J. D. Lee, *Concise Inorganic Chemistry*, 5thEd, Chapman and Hall, 1996. 4. F. A. Cotton, G. Wilkinson & P. L. Gaus, *Basic Inorganic Chemistry*, 3rd Ed.; John Wiley, 1995. 5. F. A. Cotton & G. Wilkinson, *Advanced Inorganic Chemistry*, 3rd Ed. (4th & 5th Eds. preferred); Wiley Eastern, New-Delhi, 1984. 6. D. Banerjee, *Coordination Chemistry*, 1st Ed.; Tata McGraw–Hill, New Delhi, 1994. 7. N. N. Greenwood & A. Earnshaw, *Chemistry of the Elements*,

Pergamon Press, Exeter, 1984.
8. G. Rodgers, *Introduction to coordination, solid state, and descriptive Inorganic chemistry*, 1st Ed.; McGraw–Hill, 1994.
9. R. S. Drago, *Physical Methods in Inorganic Chemistry*, Affiliated East West Press Pvt. Ltd., 2017
10. G. C. Miessler, D. A. Tarr, *Inorganic Chemistry*, 3rd Ed.; Pearson, 2004

Programme: **M.Sc. Part-I (Inorganic Chemistry)**

Course Code: **ICC-413**

Title of the course: **Chemistry of Materials**

Number of Credits: **04** Total Hours: **6** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied Inorganic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1.To provide information about different types of materials. 2.To provide knowledge about different types of synthesis. 3.To be familiar with different solid state properties of materials.
Course Outcome:	5.Students will be able to explain different methods of material synthesis. 6.Students can explain effect of size variations on solid state properties of materials. 7.Students can explain different types of defects and phase transformations in materials. 8.Students will be in position to describe magnetic, electrical, dielectric, optical, and semiconductor properties of materials.

Content	*Hrs*
1. Introduction to Materials Chemistry Basic knowledge about properties, structure and applications of materials.	1
2. Structure and bonding in solid materials Crystal lattice; unit cell; Miller indices and planes; X-Ray diffraction method; Molecular, Metallic, Covalent and Ionic solids, Hydrogen bonding; Structural classification of binary and tertiary compounds; Spinel and Perovskite structures	6
3. Crystal defects & Non-stoichiometry in Solids a. Types of defects: Point defects, Dislocations: Line defects and Plane defects. b. Oxygen deficient oxides; Metal deficient oxides and classification of non-stoichiometry.	6
4. Materials preparation techniques a. Broad Classification of methods: Ceramic method, and Different wet chemical methods. b. Types of Materials: Powdered bulk materials, Single crystal and Thin films, Amorphous materials, and Nanomaterials. c. Preparation methods for different materials with their advantages and disadvantages:	16

i. Powder materials: Co-precipitation method, Precursor method, Combustion method: Solid state and solution method, Precursor-combustion method, Sol-gel method, Spray roasting method, Freeze drying method. ii. Single crystals: (a) Growth from melt (b) from solution (c) using Flux method (d) Epitaxial growth of single crystal thin films: Using Chemical and Physical methods (e) Chemical vapour transport (f) Hydrothermal method (g) Dry high pressure method, electrochemical reduction method. iii. Amorphous Materials: Synthesis & applications. iv. Nanomaterials: Synthesis, properties: structural, optical and magnetic and applications.	
5. Reactivity of Solid Materials Tarnish reactions, decomposition reaction, solid-solid reactions, addition reactions, double decomposition reaction, electron transfer reaction, solid-gas reactions, sintering, factors influencing reactivity of solids.	4
6. Phase Transformations in Solids Thermodynamic consideration, Burgers classification, structural change in phase transformation, Martensite transformation, temperature and pressure induced transformations, order-disorder transitions, electronic transition, transformation with a change in composition, enantiotropy and monotropy, Ehrenfest's classification.	6
7. Electrical Properties Electrical conductivity, free electron theory, Fermi energy, insulators, semiconductors and conductors, band theory of semiconductor, Brilliouin zones, Hall effect, Peltier effect, Seebeck effect, photo conductivity and ionic conductivity, Superconductivity, BCS theory, Meissner effect, high temperature superconductor.	7
8. Semiconductor Devices Diodes and transistors, Junction field effect transistor and metal oxide semiconductor field effect transistor, light meter, photodiode, phototransistor, solar cells, light emitting diodes. Laser materials.	5
9. Optical and dielectric properties Luminescence and phosphorescence, piezoelectric, ferroelectric materials and applications, thermal conductivity, phonon interaction, thermal expansion coefficient.	4
10. Magnetic properties Introduction to magnetism, behavior of substance in a magnetic field, magnetic moments, diamagnetism, paramagnetism, experimental determinations of susceptibility, ferromagnetism, anti-ferromagnetism and ferrimagnetism, magnetization of ferromagnetic substance.	5
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/References / Readings	1. A. R. West, *Solid State Chemistry and Its Applications*, 1st Ed., John Wiley & Sons, Singapore, 1984 (reprint 2007). 2. L. V. Azaroff, *Introduction to Solids,* 1st Ed., Tata McGraw Hill, 2009, (33rd Reprint).

3. N. B. Hannay, *Treatise on Solid State Chemistry Vol.4 Reactivity of Solids,* 1st Ed.; Plenum Press, 1976.
4. D. K. Chakraborty, *Solid State Chemistry,* 2nd Ed.; New Age International Publisher, 2010.
5. H. V. Keer, *Principles of the Solid State,* 1st Ed., New Age International (P) Ltd., (Wiley Eastern Ltd,), 1993, (Reprint 2008).
6. C. N. R. Rao & K. J. Rao, *Phase Transitions in Solid,* 1st Ed.; McGraw Hill, 1977.
7. W. D. Callister, *Materials Science and Engineering: An Introduction,* 7th Ed.; John Wiley, 2007.
8. B. D. Fahlman, *Materials Chemistry,* 2nd Ed.; Springer, 2011.
9. H. R. Allcock, *Introduction to materials chemistry,* 1st Ed.; John Wiley & Sons, 2011.
10. C. N. R Rao & Gopalkrishnan, *New directions in solid state chemistry,* 2nd Ed.; Cambridge University Press, 1997.
11. R. S. Drago, *Physical Methods in Inorganic Chemistry*, Affiliated East West Press Pvt. Ltd., 2017.
12. G. C. Miessler, D. A. Tarr, *Inorganic Chemistry*, 3rd Ed.; Pearson, 2004.

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Title of the course: **Concepts in Molecular Symmetry and Spectroscopy**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied Inorganic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To train the students to understand the concepts of molecularsymmetry and their applications in chemistry 2. To train the students to understand different spectroscopictechniques viz. magnetic resonance, vibrational & Mössbauer spectroscopy with emphasis on spectral interpretation.
Course Outcome:	1. Students will be able to explain symmetry aspects of simplemolecules and their applications in chemistry. 2. Students will be able to explain IR, Raman, ESR, NMR, Mössbauer spectra of simple molecules to determinemolecular geometry.

Content	*Hrs*
1. Molecular symmetry a. Symmetry elements and symmetry operations, symmetry planes and symmetry reflections, inversion center, proper axes and proper rotations, improper axis and improper rotations. b. Products of symmetry operations, equivalent symmetry elements and equivalent atoms, relations among symmetry elements and operations, symmetry elements and optical isomerism, symmetry point groups, symmetries with multiple high order axes, classes of symmetry operations, procedure for symmetry classification of molecules. c. Group and it's defining properties, order of the group, examples of group, group multiplication table, cyclic group, acyclic group, abelian group, non-abelian group. Sub groups, classes, properties of conjugate elements. d. Some properties of matrices and vectors, the great orthogonality theorem, reducible and irreducible representations, irreducible representations and their characters, character tables. Bases for irreducible representations, direct product. Symmetry Adapted Linear Combinations and its applications. Cage and cluster compounds, metal sandwich compounds. e. Crystal symmetry, space groups.	30
2. Spectroscopy a. Magnetic Resonance Spectroscopy; interaction between electron spin and magnetic field, interaction between nuclear spin and magnetic field, Resonance condition, instrumental requirements, b. Presentation of ESR (electron spin resonance) and NMR (nuclear magnetic resonance) spectra, line widths of ESR and NMR spectra, hyperfine coupling in isotropic systems (e.g. H atom, methyl radical etc.), anisotropic system, number of expected ESR signals for one electron paramagnetic species, zero field splitting and Kramer's degeneracy, Spin energy levels of octahedral Mn (II) complexes, nuclear quadrupole interaction, spin Hamiltonian, ESR spectra of some transition metal compounds, Electron delocalization, NMR spectral interpretation of a few nuclei like ^{19}F, ^{29}Si, ^{31}P. c. Mössbauer spectroscopy; Mössbauer effect, Mössbauer principle, Recoilless emission and absorption spectral line widths, Doppler shift, experimental arrangement of Mössbauer spectroscopy, chemical shift (isomer shift),	30

quadrupole splitting, magnetic hyperfine interaction, discussion of selected Mössbauer nuclei like ^{57}Fe, ^{129}I. d. Vibrational spectroscopy: Infrared spectroscopy and Raman spectroscopy, principle, their use in determination of molecular structure.	
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. F. A. Cotton, *Chemical Applications of Group theory*, 3rd Ed.; John Wiley,1990 2. J. E. Huheey, E. A. Keiter, R.L. Keiter, *Inorganic Chemistry: Principles of structure and reactivity*, 4th Ed.; Pearson, 1993. 3. G. R. Desiraju, J. J. Vittal, A. Ramanan, *Crystal Engineering*, IISC Press, world Scientific, 2011. 4. R. L. Dutta, A. Syamal, *Elements of Magnetochemistry*, 2nd Ed.; Affiliated East-West Press, New Delhi, 1993. 5. C. N. Banwell, E. M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Ed.; Tata McGraw Hill, New Delhi, 1994. 6. G. Aruldhas, *Molecular structure and spectroscopy*, Prentice Hall of India, 2001 7. P. Atkins, J. De Paula, J. Keeler, *Atkins' Physical Chemistry*, International Ed.; Oxford University Press, 2018. 8. M. Weller, T. Overton, J. Rourke, F. Armstrong, *Inorganic Chemistry*, International Ed.; Oxford University Press, 2018. 9. E. A. V. Ebsworth, D. W. H. Rankin, S. Cradock, *Structural Methods in Inorganic Chemistry,* ELBS, 1988. 10. K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, *Part A: Theory and Applications in Inorganic Chemistry*, 6th Ed.; Wiley, 2009. 11. K. Nakamoto, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, *Part B: Applications in Coordination, Organometallic and Bioinorganic Chemistry*, 6th Ed.; Wiley, 2009. 12. R. S. Drago, *Physical Methods in Inorganic Chemistry*, Affiliated East West Press Pvt. Ltd., 2017 13. G. C. Miessler, D. A. Tarr, *Inorganic Chemistry*, 3rd Ed.; Pearson, 2004

Programme: **M.Sc. Part-I (Inorganic Chemistry)**

Course Code: **ICC-415**

Title of the course: **Concepts in Inorganic Chemistry**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied Inorganic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To gain knowledge in selected topics in inorganic chemistry and study the applications of inorganic compounds in selected areas. 2. To learn in details about the s-block elements and their compounds.

	3. To understand the concepts in acid-base reactions in the Inorganic chemistry. 4. To gain knowledge about atomic stability and nuclear reactions. 5. To study the importance of metal ions in the field of medicinal chemistry.
Course Outcome:	1. Students will be able to explain the chemistry of s-block elements. 2. Students will be able to explain fundamentals of inorganic medicinal chemistry. 3. Students will be able to solve numerical problems related to some concepts in acid-base and nuclear chemistry. 4. Students will be able to analyse reactions and processes in field of nuclear chemistry.

Content	*Hrs*
1. s-Block elements and their compounds a. Hydrogen and hydrides; Electronic structure, position in periodic table, abundance, preparation, properties, isotopes, ortho and para hydrogen. Classification of hydrides, preparation & properties of hydrides; hydrogen ion, hydrogen bonding and its influence on properties. b. Group 1 elements; Introduction, abundance, extraction, physical and chemical properties, solubility and hydration, solutions of metal in liquid ammonia, complexes, crowns and cryptands, electrides, alkalides, difference between lithium and the other group 1 elements, diagonal relationship between Li and Mg. c. Group 2 elements; Introduction, abundance, extraction, physical and chemical properties, solutions of metal in liquid ammonia, complexes, anomalous behaviour of beryllium, difference between beryllium and the other group 2 elements, diagonal relationship between Be and Al, preparation and properties of Grignard reagent.	17
2. Inorganic medicinal chemistry a. Anticancer agents; Platinum and Ruthenium complexes as anticancer drugs, Cancerchemotherapy, phototherapy, radiotherapy using borane compounds. b. Chelation therapy. c. Gadolinium and technetium complexes as MRI contrast agents, X-ray contrast agents. d. Anti-arthritis drugs. e. Anti-bacterial agents (Ag, Hg, Zn and boron compounds). f. Antiseptic and anti-biotic. g. Deodorants and anti-perspirants.	16
3. Chemistry of radioactive elements a. Atomic nucleus; Classification of nuclides and nuclear stability. b. Review of Nuclear models. c. Radioactivity, Decay processes and decay energy, half-life of radioactive elements. d. Nuclear reactions; Nuclear fission and fusion processes. e. Nuclear Reactors; Nuclear reactor components and functions, Q values for nuclear reactions. f. Detection and measurement of activity; Radiation detection principles. g. Physical and Chemical separation techniques of radioactive elements.	15

h. Radio-analytical techniques, Activation analysis. i. Nuclear waste management. j. Applications of radioactivity.	
4. Acids and Bases a. Brønsted acidity; Proton transfer equilibria in water, Solvent levelling, The solvent system definition of acids and bases, Characteristics of Brønsted acids, Periodic trends in aqua acid strength, Simple oxoacids, Anhydrous oxides, Polyoxo compound formation, Nonaqueous solvents. b. Lewis acidity; Examples of Lewis acids and bases, Group characteristics of Lewis acids. c. Reactions and properties of Lewis acids and bases; The fundamental types of reaction, Hard and soft acids and bases, Thermodynamic acidity parameters, Solvents as acids and bases. d. Applications of acid–base chemistry, Superacids and superbases, Heterogeneous acid–base reactions.	12

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/References / Readings	1. P. W. Atkins, T. Overton, J. Rourke, M. Weller, F. Armstrong, *Shriver & Atkins Inorganic Chemistry*, 5th Ed.; Oxford Publications, 2009. 2. J. E. Huheey, E. A. Kieter, R. L. Kieter, O. K. Medhi, *Inorganic Chemistry: Principles of Structure & Reactivity*, 4th Ed.;Pearson, 2011. 3. F. A. Cotton, G. Wilkinson, P. L. Gauss, *Basic Inorganic Chemistry*, 3rd Ed.; Wiley, 2008. 4. J. D. Lee, *Concise Inorganic Chemistry*, 5th Ed.; Wiley, 2008. 5. F. A. Cotton, G. Wilkinson, *Advanced Inorganic Chemistry*, 3rd Ed.; Wiley, 1984. 6. N. N. Greenwood, A. Earnshaw, *Chemistry of the Elements*, Pergamon Press, 1st Ed.; 1984. 7. A. G. Sykes, *Advances in Inorganic Chemistry*, UK Ed.; Academic Press Ltd., 1991. 8. H. J. Arnikar, *Essentials of Nuclear Chemistry*, 4th Revised Ed.; New Age Intl. Publishers, 2011. 9. G. Friedlander, J. W. Kennedy, E. S. Macias, J. M. Miller, *Nuclear & Radiochemistry*, 3rd Ed.; John Willey & Sons, 1981. 10. K.A. Strohfeldt, *Essentials of Inorganic Chemistry*, Ist Ed.; John Willey & Sons, 2015. 11. G.R. Choppin, J-O. Linjenzin, *Radiochemistry and Nuclear Chemistry*, 2nd Ed.; Butterworth-Heinemann Ltd, 1995. 12. R. S. Drago, *Physical Methods in Inorganic Chemistry*, Affiliated East West Press Pvt. Ltd., 2017 13. G. C. Miessler, D. A. Tarr, *Inorganic Chemistry*, 3rd Ed.; Pearson, 2004

Programme: **M.Sc. Part-I (Organic Chemistry)**

Course Code: **OCC-412**

Title of the course: **Organic Spectroscopy**

Number of Credits: **04** Total Hours: **6** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied Organic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To study various theoretical concepts related to organic spectroscopic techniques. 2. To understand the introductory aspects of commonly used 2D NMR techniques. 3. To learn interpretational aspects of spectral data pertaining to UV, IR, PMR, CMR and MS.
Course Outcome:	1. Students will be in a position to understand how spectral techniques can be used in structure elucidation. 2. Students will be able to deduce structures of simple to moderately complex molecules by combining the spectral data obtained using two or more spectral techniques. 3. Students will be in a position to apply various concepts in organic spectroscopy (PMR, CMR, MS and 2D NMR) and analyse/ predict PMR, CMR, MS and 2D NMR spectral data based on given structures of simple molecules.

Content	*Hrs*
1. UV-Visible Spectroscopy a. Introduction. Electronic transition and energy levels, the absorption laws. b. Measurement of the spectrum, chromophores, Effect of solvent, Conjugation on UV-spectra. c. Study of Tautomerism, Steric effect and geometrical isomerism in UV spectra. d. Woodward-Fieser rule for conjugated dienes and carbonyl compounds.	04
2. **Infrared Spectroscopy** a. IR spectroscopy in structural elucidation of organic compounds (various functional classes to be considered). b. Methods in IR-Spectroscopy, effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination and Fermi resonance bands. c. Factors influencing vibrational frequencies. d. Characteristic frequencies of organic molecules. e. Interpretation of spectra.	08
3. **NMR Spectroscopy** a. Principles of NMR. b. Instrumentation. c. Chemical shift- (revision of the basic concepts) d. Interpretation of PMR spectra. i. Coupling constants and AB, A_2B_2/A_2X_2, AMX and ABX spin systems. ii. Double resonance and decoupling iii. Nuclear Overhauser Effect and its applications. iv. NMR Shift reagents v. Determination of Absolute and Relative configuration	14
3. **^{13}C –NMR spectroscopy** a. Introduction to ^{13}C –NMR spectroscopy.	8

b. ^{13}C- chemical shifts effects (α-, ß-, γ-, δ-substituent effects, π-conjugation, heavy atom effect and ring size effects) c. Proton coupled and proton decoupled 13Cspectra. d. Off- resonance decoupling, APT & DEPT techniques.	
4. ^{19}F- NMR and ^{31}P- NMR spectroscopy Principles and applications; heteronuclear coupling of carbon to ^{19}F and ^{31}P.	6
5. Two-dimensional NMR spectroscopy Introduction to 2D NMR techniques and interpretation of spectra of simple organic compounds using following 2d-NMR techniques-COSY, NOESY, HSQC, HMQC, HMBC, TOCSY and INADEQUATE	8
6. Mass spectrometry a. Ionization Methods, Mass Analysis, Even and odd electron ions and fragmentation modes. b. Molecular Formulae Index (D.B.E), Molecular ion peak, base peak, metastable ions, Nitrogen rule, effect of isotopes. c. Prediction of molecular formulae based on relative abundance. Rules for fragmentation, McLafferty rearrangement, retro-Diels-Alder fragmentation, fragmentation associated with functional groups; rearrangement and mass spectra of some chemical classes. **Note: Problems involving combined use of different type of spectra, in line with course objective/ learning outcome are to be emphasized.**	12

Pedagogy	Mainly lectures and tutorials. Seminars/term papers/assignments/presentations/ self-study or a combination of some of these can be used. ICT mode should be preferred. Sessions should be interactive to enable peer group learning.
Text Books/ References / Readings	1. P.S. Kalsi, *Spectroscopy of Organic compounds*, New Age International Pub. Ltd. & Wiley Eastern Ltd., 2nd Ed., 1995. 2. R. M. Silverstein, F. X. Webster, D. Kiemle, D. Bryce, S. Samant, V. S. Nadkarni, *Spectrometric Identification of Organic compounds*, An Indian Adaptation John Wiley & Sons Inc., 8th Ed., 2022. 3. D. L. Pavia, G. M. Lampman, G. S. Kriz, J. R. Vyvyan, *Introduction to Spectroscopy*, Brooks Cole, 5th Ed., 2015. 4. R. M. Silverstein, F. X. Webster, *Spectrometric Identification of Organic compounds*, John Wiley & Sons Inc., 7th Ed. (reprint), 2011. 5. V. M. Parikh, *Absorption Spectroscopy of Organic Molecules*, Addison Wesley Longman Publishing Co., 1974. 6. D. H Williams & I. Fleming, *Spectroscopic Methods in Organic Chemistry*, Tata Mcgraw Hill Education, 6th Ed., 2011. 7. W. Kemp, *Organic Spectroscopy*, Palgrave Macmillan, 3rd Ed., 1991. 8. W. Kemp, *NMR in Chemistry: A Multinuclear Introduction*, Macmillan, 1986. 9. J. R. Dyer, *Applications of Absorption Spectroscopy of Organic compounds*, Prentice Hall of India, 1987. 10. L. D. Field, H. L. Li., A. M. Magill, *Organic Structures from 2D NMR Spectra*, Wiley, 2015.

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Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **OCC-413**

Title of the course: **Pericyclic and Organic Photochemical Reactions**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied organic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To introduce various concepts in pericyclic chemistry based on molecular orbital theory and apply for solving pericyclic reactions 2. To introduce analysis of pericyclic reactions using theoretical concepts. 3. To learn mechanistic aspects of pericyclic & photochemical reactions in organic synthesis.
Course Outcome:	1. Students will be in a position to predict course of a given pericyclic reaction using the theoretical concepts. 2. Students will be able to apply knowledge of stereochemical output in a reaction. 3. Students will be able to understand and propose plausible mechanism of pericyclic/photochemical reactions.

Content	*Hrs*
1. Pericyclic Reactions a. Theory of pericyclic reactions i. Frontier Molecular Orbital (FMO) theory ii. Transition state aromaticity (Mobius-Huckel theory) concept iii. Orbital correlation diagram method. b. Analysis of pericyclic reactions (including stereochemistry) using the above concepts i. Cycloaddition reactions ii. Electrocyclic reactions iii. Sigmatropic rearrangements under thermal and photochemical conditions (Note: Various important features to be discussed taking examples important reactions of each type) c. Some synthetically useful reactions (examples via theory of pericyclic reaction). d. Diels–Alder and retro Diels-Alder reaction: Regiochemistry, stereochemistry and intramolecular reactions. e. 1, 3-dipolar additions f. [3, 3]-Shifts; Claisen and Cope, aza-Cope-, oxy-Cope rearrangements and fluxional molecules, variants of Claisen Rearrangement such as Johnson-Claisen, Eschenmoser-Claisen, Carroll- Claisen and Ireland-Claisen. g. [2,3]-Sigmatropic rearrangements such as Sommelet-Hauser rearrangement, Sulfonium ylide rearrangement, Meisenheimer rearrangement, Wittig rearrangement, Mislow-Evans rearrangement h. Ene reaction, hetero-ene, retro-ene reactions i. [1,5]-Thermal and [1,7]-photochemical sigmatropic hydrogen shifts	34
2. Organic Photochemistry	26

a. Interaction of electromagnetic radiation with matter, laws of photochemistry; fate of excited molecule; principles of energy transfer, types of photochemical reactions. Theoretical concepts in organic photochemistry w. r. t. cycloadditions, Electrocyclic reactions and sigmatropic reactions b. Photochemical reactions of alkenes, dienes, carbonyl compounds and arenes including the following- geometrical isomerisation: *Cis-trans* isomerization and photostationary equilibrium; Paterno-Buchi reaction; Norrish Type cleavages; Di-pi methane rearrangement; bicycle rearrangement c. Photochemistry of aromatic compounds: valance isomerization; photostationary state of benzene and azabenzenes. [4+4]-photodimerization of derivatives of naphthalenes. cycloaddition reaction of benzene, naphthalene, pyrrole and indoles with alkenes and alkynes d. Reactions involving singlet and triplet oxygen: Photooxygenation reactions, examples of [2+2] and [4+2]-cycloaddition reaction with isocyclic, heterocyclic, dienes and polynuclear aromatic compounds e. Applications of Organic Photochemistry: Photochemical Reactions as Key Steps in Natural Product Synthesis (any four examples); example of photopolymerization; photochemical functionalization at unactivated carbon: Barton reaction, the hypohalite reaction and the Hofmann-Loffler-Freytag reaction	
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. N. Turro, V. Ramamurthy, J. C. Scaiano, *Modern Molecular Photochemistry of Organic molecules* , University Science Books, 2010. 2. B. Dinda, *Essentials of Pericyclic and Photochemical Reactions*, Springer, 1st Ed. 2017. 3. S. Kumar, V. Kumar, S. P. Singh, *Pericyclic Reactions: A Mechanistic and Problem-Solving Approach*, Elsevier, 2016. 4. R. E. Lehr., A. P. Marchand, *Orbital Symmetry: A Problem Solving Approach*, Academic Press, 1972. 5. R. B. Woodward, R. Hoffmann, *Conservation of Orbital Symmetry*, Verlag chemie, Academic Press, NY, 1972. 6. I. Fleming, *Frontier Orbitals and Organic Chemical Reactions*, John Wiley & Sons, 1st Ed., 1991 7. T. L. Gilchrist, R. C. Storr, *Pericyclic Reactions*, Cambridge Univ. Press, 1972. 8. F. A. Carrey, R. J. Sundberg , *Advanced Organic Chemistry* Part A and B, Pelnum Pub., 3rd Ed. 1990. 9. T. Lowery, K. Richardson, *Mechanisms and Theory in Organic Chemistry*, Harper and Row Pub., NY, 3rd Ed., 1987. 10. C. H. DePay, *Molecular Reactions and Photochemistry*, Prentice Hall (I) Ltd, New Delhi. 11. J. Kopecky, *Organic Photochemistry- A Visual Approach*, VCH Pub., 1992.

Course Code: **OCC-414**
Title of the course: **Synthetic Methodologies in Organic Chemistry**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied organic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To study various concepts related to carbon-carbon bond formation. 2. To understand designing of organic synthesis to make molecules of interest. 3. To plan total synthesis based on protection-deprotection strategy.
Course Outcome:	1. Students will be in a position to explain how a carbon-carbon bond can be constructed along with the selectivity in bond formations. 2. Students will be able to apply knowledge of various reactions in constructions of simple to complex organic molecules. 3. Students will be in a position to design protecting group strategies for synthesis of organic molecules.

Content	*Hrs*
1. Chemistry of enols and enolates a. Keto-enol tautomerism; Introduction, acidity, basicity concepts & pKa scale, neutral nitrogen and oxygen bases. Formation of enols by proton transfer, mechanism of enolization by acids & bases, types of enols & enolates, kinetically & thermodynamically stable enols, consequences of enolization, stable enolate equivalents, preparation and reactions of enol ethers. b. Formation of Enolates; Introduction, preparation & properties, non-nucleophilic bases, E / Z geometry in enolate formation, kinetic vs. thermodynamic control, other methods for the generation of enolates, issue of enolate ambidoselectivity. c. Alkylation of enolates; diverse reactivity of carbonyl groups, alkylation involving nitriles and nitroalkanes, choice of electrophile for alkylation, lithium enolates of carbonyl compounds and alkylation, specific enol equivalents to alkylate aldehydes and ketones, alkylation of β-dicarbonyl compounds, problem of regioselectivity during ketone alkylation and the remedy provided by enones. d. Reaction of enolates with aldehydes and ketones; Introduction, aldol reaction including cross & intramolecular version, enolisable substrates which are not electrophilic in nature, controlling aldol reactions with specific enol equivalents, specific enol equivalents for carboxylic acids, aldehydes and ketones. e. Acylation at carbon; Introduction, the Claisen ester condensation (intramolecular and inter / crossed), acylation of enolates by esters, preparation of keto-esters by the Claisen reaction, directed C-acylation of enols and enolates & acylation of enamines. f. Conjugate addition of enolates; Introduction, thermodynamic control vs. conjugate addition, utility of various electrophilic alkenes in conjugate addition, formation of six-membered rings via conjugate addition and nitroalkanes as versatile synthons. g. Examples pertaining to the application of following condensation reactions in organic synthesis; Mukaiyama reaction, Perkin reaction, Dieckmann	22

condensation, Michael addition, Robinson annulation, Sakurai reaction, Knoevenagel Reaction, Darzen, Stobbe, Benzoin, Pechmann condensation.	
2. Synthetic utility of important name reactions / methodology a. Mannich Reaction, Nef Reaction, Mitsunobu and Appel Reaction, Baylis Hillman reaction, Mc. Murry coupling, vicarious nucleophilic substitution, Steglich and Yamaguchi esterification. b. Ring closing and cross metathesis; Grubb's various generation, Grubbs-Hoveyda, Schrock catalysts.	8
3. The Ylides in Organic Synthesis a. Phosphorus Ylides; Nomenclature and Preparation. Wittig olefination: mechanism, stereoselectivity, cis- and trans selective reactions, Wittig reagents derived from α-halo carbonyl compounds. b. Modified Wittig, Horner – Wadsworth – Emmons, Stille-Gennari modification with achiral and chiral substrates, Peterson reaction, Julia Olefination. c. Sulfur Ylides; Sulfonium & sulfoxonium ylides in synthesis, diphenylcyclopropyl sulfonium ylides & their reactions with carbonyl compounds / Michael acceptors	8
4. Protecting Groups in Organic Synthesis a. Introduction and effective use of protecting groups, umpolung of reactivity. b. Common protective groups namely acetals & ketals, dithio acetal/ketals, trialkylsilyl, TBDMS, THP, MOM, MEM, SEM & benzyl ether, methyl ether, benzyl amine, Cbz, *t*-Boc, Fmoc, *t*-butyl ester and methods for deprotection. Some examples of multistep synthesis using protection-deprotection procedures.	6
5. Asymmetric Synthesis a. Chiral pool (chiron approach). b. Chiral auxiliary approach; Oxazolidinone & norephedrine-derived chiral auxiliary controlled Diels-Alder reaction and alkylation of chiral enolates and aldol reaction, Alkylation using SAMP and RAMP. c. Chiral Reagents - Use of (-)-sparteine. d. Asymmetric catalysis; CBS catalyst, Ruthenium catalyzed chiral reductions of ketones, Catalytic asymmetric hydrogenation of alkenes, Asymmetric epoxidation (Sharpless and Jacobson), Sharpless asymmetric dihydroxylation reaction, Organocatalyzed aldol reaction (Use of proline).	12
6. Halogenation and esterification reactions a. Formation of Carbon Halogen bonds; Substitution in saturated compounds, alcohols, carbonyl compounds, substitution at allylic and benzylic compounds, bromodecarboxylation (Hunsdiecker reaction), Finkelstein reaction, iodolactonisation. b. Acid and base catalyzed esterification and hydrolysis.	4
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be

	used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. W. Caruthers, I. Coldham, *Modern Methods of Organic Synthesis*, Cambridge University Press, 4th Ed, 2016. 2. M. B. Smith, *Organic Synthesis*, McGraw–HILL, New York, International Edition, 1994. 3. J. Clayden, N. Greeves, S. Warren, P. Wothers, *Organic Chemistry*, Oxford University Press, 2nd edition, 2012. 4. R. Bruckner, *Advanced Organic Chemistry – Reaction Mechanisms*, San Diego, CA: Harcourt /Academic Press, San Diego, 2002. 5. J. Fuhrhop, G. Penxlin, *Organic Synthesis – Concepts, Methods, Starting Materials*, VCH Publishers Inc., New York, 1994. 6. H. O. House, *Modern Synthetic Reactions*, W. A. Benjamin, 1965, 2nd Ed. (revised with corrections). 7. M. Nogradi, *Stereoselective Synthesis*, VCH Publishers, Inc., Revised and Enlarged Edition, 1994. 8. F. A. Carey, R. J. Sundberg, *Advanced Organic Chemistry*, Springer India Private Limited, 5th Ed, 2007. 9. T. Laue, A. Plagens, *Named Organic Reactions*, John Wiley and Sons, Inc., 2005.

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Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **OCC-415**

Title of the course: **Stereochemistry and Organic Transformations**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied organic chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To study various principles of stereochemistry 2. To understand the importance of chirality in organic syntheses 3. To learn stereoselective reactions and to plan oxidation, reduction reactions
Course Outcome:	1. Students will be in a position to explain stereochemistry and organic transformations 2. Students will be in a position to apply knowledge of various reactions in functional group manipulations. 3. Students will be in a position to apply stereoselective reactions for the synthesis of chiral organic molecules

Content	*Hrs*
1. Stereochemistry a. Stereoselectivity in cyclic compounds: Introduction, stereochemical control in six membered rings, reactions on small rings, regiochemical control in cyclohexene epoxides, Stereoselectivity in bicyclic compounds b. Conformations, stability and reactivity of fused ring compounds: Fused bicyclic systems with small and medium rings: cis- and trans- decalones and	20

decalols, Octahydronaphthalins (octalins), Bicyclo [4.3.0] nonane (cis- and trans-hydrindanes) c. Fused polycyclic systems: Perhydrophenanthrenes, Perhydroanthracenes, Perhydrocyclopentenophenanthrene system (steroids, triterpenoids and hormones). Conformations and reactivity towards esterification, hydrolysis, chromium trioxide oxidation, ionic additions of halogen (X_2) to double bonds, formation and opening of epoxide ring, epoxidation by peroxy acids. d. Spirocyclic compounds e. Reactions with cyclic intermediates or cyclic transition state f. Stereoisomerism due to axial chirality, planar chirality and helicity. g. Stereochemistry and configurational (*R/S*) nomenclature in appropriately substituted allenes, alkylidenecycloalkenes, spiranes, adamantoids, biaryls, trans-cycloalkenes, cyclophanes and ansa compounds. h. Atropisomerism in biphenyls and bridged biphenyls	
2. Conformation of bridged ring compounds a. Bicyclo [2.2.1] heptane (norbornane): Geometry and topic relationship of hydrogens, solvolysis of bicycle [2.2.1] heptyl systems, formation, stability and reactivity of norbornylcation, relative stability and the rate of formation of endo and exo isomers in both bornane and norbornane systems. b. Bicyclo [2.2.2] octane system: Geometry and topic relationship of hydrogens, solvolysis of bicycle [2.2.2] octyl system. c. Other bridged ring systems: starting from bicycle [1.1.1] pentane to bicycle [3.3.3] undecane d. Bicyclo system with heteroatom: the relative stabilities of tropine, pseudotropine and benzoyl derivatives of norpseudotropine.	10
3. Dynamic Stereochemistry: Stereoselective Reactions a. Stereoselectivity: classification, terminology and principle. Selectivity in chemistry– substrate and product selectivity. b. Stereoselective reaction of cyclic compounds: Introduction, reactions of four, five and six-membered rings. Conformational control in the formation of six-membered ring. c. Diastereoselectivity: Introduction, making single diastereoisomers using stereospecific reactions of alkenes. d. 1,2-Addition to carbonyl compounds: Predicting various addition outcomes using different predictive models such as, Cram Chelate, Cornforth, Felkin-Anh. Specific reactions: allylation/crotylation by Brown, Roush, BINOL catalyzed. e. Stereoselective reaction of acyclic alkenes: The Houk model	14
4. Oxidation and reduction reactions a. Oxidation reactions: Oxidation of organic compounds using Oppenauer oxidation, Swern oxidation. Other methods of oxidation such as selenium dioxide, $Pb(OAc)_4$, HIO_4, OsO_4, RuO_4, DMSO (Swern) sodium bromate / CAN & NaOCl, DDQ, Prevost's reagent and Woodward Conditions; Catalytic oxidation over Pt, Photosensitised oxidation of alkenes, oxidation with molecular oxygen, aromatization, silver based reagents. b. Reduction reactions: Reduction of organic compounds using hydride-transfer reagents and related reactions: MPV reduction, Trialkylborohydrides, LAH, mixed LAH-$AlCl_3$ reagents, enzymatic reduction	16

	involving liver alcohol dehydrogenase/NADH & Bakers' yeast, catalytic hydrogenation, dissolving metal reductions including acyloin condensation, other methods of reduction: Raney Ni desulphurisation, di-imide.	
Pedagogy	Lectures & tutorials. Seminars / assignments / presentations / self-study or a combination of some of these could also be used to some extent. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.	
Text Books/ References / Readings	1. M. B. Smith, J. March, *Advanced Organic Chemistry- 50 Reaction, Mechanism and Structure*, Wiley, 2006, 6th Ed. 2. D. Nasipuri, *Stereochemistry of Organic compounds, Principles and applications*, New Age International Pvt. Ltd., 1994, 2nd Ed. 3. E. L. Eliel, *Stereochemistry of Carbon Compound*, Tata McGraw Hill, 1975. 4. W. Caruthers, I. Colddham, *Modern Methods of Organic Synthesis*, Cambridge University Press, 2016, 4th Ed. 5. J. Clayden, N. Greeves, S. Warren, Oxford, 2016. 6. I. L. Finar, *Stereochemistry and the Chemistry of Natural Products*, ELBS, Vol. 2, Longman Edn, 1975. 5th Ed. 7. E. S. Gould, *Mechanism and Structure in Organic Chemistry*, Holt, Reinhart and Winston, 1965. 8. F. A. Carey, R. J. Sundberg, *Advanced Organic Chemistry: Part A and B*, Springer India Private Limited, 2007, 5th Ed. 9. R. O. Norman J, M. Coxon, *Principles of Organic Syntheses*, CRC Press Inc, 1993, 3rd Ed. 10. V.M. Potapov, A. Beknazarov, *Stereochemistry*, Central Books Ltd., 1980. 11. D. G. Morris, *Stereochemistry*, Wiley-RSC, 2002, 1st Ed. 12. Clayden, Greeves, Warren, Wothers, *Organic Chemistry*, Oxford University Press, 2002, 2nd Ed. 13. M. Nogradi, *Stereoselective Synthesis*, VCH Publishers, Inc., 1994, Revised and Enlarged Ed.	

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Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **PCC-412**

Title of the course: **Quantum Chemistry and Statistical Thermodynamics**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied physical chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	4. Introduction of various concepts of quantum chemistry. 5. To introduce various concepts of statistical thermodynamics.
Course Outcome:	3. Students should be in a position to understand and explain various concepts of quantum chemistry viz. the wave function and applications. 4. Students should be able to explain various concepts in statistical thermodynamics viz. the partition function and applications.

Content	*Hrs*
1. Quantum Chemistry a. The origin of quantum mechanics: Planck's quantum theory, wave particle duality, uncertainty principle concept of wave function, the Born interpretation of wave function. Normalization and orthogonalizations, quantization, Eigen values and Eigen functions. b. Postulates of quantum mechanics; Schrödinger equation for free particle, particle in a box, degeneracy. Quantum mechanical operators and their properties, commutation relations, Hamiltonian and Laplacian operators, Harmonic oscillators, Angular momentum, Ladder Operators. c. Approximate methods, Schrödinger equation, its importance and limitations, Born-Oppenheimer approximation, Anti-symmetric wave functions and Slater determinants (many electron system e.g. He atom), Exclusion and Aufbau principle, Variation method, Linear Variation Principle, Perturbation theory (first order non-degenerate) and their applications to simple systems. d. MO theory, Hückel MO theory, Bond-order, Charge density matrix, Unification of HMO and VB theory, their applications in spectroscopy and chemical reactivity, electron density forces and their role in chemical bonding. Hybridization and valence MOs of H_2O, NH_3 and CH_4. Application of Hückel Theory to ethylene, butadiene and benzene molecules.	34
2. Statistical Thermodynamics a. The language of statistical thermodynamics: Probability, ensemble, microstate, degeneracy, permutations and combinations. Configuration and weights, the dominant configuration. The Boltzmann distribution. The molecular partition function: its interpretation and its relation to uniform energy levels. b. Translational, Rotational, Vibrational and Electronic Partition functions for diatomic molecules. Relation between thermodynamic functions and partition functions and their statistical interpretations. Equilibrium constants from partition function. c. Law of Equipartition energy. Theories of specific heat of solids. Comparison between Einstein and Debye theories. d. Concept of symmetric and antisymmetric wave functions. Ortho and para hydrogens. Quantum Statistics: Fermi-Dirac (FD)and Bose-Einstein (BE) statistics. Comparison between MB, FD and BE Statistics.	26

Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.

Text Books/ References / Readings	5. P. W. Atkins and J. D. Paula, *Physical Chemistry*, 8th Ed., Oxford University Press, (2007) New Delhi. 6. G. M. Barrow, *Physical Chemistry*, 5th Ed., Tata McGraw Hill, (2016) New Delhi. 7. M.C. Gupta, *Statistical Thermodynamics*, Wiley Eastern, (1990) New Delhi. 8. I. N. Levine, *Quantum Chemistry*, 7th Ed., Prentice-Hall, (1999) New Delhi. 9. H. Metiu, Physical Chemistry, Statistical Mechanics, Taylor & Francis, (2006) New York

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Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **PCC-413**

Title of the course: **Group Theory and Molecular Spectroscopy**

Number of Credits: **04** Total Hours: **6** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied physical chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To introduce concepts in Group Theory and it applications to chemistry. 2. To introduce some advance topics in spectroscopy.
Course Outcome:	1. Students should be in a position to explain various concepts in Group Theory. 2. Should be able to apply character table to solve various problems. 3. Students should be in a position to apply the knowledge of spectroscopy for their dissertation and research work.

Content	*Hrs*
1. Group Theory for Chemistry a. Symmetry elements and symmetry operations, Concept of group and group multiplication tables, order of the group, classes and subgroups in a group, Different types of groups (cyclic, abelian and non-abelian groups). b. Point groups, Matrix representations of a group, Reducible and Irreducible representations groups, Great Orthogonality Theorem, Properties of Irreducible representations, Mulliken symbols for Irreducible representations, Character tables. c. Standard reduction formula, Direct products of representations and it applications Quantum Chemistry and spectroscopy: Vanishing of integrals, Selection rules. Applications of group theory for hybridization of atomic orbitals. Projection operator and Symmetry adapted linear combinations (SALCs), MO treatment (within Huckel Molecular Orbital Theory) of large molecules with symmetry. Applications of group theory to Infra-red and Raman spectroscopy. d. Space Groups**:** Symmetry elements, Schoenflies, and Hermann Mauguin notation, Representation of point groups and space groups, point symmetry, space symmetry, glide plane, helical screw axis	30
2. Microwave, IR and Raman Spectroscopy a. Theoretical treatment of Rotational and Vibrational spectroscopy.	12

b. Principle of Fourier Transform (FT) spectroscopy, FTIR spectroscopy: Theory, instrumentation and applications. c. Quantum theory of Raman effect, Raman shift, Instrumentation, Resonance Raman spectroscopy, Complimentary nature of IR and Raman spectroscopy in structure determination, Applications.	
3. NMR Spectroscopy a. Basic principles of NMR b. Theory of pulse NMR and Fourier analysis, FT-NMR. c. Solid state NMR, magic angle spinning (MAS), dipolar decoupling and cross polarization, applications of solid-state NMR. d. Double resonance, NOE, Spin tickling, Solvent and shift reagents, Structure determination by NMR.	10
4. ESR Spectroscopy a. Theory and experimental techniques, Identification of odd-electron species (methyl and ethyl free radicals) and radicals containing hetero atoms. b. Spin trapping and isotopic substitution, Spin densities and McConell relationship, Double resonance techniques.	8
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. P. W. Atkins and J. D. Paula, *Physical Chemistry*, 8th Ed., Oxford University Press, (2007) New Delhi. 2. F.A. Cotton, *Chemical Applications of Group Theory*, 3rd Ed., John Wiley & Sons-Asia, (1999) New Delhi 3. K. V. Raman, *Group Theory and its applications to chemistry*, Tata McGraw-Hill, (1999) New Delhi 4. C. N. Banwell and E.M. McCash, *Fundamentals of Molecular Spectroscopy*, Tata McGraw-Hill, (1994) New Delhi. 5. W. Kemp, *NMR in Chemistry a multinuclear introduction*, Macmillan (1986). 6. R.S. Drago, *Physical Methods in Chemistry*, W.B. Saunders Company (1977).

Programme: **M.Sc. Part-II (Physical Chemistry)**

Course Code: **PCC-414**

Title of the course: **Chemical Kinetics and Thermodynamics**

Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied physical chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To introduce concepts of reaction kinetics and thermodynamics 2. To provide fundamental knowledge of theories that govern chemical reactions 3. To introduce newer classes of reaction types and their kinetics 4. To introduce latest developments in the advance instrumental techniques and methods for monitoring reaction kinetics and dynamics.
Course Outcome:	1. Students should be in a position to understand and explain various concepts in chemical kinetics and thermodynamics. 2. Students should be in a position to apply these concepts during the lab course in experimental physical chemistry.

Content	*Hrs*
1. Theories of reaction rates a. Generalized kinetic theory and extended collision theory. Concept of collisional number, collisional frequency factor, collisional and reactive cross section, steric factor, microscopic rate constant. Assumptions and limitations of collision theory. b. Conventional transition state theory, equilibrium hypothesis and derivation of reaction rates. Thermodynamic formulation of transition state theory. Arrhenius temperature dependent and independent activation energy and its significance. Assumptions and limitations of transition state theory. Lindemann-Hinshelwood theory of thermal unimolecular reactions.	10
2. Elementary reactions in solutions Collisional kinetics in solution, effect of solvent polarity, solvent cohesion energy, and ion-dipole and dipole-dipole reactions on reaction rates.	3
3. Kinetics of Homogeneous reactions Homogeneous kinetics, enzymatic reactions and Michaelis-Menten, Lineweaver-Burk and Eadie Analysis, Autocatalytic reactions.	5
4. Composite reactions Types of composite mechanisms, kinetics of parallel and consecutive reactions. Introduction to shock tube method and its use in combustion analysis.	3
5. Fast Reactions Photochemical fast reactions, Pulsed laser photolysis, and its use in monitoring fast reactions.	3
6. Reversible, Irreversible and Oscillatory reactions. a. Kinetics of reversible reactions and graphical analysis b. Oscillatory reactions, Voltera-Lotka hypothesis of oscillatory reactions. The significance of bi-stability in the Briggs-Rauscher Reaction and Belousov-Zhabotinskii reaction.	4
7. Reaction Dynamics Introduction to potential energy surfaces, description of H_2O and HF potential energy surface diagrams.	2
8. Equilibrium Thermodynamics	17

a. Important terminologies in Thermodynamics; Thermodynamics state functions; work & heat; work expansion; Mathematical interlude Exact and inexact differentials. Cyclic rule; partial derivatives. b. Heat change at constant pressure, volume; relationship between Qp &Qv; Heat capacities Cp, Cv; Concept of Entropy, entropy change for an ideal gas at different conditions; Entropy of mixing of ideal gas and the Gibbs paradox; Physical significance of entropy. c. Work function and free energy function; Variation of free energy with temperature and pressure; Maxwell relations; Thermodynamic equations of state; Gibbs-Helmholtz equation. d. Thermodynamics of open systems, partial molar properties; chemical potential, variation of chemical potential with temperature and pressure; Gibbs-Duhem equation; Duhem-Margules equation; applications of chemical potential; thermodynamic derivation of phase rule.	
9. Non-Equilibrium thermodynamics a. Concept of internal entropy and spontaneity of a process in relation to free energy. Chemical affinity and extent of a reaction. Phenomenological Laws and Onsager's Reciprocal Relations; Conservation of Mass and energy in closed and open system. b. Postulates of non-equilibrium thermodynamics. Entropy production in heat flow. Entropy production of chemical reactions and Entropy production/entropy flow in open system. c. Principle of microscopic reversibility and the Onsager reciprocal relations; Validity of Onsager's equation and its verification; Application of Irreversible Thermodynamics to Biological Systems; Application to thermo-electric and electrokinetic phenomena.	13
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. K. J. Laidler, *Chemical Kinetics,* 3rd Ed.*;* Pearson Education, 1987; (printed in India by Anand Sons, 2004). 2. P.W. Atkins and J. De. Paulo, *Atkins' Physical Chemistry,* 8th Ed. Oxford University Press, 2007. 3. J. I. Steinfeld, J. S. Francisco and W. L. Hase, *Chemical Kinetics and Dynamics,* 2nd Ed.*;* Prentice Hall, 1999. 4. D. K. Chakrabarty and B. Viswanathan, *Heterogeneous Catalysis,* New Age International Publishers, 2008. 5. S. K. Scott, *Oscillations, waves and Chaos in chemical kinetics,* Oxford Science Publications, 1994. 6. T. S. Briggs, and W. C. Rauscher, *An oscillating iodine clock, J.* Chem. Educ., 1973. 7. G. W. Castellan, *Physical Chemistry*, 3rd Ed.; University of Maryland, Addison-Wesley Publishing Company, 1983. 8. E. N. Yeremin, *Fundamentals of Chemical Thermodynamics* Firebird Publications, 1978. 9. D. A. McQuarrie & John D. Simon, *Physical Chemistry*: A molecular approach, Viva Books Pvt. Ltd., New Delhi.

10. S. R. De Groot, *Non-equilibrium thermodynamics*, Dover Publications, 2011.
11. A. Kleidon, R.D. Lorenz (Eds.), *Non-equilibrium thermodynamics and the production of entropy: life, earth, and beyond*, Springer Berlin Heidelberg New York, 2005.
12. J. Rajaram, J. C. Kuriacose, S. N. & Co., *Thermodynamics for students of Chemistry, Classical, Statistical and Irreversible*, Jalandhar, 1996.
13. P. W. Atkins & J. De. Paulo, Atkins' *Physical Chemistry,* 8th Ed.; Oxford Univ. Press, 2007.

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Programme: **M.Sc. Part-I (Chemistry)**

Course Code: **PCC-415**
Title of the course: **Electrochemistry and Surface Studies**
Number of Credits: **04** Total Hours: **60** Effective from AY: **2022-23**

Prerequisites for the course:	Students should have studied physical chemistry courses at M.Sc. Chemistry in semester I
Course Objective:	1. To introduce some core concepts of electrochemical processes including ionic interaction theories, electrified interfaces, electrochemical kinetics and thermodynamics 2. To develop problem solving skills in electrochemistry 3. To introduce fundamental concepts and applications of electrochemistry in day-today life eg. batteries, solar cells, capacitors
Course Outcome:	1. Students will be in a position to explain various fundamental and core concepts of electrochemistry. 2. Students should be in a position to apply the knowledge of electrochemistry for their dissertation and research work 3. Students should be in a position to apply these concepts during the lab course in physical chemistry

Content	*Hrs*
1. Ionic Interactions and Conductance in Electrolytes a. Ion-solvent interactions. Born Theory, validity and limitations. b. Solvation number and coordination number. c. Ion-ion interactions and Debye-Huckel theory of ion cloud. d. Applications of Debye- Huckel equation. Concept of ionic strength and activity coefficient. e. Debye-Huckel limiting law and its modifications. f. Debye-Huckel-Onsager equation, validity and limitations. g. Einstein-Smoluchowski equation. h. Influence of ionic atmospheres on ionic migration: Relaxation and Electrophoretic effects. i. Conductance in strong and weak electrolytes.	10

2. Electrified Interfaces a. Formation of an electrode/electrolyte interface and its structure. b. Polarizable and non-polarizable interfaces. c. Potential difference across electrical double layer: outer potential, surface potential, inner potential and relationship between them, chemical and electrochemical potentials. d. Thermodynamics of electrified interface: Surface tension, surface excess, Electro-capillary curves. Determination of surface excess. Condition for thermodynamic equilibrium at electrified interface. e. Generalized Gibbs equation, Lippmann equation and electrical capacitance at the double layer. f. Models of the electrified interface. g. Ion adsorption at the electrode: hydrated electrodes, contact adsorption, Gibbs adsorption equation.	10
3. Pure Liquid Electrolytes: Ionic Liquids a. Thermal loosening of ionic lattice. b. Ionic liquids in surface electrochemistry: Electrode/electrolyte interfacial processes in ionic liquids. c. Electrochemistry of Ti (IV) in Ionic liquids.	8
4. Electrode Kinetics and Corrosion a. Disturbance of electrode equilibrium, cause of electron transfer, fast and slow systems and their current-potential relationship. b. Butler-Volmer equation and its low and high field approximations. c. Nernst equation as a special case of B-V equation. d. Tafel plots for anodic and cathodic processes. e. Fundamentals of Impedance spectroscopy; determining exchange current densities and rate constants from impedance plots. f. Principles of corrosion, electrochemical methods of avoiding corrosion. g. pH-potential diagrams: Pourbaix diagram for corrosion of iron and stability of water.	12
5. Colloidal Chemistry a. Interaction of double layers and Stability of Sols. DLVO theory. b. Colloidal electrolytes, critical micelle concentration, Kraft temperature. c. Electrokinetic phenomena: Electroosmosis, streaming potential and current, electrophoresis. Zeta potential. d. Donnan membrane equilibria. e. Micelles and reverse micelles, Emulsions and Microemulsions.	8
6. Electrochemical Energies: Conversion and Storage a. Thermodynamics of electrochemical energy conversion. b. Batteries: basic principles; rating and shelf life. Zinc-manganese dioxide: Leclanche and alkaline batteries. Lithium ion batteries and recharge	7

ability. c. Fuel cells: Principle of a hydrogen-oxygen fuel cell. Classification of fuel cell systems based on types of electrolytes/temperature. Efficiency w.r.t. thermodynamic efficiency, reliability and economic benefits. Direct methanol-polymer electrolyte fuel cell and electro- catalysts - a case study. Reactions occurring in various fuel cells and calculation of their electrode and cell potentials. d. Super-capacitors: Introduction: Origin of supercapacitance.	
7. Photoelectrochemistry a. Semiconductor/Electrolyte Interface: Band edge and Band bending. b. Light absorption and carrier generation at the electrode: photoinduced charge transfer, hot carriers. c. Photoelectrodes: p-type photocathode, n-type photoanode. d. Determination of surface states. e. Photoelectrocatalysis: photoelectrochemical water splitting and CO_2 reduction. f. Types of photoelectrochemical devices.	5
Pedagogy	Mainly lectures and tutorials. Seminars / term papers /assignments / presentations / self-study or a combination of some of these can also be used. ICT mode should be preferred. Sessions should be interactive in nature to enable peer group learning.
Text Books/ References / Readings	1. J.O.M. Bockris & A.K.N. Reddy, *Modern Electrochemistry*, Springer India Pvt. Ltd, 2000, Vol. 1, 2 and 3. 2. D. Crow, *Principles and Applications of Electrochemistry*, Blackie Academy and Professional, 1994. 3. C.M.A. Brett & A.M.O. Brett, *Electrochemistry: Principles, methods and applications*, Oxford, New York Oxford University Press, 1993. 4. R.D. Vold & M.J. Vold, *Colloid and Interface Chemistry*, Addison-Wesley, 1983. 5. A. Vincent & B. Sacrosati, *Modern Batteries*, John Wiley, New York, 1997. 6. J.O. M. Bockris & S. Srinivasan, *Fuel cells: Their Electrochemistry*, McGraw-Hill Book Co., 1969. 7. A. A. J. Torriero, *Electrochemistry in Ionic Liquids*, Vol. 1: Fundamentals, Springer International Publishing, 2015 8. B. A.J., Stratmann M., Licht D, *Encyclopedia of Electrochemistry, Semiconductor Electrodes and Photoelectrochemistry*, Wiley-VCH, 2002.

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D 3.18 Minutes of the Board of Studies in Psychology meeting held on 20.04.2022.

Annexure I

ANNEXURE I

THE COURSE STRUCTURE FOR M.A. PSYCHOLOGY PART I

	CODE	COURSE NO.	COURSE TITLE	CREDIT
SEMESTER I	DSCC	101	Psychometrics	4
	DSCC	102	Practicum: Experiments and Tests	4
	DSCC	103	Psychopathology	4
	DSCC	104	Counselling across lifespan	4
	DSOC	101	Applied Positive Psychology	4
	DSOC	102	Guidance and Counselling in Schools	4
	DSOC	103	Cognitive Psychology	4

	CODE	COURSE NO.	COURSE TITLE	CREDIT
SEMESTER II	DSCC	105	Personality Theories	4
	DSCC	106	Supervised Practicum	4
	DSCC	107	Psychotherapy	4
	DSCC	108	Human Resource Management	4
	DSOC	104	Neuropsychology	4
	DSOC	105	Psychology of Addiction	4
	DSOC	106	Psychosocial Rehabilitation	4

Programme: M.A Psychology
Course Code: DSCC 101 **Title of the Course: Psychometrics**
Number of Credits: 04 **Effective from AY: 2022-23**

Prerequisites	Students should have basic knowledge of psychological testing.	
Objectives:	1. To familiarize students with psychometric concepts, theory and principles of test construction. 2. To understand the application and contextual interpretation of data from psychological measurement.	
Content:	I - THEORETICAL - CONCEPTUAL ORIENTATION 1. The development of psychometrics: The history of psychometrics, psychometrics today. 2. Test development: The process of test construction, constructing your own questionnaire. 3. Psychometric properties: Item analysis, reliability, validity, standardisation and normalisation.	15 Hours

	4. Ethical considerations and future of psychometrics: Issues in intelligence testing, ethical test use and integrity testing, psychometrics in the information technology age.	
	II - INTELLIGENCE, APTITUDE, PERSONALITY AND NEURO-PSYCHOLOGICAL TESTING 1. Intelligence: Measurement of Intelligence - Wechsler Intelligence Scales, Ravens Progressive Matrices 2. Aptitude: Measurement of Aptitude – David's Battery of Differential Abilities (DBDA), Scholastic Aptitude Test 3. Personality: Measurement of Personality-NEO PI-R, MMPI-2 4. Neuropsychology: Neuropsychological Assessment-The Luria-Nebraska Neuropsychological Battery, Screening for alcohol use disorders	15 Hours
	III- PROJECTIVE TESTING 1. Classification of personality tests 2. Inkblot Tests: Rorschach test, Alternative inkblot tests-Holtzman inkblot 3. Apperception Tests: Thematic Apperception Test, Alternative apperception procedures- CAT 4. Non-pictorial Projective procedures: word association test, sentence completion test	15 Hours
	IV- PSYCHOMETRIC APPLICATIONS 1. Using psychometrics in clinical psychology: Identifying specific learning disabilities 2. Using psychometrics in educational settings: Measuring ability and achievement in school children 3. Testing special population: Infant and Preschool assessment 4. Psychometric assessment of personality in occupational settings: The big Five model, Orpheus, The Orpheus scales	15 Hours
Pedagogy:	Blended Learning, Flipped Classroom/Flipped Learning, Crossover learning & Experiential learning.	
Text Books:	1. Rust, J. & Golombok. (2020). Modern psychometrics: The science of psychological assessment, (4th ed.). New York: Psychology press. 2. Cohen, J.R., Swerdlik, M. E. &Kumthekar, M.M. (2017). Psychological testing and assessment: An introduction to tests and measurement. (9th ed.). New York. w-Hill International edition 3. Anastasi, A. & Urbana, S. (2016). Psychological testing. (7th ed.). Delhi: Pearson Education Pvt. Ltd. 4. Gregory, R. J. (2017). Psychological Testing: History, principles and applications. (7th ed.). New Delhi: Pearson Education 5. Kaplan, R. M.,& Saccuzzo, D. P. (2018). Psychological assessment and theory creating and using psychological tests. (9th ed.). Delhi: Wadsworth Thomson Learning, 6. Murphy, R.K. & Davidshofer, O.C. (2019). Psychological testing: Principles & applications. (6th ed.). New Jersey: Prentice Hall.	
Learning Outcomes	Students will be able to: 1. Understand psychometric theory and principles of test construction.	

	2. Relate to the application and contextual interpretation of data from psychological measurement. 3. Explain and illustrate concepts in psychometrics.	

Programme: M.A Psychology
Course Code: DSCC 102 Title of the Course: Practicum: Experiments and Tests
Number of Credits: 04 Effective from AY: 2022-23

Prerequisites	Completing at least one core experimental psychology course in the relevant field of psychology.	
Objectives:	1. To equip students with skills in conducting experiments in various areas of psychology. 2. To familiarize students with various types of psychological tests, their administration and interpretation.	
Content:	PART ONE: EXPERIMENTS I – EXPERIMENTS Any 4 of the following experiments to be conducted 1. Divided Attention 2. Finger Dexterity 3. Frustration on Performance 4. Maze Learning 5. Mental Fatigue 6. Organization in Memory 7. Problem Solving 8. Selection and Grouping in Perception Coglab Experiments: Any 1 to be conducted 1. Memory Judgment 2. Link Word 3. Phonological Similarity Effect 4. Sternberg Search II - DESIGNING AN EXPERIMENT Experimental designs: 1. Between-subjects design 2. Within-subjects design 3. Pretest- Post test design 4. AB design 5. ABA design 6. Multiple baseline design Each student has to choose any one area and design an experiment based on the above experimental designs. The areas are: Perception, Memory, Attention, Imagery, Spatial Cognition. The individual experiment designed by each student has to be computerized using open-source package (e.g. PEBL, Open Sesame, etc.) and presented in a CD for internal assessment.	30 Hours
	PART TWO: TESTS	30 Hours

	I: PSYCHOLOGICAL TESTING Any 5 of the following tests: Administration, analysis and interpretation. 1. Revised Amsterdam Kinder Intelligence Test (RAKIT) 2. Dr. Bhatia's Battery of Performance Test of Intelligence 3. Wechsler Adult Performance Intelligence Scale (WAPIS) 4. Bender Visual Motor Gestalt Test 5. PGI Battery of Brain Dysfunction 6. David's Battery of Differential Abilities (DBDA) 7. Minnesota Multiphasic Personality Inventory (MMPI) 8. Eight State Questionnaire (8SQ) 9. Rorschach Inkbot Test 10. Thematic Apperception Test (TAT) II: SKILLS TRAINING EXERCISE Developing a Test. The newly developed test has to be administered on a minimum of 10 individuals. The item analysis, reliability, validity and norms are to be computed and reported in the journal. Marking Scheme: Experiments ISA 20 Marks: Journal (10 marks), designing the experiment (10 marks). SEA 30 Marks: Conduct (10 marks), Report writing (10 marks), Viva (10 marks) Tests ISA 20 Marks: Journal (10 marks), test development (10 marks). SEA 30 Marks: Conduct (10 marks), Report writing (10 marks), Viva (10 marks)	
Pedagogy:	Blended Learning, Flipped Classroom & Crossover learning	
Text Books	1. Singh, A.K. (2019). Tests, measurements, and research methods in behavioural sciences. New Delhi: Bharati Bhawan Publishers and Distributers. 2. Mohsin, S.M. (2016). Experiments in psychology. New Delhi: Motilal Banarsidass 3. Hussain, A. (2014). Experiments in psychology. Delhi: PHI Learning Private Limited. 4. Hussain, A. (2012). Psychological testing. New Delhi: Pearson Education India 5. Miller, L.A., Lovler, R.L., &Mclntire, S.A. (2015). Psychological testing: A practical approach. (4thed.). New Delhi: Sage Publications 6. Shergill, H.K. (2012). Experimental psychology. New Delhi: Prentice hall India Learning Private Limited.	
Learning Outcomes	The students will be able to:	

	1. Conduct experiments in various areas of psychology and have the necessary skills required. 2. Understand various types of psychological tests, and conduct administration and interpretation.	

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Programme: M.A Psychology
Course Code: DSCC 103 Title of the Course: PSYCHOPATHOLOGY
Number of Credits: 04 Effective from AY: 2022-2023

Prerequisites	The student should have an understanding of the term 'mental illness', should be aware of the purpose and history of DSM classification and ICD classification, be fairly read on the bio-psycho-socio model and diathesis-stress model of psychological illnesses.	
Objectives:	1. To understand the nature of maladaptive behaviour and etiology of psychopathology 2. To analyze symptoms and understand the clinical presentation of psychological disorders according to DSM V. 3. To apply the treatments suitable for the psychological disorders	
Content:	I – NEURODEVELOPMENTAL DISORDERS 1. Intellectual disabilities 2. Communication disorders 3. Autism spectrum disorders 4. Attention-Deficit/Hyperactivity disorder 5. Specific learning disorders	15 Hours
	II – SCHIZOPHRENIA SPECTRUM, MOOD, & ANXIETY-RELATED DISORDERS 1. Schizophrenia spectrum and other psychotic disorders 2. Bipolar and related disorders 3. Depressive disorders 4. Anxiety, Obsessive-compulsive, trauma and stressor-related disorders	15 Hours
	III – DISSOCIATIVE, SOMATIC, SEXUAL AND PERSONALITY DISORDERS 1. Dissociative disorders 2. Somatic symptom and related disorders 3. Sexual dysfunctions 4. Personality Disorders	15 Hours
	IV – FEEDING, ELIMINATION, SLEEP & SUBSTANCE RELATED DISORDERS 1. Feeding and Eating disorders 2. Elimination disorders 3. Sleep-wake disorders 4. Substance-related and addictive disorders NOTE: All the disorders will cover the following:	15 Hours

	• Clinical presentation • Diagnostic criteria •Etiology • Treatment	
Pedagogy:	Blended learning, Flipped learning Crossover learning & Experiential learning.	
Text Books	1. American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Arlington, VA: American Psychiatric Publishing. 2. Butcher, J. N., Mineka, S., & Hooley, J. M. (2018). Abnormal psychology (17th edition). Boston: Pearson. 3. Dziegielewski, S. F. (2014). DSM-5 in action (3rd ed.). Hoboken, NJ: John Wiley & Sons. 4. Kring, A. M., Johnson, S. L., Davison, G. C., & Neale, J. M. (2014). Abnormal psychology. New Jersey: John Wiley & Sons. 5. Mulherin, K. L. (2014). Introduction to abnormal psychology. USA: Asia Pacific holdings Private Limited. 6. Sadock, B. J., Sadock, V. A., & Ruiz, P. (2017). Kaplan & Sadock's synopsis of psychiatry: Behavioral sciences/clinical psychiatry. Philadelphia: Wolters Kluwer. 7. Whitbourne, S. (2021). Abnormal Psychology: Clinical Perspectives on Psychological disrders. (9th Edition). Noida, U.P.: Mc Graw Hill SUGGESTED READINGS: 1. Comer, R.J. (2012). Abnormal psychology. New York, NY: Worth. 2. Craighead, W. E. (2017). Psychopathology: History, diagnosis, and empirical foundations (2nd ed.). John Wiley & Sons. 3. Davison, G. C., & Neale, J. M. (2001). Abnormal psychology. New York: John Wiley. 4. Sperry, L., Carlson, J., & Sperry, J. (2014). 4. Psychopathology and psychotherapy: DSM-5 diagnosis, case conceptualization, and treatment (3rd ed.). Routledge	
Learning Outcomes	1. Students will be able to evaluate the nature of maladaptive behavior and analyze and write the etiological factors of psychopathology 2. Students will be able to classify symptoms of psychological disorders as per DSM V categorization and will be able to correlate the clinical presentation of the psychological disorders. 3. Students will be able to identify and apply treatment modalities suitable for the psychological disorders.	

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Programme: M.A Psychology
Course Code: DSCC 104. Title of the Course: COUNSELLING ACROSS THE

LIFESPAN

Number of Credits: 04 **Effective from AY: 2022-2023**

Prerequisites	The student should have basic knowledge about the human development across the lifespan. with Developmental psychology.	
Objectives:	1. To develop an understanding of specific concerns associated with each stage of the lifespan. 2. To apply knowledge of specific concerns in each stage to design suitable preventive and treatment strategies. 3. To understand the importance of health promotion for numerous contexts over the lifespan	
Content:	I - COUNSELLING CHILDREN 1. Child identity development 2. Fostering resilience in children experiencing developmental disruptions 3. Promoting healthy and effective relationships among school aged children 4. Psychosocial adjustment of children with chronic illness	15 Hours
	II - COUNSELLING ADOLESCENTS 1. Promoting healthy lifestyles 2. Positive identity development among adolescents 3. Fostering adolescent work and career readiness 4. Health disparities and help-seeking behaviour among adolescents	15 Hours
	III – COUNSELLING ADULTS 1. Young adulthood: Promoting healthy relationships, treating behavioural health challenges, positive parenting and child rearing 2. Middle adulthood: Role strain and conflict, supporting adaptation to new family roles, promoting positive career change in midlife	15 Hours
	IV - GERIATRIC COUNSELLING 1. A positive aging framework for counselling older adults 2. Psychosocial crisis and emotional impact of chronic illness and disability 3. Facilitating transitions through retirement 4. Working therapeutically with older adults	15 Hours
Pedagogy:	• Blended learning • Flipped Classroom/ Flipped learning • Cross-over learning • Experiential Learning	

Text Books/Reference Books:	BOOKS FOR STUDY: 1. Capuzzi, D. (2016). Human growth and development across the lifespan: Applications for counselors. John Wiley & Sons. 2. Juntunen, C. L., & Schwartz, J. P. (Eds.). (2015). Counseling Across the Lifespan: Prevention and Treatment (2nd ed.). Sage Publications. 3. Vondracek, F. W., Lerner, R. M., & Schulenberg, J. E. (2018). Career development: A life-span developmental approach. Routledge. 4. Wong, D. W., Hall, K. R., Justice, C. A., & Hernandez, L. W. (2015). Counselling individuals through the lifespan. Sage Publications. SUGGESTED READINGS: 1. Sharry, J. (2004). Counseling children, adolescents and families: A strengths-based approach. Sage Publications. 2. Horton-Parker, R. J., & Brown, N. W. (2002). The unfolding life: Counseling across the lifespan. Bergin & Garvey 3. Wong, D. W., Hall, K. R., & Hernandez, L. W. (2020). *Counseling individuals through the lifespan*. Sage Publications.	
Learning Outcomes	At the end of this course, the learner will be able to: 1. Identify specific concerns in childhood, adolescence, adulthood and old age. 2. Design effective strategies to deal with specific concerns such as developmental disruptions, psychosocial crisis and conflicts experienced at various stages across the lifespan. 3. Formulate developmentally appropriate counseling strategies and interventions to facilitate optimal health over the lifespan. 4. Apply the developmental concepts, theories and specific evidence-based research findings to understand counselling practice and social issues and apply it in practical settings.	

Programme: M.A Psychology
Course Code: DSOC 101 **Title of the Course: Applied Positive Psychology**
Number of Credits: 04 **Effective from AY: 2022-2023**

Prerequisites	The student needs to be familiar with the history and important concepts in Positive Psychology	
Objectives:	Course Objectives: 1. To understand the fundamental concepts of positive psychology. 2. To examine established areas of positive psychology. 3. To apply positive psychological interventions.	

Content:	I – INTRODUCTION TO POSITIVE PSYCHOLOGY 1. Positive psychology: Meaning, nature, Core theories and concepts, importance 2. The relationship between counseling psychology and positive psychology 3. General guidelines for developing positive psychological treatment plans 4. Challenges associated with implementing positive psychological interventions	15 Hours
	II - INTERVENTIONS IN POSITIVE PSYCHOLOGY - 1 1. Gratitude interventions: Interventions to increase gratitude in children, adolescents and adults 2. Positive psychological interventions for promoting forgiveness: Efficacious components of forgiveness interventions, unresolved questions about forgiveness interventions 3. Empathy-related interventions	15 Hours
	III - INTERVENTIONS IN POSITIVE PSYCHOLOGY - 2 1. Creativity as a target and tool for positive interventions: Creativity as a tool for increasing well-being, building creativity-based positive interventions 2. Patience interventions to improve well-being: Defining and discriminating patience, possible applications of patience interventions 4. Positive family therapy interventions: Systems theory, positive family therapy, interventions in positive family therapy	15 Hours
	IV- POSITIVE PSYCHOLOGY APPLICATION AMONG INDIVIDUALS, SPECIFIC POPULATIONS AND CONTEXTS 1. Applications of Positive Psychology to Individual Therapy. 2. Interventions across populations: Positive psychology for children, Clinical populations, chronic illnesses, substance abuse. 3. Interventions across contexts: Workplace, classroom, rehabilitation, community 4. Other Areas of Application: Online positive psychological interventions, social identity interventions, posttraumatic growth, resilience.	15 Hours
Pedagogy:	• Blended learning • Flipped Classroom/ Flipped learning • Cross-over learning • Experiential Learning	
Text Books/Reference Books:	BOOKS FOR STUDY: 1. Magyar-Moe, J. L. (2009). Therapist's guide to positive psychological interventions. Academic press. Carr, A. (2013). *Positive psychology: The science of happiness and human strengths*. Routledge..	

	Joseph, S. (2015). Positive psychology in practice: Promoting human flourishing in work, health, education, and everyday life. John Wiley & Sons. 2. Dunn, D. S. (Ed.). (2017). Positive Psychology: Established and Emerging Issues. Routledge. 3. Lopez, S. J., Pedrotti, J. T., & Snyder, C. R. (2018). Positive psychology: The scientific and practical explorations of human strengths. Sage Publications. 4. Parks, A. C., &Schueller, S. (Eds.). (2014). The Wiley Blackwell handbook of positive psychological interventions. John Wiley & Sons. 5. Proctor, C. (Ed.). (2017). Positive psychology interventions in practice. Springer. 6. Warren, M. A., & Donaldson, S. I. (2017). Scientific advances in positive psychology. Westport, Connecticut: Praeger Publishers. SUGGESTED READINGS: 1. Donaldson, S. I., Csikszentmihalyi, M., & Nakamura, J. (Eds.). (2011). Applied positive psychology: Improving everyday life, health, schools, work, and society. Routledge. 2. Lomas, T., Hefferon, K., &Ivtzan, I. (2014). Applied positive psychology: Integrated positive practice. Sage. 3. Snyder, C. R., Lopez, S. J., Edwards, L. M., & Marques, S. C. (Eds.). (2020). The Oxford handbook of positive psychology. Oxford university press.	
Learning Outcomes	Learning Outcomes: At the end of this course, the learner will be able to: 1. Describe the meaning, nature, importance of interventions in positive psychology and the general guidelines and challenges associated with developing and implementing positive psychological interventions. 2. Implement a strength-based practice through the use of gratitude, patience, creativity, forgiveness, and empathy-related interventions in diverse settings. 3. Use positive psychological interventions among individuals, specific populations and contexts. 4. The student will be able to design Positive Psychology interventions based on past theory and research evidence	

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Programme: M.A Psychology
Course Code: DSOC 102 Title of the Course: Guidance and Counseling in Schools
Number of Credits: 04 Effective from AY: 2022-2023

Prerequisites	The student needs to be familiar with basics of psychological concepts and theories, assessment techniques and interventions.	
Objectives:	1. To understand the concepts of guidance and counseling in school settings. 2. To develop knowledge of different types of exceptionalities among children. 3. To design client-specific assessment methods and interventions.	

	4. To relate the individual's strengths to the best-suited opportunities in the world of work.	
Content:	**I- INTRODUCTION TO GUIDANCE AND COUNSELING** 1. Guidance: Definition, Characteristics, Nature, Types, Aims. 2. Educational guidance and Vocational guidance. 3. Counseling: Definition, Role of a counselor, Counseling process and interviews. 4. Counseling Process: Intake, Assessment, Intervention and Documentation	Number of Hours: 15 Hours
	II- COUNSELORS IN EDUCATIONAL SETTINGS 1. Role and functions of counselors in school settings: Elementary, middle, high school, secondary, vocational schools and higher education. 2. Testing techniques: Intelligence, Aptitude, Achievement, Interest, Interpersonal Relationships, Personality, Risk assessment. 3. Psychoeducational interventions in schools. 4. Inclusive education: Concept, Need, Steps for inclusive education at school level, Multicultural Sensitivity.	15 Hours
	III. COUNSELING CHILDREN WITH SPECIAL CONCERNS 1. Counseling children with a physical and learning disabilities. 2. Counseling children with behavioral problems. 3. Counseling children facing abuse and neglect. 4. Counseling children in single-parent families and blended families.	15 Hours
	IV. COUNSELING FOR CAREER PLANNING AND DECISION MAKING 1. The changing nature of the world of work and current interests in career planning. 2. The school counselor's role in student career development, Techniques for career planning and decision making in schools. 3. Career counseling in non-school settings: Community mental health agencies, Community career centers, Employment offices, Employment assistance programs, Private practice. 4. Computerized career assistance systems: Information systems, Guidance systems, Career information and the internet, Ethical considerations.	15 Hours
Pedagogy:	Power Point Presentations, Role plays, Structured exercises, Group discussions, Crossover Learning.	

Text Books/Reference Books:	1. Aggarwal, J. C. (2014). *Essentials of educational psychology* (3rd ed.). Noida: Vikas publishing house Private Limited. 2. Gibson, R. L., & Mitchell, M. H. (2014). *Introduction to counseling and guidance* (7th ed.). New Delhi: PHI Learning Private Limited. 3. Henderson, D. A., & Thompson, C. L. (2011). *Counseling children* (8th ed.). Spain: Brooks/Cole Cengage Learning. 4. Kolbert, J. B., Williams, R. L., Morgan, L. M. Crothers, L. M., Hughes, T. L. (2016). *Introduction to professional school counseling: Advocacy, leadership, and intervention*. New York: Routledge. 5. Ziomek-Daigle, J. (2016). *School counseling classroom guidance: Prevention, accountability and outcomes*. London: Sage Publications. 6. Bor, R., Landy, J. E., Gill, S. & Brace, C. (2002). *Counseling in schools*. London: Sage Publications. 7. Sharry, J. (2004). *Counseling children, adolescents and families: A strength-based approach.* London: Sage Publications. 8. Ziomek-Daigle, J. (2017). *Counseling children and adolescents: Working in school and clinical mental health settings*. New York: Routledge.	
Learning Outcomes	At the end of this course, the learner will be able to: 1. Explain the concepts of guidance and counseling in school settings. 2. Identify exceptionalities among children and use appropriate interventions. 3. Develop a step-by-step vocational guidance plan to connect the vocational progress of the individual to the requirements in the world of work. 4. Create prevention programs to integrate Psychoeducation in school counseling.	

Programme: M.A Psychology
Course Code: DSOC 103 **Title of the Course: COGNITIVE PSYCHOLOGY**
Number of Credits: 04 **Effective from AY: 2022-2023**

Prerequisites	The student should have an understanding of the basic concepts of psychology	
Objectives:	1. To provide students with an understanding of the fundamental concepts of cognitive psychology and the neuropsychological underpinnings of cognitive processes. 2. To enable students to illustrate the significance of cognitive processes for understanding human behavior.	

Content:	I - INTRODUCTION TO COGNITIVE PSYCHOLOGY 1. Core concepts in Cognitive Psychology: Mental Representations, Stages of Processing, Serial Versus Parallel Processing, Hierarchical Systems, Cognitive Architecture, Memory Stores, Consciousness, Emotion 2. Paradigms of Cognitive Psychology: Information Processing Approach, Connectionist Approach, Evolutionary Approach, Ecological Approach 3. Theories of Cognitive Development – Piaget, Vygotsky 4. Application: Cognitive Style and Cognitive Map	Number of hours: 15 Hours
	II - PERCEPTION, ATTENTION, AND IMAGERY 1. Perceiving Objects and Recognizing Patterns: Gestalt Approaches; Bottom-Up Processes – Template Matching, Featural Analysis, Prototype Matching; Top-Down Approaches – Perceptual Learning, Change Blindness, Word Superiority Effect 2. Attention: Filter Theories, Capacity Theories, Automatic Processes, The Central Bottleneck, Visual Attention 3. Mental Imagery: Finke's Principles of Visual Imagery 4. Neuroscientific Studies of Attention 5. Application: perceptual and attentional disorders	15 Hours
	III – MEMORY 1. Types and Models of Memory: Sensory Memory - Iconic and Echoic Memory; Short Term Memory– Capacity and Coding; Retention Duration and Forgetting; Working Memory; Executive Functioning; Long-Term Memory – Declarative versus Procedural, Episodic versus Semantic, Levels-of-Processing View, Reconstructive Nature of Memory, Flashbulb and Autobiographical Memory, Eyewitness Testimony 2. Forgetting and Mnemonics 3. Neurological Studies of Memory Processes 4. Application – memory disorders	15 Hours
	IV - HIGHER COGNITIVE PROCESSES 1. Language and Cognition: Whorfian and Modularity Hypothesis; Neuropsychological Perspective; Application – Multilingualism 2. Problem Solving and Creativity: Problems and Methods of Solution – Generate-andTest, Means-End Analysis, Working Backward, Backtracking, Reasoning by Analogy; Blocks to Problem Solving – Mental Set, Incomplete Representations, Lack of Problem-Specific Knowledge or Expertise; Stages and Sources of Creativity, Blocks to Creativity 3. Reasoning and Decision Making: Types of Reasoning – Deductive, Inductive, and Everyday Reasoning; Phases and Cognitive Illusions in Decision Making; 4. Application - Artificial Intelligence	15 Hours
Pedagogy:	1. Blended learning 2. Flipped learning 3. Crossover learning 4. Experiential learning	

Text Books/Reference Books:	1. Galotti, K. M. (2013). Cognitive psychology in and out of the laboratory. (5th ed.). New Delhi: Sage Publications. 2. Goldstein, E. B. (2014). Cognitive psychology: Connecting mind, research and everyday experience. Canada: Nelson Education. 3. Groome, D. (2013). An introduction to cognitive psychology: Processes and disorders. Psychology Press. 4. Groome, D., & Eysenck, M. (2016). An introduction to applied cognitive psychology (2nd ed.). Psychology Press. 5. Kellogg, R.T. (2012). Fundamentals of cognitive psychology. (2nd Edition) N.D. Sage Publications. 6. Matlin, M.W. & Farmer, T.A. (2016) Cognition (9th ed.). New Jersey, USA: John Wiley & sons 7. Solso, R.L., Maclin, O.H., & Maclin, M.K. (2013). Cognitive psychology. New Delhi: Pearson education, first Indian reprint 2014 8. Sternberg, R. J. & Sternberg, K. (2016). Cognitive psychology (7th ed.). Belmont, CA: Wadsworth.	
Learning Outcomes	1. Students will be able to explain the relevance and critically evaluate the processes of cognition. 2. Students will be able to appraise the etiology and evaluate the implications of the disorders associated with cognitive processes 3. Students will be able to apply the principles of cognitive psychology in real-world settings and design techniques to enhance cognitive skills.	

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Programme: M.A Psychology
Course Code: DSCC 105 **Title of the Course:** Personality Theories
Number of Credits: 04 **Effective from AY**: 2022-2023

Prerequisites:	The student should have completed at least one course paper of Psychology at the higher secondary or graduate level of study.	
Objectives:	1. To understand the fundamentals of the nature of human personality. 2. To understand the various theoretical orientations to the study of personality. 3. To apply personality theories in understanding human behaviour.	

Content:	**I – INTRODUCTION TO PERSONALITY AND TRAIT THEORIES** 1. Definition, Nature and Functions of Personality 2. Theoretical orientation to personality study and research: Bio-Psycho-Social and Gestalt Approaches 3. Type and Trait Theories**:** Hippocrates and Body Humors, William Sheldon and body types, Ernest Kretschmer and body physique, Gordon Allport, Raymond Cattell **II – HUMANISTIC AND EXISTENTIAL THEORIES** 1. Abraham Maslow 2. Carl Rogers 3. Rollo May **III – PSYCHOANALYSIS AND NEO-FREUDIAN THEORIES** 1. Sigmund Freud 2. Carl Jung 3. Alfred Adler 4. Erik Erikson **IV – SOCIO-COGNITIVE AND BEHAVIOURAL THEORIES** 1. B.F. Skinner 2. Albert Bandura 3. Cognitive Behavioural Approaches: Aaron Beck, Albert Ellis **NOTE: All the theories will cover the following:** • **Theoretical orientation and concepts** • **Assessment techniques** • **Implications: strength, weakness, application**	**Number of Hours:** **15 Hours** **15 Hours** **15 Hours** **15 Hours**
Pedagogy:	• Audio Visual Teaching tools • Case Conferences • Personality Assessment tools • Quiz	
Text Books/Reference Books:	1. Carver, C. S., and Scheler, M.F. (2016) *Perspectives on personality* (8th ed.). Pearson. 2. Engler, Barbara. (2014). *Personality theories* (7th ed.). USA: Hougthon Mifflin Company. 3. Pervin, L.A. (2003). *The science of personality* (2nd ed.). USA: Oxford University Press. 4. Ryckman, R.M.., (2014). *Theories of personality* (10th ed.). New Delhi: Cengage Learning, 5. Schultz, D.P., & Schultz, S.E., (2017). *Theories of personality (*11th ed.). New Delhi: Cengage Learning.	
Learning Outcomes	At the end of this course the learner will be able to: 1. To appreciate the value of various personality systems and theoretical frameworks 2. To compare and critically analyse various theories of personality 3. Apply the knowledge gained in various case situations	

Programme: M.A Psychology
Course Code: DSCC 106 **Title of the Course:** SUPERVISED PRACTICUM
Number of Credits: 4 **Effective from AY:** 2022-2023

Prerequisites	Student should have completed a course paper in the area of psychometrics.	
Objectives:	1. To understand techniques of assessment and report writing in mental health settings. 2. To develop knowledge to administer and interpret psychological assessment tools. 3. To develop planning and organization skills through interactive and experiential learning. 4. To analyze case studies with respect to problem identification and management plan.	
Content:	**I – THERAPEUTIC INTERVENTION: OVERVIEW** 1. Rapport building and understanding client distress • Taking a case history, conducting Mental Status Examination, 2. Learning Disability Screening • NIMHANS (SLD) Battery, Wechsler Individual Achievement Test (WIAT) III 3. Formulating and executing the intervention plan 4. Case analysis and Case conferences Assessment will be conducted through simulated role-play exercises, movie reviews, group discussions **II – OBSERVATION AND COMMUNITY OUTREACH** 1. Observation in various field settings: NGOs, schools, private practitioner clinics, companies and industrial/ corporate organizations. Observation log book to be maintained. 2. Organizing and conducting workshops for specific target groups (adolescents, parents, educators, employees etc.) To promote awareness and engage in psycho-education on critical psychological issues **III - CLIENT INTERACTION AND CASE WRITING** 6 cases to be assessed: Child – 01, Adolescents – 01, Adults – 02, Geriatric – 01, Special Case- 01 (Special case: individuals with any specific pathology e.g. Learning Disability, ADHD, Eating Disorder, Depression) The student has to maintain a journal to include the following: Detailed Case history, Mental Status Examination, testing rationale with basic test details, test interpretation, points to consider, suggested interventions, prognosis	**Number of Hours:** **15 Hours** **15 Hours** **30 Hours**

Pedagogy:	• Role plays • Psychological Assessment tools • Brainstorming • Case conferences • Journal Writing • Experiential Experiences.	
Text Books/Reference Books:	----------	
Learning Outcomes	1. Examine case studies with respect to problem identification and management plan. 2. Administer and interpret psychological assessment tools to target groups. 3. Demonstrate planning and organization skills by conducting workshops on selected topics related to mental health. 4. To apply appropriate treatment goals in collaboration with the client.	

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Programme: M.A Psychology
Course Code: DSCC 107 **Title of the Course:** Psychotherapy
Number of Credits: 04 **Effective from AY:** 2022-2023

Prerequisites	The student must have the basic knowledge about psychological disorders.	
Objectives:	1. To understand the therapeutic approaches available in the treatment of psychological disorders 2. To examine the intervention techniques as postulated by the therapeutic approaches. 3. To develop knowledge of the application of various psychotherapeutic techniques in varied techniques	
Content:	**I – PSYCHOTHERAPY: ANALYTICAL APPROACHES** 1. Counselling theory, competency and treatment planning 2. Psychoanalysis 3. Transactional analysis **II – PSYCHOTHERAPY: HUMANISTIC-EXISTENTIAL APPROACHES** 1. Person centered counselling and psychotherapy 2. Existential counselling and psychotherapy 3. Gestalt counselling and psychotherapy **III – PSYCHOTHERAPY: ACTION-ORIENTED APPROACHES** 1. Behaviour therapy 2. Cognitive –behaviour therapy 3. Rational Emotive behaviour therapy	**Number of Hours: 15 Hours** **15 Hours**

	4. Evidence-based cognitive behavioural approaches: dialectical behaviour therapy and Trauma focused cognitive behavioural therapy **IV – PSYCHOTHERAPY: POST MODERN APPROACHES** 1. Solution-based approach 2. Narrative and Collaborative approaches 3. Feminist and multicultural counselling and psychotherapy **NOTE:** All the therapies will cover the following: • Concepts • Overview of the counseling process • Counselling relationship • Goal setting • Interventions and special concerns in therapy	**15 Hours** **15 Hours**
Pedagogy:	• Audio Visual Teaching Tools • Case Discussion • Experiential Learning • Interactive Activity	
Text Books/Reference Books:	**BOOKS FOR STUDY:** 1. Bhola, P., Duggal, C., & Isaac, R. (2022). *Reflective Practice and Professional Development in Psychotherapy*. SAGE Publishing India. 2. Chamberlain, L. L. (2020). *Practicing Psychotherapy: Lessons on Helping Clients and Growing as a Professional*. Routledge. 3. Corey, G. (2019). *Theory and practice of counseling and psychotherapy*. (10th ed.) Cengage Learning India. 4. Gehart, D. R. (2016). *Theory and treatment planning in counseling and psychotherapy*. Cengage India. 5. Gehart, D. R. (2017) *Mastering competencies in family therapy : A practical approach to theories and clinical case documentation.* (3rd ed.). Belmont, CA : Brooks/Col 6. Seligman, L. &Reichenberg, L.W. (2013). *Theories of Counseling and psychotherapy: systems, strategies, and skills.* (4th ed.). Pearson. 7. Sharf, R. S. (2014). *Theories of psychotherapy and counselling: Concepts and cases*. Pacific Grove: Brooks/Cole Pub. Co. **SUGGESTED READINGS:** 1. George, R. and Cristiani, T. (1995). *Counseling: Theory and practice*. Old Tappen, United States: Pearson Education, p.28. 2. James, R. K., & Gilliland, B. E. (2003). *Theories and strategies in counseling and psychotherapy* (5th ed.). Needham Heights, MA, US: Allyn& Bacon.	

	3. Prochaska, J. O., & Norcross, J. C. (2003). *Systems of psychotherapy: A transtheoretical analysis*. Pacific Grove, CA: Brooks/Cole Pub.	
Learning Outcomes	1. Outline the therapeutic approaches available in the treatment of psychological disorders 2. Explain the intervention techniques as postulated by the therapeutic approaches. 3. Apply various psychotherapeutic techniques in varied settings.	

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Programme: M.A Psychology
Course Code: DSCC108 **Title of the Course:** Human Resource Management
Number of Credits: 04 **Effective from AY:** 2022-2023

Prerequisites	The student must learn at least one course paper of Psychology at the undergraduate level	
Objectives:	1. To understand the current theory and practice of human resource management. 2. To develop knowledge of the key issues such as motivation, career planning, diversity and training in order to enhance human resource planning and management. 3. To apply motivational techniques and feedback strategies that help employees reach professional and organizational goals.	
Content:	**I - NATURE OF HUMAN RESOURCE MANAGEMENT** 1. Nature and functions of Human Resource Management. 2. Human resource Models: Fombrun model, Harvard model, Guest model, Warwick model, Ulrich model. 3. Context of Human Resource Management: External forces, Technology, Cultural forces, Internal forces. 4. Integrating HR strategy with Business strategy: Strategic human resource management, Integrating HR with strategic management, Benefits and challenges of strategic management. **II - HUMAN RESOURCE PLANNING** 1. The planning process: Environmental scanning, organizational objectives and policies, HR demand forecast, Managerial judgment, HR supply forecast, HR programming, HR plan implementation, Control and evaluation. 2. Job design and Job evaluation: Job design approaches, Significance, Factors influencing job designs, Job evaluation process, Wage survey, Employee classification. 3. Recruitment: Nature, Process, Evaluation and control. 4. Selection: Nature, Process, Evaluation, Barriers. **III - INDUSTRIAL RELATIONS, DISPUTES AND TRADE UNIONS**	**Number of Hours:** **15 Hours** **15 Hours**

	1. Industrial Relations: Nature, Industrial relations strategy, Approaches – Systems approach, Unitary approach, Pluralistic approach, Marxist approach. 2. Industrial disputes: Nature, Manifestation, Settlement. 3. Trade Unions: Movement in India, Major Unions, Trends, Managing trade unions. 4. Labor laws: Nature and need of labor laws, Principles of labor legislations, Trade Union legislation, The Industrial Disputes act (1947), The Payment of Wages Act (1936), The Factories Act (1948), The Employee' Compensation Act (1923). **IV - DEVELOPMENTS IN HUMAN RESOURCE MANAGEMENT** 1. New frontiers: Non-hierarchical structure, Attitude and emotions, Team design and analysis, Employee referrals, Employees for lease, Outsourcing, Moon-lighting by employees, Dual career groups, Flextime. 2. Knowledge management and Learning organizations: Individual knowledge conversion process, Organizational knowledge creation process, Knowledge management process and benefits; Need for organizational learning, Characteristics, Quality circles, Total Quality Management. 3. Virtual organizations and Human resource management: Concept, Characteristics, Human resource trends. 4. Managing global human resources: The internalization of business, Global differences and similarities in HR practices, Staffing the global organization, Training and maintaining expatriate employees, Equal employment opportunity responsibilities of multinational employers.	**15 Hours** **15 Hours**
Pedagogy:	• Audio-Visual Teaching Tools • Case Discussion • Experiential Exercises • Industry Based Assignments	
Text Books/Reference Books:	**BOOKS FOR STUDY:** 1. Aswathappa, K. (2017). *Human resource management: Text and cases* (8th ed.).Chennai: McGraw Hill Education (India) Private Limited. 2. Azmi, F. T. (2019). *Strategic Human Resource Management: Text and Cases*. Cambridge University Press. 3. Bratton, J., & Gold, J. (2017). *Human resource management: Theory and practice* (6th ed.). New York: Palgrave Macmillan. 4. Dessler, G., &Varrkey, B. (2020). Human Resource Management, (16th ed). Pearson Education India.	

	5. Kleiman, L. (2012). *Human resource management: A managerial tool for competitive advantage* (6th ed.). US: Kendall Hunt Publishing. 6. Robbins, S. P., Verhulst, S. L., &Decenzo, D. A. (2016). *Human resource management* (12th ed.). Singapore: John Wiley & Sons. **SUGGESTED READINGS:** 1. Durai, P. (2016). *Human resource management* (2ed.). India: Pearson India Education Services Pvt. Ltd. 2. Jain, T. K., &Chugh, P. (2011). *Human resource management.* Jaipur: Garima Publications. 3. Sinha, P.R., Shekhar,P. S., &Sinha, B. I. (2017). *Industrial relations, trade unions and labour legislations* (3rd ed.). India: Pearson India Education Services Pvt. Ltd.	
Learning Outcomes	1. Outline the current theory and practice of human resource management. 2. Identify the key issues such as motivation, career planning, diversity and training inorder to enhance human resource planning and management. 3. Explain motivational techniques and feedback strategies that help employees reach professional and organizational goals.	

Programme: M.A Psychology
Course Code: DSOC 104 **Title of the Course:** NEUROPSYCHOLOGY
Number of Credits: 4 **Effective from AY:** 2022 - 2023

Prerequisites	Student should have completed Graduate Degree.	
Objectives:	1. To understand the structure and functions of the nervous system. 2. To highlight the link between behavior, mental processes and biological processes. 3. To understand the application of cognitive and biological foundations in clinical practice.	
Content:	**I – FOUNDATIONS OF BIOPSYCHOLOGY & NEUROPSYCHOLOGY** 1. Structure and Functions of the Nervous System: The Central Nervous System, The Peripheral Nervous System, 2. Communication in the Nervous System: Cells of the Nervous System, How neurons communicate. 3. The Visual System 4. Audition, The Body Senses and Chemical Senses **II - NEURO-PSYCHOLOGICAL BASIS OF BEHAVIOR** 1. Learning, Language and Memory: The nature of learning, Learning and synaptic plasticity; Cortical localization of language, The Wernicke-Geschwind model; Relational learning Human anterograde amnesia, spared learning abilities, declarative and non- declarative memory	**Number of Hours** **15 Hours** **15 Hours**

	2. Emotions: Emotions as response patterns; Facial expression of emotions; Neural basis of the communication of Emotions - Recognition and Expression 3. Sexual and reproductive behavior: Hormonal control of Sexual behavior, Neural mechanisms in sexual behavior 4. Sleep and Biological Rhythms: A physiological and behavioral description of sleep, Physiological mechanisms of sleep and waking. **III– NEUROPLASTICITY** 1. Phases of neural development: Induction of the neural plate, Neural proliferation, migration and aggregation, axon growth and synapse formation, neuron death and Synapse rearrangement. 2. Causes of brain damage: Brain tumors, Cerebrovascular disorders, Closed head injuries, Infections of the brain, Neurotoxins, Genetic factors, Programmed cell death 3. Responses to Nervous system damage: Neural degeneration, Neural regeneration and Neural reorganization 4. Neuroplasticity and the treatment of CNS damage: Promotion of recovery from CNS damage by rehabilitative training, Genetic engineering, Neurotransplantation. **IV. Neuropsychological Basis of Specific Disorders** 1. Degenerative Disorders 2. Schizophrenia and Major Affective Disorders 3. Autism and ADHD 4. Stress Disorders	**15 Hours** **15 Hours**
Pedagogy:	• Audio and visual teaching tools, • Case Discussion • Quizzes • Experimental Learning.	
Text Books/Reference Books:	1. Carlson, N. R. (2007). Foundations of physiological psychology. (7th ed.). New Delhi: Pearson Education. 2. Gazzaniga, M., Heatherton, T., & Halpern, D. (2016). Psychological science. (5thed.). New York: W. W. Norton & Company, Inc. 3. Gupta, G. C. (2001). Cognitive science: Issues and perspectives. New Delhi: Icon publications Pvt. Ltd. 4. Pinel, J. P. J. (2009). Biopsychology. (7thed.). London: Allyn and Bacon. 5. Pinel, J. P. J., & Barnes, S. J. (2018). Introduction to biopsychology. (10thed.). Noida: Pearson India Education Services Pvt. Ltd. 6. Rosenzweig, M. R., Leiman, A. L. & Breedlove, S. M. (2010). Biological psychology: An introduction to behavioral, cognitive, clinical neuroscience. (2nded.). USA: Sinauer Associates, Inc. 7. Wagner, H., & Silber, K. (2007). Physiological psychology. UK: Garland Science/ BIOS Scientific Publishers	

Learning Outcomes	1. Identify and describe the structure and functions of the nervous system. 2. Understand and analyze the role of biological processes and mental processes in Behavior. 3. Apply cognitive and biological foundations in clinical practice.	

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Programme: M.A Psychology
Course Code: DSOC 105 **Title of the Course:** Psychology of Addiction
Number of Credits: 4 **Effective from AY:** 2022-2023

Prerequisites	The student should have completed their Graduate degree with at least one course paper in psychology.	
Objectives:	1. To develop knowledge and skills useful in working with individuals with addictive behaviors. 2. To examine specific addiction models with suitable counselling approaches. 3. To understand the major classifications of psychotropic drugs of abuse and typical routes of administration.	
Content:	**I – ADDICTION: A COMPREHENSIVE APPROACH** 1. Addiction: Definition, Signs And Symptoms 2. Models of Addictions: Social Model, Physiological Model, Intrapsychic Model, Behavioral Model, Biopsychosocial Model. 3. Risk and Protective Factors for Addiction 4. Legal and Ethical Aspects of Addiction Counselling **II – SUBSTANCE ABUSE AND ADDICTION** 1. Classification of Drugs of Abuse 2. Substance-related and Addictive Disorders: DSM V Classification 3. Subjective Aspects of Drug Use: Craving, Intoxication, Cognitive Deficits. 4. Physiology and Pharmacology: Body and Alcohol; Ingestion, Absorption, Excretion, Metabolism, Alcohol and Behaviour; Tolerance, Synergism, Effects on Blood Vessels **III – ADDICTION: THE FAMILY DISEASE** 1. Addiction and Mental Health: Association between Substance Misuse and Psychosis, Prevalence, Outcomes Associated with Addiction 2. Short- and Long-term Effects on Health: Fatal Alcohol Effects 3. Substance Misuse in Older Adults: Illicit Drug Use, Medication Misuse, Assessment of Older People with Substance Misuse, Using & Evaluating Health and Social Outcomes 4. Family and Addiction: Impact on Children, Co-Dependency, Family **IV – TREATMENT AND RECOVERY PROCESS** 1. Using CBT to Treat Addictions 2. Alcoholics Anonymous and 12 Steps Therapy	**Number of Hours:** 15 Hours 15 Hours 15 Hours 15 Hours

	3. Narrative Identity and Change: Addiction & Recovery; Narrative Therapy, Client Talk, Generating Narrative, Narratives of Recovery, Interviewing; Change Talk, The four Motivational Interview Processes, Core Motivational Interview Skills 4. Relapse Prevention: Models and Prevention Counselling, Building a Support System in Communication, Psycho- Social Care	
Pedagogy:	• Audio Visual Teaching Tools • Simulated Case discussion • Field trips	
Text Books/Reference Books:	**BOOKS FOR STUDY:** 1. Abadinsky, H. (2018). *Drug use and abuse* (9th ed.). Boston: Cengage Learning. 2. Chandler, C. S. (2018). *Addiction psychology: Theory, intervention and practical issues*. New Delhi: Sage Publications. 3. Davis, P., Patton, Robert.,& Jackson, S. (2017). *Addiction Psychology and Treatment*. New Jersey: John Wiley and Sons. 4. DiClemente, C.C. (2018). *Addiction and Change: How Addictions Develop and Addicted People Recover* (2nd ed.). New York: Guilford Press. 4. Maisto, S., Galizio, M. & Connors, G. (2019). *Drug use and abuse* (8thed.). Boston: Cengage Learning. **SUGGESTED READINGS:** 1. Moss, A., & Dyer, K. (2010). *Psychology of addictive behavior*. London: Red Globe Press. 2. Svanberg, J. (2018). *The psychology of addiction*. London: Routledge, Taylor & Francis Group. 3. West, R. (2013). *Theory of addiction*. New Jersey: John Wiley and Sons.	
Learning Outcomes:	At the end of this course, the learner will be able to: 1. Discuss knowledge and skills useful in working with individuals with addictive behaviors. 2. Classify specific addiction models with suitable counselling approaches. 3. Identify the major classifications of psychotropic drugs of abuse and typical routes of administration.	

Programme: M.A Psychology
Course Code: DSOC 106 **Title of the Course:** Psychosocial Rehabilitation
Number of Credits: 4. **Effective from AY:** 2022-2023

Prerequisites	Student should have completed Graduate Degree.	
Objectives:	1. To develop knowledge of the concepts, nature, scope, theories, models and ethical concerns in psychosocial rehabilitation. 2. To examine the assessment strategies and ways of engaging clients in the process of recovery so as to build a recovery	

	focused therapeutic relationship and collaborative rehabilitation plan. 3. To sketch an understanding of specific skills and interventions such as formulating a rehabilitation goal, strengths assessment and treatment adherence. 4. To evaluate the critical role of life care planning and community support systems in facilitating psychosocial recovery.	
Content:	**I - INTRODUCTION TO PSYCHOSOCIAL REHABILITATION** 1. Understanding the nature and scope of psychosocial rehabilitation. 2. Concepts of ability, disability, recovery and rehabilitation 3. Theories and models in rehabilitation psychology: Medical, neuropsychological, social, and bio-psychosocial models 4. Ethical issues in rehabilitation **II - THERAPEUTIC RELATIONSHIP AND REHABILITATION PLAN** 1. Components of therapeutic relationship, therapeutic alliance and treatment outcomes 2. Client engagement in the therapeutic process 3. Overcoming strains in the therapeutic alliance and resolving alliance ruptures 4. The assessment strategy 5. The rehabilitation plan **III - THERAPEUTIC SKILLS AND INTERVENTIONS** 1. Deciding on life changes: Role of motivational interviewing 2. Individual recovery planning: aligning values, strengths and goals 3. Activation and related interventions 4. Cognitive remediation 5. Treatment adherence **IV - COMMUNITY AND PEER-SUPPORT** 1. Social skills and employment 2. Promoting healthy lifestyles 3. Living skills 4. Peer support in mental health service context 5. Supporting families and careers	**Number of Hours:** **15 Hours** **15 Hours** **15 Hours** **15 Hours**
Pedagogy:	• Audio Visual Teaching Tools • Experiential Learning • Case conferences	
Text Books/Reference Books:	1. Corrigan, P. W. (2016). Principles and practice of psychiatric rehabilitation: An empirical approach. Guilford Press. 2. Cox, D. R., Cox, R. H., &Caplan, B. (2013). Specialty competencies in rehabilitation psychology. Oxford University Press 3. King, R., Lloyd, C., & Meehan, T. (2013). Handbook of psychosocial rehabilitation. John Wiley & Sons.	

	4. Pratt, C. W., Gill, K. J., Barrett, N. M., & Roberts, M. M. (2013). Psychiatric rehabilitation. Academic Press. 5. Frank, R. G., Rosenthal, M., &Caplan, B. (2010). Handbook of rehabilitation psychology (2nd ed.). Washington, DC, US: American Psychological Association 6. King, R., Lloyd, C., Meehan, T., Deane, F., & Kavanagh, D. (Eds.). (2012). Manual of psychosocial rehabilitation. John Wiley & Sons. 7. Sunder, S. (2019). Textbook of Rehabilitation (4th ed.). Chennai: Jaypee brothers Medical Publishers.	
Learning Outcomes	1. Describe the concepts, nature, scope, theories, models and ethical concerns in psychosocial rehabilitation. 2. Demonstrate skills and intervention strategies within the context of comprehensive rehabilitation treatment planning. 3. Discuss assessment strategies and the importance of client engagement in the recovery focused therapeutic relationship and rehabilitation plan. 4. Formulate a rehabilitation treatment plan that aims at reconnecting/integrating clients into the community through life care planning and community support systems.	

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D 3.19 Minutes of the Board of Studies in Social Work meeting held on 28.04.2022.

Annexure I

GOA UNIVERSITY
Sub P. O. Goa University, Taleigao Plateau, Goa – 403206, India
Manohar Parrikar School of Law, Governance and Public Policy
Syllabus of Masters of Social Work (MSW) Programme
following the Choice-based Credit System
Approved by Board of Studies in Social Work on XXXXXX
Implemented from June 2022
IN LINE WITH NEP 2020
Total credits 80 credits

Purpose:
The Master of Social Work (MSW) programme aims to impart an advanced-level training in social work practice with diverse individuals, families, and communities. The curriculum focuses on training practitioners who are able to develop an in-depth understanding of diverse views; empower diverse people to expand their capacities, resources and opportunities; and advocate for policies and services that address social conditions that limit the quality of life for all people. The MSW programme aims to produce post-graduates who have a lifelong commitment to upholding human rights, respecting human diversity and working towards social justice in their professional and personal lives. The Programme envisions creating professionalism in social work and development sector leading to a socially just and inclusive society in Goa. The MSW programme is governed by OA-18A of the Goa University.

Course Structure:
The MSW programme consists of 80 credits taught over two years in 4 Semesters. The programme includes mandatory Field Work Practicum, a Rural Camp (Semester 2), Block Placement (after selection of specialization at the end of the first academic year), a Study Tour (Semester 3). At the end of Semester 3, students shall submit their Research Proposals and complete the Research Project/Dissertation (in Semester 4).

The Course and Credit Distribution is as follows:

Courses	Codes	SEM 1	Sem 2	SEM 3	SEM 4	Total Credits
Discipline Specific Core Course	DSCC	16	16			32
Discipline Specific Optional Course	DSOC	4	4			08
Research Specific Optional Course	RSOC			8	4	12
Optional Generic Course	OGC			12		12
Discipline Specific Dissertation	DSD				16	16
Total Credits		20	20	20	20	80

One Credit is 15 contact hours

The MSW Programme courses and structure:

Master of Social Work Programme		
Semester I		
Title of the Course	**Course Code**	**Credits**
Introduction to Social Work: History and Ideology	SWDSCC1	4
Case Work and Counselling	SWDSCC2	4
Group Work	SWDSCC3	4
Concurrent Field Work Practicum	SWDSCC4	4
Understanding Society and Social Problems	SWDSOC1	4
Total Credits in Semester 1		**20**
Semester 2		
Title of the Course	**Course Code**	**Credits**
Law, Public Policy and Social Work	SWDSCC5	4
Human Growth and Behaviour	SWDSCC6	2
Social Welfare Administration	SWDSCC7	2
Community Organization	SWDSCC8	4
Concurrent Field Work Practicum and Rural Camp	SWDSCC9	4
Social Action, Social Movements, Networking and Advocacy	SWDSOC2	2
Gender and Equity	SWDSOC3	2
Total Credits in Semester 2		**20**
BLOCK PLACEMENT IN THE SUMMER BREAK AFTER SELECTION OF SPECIALIZATION		
Semester 3		
Title of the Course	**Course Code**	**Credits**
Social Work Research with Mandatory Research Proposal	SWRSOC1	4
Block Placement & Specialisation Related Field-Work Practicum	SWRSOC2	4
Specialization-wise Courses Optional		
1.Health and Development		
Health Care Social Work Practice – I	SWOGC1A	4
Health Care Social Work Practice – II	SWOGC1B	4
Rehabilitation and After Care Services	SWOGC1C	2
Health Care Administration and Programming	SWOGC1D	2
2. Community Organization and Community Development Practice		
Perspectives On Urban Community Development	SWOGC2A	4
Perspectives On Rural Community Development	SWOGC2B	4
Community Development Practice with Disempowered Communities	SWOGC2C	2
Perspectives on Tribes and Tribal Development	SWOGC2D	2
3.Social Work Practice with Children, Family and Youth		
Family Centred Social Work Practice	SWOGC3A	4
Social Work Practice with Children	SWOGC3B	4
Social Work in the Field of Education	SWOGC3C	2
Social Work Practice with Youth	SWOGC3D	2

4. Gender and Development		
Women's Movement and Gender Issues in India	SWOGC4A	4
Gender Interventions for Social Work Practice	SWOGC4B	4
Intersectional Perspectives on Gender	SWOGC4C	2
Gender Concerns in Goa	SWOGC4D	2
5.Tribal Development		
Understanding Marginality, Tribal livelihood and Rights	SWOGC5A	4
Development and Tribal Rights	SWOGC5B	4
Tribal Issues in India and Goa	SWOGC5C	2
Interventions for Empowering Tribal Communities	SWOGC5D	2
6.Working with People with Disabilities		
Social Work Practice with families of persons with disability	SWOGC6A	4
Case Work with people with disabilities	SWOGC6B	4
Disability Rights and Laws	SWOGC6C	2
Mapping Interventions for Persons with Disability	SWOGC6D	2
A study tour will be part of SWOGC all D		
Total Credits in Semester 3		20
Semester 4		
Title of the Course	**Course Code**	**Credits**
Specialization Specific Field Work Practicum	SWRSOC3	4
Dissertation	SWDSD	16
Total Credits in Semester 4		20
Total Credits in all 4 Semesters of MSW Programme		**80**

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DETAILED MSW SYLLABUS WITH COURSE OUTLINES

SEMESTER I

Programme: MSW
Course Title: INTRODUCTION TO SOCIAL WORK: HISTORY AND IDEOLOGY
Course Code: SWDSCC1
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To introduce students to the history of the social work profession in India and the west and contemporary ideologies of social work and social change. 2. Developing skills in ethical decision-making at macro and micro levels. 3. Developing social work values and consciously applying them in practice. 4. Understanding contemporary reality in its historical context.	
Content:	**Module I: Introduction to Social Work, History & Perspectives** Meaning, definition, objectives and scope of Social Work. Levels of Social Work Practice and Social Work Methods. Western History of Social Work Profession: Organised and Scientific Charity (Elizabethan Poor Laws, Charity Organization Society and Settlement House Movement, Beveridge Report), Beginning of Social Work Education, Indian Ideologies for Social Change: Ancient Period (Vedic Ideologies, Jainism and Buddhism), Medieval Period (Zorastrianism, Islam, Mysticism of Bhakti and Sufi Movements, Sikhism), Modern Period (Ideas of Ambedkar and Annihilation of Caste, Gandhian Ideology and Sarvodaya Movement, Nationalism and Indian Constitution, Subaltern perspectives, Western Ideologies for Social Change: Medieval Period (Judeo-Christian Ideologies, Secular Humanism, Protestantism) Modern Period (Rationalism, Welfarism, Liberalism and Democracy, Utilitarianism, Socialism, Human Rights) Indian History of Social Work Profession	20 hours
	Module II: Contemporary Context of Social Work Practice Neo-liberalism and Globalisation, Post Modernism, Concept of Social Justice, Human Rights and Social Justice, New Social Movements, Local Self -Governance, Feminism, Sustainable Development. Dalit movements, Tribal Movements, Peasant Movements, Working Class Movements, Naxalite Movements, Women's movements, Environment and Ecological	20 hours

	movements, Movements of project affected persons. **Module III: Social Work as a Profession** Social Work Profession: Concept of Profession, Concept of Social Work Profession in India, Social Work Values, Skills for Social Work, Social Work Education, Professional Organisations: Indian Association of Schools of Social Work, National Association of Professional Social Workers, Debates about Professionalization of Social Work Code of Ethics: Code of ethics for social workers (NASW, IASSW, BATSW), Significance & functions in Social Worker practices, Best Ethical Practices & responsibilities towards Self, Society, Co-workers & Profession, Standard operative practices (SOP)	20 hours
Pedagogy:	lectures/power point presentation/assignments/ games/ films and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Bodhi, S. R. (2011). *Professional Social Work Education in India: A Critical View from the Periphery*, The Indian Journal of Social Work, Vol. 72(2), 289-300. Chowdhury, Paul. (2000). *Introduction to Social Work*, Delhi: Atma Ram and Sons. Colby, I., Dziegielewski, S. F. (2015). *Introduction to Social Work, Fourth Edition: The People's Profession*. United States: Oxford University Press. Desai, Murali. (2002.) *Ideologies and Social Work: Historical and Contemporary Analysis*, Jaipur: Rawat Publication. Dominelli, Lena (2004) *Social work: theory and practice for a changing profession*, Cambridge, UK. Polity Press Diwakar, V. D., (1991), *Social Reform Movement in India, Mumbai:* Popular Prakashan. Dunk- West, P., (2013) *How to be a Social Worker: A Critical Guide for Students,* Palgrave Macmillan, London Duschinsky, R., Lampitt, S and Bell, S. (2016) *Sustaining Social Work: Between Power and Powerlessness*, Palgrave Macmillan, London Finn, J. L. (2016). *Just Practice: A Social Justice Approach to Social Work.* United States: Oxford University Press. Gore, M. S. (2011). *Social Work and Social Work Education*. India: Rawat Publications	

Hodgson, D., & Watts, L. (2019). *Social Justice Theory and Practice for Social Work.* Springer.

Hepworth, D., Rooney, R. H., Rooney, G. D., & Strom-Gottfried, K. (2017). *Direct social work practice: Theory and skills*, 10th ed. Boston, MA: Cengage Learning

International Federation of Social Workers & International Association of Schools of Social Work (IASSW). (2018). Global social work statement of ethical principles. Retrieved from https://www.iassw-aiets.org/wp-content/uploads/2018/04/Global-Social-Work-Statement-ofEthical-Principles-IASSW-27-April-2018-1.pdf

Lyons, K. (2017). *Reflecting on Social Work - Discipline and Profession.* United Kingdom: Taylor & Francis.

Nair, T. Krishnan, (1981), *Social Work Education and Social Work Practice in India,* Madras: Association of School of Social Work in India.

Nash, Mary. & O'Donoghue, Kieran. & Munford, Robyn. (2005). *Social work theories in action*. Philadelphia: Jessica Kingsley Publishers

National Association of Social Workers (NASW). (2017). Code of ethics of the National Association of Social Workers. Washington, DC: National Association of Social Workers. Retrieved from https://www.socialworkers.org/About/Ethics/Code-of- Ethics/Code-of-Ethics English

Parrott, L. (2014). *Values and Ethics in Social Work Practice* Philippines: SAGE Publications.

Parrott, L., Maguinness, N. (2017). *Social Work in Context: Theory and Concepts*. United Kingdom: SAGE Publications

Payne, M. (2014). *Modern Social Work Theory*. Palgrave Macmilan.

Rameshwari Devi and Prakash Ravi. (2000). *Social Work Practice*, Jaipur: Mangal Deep Publications

Sociology for Social Work: An Introduction. (2010). United Kingdom: SAGE Publications.

Sowers, K. M., Dulmus, C. N. (2012). *The Profession of Social Work: Guided by History*, Led by Evidence. Germany: Wiley.

The Routledge Handbook of Social Work Theory. (2019). United Kingdom: Taylor & Francis.

	Tice, C. J., Cox, L. E., Long, D. D. (2017). *Introduction to Social Work: An Advocacy-Based Profession*. United States: SAGE Publications. Teater, B. (2014). Contemporary Social Work Practice: A Handbook for Students. United Kingdom: McGraw-Hill Education. Wadia, A. R. (1961), *History and Philosophy of Social Work in India*, Mumbai: Allied Publisher Private Ltd. Wilkins, D and Boahen, G. (2013) *Critical Analysis Skills for Social Workers*, Open University Press: Maidenhead.
Additional Readings:	Tata Institute of Social Sciences, Social Work Educators Forum (TISSSWEF)(1997): Declaration of Ethics for Professional Social Workers, The Indian Journal of Social Work, 58(2), 335-341 Gracy (2006) An Enquiry into Ethical Dilemmas in Social Work; College of Social Work, Nirmala Niketan, Mumbai – 400 020.
Learning Outcomes	Students will be introduced to professional Social Work, the history and development of professional social work and social movements that have contributed to social work practice.

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Programme: MSW
Course Title: CASE WORK AND COUNSELLING
Course Code: SWDSCC2
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To understand case work as a method of social work; and understand the values and principles of working with individuals and families. 2. To develop the ability to critically analyze problems of individuals and families and factors affecting them. 3. To enhance understanding of the basic concepts, tools and techniques in working with individuals and families, in problem-solving and in developmental work. 4. To develop counselling skills and attitudes to work with individuals and their families and the interaction with their various environments.	
Content:	**Module I- Introduction, Principles and Models of Social Case Work** Introduction to Social Casework as a Method of Social Work, Concept and Definitions, Components of casework: Person-client; significant others and collaterals; Problem-Need, Impaired Social Functioning; Place-Agency, objectives, functions, policies and resources; Process: casework intervention. **Principles**: Begin where the client is; Individualization; Purposeful expression of feelings; Controlled emotional involvement; Acceptance; Non-judgmental attitude; Client self-determination; Confidentiality. **Models**: a) Social Diagnostic (Richmond); b) Supportive and Modificatory (Hamilton); c) Problem Solving (Perlman);d) Crisis intervention (Rapport) e) Classified treatment method; f) Competence Based approach **Module II-Tools of Working with Individuals and Families** Intake-record/sheet and the intake interview (client engagement); Casework interview; Home visit- collateral contacts, Recording and its types–narrative, process, problem oriented record keeping (PORK), Subjective and objective assessment plan (SOAP), Use of casework records as a tool of intervention, Caseworker–client relationship, Knowledge of resources (networking), Case presentation as tool of professional development. **Module III - The Process of Intervention with Client System and Target System** a. Study; b. Continuous Assessment and Analysis; c. Psycho-	15 hours 15 hours 10 hours

	social diagnosis; d. Intervention; e. Follow-up; f. Termination; g. Case Presentation based on Fieldwork Practice **Module IV- Counselling in Casework in Practice** Counselling skills, process and techniques. Counselling in different settings. Ethical issues in Counselling. Social casework and Counselling – similarities and differences; Limitations of the methods. Role of the caseworker/counsellor	20 hours
Pedagogy:	Classroom learning through power point presentation, case studies and mock counselling sessions through role play.	
Recommended Readings:	American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders*, (5th Ed.) Washington, DC: American Psychiatric Association. *Case Studies in Social Work Practice*. (2014). Germany: Wiley. Datar, Sudha et al. (2010), *Skill Training for Social Workers*, New Delhi: Sage Publications Devi, Rameshwari and Prakash, Ravi. (2004.) *Social Work Methods, Practice and Perspectives: Ch.3 Models of Casework Practice*, Vol. II, Jaipur: Mangal Deep Publication. *Ethical Issues in Social Work Practice*. (2017). United States: IGI Global. Garrett, Annett. (1972.) *Interviewing–Its Principles and Methods*, New York: Family Service Association of America. Higham, P. (2019). *Communication and Interviewing Skills for Practice in Social Work, Counselling, and the Health Professions*. United Kingdom: Taylor & Francis. Holosko, M. J. (2017). *Social Work Case Management: Case Studies from the Frontlines*. United States: SAGE Publications. Kadushin, Alfred. (1990.) *The Social Work Interview*, New York: Columbia University Press. Kottler Jeffery A., David S. Shepard. (2008.) *Counselling Theory and Practice* (1st Edition). Loughran, H. (2018). *Counselling Skills for Social Workers.* United Kingdom: Taylor & Francis. Mathew, Grace. (1992.) *An Introduction to Social Case Work*, Bombay: Tata Institute of Social Sciences. Miller, P. (2007). *Ethical Decision Making in Social Work and Counselling: A Problem/inquiry-based Approach*. Canada: Thomson Nelson.	

	Perlman, Helen Harris. (1964.) *Social Case Work – A Problem Solving Process*, London: University of Chicago Press Seden, J. (2005). *Counselling Skills in Social Work Practice*. United Kingdom: Open University Press.
Learning Outcomes	Students will develop skills and sensitivity for casework. They will understand casework as a method, its application in practice and develop competencies in the use of the method in practice while working with individual clients and families as part of the Social Work Practicum.

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Programme: MSW
Course Title: GROUP WORK
Course Code: SWDSCC3
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To understand the specific characteristics of Group Work and its contributions as a method of social work intervention. 2. To gain knowledge about group formation and the use of a variety of group approaches. 3. To develop an understanding of concepts, dynamics and small group theory in relation to all types of groups, e.g. family, staff, committee, long-term client groups. 4. To identify the various situations and settings where the method could be used, in the Context of social realities of the country.	
Content:	**Module I: Social Group Work Method and Group Work Process** i. Concept of group and its importance of groups in human life cycle; ii. Definition of social group work; iii. Characteristics of social group work; iv. History and development of social group work. v. Theories applicable to group work practice; vi. Values and distinctive principles of Group Work; vii. Social group work in different fields; viii. Types of groups in social group work practice- open and closed groups, social treatment groups, task oriented groups (forum, committees and work team), developmental groups (self-help groups and support groups); ix. Steps in group formation; x. Stages in group development: pre-group stage, orientation stage, problem solving stage, termination stage; xi. Role of social worker in different stages of group development. **Module II: Use of Programme in Social Group Work and Skills of Group Worker** i. Concept of programme; ii. Principles of programme planning; iii. Importance of programme in group work practice; iv. Programme planning and implementation; v. For group	15 hours 15 hours

	development; vi. For programme planning; vii. For programme implementation. **Module III: Group Process and Dynamics and Use of Techniques and Tools in Group Work** i. Steps in understanding group process; ii. Analysis of group interaction; iii. Leadership and its development in group process; iv. Communication in group; v. Group dynamics: - group bond, sub-groups, group conflict, confrontation, apathy and group control; vi. Use of relationship; vii. Conflict resolution; viii. Verbal and non-verbal communication; ix. Purposeful creation of environment; x. Fishbowl technique. **Module IV: Recording in Group Work and Evaluation of Group Work** Use of communication-self and interpersonal communication, Recordings i. Importance of recording in group work; ii. Principles of recording; iii. Types of recording- narrative, process and summary; iv. Techniques of recording –observation, sociogram, interaction diagrams; v. Importance of continuous evaluation in group work; vi. Types of evaluation; vii. Methods of evaluation.	15 hours 15 hours
Pedagogy:	Classroom lectures through power point, classroom discussions and role play	
Recommended Readings:	Alissi, A. S. (2008). Perspectives on Social Group Work Practice. United Kingdom: Free Press. Barhard. (1975). *The Use of Groups in Social Work Practice, USA*: Rutledge and Kegan Paul. Doel, Mark and Sawda, Catherine. (2003). *The Essentials of Group Worker,* London: Jessica Kingsley Pub. Douglas, Tom. (1976). *Group Process in Social Work - a Theoretical Synthesis,* New York: John Wiley and Sons. Encyclopedia of Social Work with Groups. (2009). (n.p.): Taylor & Francis. Handbook of Social Work with Groups, Second Edition. (2017). United Kingdom: Guilford Publications. Heap, K. (2014). *Group Theory for Social Workers*. Netherlands: Elsevier Science. Konopka Gisela. (1983). *Social Group Work a Helping Process*, 3rd Ed New Jersey: Prentice Hall. Kurland, R., Northern, H. (2001). *Social Work with Groups.* United States: Columbia University Press.	

	Lang, N. C. (2010). *Group Work Practice to Advance Social Competence: A Specialized Methodology for Social Work*. United States: Columbia University Press. McDermott, F. (2020). *Inside Group Work: A Guide to Reflective Practice.* United Kingdom: Taylor & Francis. Northern, Helen. (1969.) *Social Work with Groups*, New York: Columbia University Press. Northen, Helen, et al .(1976). *Theory of Social Work with Groups*, New York: Columbia University Press. Phillips, Helen. (1962). *Essentials of Social Group Work Skills*, New York: Associate Press. *Principles and Practice of Group Work in Addictions.* (2011). United Kingdom: Taylor & Francis. Reid E. Kenneth. (1996). *Social Work Practice with Groups - A Clinical Perspective*, USA: Brook/Cole Publishing Company. Siddiqui, H.Y. (2008) Group Work: Theories and Practices, Rawat Publications, New Delhi. Strength and Diversity in Social Work with Groups: Think Group. (2008). United States: Taylor & Francis. Trecker, Herleigh. (1970). *Social Group Work-Principles and Practices,* New York: Associate Press. Toseland, R. W., Rivas, R. F. (2016). *An Introduction to Group Work Practice.* Canada: Pearson Education.
Learning Outcomes	Students will develop skills and knowledge of methods for group work. Students will develop an understanding of the place of group work in social work intervention and the tools used in group work in different settings.

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Programme: MSW
Course Title: CONCURRENT FIELD WORK PRACTICUM
Course Code: SWDSCC4
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges

Objectives:	This course is intended to give students the field experience of what is taught in the classroom	
Content:	**Module I**: **Orientation:** The Orientation Programme is aimed at providing appropriate direction to professional learning. It involves familiarizing students with the problems of society, especially marginalized and weaker sections. They are made aware of the existing resource base available for their development and ways of mobilizing them and motivating them to initiate work in the field. The knowledge and skill base of the students is supplemented by supportive field instructions given by academicians and field practitioners throughout the year. The contents of the Orientation Programme are: 1) Introduction to Social Work Profession 2) Fieldwork in Social Work Education (a. Rules and Regulation b. Supervision c. Recording, d. Evaluation) 3) Methods of working with people (a. Social Case Work b. Social Group Work c. Community Organisation d. Social Action e. Research in Social Work f. Social Work Administration.) 4) Areas/Settings of Social Work Practice 5) Understanding of the Department's Projects 6) Interactive Sessions for the purpose of a. Introduction to the faculty b. Getting to know each other c. Interaction with seniors and alumni (Sharing of field experiences) d. Adapting to the new environment **Module II: Practice Skills Laboratory** The Skill Laboratory Workshop provides the opportunity of "learning by doing" in a safe environment of the classroom. This environment, that is the skill laboratory, wherein learners and facilitators meet jointly to experience certain intervention skills etc., needs to be amongst the most non-threatening methods of learning, especially for beginners. This learning opportunity is conducted through simulated exercises, including role plays. Structured experiences are directed to helping the learners enhance their awareness about self and others to aid conscious use of intervention tools. 1) Communication skills and Interpersonal Relations 2) Analysis of Indian Society and Social Problems 3) Leadership and Personality Development 4) Values and Ethics in Social Work 5) Reality walk – meeting Social Work Professionals Minimum 3 Skill Laboratory Workshop sessions must be organized, each of 2 hours duration, during the first semester. A total of 10 marks shall be earmarked for this activity. Students are required to	6 hours (1 day worksh op) 6 hours

	record the skill laboratory sessions that they attend in their field work journal. Those who remain absent from the skill laboratory workshops shall forfeit the marks allotted. No other assignment shall be given to an absentee student in lieu of skill laboratory workshops. **Module III: Observation Visits:** The aim of Observational Visits is to provide an exposure to and understanding of the type of services provided by different social work agencies and development projects in response to the needs of their client system. **Observational Visits:** 1) **Community Services:-** Skill development programme centers, environment improvement centers, family service centers, community development projects in urban and rural settings, Social Movement based Organisations. 2) **Health Setting** - Hospitals, Community health extension projects, Primary health centers, Psychiatric Departments, Clinics, HIV Guidance Centres etc. 3) **Educational Setting** - Formal schools, Non-Formal/adult Education Centers, income generating skill development centers, vocational training facilities, etc. 4) **Institutional and Non-Institutional Services for Special groups :** the Differently abled, Mentally challenged, Destitute, Migrants, Women, Street children, Elderly, Dalits and Tribals; Adoption agencies, Child rights protection facilities, Labour Welfare Centres etc. 5) **Civic Administration Centers** – Municipal Corporation, Ward offices, Zilla Parishad, Panchayat Samiti, Block Development Office, etc. Those students who remain absent from the observational visits shall forfeit the marks allotted. No other assignment shall be given to an absentee student in lieu of observational visits. The Observation Visits aim to make the students get oriented to the objectives, administrative structure and process and the client system of various organisations in the field of social work, such as non-governmental organisations involved in welfare and development activities, government bodies involved in development work, hospitals and health care organisations, organisations in the care of aged, women and children and Corporate Social Responsibility initiatives of corporate organizations. **Module IV: Concurrent Field Work on days prescribed in the time table** The broad aim of concurrent field work is to provide opportunities for students to apply the knowledge learnt in the classroom	5 visits

	situations and to plan, implement and evaluate these experiences while working with individuals, groups and communities. These will be in keeping with the placement agency's philosophy, policy and goals and use of guided supervision. It would aim to develop the right values and attitudes required for a professional social worker. The student is expected to develop a sense of responsibility and proper work habits, the student is expected to have 100% attendance in field work. The student should observe regularity, punctuality in attendance. In general, the student should follow the work schedule of the agency where he/she is placed, with reference to working days and working hours. Any special schedule of work for the student may be decided upon by mutual discussions between the faculty supervisor and the agency supervisor or if it is a direct community placement by mutual discussion between the faculty supervisor and student. The student shall abide by the rules and regulations of the agency that normally apply to the other agency staff. Participation in Workshops or Seminars will be considered as a part of field work. Such workshops on field work days should not exceed a total of 4 days in a semester. The participation in such workshops is subject to the approval from concerned authorities. The student is not eligible to take leave on field work days. If a student has to be absent on a field work day for serious reasons and unavoidable circumstances, it shall be with knowledge and permission of the faculty supervisor. In such a situation, the student should be responsible for informing the agency of his / her leave. The number of days of leave granted by the faculty supervisor must be compensated by the student through extra days of field work, in consultation with the faculty and agency supervisor. Any leave taken by the student without the permission of the faculty supervisor shall be considered as absence from field work. The student is required to have regular weekly supervisory conferences with the faculty supervisor according to a pre-planned schedule. Conferences shall be considered a part of field work. Both individual and group conferences shall be held once every consecutive week. Regularity and punctuality of attendance at conferences both individual and group is compulsory. Failure to attend conferences will be viewed seriously	2 fieldwork days in every week
Pedagogy:	lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Challenges, Opportunities and Innovations in Social Work Field Education. (2020). United Kingdom: Taylor & Francis.	

	Fieldwork Training in Social Work. (2019). United States: Taylor & Francis. Field Instruction in Social Work Education: The Indian Experience. (2019). United States: Taylor & Francis. Subhedar, I. S. (2001). Fieldwork Training in Social Work. India: Rawat Publications.
Learning Outcomes	Students will develop skills for fieldwork practice and be able to link classroom learning with field realities.

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Programme: MSW
Course Title: UNDERSTANDING SOCIETY AND SOCIAL PROBLEMS
Course Code: SWDSOC1
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To understand society and gain sociological insights for effective social work practice. 2. To enable the students to understand the status, issues and problems associated with vulnerable, marginalized and underprivileged sections of the society. 3. To get deeper knowledge of issues in Goa both past and contemporary and enable students to understand how it has impacted modern Goan society.	
Content:	**Module I: Sociology for Social Work** Concept of Society-Definition, Major Elements of Society, Individuals, Groups, Association, and Institutions; Social Position, Social Role, Social Institutions, Social Control, Socialisation, Culture, Social Disorganization, Structural Analysis of Society. Intersection between sociology and social work **Module II: Social Change in India** Concept, theories, the factors and process of social change, Urbanization, Industrialization, Westernization, Globalisation, Secularization, Resistance to Change. **Module III: Social Problems in India** Major Social problems: Concept, Causes, Consequences and Measures : Poverty, Population growth, Illiteracy, Unemployment, Begging, Child Labour, Differently-Abled, Caste, Caste-based Discrimination and Violence Social Deviance, Crime, Juvenile in Conflict with Law, Crimes against women, Casteism, Communalism, Corruption Delinquency, Suicide, Alcoholism, Drug Abuse, Sex Work, HIV AIDS, Youth Unrest, Development	15hours 15hours 15 hours

	and Displacement, Human Trafficking, Insurgency, Militancy, Social Problems in Goa, etc. **Module IV:** Social Work and Issues in Goa Role of Missionaries and Faith-based Institution, Inquisition, Goa's Freedom Struggle, Social Reforms After Liberation, Opinion Poll, New Social Movements	15 hours
Pedagogy:	Classroom learning with power point presentations, guest lectures, group discussions and debate, research-based assignments.	
Recommended Readings:	Agarwal, Bablia. (2009.) *Social Problems in the Age of Globalisation,* Jaipur: ABD Publishers. Ahuja, R. (2014). Social Problems in India. India: Rawat Publications. Alvares, Claude. (2002). *Fish Curry and Rice, Goa*: The Goa Foundation. Bhushan, Vidya and Sachdeva, D. R. (1989). *An Introduction of Sociology,* Allahabad: Kitab Mahal. Binay, B. (1994). *Towards Communal Harmony,* Calcutta: Germinal Publication Private Ltd. Bruce, S. (2018). *Sociology: A Very Short Introduction*. United Kingdom: OUP Oxford. Delaney, T. (2015). *Connecting Sociology to Our Lives: An Introduction to Sociology*. United Kingdom: Taylor & Francis. Giddens, Anthony. (2001). *Sociology*, Cambridge Press. Gisbert, P. (1973). *Fundamentals of Sociology*. 3rd Ed. Bombay: Orient Longman Ltd. Gosh B.N, (1993) *Poverty and Development: The Basic Issues*, New Delhi: Deep and Deep Publications Llewellyn, A., Agu, L., Mercer, D. (2008). Sociology for Social Workers. United Kingdom: Wiley. Madan, G.R. (1997), *Indian Social Problems* (Vol. I and II), New Delhi: Allied Publications. Parasuraman, S. (1999). *Development Dilemma: Displacement in India*. London: Mac Millan Press Limited *Sociology for Social Work: An Introduction*. (2010). United Kingdom: SAGE Publications	

	Shah, A. (2019). *The Structure of Indian Society: Then and Now.* India: Taylor & Francis. Sharma, K.L., (2007). *Indian Social Structure and Change*, Jaipur: Rawat Publications. Srinivas, M.N., (1980). *Social Structure*, New Delhi: Hindusthan Publishers Corporation. Vijayakumar, Lakshmi(ed.). (2003). Suicide Prevention: Meeting the Challenge Together, Chennai: Orient Longman.
Learning Outcomes	Students will develop a critical understanding of social problems, basic sociological concepts and the need, importance, and functions of primary social institutions.

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SEMESTER II

Programme: MSW
Course Title: LAW, PUBLIC POLICY, AND SOCIAL WORK
Course Code: SWDSCC5
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To gain knowledge about the constitution of India 2. To acquire competency to apply knowledge of human rights and social legislation in social work practice. 3. To understand the different social legislations. 4. To gain knowledge about public policy and planning in India	
Content:	**Module I: Introduction to Law** Understanding concepts of law, social justice and social legislation, 1. 1. The Constitution of India: Overview, Preamble and fundamental rights; Directive Principles of State Policy, Fundamental Duties, 73rd and 74th Amendment, Writ Jurisdiction and PIL. 2. 2. Human Rights and Social Justice: Meaning and definition 3. 3. Classification of law: Civil and criminal law. Structure of India's Legal System Relevance of law and legal systems to social work practice, partnership and interface between social workers and legal system **Module II: Social Legislations in India** Social Legislations relating to Women, Children, Juvenile Justice Act, Social legislations: Prohibition of Child Labour Act,	20 hours 20 hours

	Domestic Violence Act, Sexual Harassment at Workplace, Dowry Prohibition Act, SC/ST Atrocities Act, Labour Laws- Industrial Disputes Act, Laws relating to Trade Unions, Contract Labour, Marriage and Maintenance Laws. **Module III: Public Policy and Development** Governance and Public Policy: Concept and Meaning, Policy Planning Linkages; Public Policy- Goals and Strategies; Development Concept, Meaning and Approaches: Sustainable development, Post Development, Alternative Development, Planning in India, Five Year Plans in the Post Independent India, Industrialisation, Agriculture, Education, Health, Poverty. Debates on Post 1991 Reforms: Liberalisation, Privatisation and Globalisation.	20 hours
Pedagogy:	Lectures, use of power point presentations, case studies, debates, role play, group discussion and field visits	
Recommended Readings:	Flavia Agnes. 1997. *Give us this Day, Our Daily Bread, Procedures and Case Law on Maintenance* Atul K. Kohli. 2001. *The Success of India's Democracy*, Cambridge: Cambridge University Press, –– 1990, *Democracy and Discontent: India's Growing Crisis of Governability,* Cambridge: Cambridge University Press. Bava, N. (Ed.) (2000). *Human Rights and Criminal Justice Administration in India.* New Delhi: Uppal Publishing House De, R. (2018). A People's Constitution: The Everyday Life of Law in the Indian Republic. United States: Princeton University Press. Gangrade, K. D. *Social Legislation in India* (Vol-1 and Vol.2), Delhi: Concept Publishing Company. F., Agnes, F., Basu, M., Chandra, S. (2004). Women and Law in India. India: Oxford University Press. Hyden, Goran, Jullius Court, and Kenneth Mease (2005), Making Sense of Governance New Delhi: Viva Books Private Ltd. India's Development and Public Policy. (2018). United Kingdom: Taylor & Francis. Jayal Niraja Gopal. (1999). *Democracy and State: Welfare, Secularism and Developments in Contemporary India*, Delhi: Oxford University Press. Jean Dreze and Amartya Sen, (2002). *India: Development and Participation*, 2nd edition, New Delhi: Oxford University Press	

	Kant, Anjani. (1997). *Women and the Law,* New Delhi: APH Publication Corporation. Mendelsohn, O. (2014). *Law and Social Transformation in India*. India: Oxford University Press. Reichert, E. (2011). *Social Work and Human Rights: A Foundation for Policy and Practice*. Ukraine: Columbia University Press. SAHRDC. (2006). *Introducing Human Rights*. New Delhi: South Asia Human Rights Documentation Centre. Shah, Ghanshyam. (1998). *Social Justice- A Dialogue*, Jaipur: Rawat Publication. Shalendra D. Sharma. (2003). *Development and Democracy in India.* New Delhi: Rawat Publications. *Social Legislation in India*. (2011.). (n.p.): Concept Publishing Company Stewart, F., Ranis, G., Samman, E. (2018). Advancing Human Development: Theory and Practice. United Kingdom: Oxford University Press. Thomas A. Birkland, (2005). *An Introduction to the Policy Process, Theories, concepts, and models of Public Policy Making,* New York: M.E. Sharpe. *Transforming Society: Strategies for Social Development from Singapore, Asia and Around the World*. (2017). United Kingdom: Taylor & Francis.
Additional Readings	Pulapre Balakrishnan. 2007."The Recovery of India: Economic Growth in the Nehru Era, Economic and Political Weekly, November, 2007 South Asia Human Rights Documentation Centre, 2006, Hand Book of Human Rights and Criminal Justice in India, New Delhi: Oxford University Press
Learning Outcomes	Students will be versed with important provisions of the law in India in the context of the Social Work profession.

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Programme: MSW
Course Title: HUMAN GROWTH AND BEHAVIOUR
Course Code: SWDSCC6
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite :	Registration in the MSW Programme at Goa University or its affiliated colleges

Objectives:	1. To develop an overall understanding of the principles of growth, their relevance and application to behaviour at various phases in the life span. 2. To apply the information of growth, development and health in social work practice in general and to individuals, groups and communities in particular. 3. To understand the implications of family norms for status of individuals and developmental opportunities in the family by age and gender.	
Content:	**Module I: Introduction to Growth and Behaviour** Meaning of growth and development and maturity, Approaches to the study of human development—observation, experimentation, case studies, self-report techniques and longitudinal studies, Principles of human development, Biological and Social aspects of human development, Life- Span Perspective and the System approach to the understanding of human growth and behavior, Methods of studying human behavior, Role of Heredity and Environment- Social Customs, traditions, values in child rearing practices, deprivation and development. **Module II: Critical Understanding of Theories of Human Development** Psychodynamic Theories—Freud's psychosexual theory and Erikson's psychosocial theory; Behavioural Theories, Social Learning Theory, Piaget's Theory of Cognitive Development, Behaviour Management. **Module III: Developmental Stages** Physical, cognitive and moral development of the following developmental stages: prenatal period, infancy, babyhood, early childhood, late childhood, adolescence, early adulthood, middle age and old age.	10 hours 10 hours 10 hours
Pedagogy:	Use of Power point presentations, use of charts, videos and group discussions	
Recommended Readings:	American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders,* (5th Ed.) Washington, DC: American Psychiatric Association. An Introduction to Psychology. (2009). India: Sterling Publishers Private Limited. Berk, L. E. (2006). *Child Development (Seventh Edition)*, Boston: Pearson Education. Caplan, G. (1961). *An Approach to Community Mental Health*. London: Tavistock Publications Clifford, M., King, Weinz and Schopler (1998*). Introduction to Psychology*. 6th ed. New Delhi: Tata Mc Graw Hill Publishing Company Limited. Haight, W. L., Taylor, E. H., Soffer-Elnekave, R. (2020*) Human Behavior for Social Work Practice: A Developmental-Ecological Framework.* United Kingdom: Oxford University Press.	

	Handbook of Child Psychology, Social, Emotional, and Personality Development. (2006). Germany: Wiley. *Human Behaviour Theory and Social Work Practice.* (2017). United Kingdom: Taylor & Francis. Hurlock, Elizabeth. (2001.) *Developmental Psychology*, New York: Tata Mc Graw Hill. Ingleby, E. (2010). Applied Psychology for Social Work. United Kingdom: SAGE Publications. Morgan, C.T., King, R.A., Weisz, J.R., and Schopler, J. 2001. *Introduction to Psychology,* New Delhi: McGraw-Hill. Salkind, N. J. (2001). *Child Development.* Macmillan Library references. Sharf R. S. (2000). *Theories of Psychotherapy and Counselling*, Australia: Brooks/Cole, 2nd Edition. Steinberg, Laurence. (1993). *Adolescence*, New York, McGraw Hill Inc. Sudbery, J. (2009). *Human Growth and Development: An Introduction for Social Workers*. Taylor & Francis. Thomas, R. M. (2001). *Recent theories of human development.* United Kingdom: SAGE Publications. The Cambridge Encyclopaedia of Child Development. (2017). India: Cambridge University Press.
Learning Outcomes	Students will develop an understanding of human growth and the different stages of development; the changes associated with each stage and develop a sensitivity to human problems.

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Programme: MSW
Course Title: SOCIAL WELFARE ADMINISTRATION
Course Code: SWDSCC7
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges
Objectives:	1. The course will introduce the administrative structures, processes and procedures in an organization 2. Provide knowledge and skills in the use of different management techniques in human service organizations.

	3. Provide understanding of policies and procedures involved in establishing and maintaining NGO and the management skills, 4. Discuss schemes and programmes of the State and Central government.	
Content:	**Module I: Social Welfare Administration** Definition, Principles and scope, democratic nature of social welfare administration. Delegation, decentralization, and participation. Management by objectives as applied to social welfare administration.	6 hours
	Module II: Administration of Voluntary Organizations Legal procedures for establishment of NGOs – Trust and Society and their differences. Formation of Trust and Society. Registration procedure for NGO– Societies Registration Act, Indian Trust Act, Foreign Contribution Regulation Act, Tax Reliefs under various Acts (12A, 80G, 35AC), Office Procedure and Documentation – Documents of trust and society. Contents of Memorandum of Association (MOA), Importance of by-laws, Registration under Company's Act. Difference between public and private trust; Function and responsibilities of governing board, committees and office bearers, Project Management – Basic Concepts of Project Management, Project identification, Project life cycles and success factors. Corporate Social Responsibility implementation	14 hours
	Module III: Developmental Administration Public Welfare Programs. Responsibility of state for welfare program. Structural arrangement of public welfare system in India – Central, State, District and Local. Process of Community Participation in social welfare programs – National Literacy Mission 2009, JNNURM Pradhanmantri Gramina Sadak Yojana, Sampurna Gramina Rojgar Yojana. National Rural Employment Guarantee Scheme, Swarna Jayanti Gramswa Rojagar Yojana, Planning and Development. NITI Aayog and National Development Council, State and District planning.	5 hours
	Module IV: Social Work Administration in Goa Welfare Programmes in Goa – Social Welfare Department, Tribal Welfare, Rural Development Agency, Women and Child Department, Educational Schemes, Welfare Programmes in Panchayat, etc.	5 hours
Pedagogy:	Classroom learning with help of powerpoint, task and classroom assignments, group discussions and presentations, field visits and workshops	
Recommended Readings:	BalsaraJal F. 1984. *Perspectives on Social Welfare in India*. Chand Co. Ltd., New Delhi. Bhattachary, S. (2009). *Social Work Administration and Development.* New Delhi: Rawat Publications Chowdhury Paul D. 1979. *Social Welfare Administration*. Atma Ram Sons. Delhi.	

	Coulshed, V. (1990). Management in Social Work. London: Palgrave. Goel S.L. 1988. *Social Welfare Administration VOL 1 and .2: Theory and Practice*. Deep and Deep Publications. Garain, S. 1998. *Organizational Effectiveness of NGOs*. Jaipur: University Book House. Kohli A.S., and Sharma S.R. 1996. *Encyclopaedia of Social Welfare and Administration Vol. 1-7*. Anmol Pub. Pvt. Ltd., New Delhi. Lauffer, A. 1977. *Getting the Resources, You Need*. New Delhi: Sage Publications. Lauffer, A. 1977, *Understanding Your Social Agency*. London: Sage Publications. Lawler, J., Bilson, A. (2010). *Social Work Management and Leadership: Managing Complexity with Creativity.* United Kingdom: Routledge. Lewis, D. (2007). *The Management of Non-governmental Development Organizations*. United Kingdom: Routledge. Luthans, Fred. (1990). *Organizational Behaviour*. Boston, Irwin McGraw Hill. OECD. (2003). Local Economic and Employment Development the Non-profit Sector in a Changing Economy. France: OECD Publishing Skidmore, R. (1983). *Social Welfare Administration: Dynamic Management and Human Relations*. London: Prentice Hall
Additional Readings	Citizen's Charters, Government of Goa of Social Welfare Department, Tribal Welfare Department, Rural Development Agency, Women and Child Department, Educational Department, Directorate of Panchayat Garain, S., *Towards a Measure of Perceived Organizational Effectiveness in Non-Government Organization*. Mumbai: Indian Journal of Social Work, 54 (2) Tandon, R. (2002). Identity and Its Challenges for the Voluntary Sector in India. New Delhi: PRIA
Learning Outcomes	Students will understand the important elements in administration of social welfare organisations and acquire skills to participate in management and administrative processes for service delivery

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Programme: MSW
Course Title: COMMUNITY ORGANISATION

Course Code: SWDSCC8
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To develop competence to undertake critical and holistic analysis of social issues & community dynamics. 2. To understand the strategies in community organization practice and the role of community organization practitioner. 3. To enhance understanding of the models and strategies of Community Work Practice. 4. To develop attitudes and skills required to facilitate the process of people's participation in changing their situation.	
Content:	**Module I - Understanding Community** Concept of community:- Sociological, cultural and social work perspective of community – geographical and functional community; ii. Functions of community; community and identity; iv. The process of community integration and disintegration. Different perspectives on Organizing communities for change • Paulo Freire – Conscientization • Saul Alinsky -Organized mass action and community leadership • Eleaneor Ostrom – theory of commons: • Ivan Illich : Deschooling Society	15 hours
	Module II - Community Organization as Practice Method Phases in the community organization/social work practice with communities - Need assessment, Community Engagement Phase, exiting community and Ensuring Sustainability of Intervention Models, Feedback and evaluation of the work done Community mapping techniques Community organization models given by Rothman ● Locality Development ● Social Planning ● Social Action ● People centred approach in community organization	15 hours
	Module III - Strategies in Community Organization Practice and Role of Community Organization Practitioner: i. Role of community organization practitioner in community centers (the guide, enabler, expert and social therapist) and in Rothman's models; ii. Strategies and techniques in community organization: PRA and related techniques, formation and capacity building of CBOs, capacity building of community level institutions, strategies for capacity building of the marginalized groups, committee formations, leadership and cadre building and networking; iii. Skills required in community organization practice:	15 hours

	interaction skills, information gathering and assimilation skills, observation skills, analytical skills, skills in listening and responding skills; organizing skills, resource mobilization (external and internal) skills, conflict resolution skills; iv. Planning, monitoring an evaluation in community work; v. Recording: - community profiling, recording (administrative and process records; PORK, SOAP, data banks, monitoring report, evaluation reports) and documentation of the community organization processes (documentation of the best practices, case studies). **Module IV - Community Organization Practice in the Context of Various Settings** Health, Education, Livelihood and work, Natural resource management, Sustainable development, working with tribal population, working with rural and urban vulnerable communities, displaced population and rehabilitation.	15 hours
Pedagogy:	Classroom learning with use of powerpoint, group discussion, workshop on PRA and related techniques, task and classroom assignments	
Recommended Readings:	Community Organizing and Community Building for Health. (2005). United Kingdom: Rutgers University Press. Gangrade, K.D. 1971. *Community Organization in India*, Mumbai: Popular Prakashan. Hardina, D. (2012). Interpersonal Social Work Skills for Community Practice. United States: Springer Publishing Company. Hardina, D. (2002). Analytical Skills for Community Organization Practice. United States: Columbia University Press. Joseph, S. (2016). Community Organization in Social Work. India: DISCOVERY PUBLISHING HOUSE PVT Limited. Jodhka Surinder (ed.), 2002, Communities & Identities; Sage Publication McDonald, A. (2006). Understanding Community Care: A Guide for Social Workers. United Kingdom: Macmillan Education UK. Methods in Community-Based Participatory Research for Health. (2005). Germany: Wiley. PATIL, A. R. (2012). COMMUNITY ORGANIZATION AND DEVELOPMENT: An Indian Perspective. India: PHI Learning. PRIA. 1995. *Participatory Evaluation: Issues and Concerns*, New Delhi: PRIA	

	Ross, Murray and Lappin, Ben. 1967. *Community Organization; Theory, Principles, and Practice*, New York: Harper and Row. Rummery, K. (2018). Disability, Citizenship and Community Care: A Case for Welfare Rights? United Kingdom: Taylor & Francis. Somerville, P. (2016). Understanding Community: Politics, Policy and Practice. United Kingdom: Policy Press. The Handbook of Community Practice. (2013). United Kingdom: SAGE Publications. Towards Understanding Community: People and Places. (2007). United Kingdom: Palgrave Macmillan UK. Understanding Care, Welfare and Community: A Reader. (2005). United Kingdom: Taylor & Francis.
Additional Readings	Beher A and Samuel J. 2006. *Social Watch in India: Citizens Report on Governance and Development*, Pune: NCAS NCAS. 2000. *Fearless Minds: Rights Based Approach to Organizing and Advocacy*, Pune: National Centre for Advocacy
Learning Outcomes	Students will be introduced to community organization as a method of social work and the critical elements of the practice. Students will understand the role of agencies and community organizers, models and strategies for community organizations and also develop a perspective and the skills for participatory processes in the community and civil society.

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Programme: MSW
Course Title: CONCURRENT FIELD WORK PRACTICUM AND RURAL CAMP
Course Code: SWDSCC9
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges
Objectives:	1) To understand the agency as a system –governance, philosophy, objectives, structures and management of services/ programmes. 2) To develop the ability to involve the client system in the problem solving process, utilizing skills of social work interventions, including research. 3) To enable to acquire knowledge and practice skills related to social work methods at the individual, group and community level in different fields 4) To develop documentation skills 5) To develop skills in identifying and utilizing community resources, both at Government and private levels. 6) To develop the ability to work as a team.

	7) To reinforce the belief in the inherent strength of the people to meet their needs and resolve their problems. 8) To enable conscious application of professional values, ethics and principles. 9) To develop an understanding and skills in working with the professionals (Medicine, Law, accountancy etc.)	
Content:	**Module I: Concurrent Field Work** During the concurrent field work, students are expected to fulfil certain requirements namely: 1) Develop beginning perceptions about agency functioning and identify congruence or gaps between organizational stances or programs and client's service needs (e.g. restrictive intake policies, inadequate office hours, poor referral system for resources) 2) Initiate learning about how outside regulations, organizations and funding effect delivery of services. 3) Show beginning ability to identify problems/issues in organizational terms. 4) Demonstrate beginning initiative and involvement in efforts to influence agency processes on behalf of client's needs 5) Develop beginning confidence to participate and contribute to team effort. 6) Working with Individuals: Each student should get exposed to the practice of Social Case Work with the guidance of the supervisors and submit the record of each session. 7) Working with Groups: Each student should get exposed to the practice of Social Group Work with guidance of the supervisors and submit the case records. 8) Community Organisation: Each student should organise a community organisation in his/her field work agency. **Module II: Rural Camp** The Rural Camp will provide students the opportunity to experience rural life, make first hand observations about rural realities, analyze rural dynamics, and observe the functioning of local self - government and voluntary organizations. This experience aids peer participation in planning for activities for own group and those for local people. It also helps develop skills to carry out, evaluate, and report the experience. It also gives the students prospects for engaging themselves in rural reconstruction. A Rural Camp will be organized during the second semester. It shall be a residential camp in a rural or tribal setting. It shall be mandatory for each student to attend the rural camp. Those who remain absent from the practicum shall forfeit the marks allotted. No other assignment shall be given to an absentee student in lieu of rural camp. A class room seminar should be organized after returning from the rural camp, for the learners to present papers covering all aspects of the work done and experiences gained.	**(2 field work days in a week on days prescribed in the time table)** **(Residential for 10 days)**

	Objectives: 1) To develop an understanding of the rural social structures and cultural processes with special reference to specific groups experiencing poverty and deprivation. 2) To develop an understanding of the level of government intervention in relation to below the poverty line groups in the area and the related structure of decision–making and intervention. 3) To develop the capacity to make a critique of the intervention of both the voluntary organisations and the Government Agencies in relation to the specific below the poverty line group. 4) Through experience in group living, students will appreciate its value in terms of self-development, interpersonal relationships, sense of organisation, management and mutual responsibility. 5) To acquire skills in planning, organizing, implementing, and evaluating the camp	
Pedagogy:	Practical skill development	
Recommended Readings	Challenges, Opportunities and Innovations in Social Work Field Education. (2020). United Kingdom: Taylor & Francis. Fieldwork Training in Social Work. (2019). United States: Taylor & Francis. Field Instruction in Social Work Education: The Indian Experience. (2019). United States: Taylor & Francis. Subhedar, I. S. (2001). Fieldwork Training in Social Work. India: Rawat Publications.	
Learning Outcomes:	Students will develop the skill and sensitivity for field work practice	

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Programme: MSW
Course Title: SOCIAL ACTION, SOCIAL MOVEMENTS, NETWORKING AND ADVOCACY
Course Code: SWDSOC2
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the Masters Programme at Goa University or its affiliated colleges

Objectives:	1. To understand the concepts and context of Social Movements and Social Action. 2. To develop an understanding and analyzing issues in a broader context in order to respond to critical Social realities. 3. To develop a strong perspective and skill to engage themselves in struggles, protests and movements. 4. To acquire knowledge on the concepts, processes and techniques of Social Advocacy.	
Content:	**Module I: Social Action** Social action – history in India, concept, objectives, purpose and principles; process of social action and scope in India; Rights based approach, Radical social work - contributions by Saul Slinky, Paulo Freire, Mahatma Gandhi and Siddique. **Module II: Tools of Social Action** Strategies for social action from various social movements; Concept of advocacy as a tool; Strategies for Advocacy, Campaigning, and Lobbying; Use of media and public opinion building in advocacy; and Coalition and Network building; Linking up protest movements with development work. **Module III: Social Movements** Understanding the politics of protest**:** Typology of social movements, their characteristic features and contribution to social change; Overview of significant social movements in India and the world. New Social Movements and their contribution to social change : Meaning and perspectives, Issue-based, autonomous and sectarian movements, their contribution and Limitation, Overview of environmental and lifestyle movements, their scope and Limitation, Strategies employed by social movements ranging from non-violence to violence.	10 hours 10 hours 10 hours
Pedagogy:	Power point presentations, case studies, group discussion, debate and use of videos and charts.	
Recommended Readings:	Advocacy Organizations and Collective Action. (2010). (n.p.): Cambridge University Press. Alinsky, S. (2010). Rules for Radicals: A Pragmatic Primer for Realistic Radicals. United States: Knopf Doubleday Publishing Group. Bastiaan Wielenga. (1984). Introduction to Marxism, Bangalore: Centre for Social Action. Chambers, Robert. (2005). Ideas for Development, Earth Scan, London. Cohen, S. (2017). Transforming Social Action into Social Change: Improving Policy and Practice. United Kingdom: Taylor & Francis.	

	Diani, M., della Porta, D. (2009). Social Movements: An Introduction. Germany: Wiley. Ghandy, Anuradha (2012). Scripting the Change, Daanish Books. Jain, P.C. (1991). Social Movements among Tribals, New Delhi: Rawat Publications. Joshi, P.Beher A and Samuel J. (2006). Social Watch in India: Citizens Report on Governance and Development, Pune: NCAS Purohit, B. R. and Joshi, Sandeep. (2003). Social Justice in India, Jaipur: Rawat Publication. Siddiqui, H. Y. (1984) – Social Work and Social Action: A Development Perspective, New Delhi: Herman Publications The Oxford Handbook of Social Movements. (2015). United Kingdom: Oxford University Press. Twelvetrees, A. (2017). Community Development, Social Action and Social Planning. United Kingdom: Macmillan Education UK. Transformative Social Work Practice. (2015). United States: SAGE Publications.
Learning Outcomes	The subject introduces students to rights-based approach, radical social work through an understanding of different methods and models of social action. Students will learn different strategies of social action and social change through an analysis of social movements.

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Programme: MSW
Course Title: GENDER AND EQUITY
Course Code: SWDSOC3
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the Masters Programme at Goa University or its affiliated colleges
Objective:	1. To sensitize students and develop in them an understanding of gender and equity. 2. To understand the concept of gender and its implications in the context of India 3. to understand Equality and Equity 4. to learn about women, empowerment and the role of the state

Content:	**Module I: The Concept of Gender** Difference in gender and sex, social constructions of gender and sex and it's implications in the context of India. Patriarchy- meaning of patriarchy, role of social, religious and economic institutions in reinforcing patriarchy. R-Discriminatory practices within religious rituals and social practices. Introduction to Feminist theory: (Radical feminism, liberal feminism, socialist feminism, eco feminism, Dalit Feminism) **Module II: Equity vs Equality** What is equity? Its relevance for India. Difference between equity and equality. Reservation Policy. Issues of women from the Dalit, tribal, Muslim and other minority communities. **Module III: Women, Empowerment and the State** Feminization of labour and poverty. What is empowerment? Role of the state in empowerment of women**:** Legislations Relating to Women**,** Gender and Health, 73rd and 74th Amendment, Ministry of Social Justice and Empowerment, Ministry of Women and Child Development, Mahila Shakti Kendra and a brief overview of government schemes for women.	10 hours 10 hours 10 hours
Pedagogy:	lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Center For Women's Development Studies. (1984). *International Women's Decade: A balance Sheet*, New Delhi Davar Bhargavi. (2001). *Mental Health from a Gender Perspective*, Sage Publications Desai N. and Krishnaraj M. (1987). *Women and Society in India*, New Delhi: Ajanta publications. Ireae Guijt and Meera Shah. (1998). *The Myth of Community: Gender Issues in Participatory Development*, ITDG Publishing. Kabeer Naila. (1994). *Reversed Realities: Gender Hierarchies in Development Thought*. Kali for Women Khan, Bhasin. (1999). *Some Questions on Feminism and its Relevance in South Asia*, New Delhi: Kali for Women. Khullar M. (2005).*Writing the Women's Movement*: A Reader, Kali For Women. Kishwar M. (2002). *Off the Beaten Track: Rethinking Gender Justice for Indian Women*, Oxford University Press. Kudchedkar S. (1998). *Women Against Violence: Violence Against women*, Pencraft	

	International. Moser, C. (2012). Gender Planning and Development: Theory, Practice and Training. United Kingdom: Taylor & Francis. No Outlaws in the Gender Galaxy. (2015). India: Zubaan. Rao A. 2003. *Gender and Caste Issues in Contemporary Indian Feminism*, New Delhi : Kali for women, Renavikar M. R. (2003).Women and Religion: a Sociological Analysis, Jaipur:Rawat Publication. Social Justice and Gender Equality: Rethinking Development Strategies and Macroeconomic Policies. (2012). United Kingdom: Taylor & Francis. Towards Gender Equity in Development. (2018). United Kingdom: Oxford University Press. The Palgrave Handbook of Gender and Development: Critical Engagements in Feminist Theory and Practice. (2016). United Kingdom: Palgrave Macmillan UK. Violence Against Women in India. (2019). (n.p.): Taylor & Francis. Violence Against Women: Current Theory and Practice in Domestic Abuse, Sexual Violence and Exploitation. (2013). United Kingdom: Jessica Kingsley Publishers. Women of Asia: Globalization, Development, and Gender Equity. (2018). United Kingdom: Taylor & Francis.
Learning Outcomes	Students will develop an understanding of Gender and the need for gender equity

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SEMESTER III
Programme: MSW
Course Title: SOCIAL WORK RESEARCH
Course Code: SWRSOC1
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges
Objectives:	1. To comprehend the importance of research as a social work method 2. To be familiar with various research designs, methods, statistical tools and techniques relevant to social work research. 3. To cultivate research abilities through appropriate application 4. To develop a research proposal on a topic of interest that will be connected to the chosen field of specialization

Content:	**Module I – Introduction** Linkages between research and Social Work practice; role of research in policy formulation, and programme planning, implementation, and evaluation. Types of social work research – need assessment studies, situational analysis, monitoring and evaluation, impact assessment, policy research.	10 hours
	Module II: The Process of Quantitative Research Conceptualizing Quantitative Studies: problem identification and formulation; objectives, concepts, variables, hypotheses and assumptions; Designing Qualitative Studies: Types of Research Designs, and their Scope, identification of sources of data (primary data and secondary data); Methods and Tools of Data Collections; Selection of Sample; Data Processing Techniques; Analysis of Data: Levels of Measurement, Descriptive Statistics, Measures of Dispersion, hypothesis testing and interpretation of findings; Reporting Results of Quantitative Research. SPSS.	15 hours
	Module III: The Process of Qualitative Research Conceptualizing qualitative studies: identifying the focus of the study, the areas of the study and lines of inquiry ; Designing qualitative studies : developing a research starter , theoretical sampling, specifying the role of researched and researcher, and insider/ outsider perspectives; Methods of data collection; participants observation, life histories, in-depth / unstructured interview, group interview and focus group discussion and community based participatory methods and techniques; Data processing and analysis; preparing narrative data text, developing coding categories, use of matrices, and integrating findings to develop field based conceptualizations; Writing up qualitative studies	20 hours
	Module IV: Research Reporting: Preparation of a research proposal. The contents of a report, Manual of style and the need for dissemination	15 hours
Pedagogy:	Classroom lectures, classroom assignments	
Recommended Readings:	Ahuja, Ram. (2001) *Research Methods*, Jaipur: Rawat Publications. Anastas, J. W. (2000). Research Design for Social Work and the Human Services. United States: Columbia University Press. Alston, M. Bocoles, W. (2003). *Research for Social Workers - An Introduction to Methods,* Jaipur: Rawat Publications.	

	Carden, F. (2009). Knowledge to Policy: Making the Most of Development Research. India: SAGE Publications. Chattopadhyay, A. K., Mukherjee, S. P., Sinha, B. K. (2018). St atistical Methods in Social Science Research. Germany: Springer Singapore. Drake, B., Jonson-Reid, M. (2008). Social Work Research Methods: From Conceptualization to Dissemination. United Kingdom: Pearson/Allyn and Bacon. Kothari, C. R. (2004). *Research Methodology: Methods and Techniques*, 2nd edition reprint, New Delhi: New Age International. Lal Das, D.K. (2000), Practice of Social Research: A Social Work Perspective, Rawat, Jaipur. Rubin, Allen and Babbie Earl, (2001). *Research Methods for Social Work*, 4th Ed. Wadsworth, West, Brooks/Cole and Schirmer, The Routledge Handbook of Social Work Practice Research. (2020). United Kingdom: Taylor & Francis. The SAGE Handbook of Action Research: Participative Inquiry and Practice. (2007). United Kingdom: SAGE Publications. Young, Pauline, (1960). *Scientific Social Surveys and Research*, Asian student's edition, Japan: Asia Publishing House. Webber, M. (2014). Applying Research Evidence in Social Work Practice. United Kingdom: Palgrave Macmillan. Worsley, A., Hardwick, L. (2010). Doing Social Work Research. United Kingdom: SAGE Publications. York, R. O. (2019). Social Work Research Methods: Learning by Doing. United States: SAGE Publications.
Learning Outcomes	Students will develop an understanding of the research process and acquire attitudes and skills essential for social work research. Students will also develop skills in interpretation, documentation and presentation of results of the research. At the end of the course students will submit the mandatory research proposal which is to be executed in the following semester.

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Programme: MSW
Course Title: BLOCK PLACEMENT AND SPECIALIZATION RELATED FIELD WORK PRACTICUM
Course Code: SWRSOC2
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1) To develop enhanced specialization specific skills 2) To be able to integrate classroom learning with field realities. 3) To offer pre-employment work experiences that will enable the student to assume professional responsibilities and understand the role of a professional Social Worker the chosen field of specialization 4) To enhance critical thinking in the development of a research proposal connected to the area of specialization. 5) To acquire skills of networking, advocacy and programme coordination.	
Content:	**Module 1: Block Placement** Every student will complete in the summer break, a Block Placement of 30 days of field work (full- time work in an approved agency or project preferably outside Goa). Agencies /projects for Block Placement shall have to be approved by the Programme Director keeping in mind the learning opportunities the setting affords for the students. A student is not eligible for the degree unless s/he has completed Block Placement to the satisfaction of the Programme. At the conclusion of Block Placement, the Agency Supervisor will send a Report about the performance of the student to the Programme. The student will also submit a comprehensive report of the Block Placement. **Module 2: Specialization Specific field Work Practicum** The student has the option of selecting their Specialization, based on which they would be placed in an agency based on their specific specialization. ● The student will analyse complex situations and evaluate the agencies functions in relation to needs/problems of the client system, and situate this in the larger state, national and international context. ● The student will evaluate the functions of the agency based on their specific specialization in relation to the needs and problems of the client system. ● Enhance skills of working with inter-disciplinary teams to support peoples' quest to meet needs and goals. ● Take initiative and leadership roles while working with teams. ● Independently prepare and utilizes records like summary records, case studies, agency reports- annual and six monthly, minutes of meetings, press releases. **Study Tour**	30 days

	The Study tour will be organised at the end of the semester. The Study Tour is a compulsory component. The students need to gain an understanding of the functioning of government, private and people-based organisations and developmental services in the context of emerging social realities in their respective specialization. Understand the various programmes/strategies, administration / management of the organisations/programmes/services and participation of the stakeholders in problem solving and management. Understand the role of Professional Social Workers and other disciplines in relation to the organisation/development programmes/services in the respective specialization. Appreciate and analyse critically the organisation, its services/programmes and strategies in terms of their relevance, effectiveness to meet the organisational goals and achieve overall development of the people. Through the experience of group living appreciate its value in terms of self-development, interpersonal relationships, and mutual responsibility. Acquire skills in planning, organizing and evaluation of the study tour, learn conscious use of time, communication skills, team spirit, handling relationships, conflicts and differences of opinions, decision making, appreciation, sharing of resources and tasks, coping skills in problem situations with cooperation and coordination.	5-8 days
Pedagogy:	Practical experiential learning	
Recommended Reading	Challenges, Opportunities and Innovations in Social Work Field Education. (2020). United Kingdom: Taylor & Francis. Fieldwork Training in Social Work. (2019). United States: Taylor & Francis. Field Instruction in Social Work Education: The Indian Experience. (2019). United States: Taylor & Francis. Subhedar, I. S. (2001). Fieldwork Training in Social Work. India: Rawat Publications.	
Learning Outcomes:	Students will sharpen their skills and sensitivity for field work practice in their chosen specialised areas with the Block Placement and Field Practicum. They will also identify and outline in the form of a proposal their research proposal	

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SPECIALIZATION-WISE OPTIONAL COURSES

SPECIALIZATION 1: HEALTH AND DEVELOPMENT (HAND)

Programme: MSW
Course Title: HEALTH CARE SOCIAL WORK PRACTICE I
Course Code: SWOGC1A
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1. To understand the concept of health, wellbeing and disease 2. To understand the causes and prevention of the major communicable and chronic disease in India 3. To learn about the structure of healthcare services in India and related policies 4. To understand the role of NGO and private sector in health care	
Content:	**Module I: Concept of Health, Well-Being, and Disease** Health concept by WHO, determinants of health; Indicators of health status of people in a community; Disease: Causation and prevention; Health scenario of India: Major communicable and non-communicable diseases; Health as an aspect of social development, Environmental Health, Nutritional Health, Occupational Health, Mental Health.	15 hours
	Module II: Healthcare Services and Programmes Structure of healthcare services in India: Primary, secondary, and tertiary level healthcare structure and their functions; Primary healthcare: Concept, issues of availability, affordability and accessibility of healthcare services, Health planning and Policy: National Health Policy, 2002 and National Rural Health Mission	15 hours
	Module III: Social Work in Various Settings Functions of social workers: General Hospitals, Government, Corporate and private, specific disease hospitals, Specialized Clinics, community health centers, blood banks, eye banks, health camps.	15 hours
	Module IV: Emerging Concerns in Healthcare Public-private participation and collaboration in health care: Role of NGO and private sector in health care; Sexual and Reproductive Health Rights.	15 Hours
Pedagogy:	Classroom teaching, use of charts, power point presentations, videos, field visits, group discussions	
Recommended Readings:	Browne, T., Gehlert, S. (2006). Handbook of Health Social Work. United States: Wiley. Dasgupta, M. and Lincoln, C. C. (1996). *Health, Poverty and Development in India*. New Delhi: Oxford University Press.	

	Dhillon, H.S. and Philip, L. (1994). *Health Promotion and Community Action for Health in Developing Countries*. Geneva: WHO. Golightley, M., Goemans, R. (2020). Social Work and Mental Health. United Kingdom: SAGE Publications, Limited. Handbook of Health Social Work. (2011). Germany: Wiley. Park, K. (2005). *Textbook of Prevention and Social Medicine (18th edition)*. Jabalpur: Banarsidas Bhanot. Phillips, D.R.and Verhasselt, Y. (1994). *Health and Development*. London: Routledge. Schwaber Kerson, T., McCoyd, J. L. (2016). Social Work in Health Settings: Practice in Context. United Kingdom: Taylor & Francis. Spitzer, W. J., Allen, K. M. (2015). Social Work Practice in Healthcare: Advanced Approaches and Emerging Trends. United States: SAGE Publications. The Critical Practitioner in Social Work and Health Care. (2007). United Kingdom: SAGE Publications. Yuen, F. K. O. (2014). Social Work Practice with Children and Families: A Family Health Approach. United Kingdom: Taylor & Francis.
Learning Outcomes	Students will understand the changing concept of health and develop a critical perspective of healthcare services and programmes in the country. They will also understand the relevant domains and nature of social work intervention in different health settings.

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Programme: MSW
Course Title: HEALTH CARE SOCIAL WORK PRACTICE II
Course Code: SWOGC1B
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To learn about social work in various health setting 2. To understand the Medico-legal information related to offences affecting the human body mind and property 3. To learn about the Procedural aspects of medico-legal practices	
Rr	**Module I: Social Work in Various Health Settings:** Mental health Institutions, psychiatric departments in general hospitals, private psychiatric clinics, halfway homes, day care centres, sheltered workshops, child guidance clinics **Module II: Medico-legal information related to offences affecting the human body mind and property.** i) 'Identity' of Individuals, determination of age, sex, religion etc. Medico-legal significance of age. ii) Injuries and wounds: Legal definition of injury, hurt, bruises Aberrations, laceration, stab, penetration, puncture, gunshot. Injury: simple, grievous, self-inflicted burns and scalds, electrical injury. iii) Causes of death, natural, unnatural, iv) Virginity, paternity, legitimacy, sexual offences, rape, indecent assault: incest. MTP, abortion, miscarriage-therapeutic, accidental, threatened Criminal. Infanticide: Act of commission and omissions, Dead born and stillborn. v) Doctor-patient relationship - Medical Ethics, Consent for examination and: for specific treatment of specific illnesses and procedures, Informed consent. Civil malpraxis, reasonable care, skills vicarious liabilities negligence. Rights and Responsibilities of patients, Contributory negligence. **Module III: Procedural aspects of medico-legal practices:** Courts of inquiry: Police, Magistrate, Commissioner, Judge Witnesses: Simple, expert, hostile Evidence: Oral - Examination – in –chief, cross examination, re-examination, Volunteering statement, questions from the bench, "leading questions" Documentary – Certificates – Medical certificate of fitness, Medical Certificate of illness/injuries percentage of loss. Dying declaration, Death Certificate, Reports of Chemical Examinations expert, fingerprints.	15 hours 25 hours 20 hours
Pedagogy:	Classroom teaching, use of videos and charts, field visits, guest lectures and group discussions	
Recommended Readings:	Balagopal, G., Kapanee, A. R. M. (2019). Mental Health Care Services in Community Settings: Discussions on NGO Approaches in India. Germany: Springer Singapore.	

	Colin Pritchard. (2006). *Mental Health Social Work*, USA: Routledge. Davidson, K. (2014). Social Work in Health Care: A Handbook for Practice. United States: Taylor & Francis. Drake, G., Drayton, J., Bland, R. (2021). Social Work Practice in Mental Health: An Introduction. United Kingdom: Routledge. Dixit, P. C. (2004). *Medical Jurisprudence and Toxicology* – Lexis Nexis.Dora, Health and Social Work: Practice, Policy, and Research. (2018). United States: Springer Publishing Company. Parikh, C. K. (1970). *Parikh's Simplified textbook of Medical Jurisprudence and Toxicology*, Medical Publication Park, K. (2017). Park's Textbook of Preventive and Social Medicine. India: Bhanot Publishers. Patel Vikram. (2002). *Where there is no Psychiatrist*, Delhi: VHAI (Voluntary of Health Association of India). Rukadhikar A., Rukadhikar P. (2007). *Mental disorders and You*, Miraj: Psychiatric Centre. Social Work Practice for Promoting Health and Wellbeing: Critical Issues. (2013). United Kingdom: Taylor & Francis.
Learning Outcomes:	Students will be oriented to the sector of health and development and will understand the role and function of social workers in various health settings.

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Programme: MSW
Course Title: REHABILITATION AND AFTER CARE SERVICES
Course Code: SWOGC1C
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To understand the causes of various Impairment, Disabilities and Handicaps. 2. To learn about the History, philosophy and principles of psycho-social rehabilitation and Intervention in rehabilitation 3. To learn about the Rehabilitation Settings	
Content:	**Module I – Rehabilitation** Definition and scope for social work interventions; definition of Impairment, Disability, Handicap; causes of Handicap - heredity, acquired, Major illnesses - physical, neurological and psychiatric Stress, vulnerability, coping and competence to deal with handicaps; Need for comprehensive rehabilitation – psycho-social rehabilitation	10 hours
	Module II - History, philosophy and principles of psycho-social rehabilitation Specific problem areas – physical handicap - vision, hearing, orthopaedic, speech and language difficulties, mental retardation and others; neurological, psychiatric problems, disasters, alcohol and drug usage, terminal illnesses and any other. Intervention in rehabilitation: Assessment, planning, intervention, evaluation, tools for assessment, follow-up services.	5 hours
	Module III - Rehabilitation Settings Hospital based, day-care, night-care, quarter-way home, half- way-home, group home, hostels, long-stay homes, vocational guidance centre, sheltered workshop, occupational therapy centre, community based rehabilitation centre, home care, inclusive education and others Approaches: Therapeutic community, behavior modifications, transactional analysis and eclectic approach	5 hours
	Module IV - Practice of Social work methods in the process of rehabilitation Case work, group work, community organisation, research, administration and social action. legal provisions for differently abled people – The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995, Rehabilitation Council of India: Formation, scope and functions, governmental policies and programmes, initiatives from the non- governmental sectors. International trends and national initiatives in the rehabilitation scenario.	10 hours
Pedagogy:	Classroom power point presentations, use of charts, videos and field exposure.	

Recommended Readings:	Bajpai, A. (2018). From Exploitation to Empowerment: A Socio-Legal Model of Rehabilitation and Reintegration of Intellectually Disabled Children. Germany: Springer Singapore. Corey, Gerald. (6th ed.) (2004). *Theory and Practice of Group Counseling*. Thomas Brooks/ Cole Belmont Danda, Amita. (2000). *Legal order and Mental Disorder*, Sage Publications. Gibson, B. (2016). Rehabilitation: A Post-critical Approach. United Kingdom: CRC Press. Jamison, D. T. (2017). Disease Control Priorities, Third Edition (Volume 9): Improving Health and Reducing Poverty. United States: World Bank Publications. Kalyanasundaram S. and Innovations in Psychiatric Rehabilitation Verghese,Mathew,(Eds).2000 Richmond Fellowship Society, Bangalore, India. King, R., Lloyd, C., Meehan, T. (2013). Handbook of Psychosocial Rehabilitation. Germany: Wiley Lakshman Prasad. 1994. Rehabilitation of the Physically handicapped. Konark Publishers Pvt. Ltd. Liberman, Robert. P. Psychiatric Rehabilitation of Chronic Mental (ed). 1988. Patients. Washington D.C., American Psychiatric Association. Organization, W. H. (2010). Community-based Rehabilitation: CBR Guidelines. Philippines: World Health Organization.
Learning Outcomes	Students will develop an understanding of the concepts of handicap, rehabilitation and the scope for practice, identification of specific client categories requiring the rehabilitation services, rehabilitation service interventions and different therapeutic approaches to the rehabilitation process.

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Programme: MSW
Course Title: HEALTH CARE ADMINISTRATION AND PROGRAMMING
Course Code: SWOGC1D
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges.	
Objectives:	1. To understand the Concept of Community Health and various community health programmes 2. To understand the systems of health care 3. To get acquainted to Health Communication and Training in community health care 4. To learn about the Legislative measures in the field of Health	
Content:	**Module I: Concept of Community Health** Community Health Programmes, RCH, Mental Health, ICDS, Geriatrics, Immunization, Drinking Water, Low cost sanitation, SRH	5 hours
	Module II: Concept of Care Systems in Health Care, Family Physician, OPDs and Dispensaries, Hospitals, Day Care and Special Schools, Institutional Care, Self help and support, De-addiction Centers, Health Insurance Schemes, Organizations in health care – Voluntary Health Association of India/Goa, Indian Red Cross Society, Family Planning Association of India, WHO, UNICEF, UNAIDS, UNODC, International Planned Parenthood Federation, etc	5 hours
	Module III: Health Communication and Training Introduction to health education and training in community health, History of health education and training in India. Approaches and models of health education and training. Training technologies appropriate for community health. Participatory planning, Monitoring and evaluation. Innovations in health education and community health training. Role of social worker as health educators and trainer in community health	5 hours
	Module IV: Critique of Legislative measures in the field of Health Example: MTP Act of 1971, Mental Health Act, 1887, Persons with Disability Act, 1995, Organ Transplantation Act, 1994, Consumer Protection Act, 1986, Juvenile Justice Act 2000, Provision for Violence against women, Immoral Traffic Prevention Act, Prenatal Diagnostic Test PNDT Act 1994, Rehabilitation Council Act 1999, National Trust Act 2000 and Goa Public Health Act, etc.	10hours
	Module V: Health and Development Right to Health, Research in the field of Health, Health Indicator as Development Indicators, Relation between Nutrition, Health and Development.	5 hours

The Study Tour is a mandatory component for this subject.	
Pedagogy:	lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations
Recommended Readings:	Dill, A. (2017). Managing to Care. (n.p.): Taylor & Francis. Goya, R.S. 1990. *Community Participation in Primary Health Care*, Chandigarh: Arun Publishing House Pvt. Ltd. Health and Social Work: Practice, Policy, and Research. (2018). United States: Springer Publishing Company. Lankester, Ted. (2000). *Setting up Community Health Programmes*, New Delhi : VHA McKenzie, J. F., Pinger, R. R. (2013). An Introduction to Community Health. United States: Jones & Bartlett Learning. Social Work and Community Practice. (2016). United States: Apple Academic Press. Social Work Practice in Health: An Introduction to Contexts, Theories and Skills. (2020). United Kingdom: Taylor & Francis. Social Work in Mental Health: Contexts and Theories for Practice. (2014). India: SAGE Publications.
Learning Outcomes:	Students will understand policy implications and the impact of policies on health care delivery.

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SPECIALIZATION 2: COMMUNITY ORGANISATION AND COMMUNITY DEVELOPMENT PRACTICE (COCD)

Programme: MSW
Course Title: PERSPECTIVES ON URBAN COMMUNITY DEVELOPMENT
Course Code: SWOGC2A
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges
Objectives:	1. To learn about the Political Economy of Urbanisation 2. To understand Human Development, Urban Development and Civic Administration 3. To learn about the types and functions of Urban Governance 4. To understand the Role of Urban LSG Bodies in Urban Development

Content:	**Module I: Political Economy of Urbanisation** Urban economy in the context of: a) land; b) labour, c) capital, d) technology, and e) organization. Politico-economic history of urbanization. Migration, urban poverty and livelihood issues, slums and housing, natural resource management in urban areas, sustainable development, right of the poor to the city. **Module II: Human Development, Urban Development and Civic Administration** Measurement of human development. Economic Development and social opportunities: Economic inequality and poverty. Diversity and Social exclusion. Urban Development and Civic Administration**:** Growth of slums; Role of civic administration; Voluntary Organizations (NGOs) and urban dwellers; Role of law and town planning in urban development. **Module III: Urban Governance: Urban Local Self Government in India** a) Types of Urban Local Self Government in India: Municipal Corporations, Municipal Council/ Nagar Palika, Sources of Revenue, Structure, Powers and Functions at Each Level, Committees and their Functions, System of Elections to Urban Local Self Government, Relation of Urban Local Self Government with bodies of Governance at the state level issues. b) 74th Constitutional Amendment Review of the Content and Implementation **Module IV: Role of Urban LSG Bodies in Urban Development** a) Contemporary Issues and Potentials through Local Self Government: Women's participation; participation of marginalized groups (SC, ST and Minorities); political parties; autonomy and control; factionalism in governance; b) Challenges in developing partnerships between elected bodies, bureaucracy and civil society.	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Classroom lectures, field visits, group discussions	
Recommended Readings:	Bhowmik, Debesh. 2007. *Economics of Poverty*, New Delhi: Deep and Deep Publications. Joshi, Deepali Pant. 2006. *Poverty and sustainable Development*, New Delhi: Gyan Books. Petras, James and Veltmeyer, Henry. 2001. *Globalization Unmasked- Imperialism in the 21st Century*, New Delhi: Madhyam Books. Nagaraja Rao, C. (2016). Urban Governance in India. India: Kalpaz.	

	New Forms of Urban Governance in India: Shifts, Models, Networks and Contestations. (2009). India: SAGE Publications. Smith, D. (2019). Third World Cities in Global Perspective: The Political Economy of Uneven Urbanization. United Kingdom: Taylor & Francis Group. Social Work and the City: Urban Themes in 21st-Century Social Work. (2016). United Kingdom: Palgrave Macmillan UK. Subaltern Urbanisation in India: An Introduction to the Dynamics of Ordinary Towns. (n.d.). India: Springer India. United Nations Human Settlements Programme. (2012). The Challenge of Slums: Global Report on Human Settlements 2003. (n.p.): Taylor & Francis. Urbanisation in India: Challenges, Opportunities and the Way Forward. (2014). India: SAGE Publications. Urban Poverty and Climate Change: Life in the Slums of Asia, Africa and Latin America. (2016). United Kingdom: Taylor & Francis.
Learning Outcomes:	The course will provide an understanding of the theories of social development and the economics of urban areas from a human development perspective. The course will also cover urban economic problems in the context of globalization and help in understanding the relevance and problems of cooperatives in the current context.

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Programme: MSW

Course Title: PERSPECTIVES ON RURAL COMMUNITY DEVELOPMENT
Course Code: SWOGC2B
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To learn about the nature and concept of rural development 2. To understand the problems faced by the rural population 3. To learn about the various Rural Development Programmes 4. To understand Rural Development Administration and Governance 5. To learn about the Functions of Panchayati Raj Institutions	
Content:	**Module I - Rural Development** Concept, nature, philosophy and historical context; Meaning and Determinants; Approaches to rural community development; Different Models of Rural Development.	10hours

	Module II - Problems in Rural Development Structural inequality and rural poverty; Rural employment : problems and prospects; Illiteracy; Land ownership / entitlements and alienation, indebtedness; Issues of livelihood and food security; Issues of accessibility, availability and affordability of basic services; Housing; Health; and Sanitation. **Module III: Rural Development Programmes** An overview of rural community development programme of 1952; A review of Govt. programs of poverty alleviation; Creation of employment and increasing agricultural productivity; Role of the Block Development Officer, DRDA (District Rural Development Agency) and DPDC (District Planning and Development Committee). **Module IV - Rural Development Administration** Structure and Function of Rural Development Administration; Role of Cooperatives in Rural Development; Participation of government organizations and voluntary organizations in Rural Development. **Module V: Rural Governance** Democratic Decentralization: Meaning, Objectives and Importance, Governance: Meaning and Structures, Concept and Evolution of Panchayat Raj, The Constitutional Amendment of 73rd and 74th Amendment, Review of 73rd Constitutional Amendment. **Module VI: The Functions of Panchayati Raj Institutions** Structure, Functions and Powers at each level, revenue sources, Committees in Village Level, Panchayati Raj Bodies, Gram Sabha including Mahila Gram Sabha, Its role and importance, Community Participation in Governance, PESA: Context of its emergence and its significance, issues and challenges in its implementation.	10hours 10hours 10hours 10hours 10hours
Pedagogy:	Classroom learning with power point presentations, group discussions and debate, field visits and live projects	
Recommended Readings:	Community Development: Rural, Urban and A Tribal Perspective. (2018). (n.p.): FSP Media Publications. Habibullah, W. and Ahuja, M.(2005) *Land Reforms in India: Computerisation of Land Records Vol. X*. New Delhi: Sage Publications. Hariss-white, B. and Janakrajan S. (2004) *Rural India. Facing the 21st Century*. London: Anthem Press. Kumar, S. (2002) *Methods for Community Participation: A Complete Guide for Practitioners*. New Delhi: Vistaar Publications. Mehta, B.C. (1993) *Rural Poverty in India*. New Delhi: Concept Publishing Company.	

	Radhakrishna, R., Sharma, A.N. (Ed) (1998) *Empowering Rural Labour in India Market, State and Mobilisation*. New Delhi: Institute for Human Development. Narayanasamy, N. (2009). Participatory Rural Appraisal: Principles, Methods and Application. India: SAGE Publications. Pugh, R., Cheers, B. (2010). Rural Social Work: International Perspectives. United Kingdom: Policy Press. Rao, H.Ch. (2005) *Agriculture, Farm Size Rural Poverty Alleviation of India*. New Delhi: Academic foundation. Reddy, G.R., and Subrahmanyam, P. (2003) *Dynamics of Sustainable Rural Development*. New Delhi: Serials Publication. Schouten, T. And Moriaty, P. 2003 *Community Water, Community Management*. London: ITDG Publishing. Rural Development in India: Retrospect and Prospects. (2010). India: Concept Publishing Company. Shiva, V., and Bedi, G. (Eds) (2002) Sustainable *Agriculture and Food Security: the Impact of globalisation*. New Delhi: sage Publications Streeter, C. L., Cooper, H. S. (2013). Rural Social Work: Building and Sustaining Community Capacity. Germany: Wiley.
Learning Outcomes	Students will develop an understanding of social structures, social relations and institutions in rural communities and also develop sensitivity, commitment and skills to influence critical issues in rural communities.

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Programme: MSW
Course Title: COMMUNITY DEVELOPMENT PRACTICE WITH THE DISEMPOWERED COMMUNITIES
Course Code: SWOGC2C
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To develop and understanding of Power, Privilege and Oppression 2. Political economy of the Dalit Development 3. To understand Specific Identity Constructs and Populations at Risk 4. To develop understanding Towards an emancipator community development practice	
Content:	**Module I: Power, Privilege and Oppression** Conceptual Frameworks and Theoretical Perspectives; Critical Theories; Understanding oppression, privilege and oppression. **Module II: Political economy of the Dalit Development** Social stratification; Caste; Casteism; Colonialism and State; Gandhi and Ambedkar Debate, Ambedkar and the Annihilation of Caste. Dalits in Communal Politics, Land Distribution, Social Sector Expenditure and Development of Dalits. Right to Development, Status and Comparison with Non-Dalits, Dalit Feminism, Globalisation and Dalits, State and Civil Society in Dalit Empowerment, Alternatives to Development. Atrocities in Modern Age, Labour Market Discrimination **Module III: Specific Identity Constructs and Populations at Risk** Gender and Sexism- Gender, Culture, and Society; Race, Sexuality, and Culture (Intersections); Gendered Relations; Health, Sex, and Gender. **Module IV: Towards an emancipatory community development practice** Critical Social Work; Anti-oppressive Approach; Structural Social Work, Advanced practice skills with Individuals, Groups, Communities, Institutions, Systems, Policy, Research and Training, Social analyses; Policy analysis and drafting, Advocacy; Social activism; Networking , Skills of individual and community conscientisation processes;	6 hours 10 hours 4 hours 10 hours
Pedagogy:	Classroom teaching with power point presentations, use of video, charts and live projects.	
Recommended Readings:	Displaced by Development: Confronting Marginalisation and Gender Injustice. (2009). India: SAGE Publications.	

	Freire, A. M. A., and Macedo, D. (Eds.) (1995). *The Paulo Freire reader*. New York: Continuum. Freire, P. 1969/1998. *Education for critical consciousness*. New York: Continuum Freire, P. 1990. *Pedagogy of the oppressed*. (M. B. Ramos, Trans.) New York: Continuum. Freire, P. .1998.. *Pedagogy of freedom: Ethics, democracy, and civic courage.* (P. Clarke, Trans.) Lanham, MD: Rowman and Littlefield Publishers, Inc. Freire, P., and Macedo, D. P. (1995). *A dialogue: Culture, language, and race*. Harvard Educational Review, 65(3). Fultner, B. (ed.) (2012). *Jurgen Habermas: Key Concepts*. Rawat Publications. Jaipur Hollway, W. (1984). *'Gender difference and the production of subjectivity*', in Helen Crowley and Susan Himmelweit (eds*.)* Knowing Women*,* p240 - 275, Oxford: Polity Kimmel M. (2000). *The Gendered Society*. Introduction and Chapters 1, 2 and 4 Moore, H.L. (1988). *Feminism and Anthropology*, Ch.2, Cambridge: Polity Press, pp. 12-41. Ortner, S. (1974). *—Is Female to Male as Nature is to Culture?‖* in M.Rosaldo and L. Lamphere (eds.), *Women, Culture and Society*, Stanford University Press, pp. 67-88. Omvedt, G. (1994). Dalits and the Democratic Revolution: Dr Ambedkar and the Dalit Movement in Colonial India. India: SAGE Publications. Societies, Social Inequalities and Marginalization: Marginal Regions in the 21st Century. (2017). Germany: Springer International Publishing. Taylor, D. (ed.) (2011). *Michael Foucault: Key Concepts*. Rawat Publications. Jaipur
Learning Outcomes	Students will understand histories, meanings and issues of marginalization, oppression and disempowerment of vulnerable communities such as the Dalits, tribes and women. They will have built a capacity for critical reflection and analysis of community development issues pertaining to the disempowered.

Programme: MSW
Course Title: PERSPECTIVES ON TRIBES AND TRIBAL DEVELOPMENT
Course Code: SWOGC2D
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1. To develop an understanding of the issues of the tribal communities. 2. To Acquire knowledge about the contribution of Governmental and Non-Governmental Organisations to tribal development in India and Goa. 3. To Gain knowledge about the application of social work in tribal development programmes.	
Content:	**Module I: Tribal Issue: Background and Perspective** Understanding the Concept of Tribes, Adivasis, Indigenous people and Aboriginals, and situating tribes therein, Overview of tribal history and tribal uprisings in India from pre to post Independence period	10 hours
	Module-II Tribal Development: Philosophy and Implementation Scheduled areas: issues and governance, Administration and Local Governance; PESA and its Implementation, Highlight of significant Acts that affect tribal people, Politics of Tribal Welfare and Development, Status of tribals in the current political system. Contemporary Challenges to Tribal Development, Impact of Globalising Market Economy, Campaigns and Advocacy. Tribal Struggles in Goa and Tribal Policy in Goa.	10 hours
	Module III: Tribal Development and Five -Year Plans Constitutional provisions for Scheduled Tribes; Tribal people and the issue of reservation regarding education, employment and politics; Achievement and failures of tribal development schemes and its reasons; Role of bureaucracy in the implementation of tribal welfare schemes;	10 hours
The Study Tour is a mandatory component for this subject.		
Pedagogy:	Classroom presentations, use of charts, field visits and group discussions.	
Recommended Readings:	Bogaert, M. V. D. et al. 1975. Training Tribal Entrepreneures: An experiment in social change, *Social change*, June, Vol.5 (1-2). Gover, K. (2010). *Tribal Constitutionalism: States, Tribes and the Governance of Membership.* Oxford University press. Ghurye, G. S. (1959). *The Scheduled Tribes* Mahana, R. (2019). *Negotiating Marginality Conflicts over Tribal Development in India.* Routledge. Pandey, G. 1979. *Government's Approach to Tribal's Development: Some Rethinking*, Prashasanika, 8 (1), 56-68, 1979 Shah, D.V.,1979. *Education and social change among Tribal in India* Shah, V. P. and Patel, T. 1985. *Social Contexts of Tribal Education*. New Delhi: Concept Publishing.	

	Sharma, B. D. 1977. Administration for tribal Development, *Indian Journal of Public Administration*, 23 (3), Singh K.S. (ed.). *Tribal Movements in India,* Vol. I and II Singh, Ajit 1984. *Tribal Development in India*, Delhi: Amar Parkashan; Tribal Development in India: The Contemporary Debate. (2006). India: SAGE Publications. Tribal Development Administration in India. (1994). India: Mittal Publications. Tribal Development in India: Challenges and Prospects in Tribal Education. (2020). India: SAGE Publications. Vidyarthi, L. P. (ed.) 1981.*Tribal Development and its Administration*, New Delhi: Concept. Xaxa V. 1999. *Tribes as Indigenous People of India*, Economic and Political Weekly, December
Learning Outcomes	The course aims at gaining a critical understanding of the tribal situation in the country and appreciating the need for social work intervention to address issues of tribal population and also critically assess the role of various agencies involved in tribal development.

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SPECIALIZATION 3: SOCIAL WORK PRACTICE WITH CHILDREN, FAMILY AND YOUTH (SICFY)

Programme: MSW
Course Title: FAMILY CENTRED SOCIAL WORK PRACTICE
Course Code: SWOGC3A
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To understand the concept of Family as a social institution 2. To understand Displacement and disaster generated changes in the family 3. To understand Family in the context of Social Change 4. To learn about Family centred social work the interventions, techniques and skills required	
Content:	**Module I: Family as a Social Institution** Concept of family, Types of family, Functions of family, Family dynamics – power, myths, role and patriarchy in family, Concept of Marriage	10 hours
	Module II: Family- Displacement and Violence Displacement and disaster generated changes in the family (war, conflict, riots and natural calamities) and its implications. Vulnerability of families, marginalised families due to poverty, caste, cultural inequalities. The global crisis of violence. Violence against women and children	10 hours
	Module III: The Family in the context of Social Change Alternative Family and Marriage Patterns and Structures. Dual earner/career and impacts on families. Single parent families. Female headed households. Childless families. Reconstituted/ step families. Consensual unions. Same sex couples, Review of changing situations in marriages and marital relationship	20 hours
	Module IV: Work with families: interventions, techniques and skills: Family centred social work – problem solving approach. Life enrichment programmes – developmental approach. Programmes for family empowerment and protection of human rights. Efforts of government in strengthening families – Policy, Legislation and programmes. (Brief review), ICDS, Micro-credit, component plan, Schemes for families, Public Distribution System, Health – Family Welfare Programme, Health Insurance.	20 hours
Pedagogy:	Classroom learning with power point presentations, charts and group discussions, role play and group discussions	

Recommended Readings:	Burgess, Ernest W., Locke Harvey J., Thomes Mary Margaret. *The Family from Traditional to companionship. (4th edition),* New York: Van Nostrand Reinhold Co. Desai, Murli. 1986. *Family and Intervention – Some Case Studies*, Mumbai: TISS. Gore, M S. 1968. *Urbanization and Family Change*, Mumbai: Poplar Prakashan. Hanna, S. M. (2018). The Practice of Family Therapy: Key Elements Across Models. United Kingdom: Taylor & Francis. Harris, C. C. 1969. *The Family an Introduction*, London: George Allen and Unwin Ltd. Jayapalan N. 2001. *Indian Society and Social Institutions – Vol. I*, New Delhi: Atlantic Publishers and Distributors. Jouer, Linda J. 1994. *The Social Context of Health and Health Work*, UK: Macmillan Press Ltd. Kumar, S., Chacko, K. M. 1985. *Indian Society and Social Institutions*, New Delhi: New Heights Publishers and Distributors. Lee, D. (2015). Social Work with Families: Content and Process. United States: Oxford University Press. O'Loughlin, S., O'Loughlin, M. (2016). Social Work with Children and Families. United Kingdom: SAGE Publications. Philips Belanard S. 1969. *Sociology Social Structure and Change*, London: Macmillan Co. Singh, Yogendra. 1997. *Social Stratification and Change in India*, New Delhi: Manohar Publication. Williamson, Robert C. 1967. *Marriage and Family Relations*, New York, London, Sydney: John Wiley and Sons, Inc.
Learning Outcomes	Students will understand family as a social institution, government efforts to strengthen families and the impact of globalization on families and the social system. Students will also imbibe skills, techniques and interventions required for working with families.

Programme: MSW
Course Title: SOCIAL WORK PRACTICE WITH CHILDREN
Course Code:
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1. To understand the concept and process of socialisation in children 2. To understand vulnerability and Situational Analysis of Vulnerable Children in India 3. To learn about the Rights of the Child, International and National Initiatives 4. To learn about Children in Need of Care and Protection	
Content:	**Module I: Socialization of Child** Concept and process of socialisation, Goals of socialisation, Theories of socialisation, Child rearing practices, Agents of socialisation – family, school, peer group, neighbourhood, mass media, religion, Socialization of children with special needs	10 hours
	Module II: Vulnerability and Situational Analysis of Vulnerable Children. Concept of vulnerability, Situations contributing to the vulnerability of children- familial, societal, economical ,Vulnerability induced due to developmental and global factors, disasters, war and conflicts, trafficking of children.	10 hours
	Module III: Rights of the Child, International and National Initiatives. United Nations Convention on Rights of Children- salient features, International initiatives in child protection and child rights, National Commission for protection of child rights, State Commission for protection of child rights, their role and functions, The Juvenile Justice (Care and Protection of Children) Act, 2000, Goa Children's Act 2003.	10 hours
	Module IV: Children in Need of Care and Protection. Magnitude, profile and problems, Destitute and orphan children, working and street children, the girl child, Children of sex workers, children of alcoholics and substance abusers, children affected by HIV/AIDS, Child Abuse, Paedophilia , Children with special needs/ Differently abled children	10 hours
	Module V: Children in Conflict with Law. Definition, magnitude, types of offences, profile and problems Theories of juvenile delinquency- Social Learning theory, Strain theory, Labelling theory, Control theory	10 hours
	Module VI: Skills for Working with children.	

	Communication – individual and group, Use of creative activities. Skills in Behaviour modification techniques. Skills in Advocacy and campaigning for children	10 hours
Pedagogy:	Classroom learning through power point presentations, use of charts and videos, group discussions and guest lecture.	
Recommended Readings:	Adenwalla Maharukh, 2008. *CHILD Protection and Juvenile Justice System for children in conflict with law*, Childline India Foundation, Mumbai. Ahuja Ram, 1997. *Social Problems in India – Juvenile Delinquency, Ch.4*. Jaipur: Rawat Publication. Agarwal, K. G. and Panchal, T. K., 1993. *Inner World of Handicapped: A Study of Problems of the Disabled*, Khanna Publisher, New Delhi. Anderson, D, 1993. *Social Work and the Mentally Handicapped*, Macmillan and Company, London. Bajpai Asha, 2003. *Child Rights in India: Law policy and practice*, Oxford University Press, New Delhi. Chandra, K. and Devg, P. G. 1994. *Handbook of Psychology for the Disabled and Handicapped*, Anmol Prakashan, New Delhi. Government of Goa, *Goa Children's Act 2003* Child-Centred Social Work in India: Journeys and the Way Forward. (2022). India: Taylor & Francis. Government of India, *Child Labour (Prevention and Regulation) Act*, 1986. Gupta M. C., 2001. *Child Victims of Crime: Problems and Perspectives*, Gyan Publishing House. Hegade, Karandikar Madhavi, 2001. *Adoption*, Bal AshaTrust, Mumbai. Madan, G.R. 1997: *Indian Social Problems (Vols. I and II)*, Allied Publications, New Delhi. Mehta Nilima, 2008. *Child Protection and Juvenile Justice System for children in need of care and protection*, Childline India Foundation, Mumbai. Mehta Nilima, 1992. *Ours by Choice: preventing through adoption*, UNICEF, Delhi. Mukhopadhyay Suresh and Mani MNG. 2002. *Education of Children with special needs in India, Education Report*, *Pp 98-108*. NIPCCD: Documents and literature on Children Rane A. 1994. *Street Children: a challenge to the social work profession*, TISS, Bombay. Sarkar C. 1987. *Juvenile Delinquency of India: an etiological analysis*, Daya Publishing House, Delhi. Tata Institute of Social Sciences. 2002. *Forced separation: children of imprisoned mothers, an exploration in Two Indian cities*, PRAYAS, Mumbai.	
Learning Outcomes:	Students will understand the situation of children in India, national and international efforts for child welfare, children related laws, the programmes and services for child welfare and also acquire the skills for working with children. (Back to Index) (Back to Agenda)	

Programme: MSW

Course Title: SOCIAL WORK IN THE FIELD OF EDUCATION
Course Code: SWOGC3C
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	1. To introduce to the students the Levels and Types of Education system in India and some major contributors in the field of education. 2. To understand the problems and issues relating to education in India 3. To understand the efforts of other agencies that have contributed to improve the sytem of education in India 4. To understand the Role of social worker in educational settings.	
Content:	**Module I: Education System in India & Perspectives on Education** Levels and Types of Education: Primary ,Secondary and Higher Education, Distance Education, On-line Education and Administration of Education in India, Government, aided and private-funded education. Historical overview of education in pre-independence India, Contributions of Vidyasagar, Savitribai Phule, Mhatma Jyotiba Phule, Dr. Babasaheb Ambedkar, Gandhi., Abdul Kalam Azad, Dr. Amartya Sen, Perspectives of Paulo Freire on education of the oppressed and Ivan Illich on deschooling society **Module II: Issues related Education in India** Problems of availability, access and affordability; impact on enrolment and retention, Exclusion of migrant, tribal and other poverty groups, Gender and caste discrimination in education, Difficulties faced by children with disability. Issues related to Universalisation of education in India: School related factors-infrastructure, curriculum, teacher, employability. System related factors—commitment of state towards education as reflected in the financing of education, withdrawal of the state from education and growth of self-financing courses, private institutions and universities, commercialization of education. **Module III: Efforts to Improve the Educational System** UN statement on child's right to education. UNICEF, UNESCO, UNDP programmes, Millennium Development Goals. Government efforts – education policy from Kothari Commission to Right to Education Government efforts for the excluded and vulnerable groups- Adult Literacy programmes, Navodaya Vidyalaya, Ashram Schools, Sarva Shiksha Abhiyan, etc, Overview of Nongovernment efforts in education: **R**ight to education. Role of social worker in educational settings.	10 hours 10 hours 10 hours
Pedagogy:	Classroom teaching using Power point, charts and videos. Guest lecture, live projects and group discussions.	
Recommended Readings:	ANKUR, Field action report of the College of Social Work N.N. Mumbai.	

	Edutracks Series. 2004 Thinkers on Education, Hyderabad: Neelkamal Publications.	
	Gail Omvedt, 1976. Cultural Revolt in Colonial Society: The Non-Brahman movement in Western India, 1873-1930, Bombay: Scientific Socialist Education.	
	Ghosh SC, 2007. History of education in Ancient India, Jaipur: Rawat Publication,	
	India Ministry of HRD, Status report of literacy and post literacy campaign, Ashish Publishing House, New Delhi, 1993.	
	Karnath Pratibha and Rozario Joe, 2003. Learning Disabilities In India: Willing the Mind to Learn, Sage Publication, New Delhi.	
	Naik, J.P and Nurullah, 1974. A Student's History of Education India, (1800-1973), New Delhi: Macmillan and Co. of India Ltd.	
	NIEPA. 2000.India Education Report	
	Sharma S. P., 2005. Education and Human Development, New Delhi: Kanishka Publishing House.	
Learning Outcomes	Students will understand the educational system in India and the perspectives of Indian and western thinkers on education.	

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Programme: MSW
Course Title: SOCIAL WORK PRACTICE WITH YOUTH
Course Code: SWOGC3D
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1. To understand the concept of youth in India and its emerging patterns 2. To understand youth and development at national and global levels 3. To understand the essence of life skill education while working with youth	
Content:	**Module I: Situational Analysis of Youth** Concept, definition and characteristics of youth; Youth in India – location – urban, rural, tribal; Role – student, non-student, gender, class, religion, caste – analysis of situation of youth; Influence of socio- economic and political situation of youth. Emerging patterns of youth culture in contemporary Indian society: Concept of youth culture in a multicultural society. **Module II: Youth and Development** Construction of youthhood at the national and global levels: key ideas and debates on youth from several perspectives such as, social sciences, development studies, psychology, feminist ideology, human rights; youth in international political economy; Influence of societal systems on youth; Critical issues affecting youth in relation to their developmental roles and task: education, work, family, marriage and relationships; Youth culture: young people's participation, understanding and meanings of	5 hours 15 hours

	subcultures, life-styles, and identity; Youth and sexuality: sexual development and experiences; Sexual preferences, variations, roles, power, exploration, sex education, High risk behavior. Substance abuse, HIV/AIDS, Crime and violence, delinquency; Youth policy in Goa and National Youth Policy 2014 **Module III: Skills of Working with Youth** Issues related to their stage of development – Life Skills Education: AIDS Counselling, Substance Abuse, Peer Helping and Counselling; Understanding the concept of youth Identity and Culture; Schemes for youth [govt. and civil society initiatives]; Skills for working with youth at the individual, family, group levels. Mobilising Youth for Social Change Mobilisation and Collective Action: social action, capacity building and training programmes; youth and social movements; advocacy initiatives	10 hours
T**he Study Tour is a mandatory component for this subject.**		
Pedagogy:	Classroom lectures, group discussions, live projects, debates.	
Recommended Readings:	Ahuja, Ram 1996. Youth and Crime, Jaipur and New Delhi: Rawat Publications. Altbach, Philip G. 1970. The Student Revolution – A Global Analysis, Bombay: Lalvani Publishing House. Anthony, A. D'souza. 1979. Sex Education and Personality development, New Delhi : Usha Publication. Baja, Premed Kumar. 1992. Youth Education and Unemployment, New Delhi : Hashish Publishing Bajpai, P. 1992. Youth, Education and Unemployment. New Delhi: Ashish Publishing. Engene Morris, C (1956) Counselling with Young People, New York : Association Press. Erik H. Erikson (1965) The Challenge of Youth, New York : Doubleday and Com. Inc. Gore, M. S. (1977): Indian Youth. New Delhi: Vishwa Yuvak Kendra. Hassan, M. K. 1981. Prejudice in Indian Youth. New Delhi: Classical Publishing Jayaswal (1992) Modernization and Youth in India, Jaipur and New Delhi : Rawat Publications. Jayaswal, R. 1992. Modernization and Youth in India. Jaipur: Rawat Publications. Naidu, U. and Parasuraman, S. 1982. : Health Situation of Youth in India. Bombay: Tata Institute of Social Sciences. Nair, P. S., et al. 1989: Indian Youth: A Profile. New Delhi: Mittal Publications.	
Learning Outcomes	Students will develop skills to work with youth on different issues and knowledge about the situation of youth in India, the factors responsible for their socio-economic and political situation and governmental/civil society initiatives for youth development.	

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SPECIALIZATION 4: GENDER AND DEVELOPMENT (GEND)

Programme: Masters of Social Work (MSW)
Course Title: Women's Movement and Gender Issues in India

Course Code: SWOGC4A
Number of Credits: 4
Effective from Academic Year: 2022 – 2023

Course Prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	Beginning with the women's question in colonial India, to issues raised during the Independence movement, women's involvement in the Nationalist struggle for independence to the IWM post-Independence, this course takes students through the trajectory of the women's movement in the west and focuses on mapping the different phases and issues concerning the Indian Women's Movement (IWM). The birth of the Autonomous Women's Movement with the Towards Equality Report from individual achievements of women to contemporary women's issues and movements will be discussed.	
Content:	**Module 1:** Women as beneficiaries and in need of protection. Women's issues in colonial India: sati, bride price, child marriage and the concerns brought about with teenaged mothers, education, plight of widows, religious dedication and prostitution, etc. Social reform movement (Abbaka Rani, Rani of Jhansi, Anandi bai Joshi, Rasundari Devi, Rukmabai, Pandita Ramabai, Durgabai Deshmukh, Savitribai Phule, etc.). **Module 2:** Gandhi and Women. Participation in Nationalist movement. Women leaders. Post-Independence. **Module 3:** History of the women's movement in the west (First Wave, Second Wave and Third Wave). Towards Equality Report and the birth of the Autonomous Women's Movement. Women's issues, movements and growth of NGOisation. The journey from Welfare to Empowerment **Module 4:** Contemporary Movements and Issues, use of media, social media and women's movement	15 hours 15 hours 15 hours 15 hours
Pedagogy:	lectures/assignments /poster making/presentations/and discussions	
Recommended Readings:	Anagol Padma.2016. The Emergence of Feminism in India 1850 -1920. NY: Ashgate. Chaudhuri Maitrayee. 2005. Feminism in India: Issues in contemporary Indian Feminism Gandhi Nandita and Nandita Shah. 1992. *The Issues at Stake : Theory and Practice in the Contemporary Women s Movement in India*. New Delhi: Kali for Women. Gangoli Geetanjali.2007. *Law, Patriarchies and Violence in India*. USA: Ashgate. Jayawardena Kumari*. 2016. Feminism and Nationalism in the Third World. Verso Books.*	

	Kumar, Radha. 1993. The History of Doing 1800 – 1990. New Delhi: Kali for Women. Murthy Laxmi & Rajashri Dasgupta. 2013. Our Pictures, Our Words: A Visual Journey through the Women's Movement. New Delhi: Zubaan Sarkar. S & Tanika Sarkar (eds.).2008. Women and Social Reform in Modern India: A Reader, Indiana University Press
Learning Outcomes:	Students will understand the transitions within the Women's Movement and have a deeper understanding of present realities. Through the course, students will be enabled to develop a critical understanding gender concerns in India.

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Programme: Master of Social Work (MSW)
Course Title: Gender Interventions for Social Work Practice
Course Code:
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges.	
Objectives:	This course will introduce students to participatory methods and tools (including participatory reflection and action: PRA) to bring about change and the objective of this course is to encourage students to create campaigns, group dynamic games and other gender sensitization and gender analytical tools, as well as programmes for gender equality that can be used with various groups of stakeholders. Students will work on group projects as well as individual assignments. The students will be encouraged to use various media, address different target groups. This course is completely project based. Students will be expected to use the tools created for the target audience during their projects. The student in the final month of the course will self-assess the impact of the intervention created with guidelines followed for the assessment.	
Content:	**Module 1:** Feminist Social Work practice, social work interventions with individuals, families and community from gender perspective. Participatory Workshops to learn the use of different participatory tools: Social Mapping, Simulation games, group dynamic sessions, skits and songs, flexi flans, 3 pile sorting cards, story with a gap. Modelling tools to match target group. What is CSR? Project creation for CSR activities. **Module 2:** Intervention for Change and Tool Creation	15 hours 15 hours
Pedagogy:	Participatory Tools and Workshop Planning/ designing games for participatory learning/ Project implementation in the field /assignments/self-study/ group discussions/ presentations	
Recommended Readings:	Gender Analysis Framework: http://socialtransitions.kdid.org/sites/socialtransitions/files/resource/files/bk-gender-analysis-frameworks-010199-en.pdf Grambs Jean. 1976. Teaching About Women in the Social Studies : Concepts, Methods and Materials. Virginia: National Council for the Social Studies. http://hcfp.gov.in/downloads/manuals/Training_Manual_on_Gender_Sensitization.pdf http://ncw.nic.in/pdfreports/gender%20sensitization%20of%20police%20officers.pdf http://timesfoundation.indiatimes.com/articleshow/1254836.cms Murthy Ranjani K. 2001. Building Women`s Capacities. New Delhi: Sage Publications.	

	Participatory Planning for change: http://www.dfggmoi.gov.kh/documents/Learning-Theme-01/1-Handout/Module4-SA-Tools/Module4-8-SA-Tool-En/M4-1-Participatory-Planning-6-Handout-En.pdf Srinivasan Lyra. 1990. Tools for Community Participation: A Manual for Training Trainers in Participatory Techniques. UNDP PROWESS. Srinivasan Lyra. 1992. A Monograph for Decision Makers on Alternative Participatory Strategies	
Learning Outcomes:	1. The students will develop confidence to implement gender sensitive projects of their own creations in a variety of settings to bring about change. 2. Students will be able to develop their own projects that they can propose for CSR activities. 3. Students will develop creative and innovative games to translate facilitate participatory learning.	

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Programme: Master of Social Work
Course Title: INTERSECTIONAL PERSPECTIVES ON GENDER
Course Code: SWOGC4C
Number of Credits: 2
Effective from Academic Year: 2022 – 2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges
Objective:	The course will introduce students to the concerns of people on the margins of society and the intersectional impact of caste, class/ poverty, culture, disability, age and gender on the politics of exclusion, experiences of violence and exploitation. State affirmative action/initiatives for inclusion, theories of power politics, legal interventions and collective action will be discussed. The work of Ambedkar, Phule as well as the lesser heard voices of contemporary Dalit women.

Content:	**Module 1: Gender and Caste:** caste based work, caste discrimination and exclusion. Case studies of gender and religious conflicts in India, Women as targets, Women as custodians of community identity and honor. Politics of food.	10 hours
	Module 2: Gender and class/poverty	5 hours
	Module 3: Sex: Transgender Rights, Hijjara Community in India, NALSA Act. Recent debates and trends.	5 hours
	Module 4: Disability and Senior Citizens: Contemporary debates on rights, inclusion. Disability and gender, State response to disabled persons issues,legal interventions for persons with disability and for senior citizens	10 hours
Pedagogy:	lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Ambedkar BR, Annihilation of Caste, New Delhi: Critical Quest. Ambedkar BR, What the Congress and Gandhi have done to the Untouchables New Delhi: Critical Quest. Ambedkar, BR, Castes in India, New Delhi: Critical Quest. Baghel Indu. 2009. Dalit Women in Panchayati Raj. New Delhi: Jnanada Prakashan. Chakravarti Uma. 2003. Gendering Caste: Through a Feminist lens. Kolkata: Stree D Das and S B Agnihotri. 1998. Physical Disability: Is there a gender dimension. EPW Vol - XXXIII No. 52, September 26. Fraser Nancy, 1997. Recognition from Redistribution to Recognition? : Dilemmas of Justice in a "Post-socialist" Age. Chapter I in Justice Interruptus. New York: Routledge. http://ethicalpolitics.org/blackwood/fraser.htm Ghai Anita. 2015. Rethinking Disability in India. New Delhi: Routledge. Ghai, Anita. 2003 (Dis)embodied Form: Issues of Disabled Women. New Delhi: Har- Anand Publications. Gore, M.S. 1993. The Social Context of Ideology: Ambedkar's Social and Political Thought. New Delhi: Sage Publication	

Gupta Charu.2016.Gender of Caste: Representing Dalits in Print. University of Washington Press.

Guru Gopal. 2004. Dalit Cultural Movement and Dalit Politics in Maharashtra. Mumbai: Vikas Adhyayan Kendra,

Hans Asha. 2015. Disability. Gender and the Trajectories of Power. India: SAGE Publications.

International Classification of Functioning, Disability and Health. 2001. Geneva: WHO

Kelkar Govind. 1991. Gender and Tribe: Women, Land and Forests in Jharkhand. New Delhi: Kali for Women.

Majeed, Akhtar. 2002. Nation And Minorities India's Plural Society and Its Constituents, New Delhi: Kanishka Publishers.

Mani Kumar Kalanand & Fredrick Noronha.2008. Picture-Post Card Poverty, Unheard Voices Forgotten Issues from Rural Goa. Goa 1556.

Manju, Subhash. 1988. Rights of Religious Minorities in India, New Delhi: National Book Organisation.

Massey, I.P. 2002. Minority Right Discourse, Shimla: Indian Institute of Advanced Study.

Mehrotra Nilika. 2004. Women, Disabiltiy and Social Support in Rural Harayana. EPW. Vol - XXXIX No. 52, December 25.

Meyerowitz Joanne. 1980. How Sex Changed: A History of Transsexuality in the United States.
New Delhi: Kanishka Publishers.

Nongbri Tiplut. 2003. Development, Ethnicity and Gender: Select essays on Tribes in India. Jaipur: Rawat Publications.

Rajan, Nalini. 2002. Democracy and the Limits of Minority Rights, New Delhi: SAGE Publications.

Raju Saraswati.2011.Gendered Geographies: Space and Place in South Asia. Oxford University Press

Rao Anupama. Gender and Caste, New Delhi: Kali for Women and Book Review Literary Trust.

Rege Sharmila.2013. writing caste/writing gender: narrating dalit women testimonies. New Delhi: Zubaan.

	S Mitra and Usha Sambamoorthi. 2006. Employment of persons with Disabilities. EPW Vol- XLI No. 03 Jan 21. Sathyamurthy, T. 1996. Region, Religion, Caste, Gender and Culture in Contemporary India. Oxford: Oxford University Press. Shah Ghanshyam, 2001. Dalit Identity and Politics. New Delhi: Sage Publication. Teich Nicholas.2012. Transgender 101: A Simple Guide to the Complex Issue. Columbia University Press Thakur, R.N. 1999. Plight of the Minorites Problems and Grievances in their Education. New Delhi: Gyan Publishing House. Vempeny, Sebastian. 2003. Minorites in Contemporary India.India: Kanishka Publishing House
Learning Outcomes	1. The students will be introduced to theories on gender, inter-sectionality and difference with a focus on marginalized sections based on class, religion, caste, tribe, sex, age, and disability in particular. 2. The student will be taken on an overnight field trip to experience hardships faced by marginalized people.

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Programme: Masters of Social Work (MSW)
Course Title: GENDER CONCERNS IN GOA
Course Code: SWOGC4D
Number of Credits: 2
Effective from Academic Year: 2022 – 2023

Prerequisites for the course:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	This course will introduce the students to a critical understanding of gender issues in Goa post Liberation. Goa has experienced several changes which have had both negative as well as positive consequences for the society in general and women in particular. This course will look at the trajectory of issues that have emerged as well as the response of the state and women's organisations to these issues. The course will also aim to develop in the students the capacity to identify linkages between social issues, social needs, policies and programmes.	

Content:	**Module 1:** History of Women's Movement in Goa: Issues and Concerns. Women leaders in Goa's history. Understanding Goa from existing demographic data **Module 2:** Understanding Goa through issues raised by the Women's Movement in Goa. Women's movement response to tourism, mining, casinos, crimes against women and children, alcohol, etc. **Module 3:** Women in Goa: Law, custom, tradition and practices. **Module 4:** Contemporary women's movements. Social media: movements and challenges.	5 hours 10 hours 5 hours 10 hours
T**he Study Tour is a mandatory component for this subject.**		
Pedagogy:	lectures/assignments/case-study/Role Play/poster making/presentations/ group readings and discussions	
Recommended Readings:	Alvares Claude. 2002. *Fish curry and rice: A sourcebook on Goa, its ecology and life-style*. Goa: The Goa Foundation. Bailancho Saad. Issues of the *SAAD Newsletters* Desouza Shaila. 2005. *A Situational Analysis of Women and Girls in Goa*, (Monograph) New Delhi: National Commission for Women. *Goa State Development Report*, 2011, Planning Commission of India. *State of Goa's Health: A Report*, 2001. New Delhi and Sangath, Goa Voluntary Health Association of India.	
Learning Outcomes	1.The course will help students to understand the current scenario in India and to trace transitions within the Women's Movement. 2.Through the course, students will be enabled to develop a critical understanding of present society from a gendered lens and understand the growth of the women's movement in India and Goa in particular.	

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Specialisation 5 : Tribal Development

Programme: Masters of Social Work (MSW)
Course Title: Understanding Marginality and Tribal livelihood
Course Code: SWOGC5A
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges
Objective:	1. To understand marginalisation of tribal communities 2. To evaluate critically issued faced by tribal communities 3. To develop understanding of structural problems and conflicts of marginality

Content:	**Module I - Tribes and marginality,** Tribe, Adivasi, Indigenous People, History of Tribal India Pre Independence and Post Independence, Indigenous People International Convention, Politics of Inclusion and Exclusion, Fifth and Sixth Schedule Areas, NT DNT, Classification of tribal communities,	16hours
	Module II - Constitutional provisions, laws related to tribal communities, An Overview from Panchsheel to Tribal Sub-plan and Special Component Plan Minor Forest Produce (MFP); Special Commission for Tribes and their Roles, Evolution of Tribal Policy;	14 hours
	Module III Tribal movements,, Human rights conflicts and tribal communities, social and political conflicts affecting tribal communities. Intersectional discrimination of tribes,	14hours
	Module IV Analysis of Indian tribes with respect to land, food security, employment/livelihood, migration, displacement, Analysis of current tribal situation with respect to Human Development Indices. Environment, and tribal livelihood: issues and challenges, field visit to a tribal community, Community organization, social action, rural sustainable development, and tribal community	16 hours
Pedagogy:	Classroom learning with the use of PowerPoint, group discussion, workshops, tasks, and classroom assignments	
References/Readings	Arya, S. (1998). *Tribal Activism: Voice of Protest.* Primus Books. Gover, K. (2010). *Tribal Constitutionalism: States, Tribes and the Governance of Membership.* Oxford University press. Ghurye, G. S. (1959). *The Scheduled Tribes.* Mahana, R. (2019). *Negotiating Marginality Conflicts over Tribal Development in India.* Routledge. Shashi, Bairathi. *Tribal Culture, Economy and Health*. New Delhi: Rawat Publications Srivatsan, R. (2019). *Seva, Saviour and the State: Caste Politics, Tribal Welfare and Capitalist* . Routledge. Thakur, R.N. 1999. *Plight of the Minorities Problems and Grievances in their Education* , New Delhi: Gyan Publishing House. Vempeny, Sebastian 2003, *Minorities in Contemporary India*,	

	New Delhi: Kanishka Publishers.
Learning Outcomes	Students will be able to understand concepts related to marginality of tribal communities. Students will be equipped to understand dynamics of tribal livelihood in India

Programme: Masters of Social Work (MSW)
Course Title: Development and Tribal Rights
Course Code:
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1. To acquire skills to analyse development initiatives critically 2. To understand the intersection of development programs with the rights of tribal communities	
Content:	**Module I** Major Problems & Issues affecting tribal Groups- Land alienation, inequality, discrimination, Forest policy, Human rights violation, Tribal dislocation, Ecological degradation, Exploitation, Tribal economy and modern economy, **Module II** Health, education, family, culture; modern strategies vis a vis traditional indigenous knowledge, conflicts in perspectives.Tribal people and the issue of reservation regarding education, employment and politics Education as a means of empowerment, current education system and tribals – study of education initiatives for tribal communities. **Module III**; Policies and state interventions affecting tribal livelihood. Tribal Sub plan: provisions and critique, Forest rights, tribal welfare, human rights, Issues of Governance facing tribals, Globalisation, implementation of policies, and experiences of tribal communities **Module IV** Politics of Tribal Welfare and Development, Globalisation and Tribals, Labour relations and Exploitation, Displacement caused by development projects, Tribal communities' resistance to such development projects	16 hours 16hours 14hours 14 hours
Pedagogy:	Classroom learning with the use of PowerPoint, group discussion, film and documentary discussion, and classroom assignments	

References/Readings	Baviskar, A. (2009). *In the Belly of the River: Tribal Conflicts Over Development in the Narnada Vally.* Oxford University Press. Freire, P. 1969/1998. Education for critical consciousness. New York: Continuum Freire, P. 1990. *Pedagogy of the oppressed*. (M. B. Ramos, Trans.) New York: Continuum. Freire, P. .1998.. *Pedagogy of freedom: Ethics, democracy, and civic courage.* (P. Clarke, Trans.) Lanham, MD: Rowman and Littlefield Publishers, Inc. Jain, P. C. (2001). *Globalisation And Tribal Economy.* Jaipur Rawat Publication. Kelkar Govind. 1991. *Gender and Tribe*: Women, Land and Forests in Jharkhand. New Delhi: Kali for Women. Patkar, Medha. 1998. 'The people's policy on development, displacement and resettlement: Need to link displacement and development.'Economic and Political Weekly, 33(38): 2432–33. Prakash, A.. 2001. The Politics of Development and Identity. New Delhi: Orient Longman. Pandey, G. 1979. *Government's Approach to Tribal Development: Some Rethinking*, Prashasanika, 8 (1), 56-68, 1979 Rath, G. C. (2006). *Tribal Development In India.* Delhi: Sage Shah, V. P. (1985). *Social Contexts of Tribal Education.* Concept Publications. Singh, Ajit 1984. Tribal Development in India, Delhi: Amar Parkashan; Singh K.S. (ed.). Tribal Movements in India, Vol. I and II Shah, D.V.,1979. Education and social change among Tribal in India Shah, V. P. and Patel, T. 1985. Social Contexts of Tribal Education. New Delhi: Concept Publishing. Thakur R.N. 1999. Plight of the Minorities Problems and Grievances in their Education. New Delhi: Gyan Publishing House. Tribal Research and Training Institute. (2002). *Malnutrition Related Deaths Of Tribal Children In Nadurbar Dist. Of Maharashtra.* Tribal Research and Training Institute.
Learning Outcomes	Students will be able to understand impacts of social, political and economic development on tribal communities. Students will critically look at developmental programs and evaluate the need for sustainable approaches to development.

Programme: Masters of Social Work (MSW)
Course Title: Tribal Issues in India and Goa
Course Code:
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1. To understand issues faced by tribal communities in India 2. To identify issues faced by tribal communities in Goa	
Content:	**Module I** Adivasis in Chotanagpur: development displacement and resettlement, North Eastern India: State Identity, Autonomy, and Insurgency, Tribals in Andaman and Nicobar Islands, Livelihood, economic and social dimensions, Chattisgarh tribal communities and issues faced, **Module III:** case studies of economic development projects that have affected tribal communities, for eg: mining in Odisha, Chattisgarh, Displacement caused by the building of dams, roads, and wildlife sanctuaries. Tribal movements in Goa :Movement against Nylon66, Goa Bachao Abhiyaan, Anti SEZ movement, Goa's Tribal Agitation: UTAA. etc. **Module IV:** Conflicts and problems faced by tribal communities in India, marginalization, and othering of tribal communities, Contemporary issues of tribal communities in Goa, politics of classification of tribal communities, Wanarmare, Dhangar community; analysis of news reports.	14 hours 8 hours 8hours
Pedagogy:	Classroom learning with the use of PowerPoint, group discussion, film and documentary discussion, and classroom assignments	

References/ Readings	Akhup, A. (2015). *Identities and their Struggles in the North East.* Adivaani . Dhume, Anant, (1985), the cultural history of Goa from 1000 BC-1352 AD, published by panaji Ramesh Anant S. Dhume. Toppo, S. (1979). *Dynamics of Educational Development in Tribal India.* Classical Publication. Hooja, M. (2000). *Policies And Strategies For Tribal Development.* Jaipur Rawat Publication. Pereira, C. (2017). Religious dances and tourism: perceptions of the "tribal" as the repository of the traditional in Goa, India. Etnográfica, 125-152 Somasekhar, K. (2008). *Developmental Programmes and Social Change among the Tribals.* New Delhi: Serial Publications.
Learning Outcomes	Students will identify issues and concerns of tribal communities in India and Goa. Discussion on case studies of tribal issues will enable students to acquire knowledge on lives of tribal communities in Goa and India.

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Programme: Masters of Social Work
Course Title: Interventions for Empowering Tribal Communities
Course Code:
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objective:	1. To understand the process of empowerment keeping in focus tribal livelihood 2. To understand issues in process of empowering tribal communities 3. To acquire skills for creating interventions for tribal development 4. To implement professional social work practice for empowering tribal communities	
Content:	**Module I** Critical Social Work practice with Individuals, Groups and Communities, Anti oppressive social work practice. Approaches to Tribal Development: Right Based, Welfare Development & Empowerment	8 hours

	Module II Professional social work with tribal communities, community organizations empowering indigenous practices and culture**,** Social action, consciousness-raising, and tribal communities, understanding of contemporary tribal movements in India. Rural sustainable development **Module III** Advocacy; Social activism; Networking, Skills of individual and community conscientization processes; Understanding intersectional issues of gender, caste, class faced by tribal communities and the need for unique interventions for each community. Role of Non-Governmental Organisation (NGO) in tribal development, the role of local governance in tribal development	10 hours 12 hours
Pedagogy:	lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Bodhi, S. (2016). *Social Work in India Tribal an Adivasi Studies: perspectives from Within.* Adivaani. Capous-Desyllas, M., & Morgaine, K. (2015). *Anti-Oppressive Social Work Practice Putting Theory into Action.* SAGE. Dominelli, L. (2002). *Anti-Oppressive Social Work Theory and Practice.* Palgrave Macmilan. Kulkarni, M. (1974). *Problems of Tribal Development : A Case Study.* Parimal Narwani, G. S. (2004). *Tribal Law in India.* Jaipur Rawat Publication Vidyarthi, L. P. (ed.) 1981.*Tribal Development and its Administration*, New Delhi: Concept.	
Learning Outcomes	Students will acquire perspectives and skills to develop interventions for empowering tribal communities. Implementation of social work practice with focus on tribal communities.	

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Specialisation 6 : Working with people with disability

Programme: MSW

Course Title: Social Work Practice with families of persons with disability

Course Code: SWOGC6A

Number of Credits: 4

Effective from Academic Year: 2022-2023

Course prerequisite	**Registration in the MSW Programme at Goa University or its affiliated colleges**
Objective:	a) To develop understanding towards issues faced by family members of disabled persons b) To develop skills to work with families of disabled persons **c)** to develop sensitivity towards gender-specific concerns of disabled women

Content:	**Module 1:** working with families: Encouraging family-centred practices, parent self-efficacy belief and family involvement in child's learning and parenting, Encouraging family acceptance, Supporting family in fostering and developing communication and language, Involving family in fostering and developing play, recreation and values, Encouraging family involvement in educational programme and participation in community based rehabilitation programme	**20 hours**
	Module 2: Fostering family's acceptance of child's impairment and creating a positive environment: Identifying Family Needs for information, decision making, skill transfer and referral, Building parents' confidence for making informed choices and Advocacy, Supporting family in raising children, Facilitating availing of concessions, facilities and scholarship & other benefits, Encouraging family participation in self-help groups and family support networking.	**20 hours**
	Module 3: Needs and role of Family and Community: Parents- needs and responsibilities, Siblings- challenges and expectations, Peers and Extended family- role and responsibilities, Guidance and Counselling, Community participation and rehabilitation	**15 hours**
	Module 4: Gender and Disability: Gendered Experience of Disability - Public Domain: School and Outside School - Private and Familial Domain - Normalization and Social Role, Factors Contributing to Disability - Gender-Based Violence in School and Within Family - Traditional Practices, Sexual and Reproductive Health	**05 hours**

Pedagogy:	lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations
References/Readings	Disability Studies in India: Global Discourses, Local Realities. (2020). India: Taylor & Francis. Livock, R. (1995). Social Work in Community Care: Working with disabled people. Unit 12. United Kingdom: Open Learning Foundation Enterprises. French, S., Swain, J. (2011). Working with Disabled People in Policy and Practice: A Social Model. United Kingdom: Bloomsbury Publishing. Oliver, M., Sapey, B., Thomas, P. (2012). Social Work with Disabled People. United Kingdom: Bloomsbury Publishing. Disability Studies in India: Interdisciplinary Perspectives. (2020). Germany: Springer Singapore. Addlakha, R. (2011). Contemporary Perspectives on Disability in Indi. Germany: Lap Lambert Academic Publishing GmbH KG. Rummery, K. (2018). Disability, Citizenship and Community Care: A Case for Welfare Rights?. United Kingdom: Taylor & Francis.
Learning Outcomes	a) develop understanding on issues concerning family members of disabled persons b) to use the skills and knowledge of case work and counselling while working with disabled persons. **c)** Develop gender sensitivity towards disabled women**.**

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Programme: MSW
Course Title: Case Work with people with disabilities
Course Code: SWOGC6B
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite	**Registration in the MSW Programme at Goa University or its affiliated colleges**
Objective:	a) To acquire knowledge about disability and its different categories **b)** To develop case work and counselling skills to work with persons with disability

Content:	**Module 1:** What is disability? Meaning and Definition.Different categories of disability: Blindness and Low Vision, Hearing Impairment, Mental Retardation, Leprosy Cured, Neurological and Locomotor Disabilities, Learning Disabilities, Autism Spectrum Disorders, Multiple Disabilities and Various Combinations: Definition and Identification Incidence and Prevalence , Characteristics, Causes and Prevention, Intervention and Educational Programmes	**20 hours**
	Module 2: Basic Developmental Psychology: Development stages - Physical, social, cognitive, language, emotional and moral. Developmental delays and their implications in the life cycle. Adaptive deficits - self-help areas, emotional, social cognitive and language areas.	**20 hours**
	Module 3: Scope, field and role of social worker for working with disabled persons. Principles, Methods, skill and techniques to work with different categories of disabled persons: Working with disabled children, working with disabled youth, working with disabled adults and working with disabled senior citizens counselling and case work principles, skills and techniques to work with persons with disability	**20 Hours**
Pedagogy:	**lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations**	
References/Readings	Kottler Jeffery A., David S. Shepard. 2008. Counselling Theory and Practice (Ist Edition).Mathew, Grace. 1992. *An Introduction to Social Case Work*, Bombay: Tata Institute of Social Sciences. Disability Studies in India: Interdisciplinary Perspectives. (2020). Germany: Springer Singapore. Flynn, R., Marks, D. (2003). Working with Children and Families: Topic 12 : Living and Working with Disabled Children. United Kingdom: Open University. Wilson, S. (2017). Disability, Counselling and Psychotherapy: Challenges and Opportunities. United Kingdom: Bloomsbury Publishing. The SAGE Handbook of Counselling and Psychotherapy. (2017). United Kingdom: SAGE Publications. Simcock, P., Castle, R. (2016). Social Work and Disability. United Kingdom: Wiley.	

Learning Outcomes	a) to use the case work and counselling skills while working with persons with disability and significant others. **b)** to incorporate knowledge on disability and development psychology in practice

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Programme: MSW
Course Title: Disability Rights and Laws
Course Code: SWOGC6C
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite	**Registration in the MSW Programme at Goa University or its affiliated colleges**	
Objective:	a) to develop sensitive towards needs for special provisions for persons with disability b) to acquire legal knowledge and learn laws and acts relevant for disabled persons	
Content:	**Module 1:** Need and types of reservations for disabled persons: Education, employment and promotions, Understanding Public infrastructure designs to suit different categories of disabled persons, Understanding Referral agencies, linkages, networking and follow-up, Need for interdepartmental linkages at State and national levels in the services for disabled persons Human Right-based Approach and Disability: Principles of Human Rights - Equality and Non-Discrimination - Universality & Inalienability - Participation and Inclusion - Accountability and Rule of Law, Elements of Human Rights System - Legal Framework - Institutions - Development Policies & Programs - Public Awareness - Civil Society **Module 2:** Rights and Laws: Constitutional rights of Persons with disability, The Rehabilitation Council of India Act, 1992, The Person with Disability Act, 1995. The National Trust of Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities Act, 1999, National Policy for Persons with Disability Act, 2006, Declaration on the Rights of Mentally Retarded Persons, Provisions for Persons with Disability in Sarva Shiksha Abhiyaan, 2000, Right to Education Act, 2006	**15 hours** **15 hours**

Pedagogy:	**lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations**
References/Readings	Working Futures? Disabled People, Policy and Social Inclusion. (2005). United Kingdom: Policy Press. Ahmed, R. (2015). Rights of Persons with Disability in India. India: White Falcon Publishing Solutions LLP. Kothari, J. (2012). The Future of Disability Law in India: A Critical Analysis of the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995. India: OUP India. Status of Disability in India-2000. (2000). India: Rehabilitation Council of India.
Learning Outcomes	a) to use the legal knowledge for advocacy and while working with persons with disability **b)** to develop sensitivity towards need to reservations while working with persons with disability

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Programme: MSW
Course Title: Mapping Interventions for Persons with Disability
Course Code: SWOGC6D
Number of Credits: 2
Effective from Academic Year: 2022-2023

Course prerequisite	**Registration in the MSW Programme at Goa University or its affiliated colleges**
Objective:	a) to understand existing interventions for persons with disability b) to develop new modules and tools while working with disabled.

Content:	**Module 1:** Inclusive Education: Marginalisation vs. Inclusion: Meaning & Definitions: Changing Practices in Education of Children with Disabilities: Segregation, Integration & Inclusion, Diversity in Classrooms: Learning Styles, Linguistic & Socio-Cultural Multiplicity , Principles of Inclusive Education: Access, Equity, Relevance, Participation & Empowerment Barriers to Inclusive Education: Attitudinal, Physical & Instructional Rehabilitation of disabled persons: Vocational training and higher education , Employment: Open, supported, sheltered, Mental health in transition, Self-disclosure and Advocacy, Preparedness for Adulthood **Module 2:** Community based interventions: Educating and creating awareness, Creating sensitization, Advocacy, Focussed group discussion and Corporate social responsibility. Existing best practices: Global, National and local Developing tools, IEC material, games, awareness session modules for working with disabled persons (Practice Based Learning)	**15 hours** **15 hours**
T**he Study Tour is a mandatory component for this subject.**		
Pedagogy:	**lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations**	
References/Readings	**Disability Studies in India: Global Discourses, Local Realities. (2020). India: Taylor & Francis.** **Interrogating Disability in India: Theory and Practice. (n.d.). India: Springer India.**	
Learning Outcomes	**a) learn and adopt from existing best practices for disabled group** **b) develop new tools for interventions**	

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SEMESTER IV
Programme: MSW
Course Title: SPECIALIZATION SPECIFIC FIELD WORK PRACTICUM
Course Code: SWRSOC3
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration in the MSW Programme at Goa University or its affiliated colleges	
Objectives:	a) To develop skills to effectively use the integrated approach to problem solving and enhance skills of intervention, at the micro and the macro levels of the systems, in relation to the needs and problems of the client system. b) To develop skills to organize people to meet their needs and solve their problems use roles appropriate to work e.g. advocacy for child's right, human rights and women's rights etc. c) To develop the ability to carry out tasks in relation to service delivery and programme management. Routine administration, staff supervision, and training; prepare project proposals and enhance skills in documenting. d) To develop the ability to make innovative contributions to the organization's/ communities functioning. e) To develop recording skills (both process and summary) as a tool for learning and growth as a Social Work Practitioner.	
Content:	The student should function confidently as a representative of the organization with respect to tasks undertaken. Guide junior colleagues/volunteers to develop skills. Provide leadership in specific tasks in the team of social workers as well as in the inter-disciplinary teams. Task: ● Encourage learner involvement in programmes for social issues/concerns, and projects. ● Prepare proposals for new programmes at the agency. ● Develop skills for evaluation of programmes, prepare reviews, and document. ● Develop skills to guide and train various groups connected with your field work setting – Volunteers, members of	
Pedagogy:	Practical skill development	
Learning Outcomes	Students will develop the skill and sensitivity for field work practice	

Programme: MSW
Course Title: RESEARCH PROJECT DISSERTATION
Course Code: SWDSD
Number of Credits: 16
Effective from Academic Year: 2022-2023

Course prerequisite	Registration in the MSW Programme at Goa University or its affiliated colleges
Content:	Research Project Work is mandatory for all students of the Programme. As part of the Course Structure of the Masters of Social Work, writing a research project would be based on field data under the guidance of a Faculty Member in the Institution. The Research Project Proposal is submitted in Semester 3. The DC will review research proposals and decide allocation of Research Guides. The final research project dissertation will be submitted in Semester IV on a date that is decided by the DC. The relevant GU Ordinance will govern Dissertation.

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D 3.20 Minutes of the Board of Studies in Women's Studies meeting held on 21.04.2022.

Annexure I

GOA UNIVERSITY
Sub P.O. Goa University, Taleigao Plateau, Goa 403 206

WOMEN'S STUDIES PROGRAMME
MANOHAR PARRIKAR SCHOOL OF LAW, GOVERNANCE AND PUBLIC POLICY

M.A. Syllabus following the Choice-based Credit System
IN LINE WITH NEP 2020
Total credits 80 credits

About Women's Studies:
Women's Studies in India, is an interdisciplinary field of feminist scholarship designed to facilitate critical thinking and develop new knowledge, to help students understand the creation and perpetuation of inequalities with the intention to develop in students the capacity and skills to bring about change, create new areas of service and to ultimately impact policy and the discourse on women's development in the country. The programme also aims at creating research capacities for students to engage with the academic discipline of Women's Studies using a variety of pedagogical tools including field practice to understand social realities.

Prerequisites for Admission:
The prerequisite for admission into the M.A. Women's Studies Programme is the minimum prescribed percentage in a Bachelor's Degree in any subject and as per Goa University Ordinance for admission.

Semesters and Courses:
The School offers a two year M.A. Programme in the subject of Women's Studies taught over 4 semesters. The M.A. Programme is governed by Goa University Ordinances and in line with the National Education Policy 2020.

The Course and Credit Distribution:

Courses	**Codes**	**SEM1**	**SEM2**	**SEM3**	**SEM4**	**Total Credits**
Discipline Specific Core Course	DSCC	16	16			32
Discipline Specific Optional Course	DSOC	4	4			08
Research Specific Optional Course	RSOC			8	4	12
Optional Generic Course	OGC			12		12

Discipline Specific Dissertation	DSD				16	16
Total Credits		20	20	20	20	80

One Credit is 15 contact hours

The MA Programme in Women's Studies - Courses and Structure:

MA Women's Studies Programme		
Semester I		
Title of the Course	**Course Code**	**Credits**
Core Concepts in Women's Studies & Feminist Thought	WSDSCC1	4
Mapping the Women's Movement	WSDSCC2	4
Gender and Marginality	WSDSCC3	4
Women and Violence	WSDSCC4	4
One course from the list of WSDSOC	WSDSOC	4
Total Credits in Semester 1		**20**
Semester 2		
Title of the Course	**Course Code**	**Credits**
Gender, Development and the State	WSDSCC5	4
Women's Health Critical Debates	WSDSCC6	4
Gender Human Rights and Law	WSDSCC7	4
Gender-Sensitive Interventions for Change	WSDSCC8	4
One course from the list of WSDSOC	WSDSOC	4
Total Credits in Semester 2		**20**
Semester 3		
Title of the Course	**Course Code**	**Credits**
Doing Feminist Research	WSRSOC1	4
Research Methods and Academic Writing	WSRSOC2	4
One course from the list of WSOGC	WSOGC	4
One course from the list of WSOGC	WSOGC	4
One course from the list of WSOGC	WSOGC	4

Total Credits in Semester 3		**20**
Semester 4		
Title of the Course	**Course Code**	**Credits**
Field Work Skills and Practice	WSRSOC3	4
Dissertation	WSDSD	16
Total Credits in Semester 4		**20**
Total Credits in all 4 Semesters of the MA Women's Studies Programme		**80**

WOMEN'S STUDIES DISCIPLINE SPECIFIC CORE COURSES (COMPULSORY)

Course Code	Course Title	Number of Credits
WSDSCC1	Core Concepts in Women's Studies and Feminist Thought	4
WSDSCC2	Mapping the Women's Movement	4
WSDSCC3	Gender and Marginality	4
WSDSCC4	Women and Violence	4
WSDSCC5	Gender, Development and the State	4
WSDSCC6	Women's Health: Critical Debates	4
WSDSCC7	Gender, Human Rights and Law	4
WSDSCC8	Gender-Sensitive Interventions for Change	4

WOMEN'S STUDIES DISCIPLINE SPECIFIC OPTIONAL COURSES

Course Code	Course Title	Number of Credits
WSDSOC1	Gender and Culture	4
WSDSOC2	A Gender Review of Literature	4
WSDSOC3	Gender and Education	4
WSDSOC4	Demography, Labour, Work and Gender	4

WOMEN'S STUDIES RESEARCH SPECIFIC OPTIONAL COURSES

Course Code	Course Title	Number of Credits
WSRSOC1	Doing Feminist Research	4
WSRSOC2	Research Methods and Academic Writing	4

WSRSOC3 - Field Work Skills and Practice 4

WOMEN'S STUDIES OPTIONAL GENERIC COURSES

Course Code	Course Title	Number of Credits
WSOGC1 - Re-reading History: Feminist Perspectives		4
WSOGC2 - Gender and Political Processes		4
WSOGC3 - Gender, Environment and Ecology		4
WSOGC4 – Gender and Media		4
WSOGC5 – Entrepreneurship and Empowerment		4
WSOGC6* – Core Concepts in Women's Studies and Feminist Thought		4
WSOGC7* – Mapping the Women's Movement		4
WSOGC8*- Gender and Marginality		4
WSOGC9* – Women and Violence		4

The courses that are starred* are DSCC for those registered in the MA Women's Studies Programme in Semester 1 but may be OGC for other MA students registered at Goa University

WOMEN'S STUDIES DISCIPLINE SPECIFIC DISSERTATION (AS PER GU ORDINANCE)

Course Code	Number of Credits
WSDSD	16

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M.A. WOMEN'S STUDIES COURSE OUTLINES
WOMEN'S STUDIES DISCIPLINE SPECIFIC CORE COURSES (COMPULSORY)

Programme: M. A Women's Studies
Title of the Course: CORE CONCEPTS IN WOMEN'S STUDIES AND FEMINIST THOUGHT
Course Code as Discipline Specific Core Course: WSDSCC1
Course Code as Optional Generic Course: WSOGC6
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite:	
WSDSCC1:	Registration in the MA Women's Studies Programme
WSOGC6:	Registration in any Masters Programme at Goa University
Objectives:	This course will introduce students to the discipline of Women's Studies, the key concepts and the development of feminist thought around the world.

Content:	**Module 1:** History of Women's Movement and the emergence of Women's Studies, development of Women's Studies and its significance in the Indian context - nomenclature of Women's Studies /Gender Studies/ Family Studies, etc. **Key Concepts:** Equality**,** *Nature-Nurture Debate,* Sex and Gender, Stereotyping and Essentialism, Patriarchy and Masculinity, Equity,	20 hours
	Module 2: Feminism, The Wave Theory, Early developments in feminist thought: Liberal, Radical, Socialist, Marxist feminism. Parallels and points of difference. **Key Concepts:** Power, Strategic Needs vs. Practical Needs of Women, Access and Control, Levels of Gender Consciousness.	20 hours
	Module 3: Intersectionality (caste, class, sexual orientation, disability, etc.), black feminist thought, dalit feminism, Queer theory, contemporary developments in feminist thought, Post-modern feminism. **Key Concepts:** Intersectionality, Backlash	20 hours
Pedagogy:	lectures/assignments/ games/ films and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Bhagwat Vidyut. 2004. Feminist Social Thought. Jaipur: Rawat Publications. Bhasin Kamla. 1993. What is Patriarchy? New Delhi: Kali for Women. Bhasin Kamla and Nighat Said Khan. 1986. Some Questions on Feminism and its Relevance in South Asia. New Delhi: Kali for Women. Bhavnani Kumkum et al. 2006.Feminist Futures. New Delhi: Zubaan. Butler, Judith. 1990.Gender Trouble: Feminism and subversion of an Identity. Routledge Chaudhuri Maitrayee.2004. Feminism in India. New Delhi: Kali for Women Clough P.1994. Feminist Thought. Oxford: Blackwell. Connel, R. 2009. Gender. Cambridge: Polity Press Davis Kathy. 2006. Handbook of Gender and Women's Studies. London: Sage. Eagleton Mary. 2003. A Concise Companion to Feminist Theory. Malden, MA: Blackwell. Freedman Jane. 2002. Feminism. New Delhi: Viva Books. Gould Carol C. 1999. Gender: Key Concepts in Critical Theory. New York: Humanity Books. Heckman, Susan.1990. Gender and Knowledge: Elements of Postmodern Feminism, Polity Press: Cambridge. John Mary. 1996. Discrepant Dislocations: Feminism, Theory and Postcolonial Histories. Delhi: Oxford University Press.	

	Lorber Judith. 1991. The Social Construction of Gender. London: Sage McCann Carole Ruth, Kim Seung-Kyung. 2012. Feminist Theory Reader. New York: Routledge. McHugh Nancy Arden. 2007. Feminist Philosophies A-Z. Edinburgh: Edinburgh University Press. Pilcher Jane. 2005. Fifty concepts in Gender Studies. London: Sage. Ray Raka.2012. Handbook of Gender. New Delhi: Oxford University Press. Tong, Rosemary & Tina Fernandes B. 2018. Contemporary Feminist Thought: A More Comprehensive Introduction. New York: Westview Press V. Geetha. 2002. Gender. Kolkata: Stree. V. Geetha. 2007. Patriarchy. Kolkata: Stree
Learning Outcomes	1. Students will understand basic concepts in women's studies and the relevance of women's studies as an academic discipline. 2. Students will understand feminism, feminist theories, recent developments in feminist thought and will explore the future of feminism.

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Programme: M. A Women's Studies
Title of the Course: MAPPING THE WOMEN'S MOVEMENT
Course Code as Discipline Specific Core Course: WSDSCC2
Course Code as Optional Generic Course: WSOGC7
Number of Credits: 4
Effective from Academic Year: 2022-2023

Course prerequisite: WSDSCC2: WSOGC7:	Registration in the MA Women's Studies Programme Registration in any Masters Programme at Goa University	
Objectives:	This course will introduce students to the history of liberty, equality, freedom and justice and take the students through the trajectory of the women's movement in the west and will focus on mapping the different phases of the Indian Women's Movement (IWM). Beginning with the emergence of the women's question in colonial India, to issues raised during the Independence movement and women's involvement in the Nationalist struggle for independence, this course will take students through the journey of the IWM post-Independence to the birth of the Autonomous Women's Movement from individual achievements of women to women's issues and movements.	
Content:	**Module 1:** Tracing the history of liberty, equality, freedom and justice. Waves of the Feminist Movement in west; (First Wave, Second Wave and Third Wave). **Module 2**: Women as beneficiaries and in need of protection. Women's issues in colonial India: sati, bride price, child marriage and the concerns brought about with teenaged	15 hours 15 hours

	mothers, education, plight of widows, religious dedication and prostitution, etc. Social reform movement and women in colonial India (Abbaka Rani, Rani of Jhansi, Anandi bai Joshi, Rasundari Devi, Rukmabai, Pandita Ramabai, Durgabai Deshmukh, Savitribai Phule, etc.) **Module 3:** Gender and the Nation. Gandhi and Women. Participation in Nationalist movement. Women leaders. Post-Independence and the birth of the Autonomous Women's Movement. Women's experience of social and political post colonial movements in India Women's issues, movements and growth of NGOisation. Dalit feminist movements and questions within feminist movements – navigating leadership and agenda of women's movement. Women's movement and impact on policy and laws, Social media: movements and challenges. Student Protests, Sexuality, LGBTQ Movements, Menstrual Activism, Anti CAA protests, and other contemporary movements. **Module 4: Goa:** History of Women's Movement in Goa: Issues and Concerns. Mapping the Contemporary women's movements in Goa through news and social media.	15 hours 15 hours
Pedagogy:	lectures/assignments/self-study/Role Play/poster and album making/presentations/ group readings and discussions	
Recommended Readings:	Alvares Claude. 2002. Fish curry and rice: A sourcebook on Goa, its ecology and life-style. Goa: The Goa Foundation. Bassentt Susan. 1986. Feminist Experience: The Women s Movement in Four Cultures. London: Allen and Unwin. Bystydzienski Jill M and Sekhon Joti (eds.) Democratization and Women's Grassroots Movements. 2002. New Delhi: Kali for Women. Desouza Shaila. 2005. A Situational Analysis of Women and Girls in Goa, (Monograph) New Delhi: National Commission for Women. Faganis Sondra. 1994. Situating Feminism: From Thought to Action. London: Sage. Forbes Geraldine. 1999. Women in Modern India. Cambridge University Press. Forbes Geraldine. 2005. Women in Colonial India: Essays on Politics, Medicines and Historiography. New Delhi: Chronicle Books. Gandhi Nandita and Nandita Shah. 1992. The Issues at Stake : Theory and Practice in the Contemporary Women s Movement in India. New Delhi: Kali for Women. Goa State Development Report, 2011, Planning Commission of India. Jayawardena Kumari. 2016. Feminism and Nationalism in the Third World. Verso Books. Khullar Mala. 2005. Writing the Women's Movement a Reader. New Delhi: Zubaan.	

Additional Readings	Krishnraj Maitryi.2012. The Women's Movement in India: A 100 year History. India: Social Change Vol. 42 (3) Sage, 325-333. Kumar, Radha. 1993. The History of Doing 1800 – 1990. New Delhi: Kali for Women. Murthy Laxmi & Rajashri Dasgupta. 2013. Our Pictures, Our Words: A Visual Journey through the Women's Movement. New Delhi: Zubaan Sarkar. S & Tanika Sarkar (eds.).2008. Women and Social Reform in Modern India: A Reader, Indiana University Press Spender Dale.1983.There's Always Been a Women's Movement this Century. London: Pandora Press. State of Goa's Health: A Report, 2001. New Delhi and Sangath, Goa Voluntary Health Association of India. The State and the Women s Movement in India : A Report. 1995. New Delhi: Indian Association of Womens Studies. Wilson Elizabeth.1986. Hidden Agendas: Theory, Politics and Experience in the Women's Movement. London: Tavistock Publications. Zubaan Archive. 2006. Poster Women: A Visual History of the Women's Movements in India. New Delhi. Agnihotri Indu and Vina Mazumdar. 1995.'Changing terms of Political Discourse: Women's Movement in India 1970s – 1990s' EPW, Vol. XXX, No.29, July 22. Bailancho Saad. Issues of the SAAD Newsletters Kannabiran K, ' The Judiciary, Social Reform and Debate on Religious Prostitution in Colonial India', in Economic and Political Weekly, VOl.30, No. 43,1995.pp WS59-WS.
Learning Outcomes:	1.The course will help students to understand the current scenario in India and to trace transitions within the Women's Movement. 2.Through the course, students will be enabled to develop a critical understanding of present society from a gendered lens and understand the growth of the women's movement in India and Goa in particular.

Programme: M. A. Women's Studies
Title of the Course: GENDER AND MARGINALITY
Course Code as Discipline Specific Core Course: WSDSCC3
Course Code as Optional Generic Course: WSOGC8
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite: WSDSCC3: WSOGC8:	Registration in the MA Women's Studies Programme Registration in any Masters Programme at Goa University
Objectives:	The course will discuss identity politics, exclusion and state affirmative action/initiatives for inclusion. Theories of power politics and collective action. Students will be given an exposure to the work of Ambedkar, Phule as well as the lesser heard voices of women in history and contemporary

	Dalit feminist writings. The course covers the canvas of cultural oppression, ethnic conflict and violence, class exploitation, poverty and disabled persons rights from a gendered lens.	
Content:	**Module 1:** Class and Religion: Identity politics, Recognition vs Redistribution. Women factory workers, Domestic Labour: Issues, challenges and lacunae in the law (Domestic Labour Act 2010), class exploitation, poverty and vulnerability, Case studies of gender and religious conflicts in India, Women as targets, Women as custodians of community identity and honor. Politics of food. **Module 2:** Intersectionality revisited. Caste and Tribes: Historical roots of caste: Work of Ambedkar and Phule. Caste and Gender. Contemporary Dalit voices. Issues of tribal women, Forest and Wildlife Acts vs Livelihood. Field Trip.Politics of tribal classification. **Module 3:** Sex: Transgender Rights, Hijjara Community in India, Section 377 and NALSA Act. Recent debates and trends.CALERI (Campaign for Lesbian Rights), PRIDE March, NAZ Foundation. **Module 4:** Disability and Senior Citizens: Contemporary debates on rights, inclusion. Disability and gender, State response to disabled persons issues, National policy for persons with Disability 2006 and contemporary schemes, Citizens Amendment Act (CAA)2019	15 hours 15 hours 15 hours 15 hours
Pedagogy:	lectures/assignments/self-study/ documentaries, films and discussion/ group readings and discussions/ presentations/ field trip	
Recommended Readings:	Ambedkar BR, *Annihilation of Caste*, New Delhi: Critica Quest. Ambedkar BR, *What the Congress and Gandhi have done t the Untouchables* New Delhi: Critical Quest. Ambedkar, BR, *Castes in India,* New Delhi: Critical Quest. Baghel Indu. 2009. *Dalit Women in Panchayati Raj*. Ne Delhi: Jnanada Prakashan. Chakravarti Uma. 2003. *Gendering Caste:* Through Feminist lens. Kolkata: Stree Fraser Nancy, 1997. Recognition from Redistribution t Recognition? : Dilemmas of Justice in a "Pos socialist" Age. Chapter I in *Justice Interruptus*. Ne York: Routledg http://ethicalpolitics.org/blackwood/fraser.htm Ghai Anita. 2015. *Rethinking Disability in India*. New Delh Routledge. Ghai, Anita. 2003 (Dis)embodied Form: Issues of Disable Women. New Delhi: Har- Anand Publications.	

Additional Readings

Gore, M.S. 1993. *The Social Context of Ideology: Ambedkar Social and Political Thought*. New Delhi: Sag Publication

Gupta Charu.2016.Gender of Caste: Representing Dalits i Print. University of Washington Press.

Guru Gopal. 2004*. Dalit Cultural Movement and Dal Politics in Maharashtra*. Mumbai: Vikas Adhyaya Kendra,

Hans Asha. 2015. *Disability. Gender and the Trajectories o Power.* India: SAGE Publications.

International Classification of Functioning, Disability an Health. 2001. Geneva: WHO

Kelkar Govind. 1991. *Gender and Tribe*: Women, Land an Forests in Jharkhand. New Delhi: Kali for Women.

Majeed, Akhtar. 2002*. Nation And Minorities India's Plur Society and Its Constituents*, New Delhi: Kanishk Publishers.

Mani Kumar Kalanand & Fredrick Noronha.2008. Picture Post Card Poverty, Unheard Voices Forgotten Issue from Rural Goa. Goa 1556.

Manju, Subhash. 1988. *Rights of Religious Minorities i India,* New Delhi: National Book Organisation.

Massey, I.P. 2002. *Minority Right Discourse*, Shimla: India Institute of Advanced Study.

Meyerowitz Joanne. 1980. How Sex Changed: A History o Transsexuality in the United States.

New Delhi: Kanishka Publishers.

Nongbri Tiplut. 2003. *Development, Ethnicity and Gende Select essays on Tribes in India.* Jaipur: Rawa Publications.

Rajan, Nalini. 2002. *Democracy and the Limits of Minorit Rights*, New Delhi: SAGE Publications.

Raju Saraswati.2011.Gendered Geographies: Space an Place in South Asia. Oxford University Press

Rao Anupama. *Gender and Caste*, New Delhi: Kali fo Women and Book Review Literary Trust.

Rege Sharmila.2013. writing caste/writing gender: narratin dalit women testimonies. New Delhi: Zubaan.

Sathyamurthy, T. 1996. *Region, Religion, Caste, Gender an Culture in Contemporary India*. Oxford: Oxfor University Press.

Shah Ghanshyam, 2001. *Dalit Identity and Politics.* Ne Delhi: Sage Publication.

Teich Nicholas.2012. Transgender 101: A Simple Guide t the Complex Issue. Columbia University Press

Thakur, R.N. 1999. *Plight of the Minorites Problems an Grievances in their Education*. New Delhi: Gya Publishing House.

	Vempeny, Sebastian. 2003. *Minorites in Contemporar India*.India: Kanishka Publishing House D Das and S B Agnihotri. 1998. Physical Disability: Is there a gender dimens Vol - XXXIII No. 52, September 26. Mehrotra Nilika. 2004. Women, Disabiltiy and Social Support in Rural H *EPW*. Vol - XXXIX No. 52, December 25. S Mitra and Usha Sambamoorthi. 2006. Employment of persons with Di *EPW* Vol- XLI No. 03 Jan 21.
Learning Outcomes	1. The students will be introduced to theories on gender, inter-sectionality and difference with a focus on marginalized sections based on class, religion, caste, tribe, sex, age, and disability in particular. 2. The student will be taken on an overnight field trip to experience hardships faced by marginalized people.

Programme: M. A. Women's Studies
Title of the Course: WOMEN AND VIOLENCE
Course Code as Discipline Specific Core Course: WSDSCC4
Course Code as Optional Generic Course: WSOGC9
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite: WSDSCC4: WSOGC9:	Registration in the MA Women's Studies Programme Registration in any Masters Programme at Goa University
Objectives:	This course will introduce to issues of violence, masculinity and male identity and how forms of violence get legalized by social custom and tradition. The course will give an overview of different forms of violence from both a historical as well as global perspective. The different forms of violence, the evolution of society's response to that form of violence, the laws, programmes and services to address that form of violence will be discussed. The course will include concerns around domestic violence, rape, including custodial rape, intimate partner violence, honor related violence, violence against women as a weapon in war, pedophilia and child abuse, self-inflicted violence and suicide, female genital mutilation, molestation and teasing, trafficking and forms of violence that are not covered by the law. The aim of the course is to explore and problematize the connection between gender, sexuality, culture and violence.

Content:	**Module1:** Violence- a global pandemic. Gender based Violence- power and patriarchy. Violence, masculinity and male identity and how forms of violence get legalized by social custom and tradition (FGM),Violence begins before birth-infanticides and selective abortion. Subtle forms of gendered violence and cultural sanction. Violence Against Women & Intersectionality. Crimes against women as under the IPC, understanding the status from Statistics (NCRB)	20 hours
	Module 2: Different forms of Violence: dowry, domestic violence, rape, including custodial rape (Mathura Rape Case), intimate partner violence (Marital rape debate), honor related violence, violence against women as a weapon in war, pedophilia and child abuse, self-inflicted violence and suicide, female genital mutilation, molestation and teasing, trafficking.Sexual Harassment Against Women at Work	20 hours
	Module 3: Prevention and Direct Intervention Legal Initiatives to Address Violence Against Women. Nirbhaya and after: Legal Interventions, Criminal Amendment Act, society's response, role of media, services and programmes	10 hours
	Module 4: Violence and media reporting, various case studies (National and Local) Indecent Representation of Women and trolling.	10 hours
Pedagogy:	lectures/assignments/self-study/ documentaries and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Agnes Flavia. 2008, 'My Story… Our story of rebuilding broken lives, Forum Against Oppression of Women (F.A.O.W) Butalia, Urvashi. 1998. *'Other side of Silence:Voices from Partition'* New Delhi: Peinguin. Butalia, Urvashi. 2002. 'Confrontations and Negotiation: The Women's Movement Responses to Violence against Women' in Kapadia kiran(ed.) *The Violence of Development.* New Delhi: Palgrave, Macmillan. Chandiramani Radhika and Geetanjali Misra. 2008. *Sexuality, Gender and Rights*. New Delhi: Sage. Chatterjee Partha. 2002. *Community, Gender and Violence*. Delhi: Permanent Black. Chaudhari prem. 2007. *Contencious Marriage/Eloping Couples: Gender Caste and Patriarchy in Northern India*. New Delhi, OUP. Connell R. 1995. *Gender and Power: Society, the Person and Sexual Politics*. Cambridge: Polity Press. D'cruze Shani and Anupama Rao. 2005. *Violence, vulnerability and embodiment*. Oxford : Blackwell. Datar Chhaya.1995.*Struggle Against Violence, Calcutta, Stree.* Hossain Sara. 2006. *`Honour`*. New Delhi:Zubaan.	

Additional Readings	Kannabiran Kalpana. 2005., *Violence of Normal Times, New Delhi: Women Unlimited.* *Menon Nivedita.* 2004. *Recovering Subversion: Feminist Politics Beyond the Law, New Delhi: Sage.* Meyers Meryan. 1998. *News Coverage on Violence Against Women: Engendering Blame.Sage* Renzetti, Claire M., Edleson, Jeffrey L., Bergen, Raquel Kennedy. 2012. *Companion reader on Violence against Women*. New Delhi: Sage. Renzetti, C. M., Edleson, J. L., & Bergen, R. K. (Eds.). (2011). Sourcebook on violence against women (2nd ed). SAGE Publications Ruehl Sonja. 1983. *The Changing Experience of Women : Unit 4 Sexuality*. Milton Keynes: The Open University Press. Storkey, E. (2018). Scars across humanity: Understanding and overcoming violence against women. InterVarsity Press. Teltumde A.2008. *Khairlanji: A Bitter Crop, New Delhi: Navyana* Bograd, M. (1999). Strengthening Domestic Violence Theories: Intersections of Race, Class, Sexual Orientation, And Gender. *Journal of Marital and Family Therapy*, *25*(3), 275–289 Rehn, E., & Johnson-Sirleaf, E. (2002). Women, war, peace: The independent experts' assessment on the impact of armed conflict on women and women's role in peace-building. UNIFEM Qutab, S. (2012). Women Victims of Armed Conflict: Half-widows in Jammu and Kashmir. *Sociological Bulletin*, *61*(2), 255–278
Learning Outcomes	1. The students will be able to explore the relationship between cultural construction of masculinity and the perpetuation of violence against women and other sexual minorities. 2. Students will be informed about the various forms of violence against women and the politics of its normalization in a patriarchal society. 3. Students will be able to critique the media's handling of issues of crimes against women. 4. Students will also be able to critically assess the responses of state to the violence against women.

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Programme: M. A Women's Studies
Title of the Course: GENDER, DEVELOPMENT AND THE STATE
Course Code for Discipline Specific Core Course: WSDSCC5
Number of Credits: 4
Effective from Academic Year: 2022 – 2023

Course prerequisite:	Registration in the MA Women's Studies Programme
Objectives:	This course will introduce students to development concepts and debates and the perspective of engendering development. Students will be introduced to the politics of development in India, gender analysis frameworks, (gender blind, gender neutral and gender redistributive policies), gender mainstreaming and gender budgeting. This course will also

	introduce the students to a critical understanding of gender issues in Goa in particular as well as the response of the state and women's organisations to these issues. The course will also aim to develop in the students the capacity to identify linkages between social issues, needs, policies and programmes. Case studies of tourism and mining and other local development projects in Goa will be analysed.	
Content:	**Module 1:** Concepts of Development and Underdevelopment. Theories of Development: Modernization theories, Dependency Theory. Women in/and Development (WID and WAD), Gender and Development (GAD). The 4th World Conference on Women held in Beijing, China in 1995- Platform for Action and the emergence of the empowerment approach to women's development-Evaluation. Women Empowerment: Meaning, concepts and objectives of women empowerment. The Five-Year Plans Towards Equality- National Policy for Women. Structural Adjustment Programme. Globalization and Women in India	15 hours
	Module 2: Women and land rights- Women's Land Inheritance in India. Work and Gender Relations- formal and informal labour, Feminization of labour. Issues of livelihood and gender,feminization of poverty, female headed household. MDGs, Gender and Sustainable Development Goals, and its critique. HDI, Gender Related Development Index	15 hours
	Module 3: Gender analysis frameworks, gender mainstreaming and gender budgeting. Analyzing policy and programme: Gender blind, gender neutral and gender redistributive policies. Development Policy in India: Five year plans, NITI Aayog, National Commission for Women, Ministry of Women and Child Development, Mahila Shakti Kendra, State Policies and Programmes for Women. Women and micro-finance policies, Self Help Groups - a critique.	15 hours
	Module 4: Analyzing Goa's budget, Gender and Development Policy in Goa: Analyzing Tourism policy, Mining, Construction, casinos, alcohol, SEZ, Regional Plan, Nylon 66, Mopa Airport, and contemporary issues	15 hours
Pedagogy:	lectures/assignments/self-study/ group reading and discussions/ audio-visuals.	
Recommended Readings:	Afshar Haleh.1991.Women, Development and Survival in the Third World. London: Longman. Agarwal Bina et.al. 2007.Capabilities, Freedom & Equality: Amartya Sen's work from a Gender Perspective. Oxford University Press. Alvares Claude. 2002. Fish curry and rice: A sourcebook on Goa, its ecology and life-style. Goa: The Goa Foundation.	

Additional Readings	Baviskar Amita.2004. In the Belly of the River: Tribal Conflicts over Development in the Narmada River. Oxford University Press. Black, M. (2007). The no-nonsense guide to international development (2. ed). New Internationalist. Boserup Ester. 2007(Reprint). Women's Role in Economic Development.USA: Earthscan. Das Bhaswati. 2009. Gender Issues in Development. Jaipur: Rawat Publications. Department of Women's Studies, Goa University.2018. Course pack on Development Elson, D. (2006). Budgeting for women's rights: Monitoring government budgets for compliance with CEDAW. United Nations Development Fund for Women. Eswaran Mukesh.2014. Why Gender Matters in Economics. Princeton University Press. Golombok Susan. 1994. Gender Development. Cambridge: Cambridge University Press. Gupta Amit. 1986.Women and Society: The Developmental Perspective. New Delhi: Criterion Publications. Heptulla Najma. 1992. Reforms for Women: Future Options. New Delhi: Oxford & IBH. Kalpagam U. 2011.Gender and Development in India. Jaipur: Rawat Publications. Kapadia Karin. 2003. The Violence of Development. New Delhi : Zubaan. Kaur, A. (Ed.). (2004). Women workers in industrialising Asia: Costed, not valued. Palgrave Macmillan. Krishna Sumi. 2003. Livelihood and Gender: Equity in Community Resource Management. New Delhi: Sage. Momsen, J. H. (2004). Gender and development. Routledge. Phadke Shilpa et.al. 2011. Why Loiter? Women and Risk on Mumbai Streets. New Delhi: Penguin. Rai Shirin. 2008.The Gender Politics of Development. New Delhi: Zubaan. Samyukta A Journal of Women's Studies 2005, Vol 5(1) Singh Navsharan and Maitrayee Mukhopadhyay. 2007. Gender Justice, Citizenship Development. Zubaan. Tsikata Dzodzi and Pamela Golah. 2010. Land Tenure, Gender, and Globalisation. New Delhi Zubaan and IDRC. UNDP 2016. How to Conduct a Gender Analysis. Vishvanathan, Nalini et al (eds.)1998.The Women, Gender and Development Reader. London: Zed Books. World Bank. 2002. Engendering Development. Oxford: Oxford University Press. Kelkar, Govind. 2005. Development Effectiveness through Gender Mainstreaming. EPW Vol XLno.44-45. Summerfield, G. (1997). Economic Transition in China and Vietnam: Crossing the Poverty Line is Just the First Step for Women and Their Families. Review of Social Economy, 55(2), 201–214. Volpp, L. (2001). Feminism versus Multiculturalism. Columbia Law Review, 101, 41.

Learning Outcomes:	1. Students will develop a critical perspective on development, understand Policy making and its impacts for women. 2. Students will understand the politics of development issues in Goa and will develop skills to conduct gender analyses of policy and programme.

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Programme: M. A. Women's Studies
Title of the Course: WOMEN'S HEALTH - CRITICAL DEBATES
Course Code for Discipline Specific Core Course: WSDSCC6
Number of Credits: 4
Effective from Academic Year: 2022- 2023

Course prerequisite :	Registration in the MA Women's Studies Programme	
Objectives:	The course discusses the debates around health policy and programme in India and stresses the potential for women's agency and autonomy with respect to improving their health and environments.	
Content:	**Module 1**: Health, Gender and Power: Discrimination, Food access and Health. Traditional medicine: women and the power of knowledge over traditional health systems, family kitchens, pregnancy and childbirth etc. Harmful traditional practices and women's health. Women's bodies as sites of control – menstruation, family planning and contraceptive teachnology. The gender of health care providers.	15 hours
	Module 2: Health Policy in India: Welfare to Empowerment, Family Planning, Surrogacy Laws. Reproductive health and health care. Debates around PC and PNDT Act, abortion and medical termination of pregnancy. Women's health and the global environment. Medicalization of women's health concerns. Women as consumers of healthcare and health insurance.Gender and Nutritional status	15 hours
	Module 3: Women's Experience and Health: Health and Violence: Psychological concerns and women coping with stress (PMS, Postnatal depression and other mental health concerns): Alcoholism, drug abuse. Lifestyle and health including sterility. Special issues in women's health (menopause, cervical and breast cancer, hysterectomy, violence, AIDS and aging)Health, hygiene and sanitation	15 hours
	Module 4: Understanding health from available data sources (sex ratio, mortality, morbidity, hygiene and sanitation, etc.): WHO, NFHS, DLHS, State Health Intelligence Bureaus etc. State health related schemes and programmes.Five year plans and committees	15 hours

	on health sector. Women and health during the disaster, pandemic and emergency situations.	
Pedagogy:	lectures/assignments/self-study/ documentaries and discussion/ group readings and discussions/ poster making/presentations	
Recommended Readings: **Additional Readings**	Conrad Peter.2001.*The Sociology of Health & Illness*. New York: Worth Publishers. Desouza Shaila (ed.) 2006. *Women's Health in Goa: A Holistic Approach*. New Delhi: Concept Publishers. Desouza Shaila. 2005. *A Situational Analysis of Women and Girls in Goa*,(Monograph) New Delhi: National Commission for Women. Karkal Malini (ed.) 1995. *Our health: How does it count? In Our Lives Our Health*. Coordination Unit. World Conference on Women – Beijing 95. Malwande Alaka Basu. 1995. Women's roles and the gender Gap in Health and Survival in Monica Das Gupta, Lincoln Chen and T.N Krishnan (eds.) *Women's Health in India: Risk &Vulnerability*. New Delhi: Oxfam. Pande R & Vanka Sita 2019. Gender, Law and Health: International Perspectives . Rawat Publications, New Delhi Sangath. 2001. *State of Goa's Health: A Report*, 2001. New Delhi: Voluntary Health Association of India. Sen Geetha et al (ed.) 1994. *Population Policies Reconsidered: Health, Empowerment and Rights*. Boston: Harvard School of Public Health. White Kevin.2009. *An Introduction to the Sociology of Health and Illness*. Los Angeles Sage Publications WHO Gender and Health: http://whqlibdoc.who.int/publications/2009/9789241563857_eng.pdf Lingam Lakshmi. 2002. Towards understanding women's health: Critical Overview of Women's Studies. *Samyukta*. Vol.II No.1. p 51-68.	
Learning Outcomes	This course will help students get a better understanding of the politics of gender and health of women as well as the politics of health care.	

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Programme: M. A. Women's Studies
Title of the Course: GENDER, HUMAN RIGHTS AND LAW
Course Code for Discipline Specific Core Course: WSDSCC7
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration in the MA Women's Studies Programme
Objectives:	In this course will be introduced to the international discourse on human rights and will focus specifically on the Convention on the Elimination of Discrimination against Women (CEDAW), Vienna Declaration and the Beijing Platform for Action (BPFA, 1995) and initiatives for 'gender mainstreaming' while also looking at the principles of equality and non-discrimination as reflected in the Universal Declaration of Human Rights (UDHR), International Convention for Economic, Social and Cultural Rights (ICESCR) and International Convention on Civil and Political Rights (ICCPR). Issues related to

	enforcement of existing international approaches to advancing women's rights. Within the Indian context, students will be introduced to the law (sections of the Indian Penal Code specifically dealing with women's rights, various acts for the prevention of crime and protection of women's rights as well as landmark judgments). Some of the other issues that this course will address are: history and culture of silence related to crimes against women, need for anonymity of the victim, substantive equality and politics of affirmative action and positive discrimination through women specific laws and supreme court guidelines such as: the Protection of women from Domestic Violence Act 2005, ITPA, Vishaka Judgment, etc. Landmark cases of human rights violations. The family law in Goa will also be critically analysed.	
Content:	**Module 1:** History of the 'rights' perspective. International discourse on human rights: Un Declaration of Human Rights, ICESCR, ICCPR Convention on the Elimination of Discrimination against Women (CEDAW), Vienna Declaration and the Beijing Platform for Action (BPFA, 1995). Critical concepts such as intersectionality and cultural relativism related to the enforcement of existing international approaches to advancing women's rights.	15 hours
	Module 2: The concept of Substantive Equality as reflected in the Constitution of India in procedural law, and in systems of access to justice, and in legislating women specific legislation such as Protection of Women from Domestic Violence Act, 2005, and judgments such as Vishaka Judgment	15 hours
	Module 3: Rights: Concepts as reflected in the criminal laws relating to crimes against women, with special reference to the Indian Penal Code, The Immoral Traffic (Prevention) Act, 1956, Dowry Prohibition Act, 1961, Indecent Representation of Women (Prohibition) Act, 1986. Commission of Sati (Prevention) Act, 1987 (3 of 1988), The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989, all as amended to date. December 16, 2012 as a turning point in prevention of crimes against women, amendments to the law, mobilization and interventions for change. Maternity Benefit Act, Senior Citizens Act, Disability Act.	15 hours
	Module 4: Family Law in Goa which is different from the rest of the country: the Codigo Civil Portugues or the Common Civil Code	15 hours
Pedagogy:	lectures/assignments/self-study/ films, documentaries and discussion/ group readings and discussions/ presentations/ Human rights café/Role Play	
Recommended Readings:	Agnes Flavia, Ghosh Shoba Venkatesh 2012, Negotiating Spaces. New Delhi: Oxford University Press Agnes Flavia. 1999. *Law and Gender inequality: The politics of women s rights in India*. New Delhi: Oxford University Press.	

	Balasubrahmanyan Vimal. 1990. *In Search of Justice, Women, Law, Landmark Judgements and Media*. Pune: Shubhada Saraswat Prakashan. Bindra Anju. 2009. *Women and Human Rights*. New Delhi: Manglam Publishers. Bindra Anju. 2009. *Women and Human Rights*. New Delhi: Manglam Publishers. *Companion reader on violence against women*.2012. New Delhi: Sage Publications. Haksar Nandita.1986.*Demystification of Law for Women*. New Delhi: Lancer Press. International Dalit Solidarity Network – Cordaid, National Campaign on Dalit Human Rights, et al, 2007. Note prepared for 11th Session of the Human Rights Council. Mackinnon Catherine and Anne C. Herrmann. 2000. *Sex Equality: On Difference and Dominance in Theorizing Feminism: Parallel Trends in Humanities and Social Sciences*, Westview Press Mapp Susan C. 2008. *Human Rights and social Justice in a Global Perspective*. New York: Oxford University Press. Parashar Archana & Dhanda Amita,(ed), 1999, *Engendering Law: Essays in Honour of Lotika Sarkar*. New Delhi: Eastern Book Company Parashar Archana. 1992. *Women and Family Law Reform in India: Uniform Civil Code and Gender Equality*. New Delhi: Sage Publications. Sathe S. 1993.*Towards Gender Justice*. Bombay: Research Centre for Women s Studies. Translated editions of Family laws in Goa. Agnes Flavia.1990. *Journey to Justice: Procedures to be followed in a rape Case*. Bombay: Majlis
Learning Outcomes	Students will understand the women specific laws and will be enabled to analyse existing procedures followed in implementation of the law and the lacunae that continue to exist.

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Programme: M. A. Women's Studies
Title of the Course: GENDER-SENSITIVE INTERVENTIONS FOR CHANGE
Course Code for Discipline Specific Core Course: WSDSCC8
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration in the MA Women's Studies Programme
Objectives:	This course will introduce students to participatory methods and tools (including participatory reflection and action: PRA) to bring about change and the objective of this course is to encourage students to create campaigns, group dynamic games and other gender sensitization and gender analytical tools, as well as programmes for gender equality that can be used with various groups of stakeholders. Students will work on group projects as well as individual assignments. The students will be encouraged to use various media, address different target groups. This course is completely project

	based. Students will be expected to use the tools created for the target audience during their GSIC projects. The student in the final month of the course will self-assess the impact of the intervention created with guidelines followed for the assessment.	
Content:	**Module 1: Theory:** Participatory approach , Importance of Participation and Inclusion for Gender Sensitive Interventions. Participatory Workshops to learn the use of different participatory tools: Social Mapping, Simulation games, group dynamic sessions, skits and songs, flexi flans, 3 pile sorting cards, story with a gap. Modelling tools to match target group. What is Corporate Social Responsibility (CSR)? Project creation for CSR activities. Online platforms for interventions **Module 2: Practical:** Intervention for Change and Tool Creation and Purple Campaigns in Colleges	30 hours 30 hours
Pedagogy:	Participatory Tools and Workshop Planning/ designing games for participatory learning/ Project implementation in the field /assignments/self-study/ group discussions/ presentations	
Recommended Readings: **Additional Readings**	*Gender Analysis Framework*: http://socialtransitions.kdid.org/sites/socialtransitions/files/resource/files/bk-gender-analysis-frameworks-010199-en.pdf Grambs Jean. 1976. *Teaching About Women in the Social Studies : Concepts, Methods and Materials*. Virginia: National Council for the Social Studies. Murthy Ranjani K. 2001. *Building Women`s Capacities*. New Delhi: Sage Publications. Srinivasan Lyra. 1990. Tools for Community Participation: A Manual for Training Trainers in Participatory Techniques. UNDP PROWESS. Srinivasan Lyra. 1992. A Monograph for Decision Makers on Alternative Participatory Strategies http://hcfp.gov.in/downloads/manuals/Training_Manual_on_Gender_Sensitization.pdf http://ncw.nic.in/pdfreports/gender%20sensitization%20of%20police%20officers.pdf http://timesfoundation.indiatimes.com/articleshow/1254836.cms *Participatory Planning for change*: http://www.dfggmoi.gov.kh/documents/Learning-Theme-01/1-Handout/Module4-SA-Tools/Module4-8-SA-Tool-En/M4-1-Participatory-Planning-6-Handout-En.pdf	
Learning Outcomes:	1. The students will develop confidence to implement gender sensitive projects of their own creations in a variety of settings to bring about change. 2. Students will be able to develop their own projects that they can propose for CSR activities.	

	3. Students will develop creative and innovative games to translate facilitate participatory learning.

WOMEN'S STUDIES DISCIPLINE SPECIFIC OPTIONAL COURSES

Programme: M. A Women's Studies
Title of the Course: GENDER AND CULTURE
Course Code for Discipline Specific Core Course: WSDSOC1
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration in any MA Programme in Goa University	
Objectives:	Students will be introduced to theoretical positions on the understanding of culture and the methods for a gender analysis of cultural practices. Students will traverse the canvas of a variety of dimensions within custom and tradition and community identity such as the gender politics of language, dress, beauty, practices around menstruation, folklore, entertainment and festivals etc.	
Content:	**Module1:** What is Culture? Diverse understandings of culture. Raymond William's uses of culture. Definitions of culture in Anthropology. Culture in conventional and critical theory. An Introduction to Cultural Theory: a) Socio-biological, b) Psychoanalytical and c) Sociological Theories.	15 hours
	Module 2: Doing a gender analysis of culture: Understanding Culture from studying one's own - Tradition, Cultural Practices and Gender. The politics of exclusion. Folklore, gender and culture.	15 hours
	Module 3: Cultural Theory: Durkheim, Karl Marx, Max Weber, George Simmel – Action and Human Agency Theories on Culture.	15 hours
	Module 4: Gender politics of language. Dress, Beauty, Sport, Entertainment, other gender discriminatory practices that continue around the world – a critical perspective.	15 hours
Pedagogy:	lectures/individual assignments/self-study/films and discussions/ group projects/public presentations and campaigns	
Recommended Readings:	Arnot Madeleine. 2002. *Reproducing Gender*. London: Routledge . Coates Jennifer. 1986. *Women, Men and Language: A Sociolinguistic Account of Sex Differences in Language*. London: Longman. Flueckiger Joyce. 1996. *Gender and Genre in the Folklore of Middle India.* New Delhi: Oxford University Press. Gilman Charlotte P. 2002. *The Dress of Women: A Critical Introduction to the Symbolism and Sociology of Clothing*. Westport, Connecticut, London: Greenwood Press. Goddard Angela. 2009. *Language and Gender.* London: Routledge.	

	Handoo Lalita. 1999. *Folklore and Gender* .Mysore: Zooni Publications. Kauffman Linda. 1989. *Gender and Theory: Dialogues on Feminist Criticism*. Oxford: Basil Blackwell. Leslie Julia. 2002. *Invented Identities: The interplay of gender, religion and politics in India.* New Delhi: Oxford University Press. Madan T. N. 2011. *Sociological Traditions.* New Delhi: Sage Publications. N Jayaram (ed.) 2011. *Diversities in the Indian diaspora.* New Delhi : Oxford University Press Palriwala Rajni. 1996. *Shifting Circles of Support: Contextualising Gender and Kinship in South Asia and Sub-Saharan Africa*. New Delhi: Sage Publications. Poynton Cate. 1989. *Language and Gender: Making the Difference*. Oxford: Oxford University Press. Rajan Rajeswari. 1993. *Real and Imagined Women : Gender, Culture and Post-colonialism.* London Routledge. Smith Philip, 2000, *Cultural Theory: An Introduction*, Blackwell:NY (Introduction and Chapter 1 pp 1-21) Thapan Meenakshi. *Embodiment: Essay on Gender and Identity*. Delhi: Oxford University Press.
Learning Outcomes	This course will enable the students to have a critical understanding of culture and will equip them with skills for the methodological analysis of cultural practices from a gendered perspective.

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Programme: M. A. Women's Studies
Title of the Course: A GENDER REVIEW OF LITERATURE
Course Code for Discipline Specific Optional Course: WSDSOC2
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration in any Master's Programme at Goa University
Objectives:	This course aims to develop in students the understanding of how to read any literary text from a gender perspective. Highlighting the politics of exclusion of women, the male dominant narratives, students will explore the cultural, social, economic, political and psychological biases inherent in the field of literature. The course will analyse and interpret the various kinds of writings and oral narratives of women across time.

Content:	**Module 1:** Women in Literature: Feminism, Literature and Feminist Literary Criticism, the history of feminist literary criticism: identifying the position of female characters in different phases of feminist literary criticism (men's treatment of women, 'gynocriticism', the '*mad*' woman) with reference to selected texts. **Module 2**: Women and Literature: Women in Bhakti Period: oral tradition and women's voice of resistance (Mirabai, Akka Mahadevi, Andal, Bahinabai). Understanding South Asian society through women's writings (Selected women's writings from – Bangladesh, Pakistan, Sri Lanka, Nepal). **Module 3:** Women's writings as a form of protest: Women's Autobiography: women's voice of resistance to caste, colour, class and gender in women's Literature. **Module 4:** Contemporary women's writing. Women and/in Goan Literature.	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Lectures/group discussions/assignments/self-study/Book reviews/ creative writing	
Recommended Readings	Showalter Elaine. 1977. *A Literature of their own: British Women from Bronte to Lessing. USA: Princeton University Press.*	
Learning Outcomes	1. Students will develop the understanding of why gender is relevant in literature. 2. Students will understand the use of literature in self-expression.	

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Programme: M. A. Women's Studies
Title of the Course: GENDER AND EDUCATION
Course Code for Discipline Specific Optional Course: WSDSOC3
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration in any Masters Programme at Goa University	
Objectives:	Students will be exposed to Paulo Freire's ideas on the inadequacies of the 'banking system' in education and his ideas on a non-formal system of learning and Bell hooks method of 'engaged pedagogy'. To give the students an opportunity to get a hands on experience with 'connected teaching', this course will be a project based course where students will be given an opportunity to experience what Mary Field Belenky calls 'connected' learning and the Krishnamurthy philosophy of education.	
Content	**Module1:** Women's education in colonial period. Debates around importance of education and education as a SDG**.** Role of education and women's status. Paulo Freire: NFE and	20 hours

	'banking system' in education. Bell hooks engaged pedagogy. The Belenky's 'connected teaching' and the teaching/learning ideas of Krishnamurthy. **Module 2:** Critique of Government Programmes and Policies to improve Education for Women in India: Female literacy & non – formal education for women development, National Literacy Mission (NLM). Sarva Shiksha Abhiyan, Kasturba Gandhi Ballika Vidhyalaya, Mahila Samakya, NPEGEL, District Primary Education Programme, NEP, RTE, NFE. Education in conflict affected areas. **Module 3:**Gender critique of education and gender audit of education in India: focus on Goa Curriculum content, gender disparities in enrolment and dropouts. Women and STEM, selection of stream of education. Recent Trends in Women's Education – Committees and Commissions on Education. Vocational education and skill development of women**.** Education during pandemic – pros and cons of online education **.**	20 hours 20 hours
Pedagogy:	lectures/assignments/self-study/ documentaries and discussion/ group readings and discussions/ presentations/ text interpretations/workshops/ field projects	
Recommended Readings:	Apple.M. (1990), 'Ideology and Curriculum' New York: Routledge Apple.M. (2000) 'Democratic Education in a Conservative Age' New York: Routledge Belenky, Mary Field, Blyth McVicker Clinchy, Nancy Rule Goldberger, and Jill Mattuck Tarule.1986. Women's Ways of Knowing: The Development of Self, Voice, and Mind. New York: Basic Books. Chanana Karuna. 1988. Socialisation Education and Women : Explorations in Gender Identity. New Delhi:Orient Longman Dodd Anne, Wescott.2000. *Syllabus: Gender Issues in Education*. Women's Studies Quarterly Vol. 28. No.3/4. PP 336 -346. The Feminist Press. Freire Paulo. 1971. *Pedagogy of the Oppressed*. New York: Herder and Herder. Freire Paulo. 2014 'Pedagogy of Hope: Reliving Pedagogy of Oppressed' Bloomsbury . hooks, bell. 1994. *Teaching To Transgress: Education as the Practice of Freedom*. New York: Routledge. Jha Jyotsna and Dhir Jhingran.2002. Nature, Nurture or Culture? Gender in Education. Jha and Jhingran (eds.) *Elementary Education for the Poorest and Other Deprived Groups: The Real Challenge of Universalization*. New Delhi: Centre for Policy Research. Kumar Krishna. 1986. Growing up Male. *Seminar* No.387. February.pp53-55. Kumar, Krishna. 1989*.'Social Character of Learning',* New Delhi: Sage Kumar, Krishna. 2008. '*Reflections on Schooling',* New Delhi: Oxford University Press	

Additional Readings	Manjrekar Nandini. 2021. Gender and Education in India:A Reader. London and New York: Routledge. Martin Jane Roland. 1983. "The Ideal of the Educated Person." In *Philosophy of Education*, eds. Daniel R. De Nicola and Thomas W. Nelson, 3-20. Normal, 111: Philosophy of Education Society and Illinois State University. Mills Sara. 2011. Language, gender and feminism. New York : Routledge. Minnich, Elizabeth Karmarck.1990. Transforming Knowledge. Philadelphia: Temple University Press. Ray, B., & Basu, A. (2003). Womans Struggle: A History of the All Indian Womans Conference, 1927-2002. Manohar Publishers and Distributors. Salisbury Jane & Riddell Sheila.(eds) 2000. Gender, Policy & Educational Change: Shifting Agendas in the UK and Europe. London: Routledge. Sharma S. 1995. *Women s Education: A Conceptual Framework.* New Delhi: Discovery. Sharma, Rashmi, and Vimala Ramachandran. 2009. *The elementary education system in India*. New Delhi: Routledge. Skelton Christine, Francis Becky & Smulyan Lisa.(eds)2006.The Sage Handbook of Gender and Education. London: Sage Publications. Banerjee, S. (1993). Revisiting the National Literacy Mission. Economic and Political Weekly, 28(25), 1274–1278 Kamerkar, M. P. (2000). Impact of British Colonial Policy on Society Relating to Education in Western India During the 19th Century. Bulletin of the Deccan College Research Institute, 60/61, 373–382 Ramabrahmam, I. (1989). Literacy Missions: Receding Horizons. Economic and Political Weekly, 24(41), 2301–2303
Learning Outcomes	1. Students will be able to critique education and existing school curriculum from a gendered perspective. 2. Students will be able to conduct workshops based on alternate pedagogical tools.

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Programme: M. A. (Women's Studies)
Title of the Course: DEMOGRAPHY, LABOUR, WORK AND GENDER
Course Code for Discipline Specific Optional Course: WSDSOC4
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration in any Master's Programme at Goa University
Objective:	Census, NFHS and NSS sources of data will be used to enable students to understand their society from available demographic data. Goa gender-disaggregated data wherever possible will be used to understand issues and concerns for women in the State. The goal of the course is to introduce students to concepts of gender relations which are embedded and manifested in various aspects of paid, unpaid, formal and informal work.

Content:	**Module 1**: What numbers say: Analyzing women's position from existing demographic sources, Understanding Goa from existing demographic data, Feminist analyses of the global political economy, Globalization, exploitation and empowerment of women.	15 hours
	Module 2: Politics of women's work: paid and unpaid work- Use, value and market value, the gendered nature of work, the devaluation of women's work, domestic work, inequalities in the workplace, and employment equity, issues of invisibility of the domestic/caring work of women: issues of paid domestic workers: the debates around legalization of prostitution: Trafficking and commercial sex work. Engels and Marx theoretical perspectives on work and labour will be discussed. Women, the informal sector and home based work, SHG's: empowerment/disempowerment debate. Girl child in society. child labour, changing role of women and transformations in the concept of family, single parent families and same sex families, challenges faced by widows. New Economic Policy and its impact on Women's Employment	30 hours
	Module 3: Entrepreneurship -concepts and importance of entrepreneurship, factors enabling entrepreneurship. Setting up small scale enterprise. Women Entrepreneurship schemes. Gender based problems in the workplace: sexual Harassment, the glass ceiling, maternity leave, work and child care. Government programmes related to work. Institutional and individual attempts to manage gender in the family and in the workplace.	15 hours
Pedagogy:	lectures/field study/assignments/self-study/ documentaries and discussion/ group readings and discussions/presentations	
Recommended Readings:	Banerjee Nirmala. 1991. *Indian Women in a Changing Industrial Scenario*. New Delhi: Sage. Beechey Veronica. *The Changing Experience of Women: Units 10 and 11 :Women and Employment*. Milton Keynes :The Open University Press. Day Rosemary. 1985. *The Changing experience of Women: Unit 7*: *Women in the Household* and Unit 8: *Development of Family and Work in Capitalist Society*. Milton Keynes: Open University Press. Dube Leela. 1990.*Structures and Strategies : Women, Work & Family*. New Delhi Sage. Epstein T. 1981.*The Endless Day: Some Case Material on Asian Rural Women*. Oxford :Pergamon Press. Grint Keith. 2005. *The sociology of work*. Cambridge, MA, USA: Polity Press. Hall Richard. 1994. *Sociology of Work: Perspectives, Analysis and Issues*. California: Pine Forge Press.	

	Hamel Christelle et. al. 2014. A Demographic Perspective on Gender Inequality in *Population and Societies*. December 2014, no. 517, pp 1-4 Hishrich, Robert D.2011 Entrepreneurship:Tata McGraw Hill Education Pvt. Ltd : New Delhi Jain Devaki. 1985. *Women in Poverty: Tyranny of the Household: Investigative Essays on Women s Work*. New Delhi: Shakti Books. Leonard Diana. 1985.*The Changing Experience of Women : Unit 9 The Family : Daughters, Wives and Mothers.* Keynes: The Open University Press. Mahadevan, K. 1989. *Women and Population Dynamics: Perspectives from Asian Countries*. New Delhi: Sage Publications. Purushottham Sangeetha. 1998. *The Empowerment of Women in India*. New Delhi: Sage. Sahay Sushma.1998. *Women and Empowerment: Approaches and Strategies*. New Delhi: Discovery Publication House. Sharma Aradhana. 2010. *Paradoxes of Empowerment*. New Delhi: Zubaan. Singh Andrea.1987.*Invisible Hands: Women in Home-Based Production*. New Delhi: Sage. Srivastava Sushama. 2008. *Women's Empowerment*. New Delhi: Commonwealth Publishers Vanka Sita, Pande Rekha & Chillakuri Kumar 2019 Gender and work: International Perspectives.Rawat Publications. New Delhi
Learning Outcomes	1. Students will be able to interpret data and analyze the demographic situation from a gender perspective. 2. Students will understand work and workplace and be able to critically assess various government schemes and programmes on work for women.

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WOMEN'S STUDIES RESEARCH SPECIFIC OPTIONAL COURSES

Programme: M. A Women's Studies
Title of the Course: DOING FEMINIST RESEARCH
Course Code of Research Specific Optional Course: WSRSOC1
Number of Credits: 4
Effective from Academic Year: 2022- 2023

Course prerequisite:	Registration in the M.A. Women's Studies Programme	
Objective:	This course will aim at equipping students with knowledge of research methods and techniques. The student will be introduced to the nature and purpose of doing feminist research, the politics of knowledge and knowledge creation and the different ways of knowing. They will be taken through the theoretical foundations of feminist research and a critique of conventional research. Feminist research positions both epistemological and methodological will be discussed.	
Content:	**Module 1:** What is research? Steps in social science research A critique of conventional research, limitations of methodology of	15 hours

	social science, feminist empiricism vs positivism Research methods and methodology, Feminist standpoint, situated knowledge,	
	Module 2: Qualitative Research Methods: feminist ethnography narratives, oral history, discourse analysis, participatory and action research, focus group discussions, grounded theory, self-reflexivity, etc. Reviewing literature on a selected topic. Reference management software (zotero, mendeley, etc.)	15 hours
	Module 3: Using unconventional data sources. Research designs, sampling and qualitative data collection methods (case studies, survey, exploratory studies, diagnostic, experimental and action research).	15 hours
	Module 4: Proposal writing, conducting a pilot study and writing a report, Feminist research ethics, Research writing, academic writing skills, use of writing assistance software	15 hours
Pedagogy:	lectures/assignments/self-study/ documentaries and discussion/ group readings and discussions/ presentations	
Recommended Readings:	Biber Sharlene Nagy Hesse.2007, *Feminist Research Practice*. Thousand Oaks: Sage. Brooks, Abigail. 2007. *Feminist Standpoint Epistemology: Building knowledge and empowerment through women's lived experience*, in Sharlene J. Nagy Hesse-Biber and Patricia Lina Leavy (eds.) *Feminist Research Practice: A Primer*, London: Sage Pub. Code, Lorraine. 1995. *How do we know? : Questions of method in feminist practice*, in Sandra Burt and Lorraine Code (eds.) *Changing Methods: Feminist Transforming Practice,* 13-44, Canada: Broadview Press. Delamont Sara and Paul Atkinson.2008.*Gender and Research*. Los Angeles: Sage. Denscombe Martyn. 2003. *The Good Research Guide for small scale Social Research Projects*. Second Edition. Philedelphia: Open University Press. Harding, Sandra. 1987. Is there a Feminist Method*?* In *Feminism and Methodology*. Bloomington and Indianapolis: Indiana University Press. p 1-14 Hughes Christina. 2002. *Key Concepts in Feminist Theory and Research*. London: Sage. Jarvlluoma Helmi.2003. *Gender and Qualitative Methods*. London: Sage. Kannabiran K & Padmini Swaminathan (eds.). 2017. Re-Presenting Feminist Methodologies: Inter-Disciplinary Explorations. NY: Routledge. Kleinman, Sherryl. 2007. *Feminist Fieldwork Analysis*. Los Angeles: Sage Publications. Reinharz Shulamit & Lynn Davidman.1992. Feminist Methods in Social Research. Oxford University Press	

Additional Readings	Robert Helen.1986. *Doing Feminist Research*. London: Routledge. Stanley L. and Sue Wise.1993. *Breaking Out Again: Feminist Ontology and Epistemology*. London: Routledge. Tannen Deborah.1994. *Gender and Discourse*. New York: OUP. Haraway, Donna, J. 1988. *Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective*. Feminist Studies,Vol.14, No.3 (Autumn), 575-599.	
Learning Outcomes:	Students at the end of the course will understand the research process and will develop skills in: 1. Doing a review of literature and 2. Developing a research proposal which will be implemented in the following semester. 3. Conducting a pilot study.	

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Programme: M. A. Women's Studies
Title of the Course: RESEARCH METHODS AND ACADEMIC WRITING
Course Code of Research Specific Optional Course: WSRSOC2
Number of Credits: 4
Effective from Academic Year: 2022- 2023

Course prerequisite:	Registration in the M.A. Women's Studies Programme	
Objectives:	This course will introduce students to basic statistical techniques and help them understand the frameworks for collecting, storing, analyzing, and disseminating data. Students will be exposed to different methods for summarizing and/or describing data with respect to central tendency, dispersion, and association. With the appropriate use of standard inferential procedures students will be able to make generalizations from sample data to a larger population. This course will equip the students to use statistical software to perform data analysis.	
Content:	**Module 1:** Review of Statistical Concepts Useful for Causal Inference: Population and Sampling. Statistics- Descriptive and Inferential. Describing datasets: summarizing data. Computing and Understanding Averages- Exercises based on data (creating different types of charts, applications). Understanding Variability- Exercise on computing mean, median, mode and SD, Variance. Comparing Correlation Coefficient. Types of data - cross-sectional, panel, pooled and time series	15 hours
	Module 2: Probability: Sample Space, Random Variable. Conditional Probability, Distribution Function, Probability Distributions: Discrete, Continuous and Sampling	15 hours

	Distributions: Binomial, Poisson, Normal, Standard Normal, Student-T Chi-Square, F-distribution. **Module 3:**Testing of Hypothesis-Null and Alternate, Type I & II errors. Statistically significant; Test of significance. Testing means and proportion-single and two population, Testing t, Z test, F, chi square test. Correlation & Regression. Covariance, Correlation, Rank Correlation. Using linear Regression-logic of prediction, Ordinary Least Squares (OLS), Gaussian Classical Model. Importing data set using GRETL -Estimation of model by method of OLS **Module 4:**Academic Writing: Difference between academic writing and articles in popular newspapers and magazines. How to decide on your subject, the importance of research title and writing a proposal. Writing a chapter plan and getting started on your dissertation.	20 hours 10 hours
Pedagogy:	Lab exercises, assignments, presentations	
Recommended Readings:	Berenson, M. L., Levine, D. M., & Szabat, K. A. (2015). Basic business statistics: Concepts and applications (13. ed., global ed). Pearson Hood, S. (2010). Appraising research: Evaluation in academic writing. Palgrave Macmillan. Ross, S. M. (2006). Introductory Statistics. Elsevier. Salkind, N. J. (2017). Statistics for people who (think they) hate statistics (6th edition, international student edition). SAGE.	
Learning Outcomes	By the end of the course, students will be able to examine how quantitative data is produced, identify gender-related data gaps; & use analytics skills to uncover intersectional gender-based insights.	

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Programme: M. A. Women's Studies
Title of the Course: FIELDWORK SKILLS AND PRACTICE
Course Code of Research Specific Optional Course: WSRSOC3
Number of Credits: 4
Effective from Academic Year: 2022- 2023

Course prerequisite:	Registration in the M.A. Women's Studies Programme
Objectives:	This course will include a component of a minimum of 12 days of field attachment (approx 5 hours per day) as the development of skills and practice in the field is an important aspect of this course. As far as possible the fieldwork placement may be in a setting related to the area of research chosen by the student. The field experience of each student will be required to be presented to the class through a seminar or other form of presentation so that the students get the opportunity to bring their learning in the field into the classroom. This paper is an integration of theory, field realities and actual field work practice. The development of the necessary knowledge,

	skills, values and attitudes appropriate to field work practice will be an integral part of this course.	
Content:	**Module 1**: Social organizations and their administration (Government, NGO and others), National and International funding agencies. Field work techniques: Basics of case work, group work, community organization, Social work Research and Social Action. **Module 2:** Introduction to psychology: Erikson's theory of psychological development, Sigmund Freud's theory of personality, system's theory, and defense mechanisms. Group dynamics, communication skills, life skill training and values. **Module 3:** Development of skills through field work practice. Maintaining field work diaries and submission of weekly reports. Purple campaigns, MEAR	15 hours 15 hours Minimum 12 days of field-work – equivalent to 30 hours
Pedagogy:	Field work/lectures/assignments/self-study/ presentations	
Recommended Readings:	Bhanti (1996) Field Work in Social Work Perspective. Raj Publication: Udaipur. DuBois, Brenda (2002) Social Work, Allyn and Bacon Publication, Boston. Garvin, Charles D (2007) Handbook of Social Work with Groups, Jaipur: Rawat Publications Government of India. 1987. Encyclopedia in Social Work. New Delhi: Publication Division (Social Welfare Ministry). Pritchard Colin.1978. Social Work: Reform or Revolution. London: Routledge and Kegan Paul. Singh Anilkumar.1985. Women and Development: Promise and Realities. New Delhi: CWDS. Stroup, Herbert (1960) Social Work: An Introduction to the Field by Publication: New York American Book Company. Subhedar, I.S. (2001) Fieldwork Training in Social Work, Jaipur: Rawat Publications. Vishwanathan Maithili.1994. Social Framework and Strategies in Women's Development. Jaipur: Printwell. Wadia A. 1968. History and Philosophy of Social Work in India. Bombay: Allied Publishers. Welheim (1991) Freud, Richard Publication, Fontanal Press, London.	
Learning Outcomes	1. Field work will provide the student an exposure to ground realities and will provide the opportunity to learn hands on, as also by observation and active participation. 2. Field work will help the students to integrate the classroom learning with actual practice. Students with the help of field contacts as supervisors/ guides, will be given the opportunity to experience field situations that may be complex and challenging.	

	3. The course will enable student's self-development and the realization of personal limitations and capabilities.

WOMEN'S STUDIES OPTIONAL GENERIC COURSES

Programme: M. A. Women's Studies
Title of the Course: RE-READING HISTORY: FEMINIST PERSPECTIVES
Course Code for Optional Generic Course: WSOGC1
Number of Credits: 4
Effective from Academic Year: 2022- 2023

Course Prerequisite:	Registration in any Masters Programme at Goa University	
Objective:	This course will introduce students to feminist social history. The course aims to enable students to further develop their skills in critical analysis and understand the role that this exclusion of women from history has played in shaping the understanding of society.	
Content:	**Module 1**: In search of our past: Gender as a critical category in historical analysis. Debates in Feminist Historiography.	15 hours
	Module 2: Understanding history from unconventional sources (photos, diaries, recipe books, clothes, jewelry and other personal objects)	15 hours
	Module 3: Re-writing History: Contributions of feminists to the rediscovery of women's voice in history: Indian feminist contributions to rewriting history.	15 hours
	Module 4: Selection of texts and analytical skill development. Gender Analysis of school history texts.	15 hours
Pedagogy:	lectures/assignments/self-study/ documentaries and discussion/ group readings and discussions/ presentations	
Recommended Readings	Chakravati Uma. *Everyday Lives, Everyday Histories: Beyond the Kings and Brahmanas of 'Ancient'India*. New Delhi: Tulika Books. Geetha V. and S Rajdurai. Towards Non –brahmin Millenium, Culcutta, Samay,1998. Lerner Gerda.1986. 'The Creation of Patriarchy'. In *Women and History*. New York: Oxford University Press. Moon M.and Pawar Urmila., We also made history, New Delhi, Zuban Morgan S. (ed) The Feminist History Reader, London, Routledge, 2006. Omvedt Gail., Dalits and Democratic Revolution: Dr. Ambedkar and Dalit Movements in Colonial India, New Delhi, Sage,2004. Ray Bharati. 1995. *From the seams of History: Essays on Indian Women*. New Delhi: Oxford University Press. Roy Kumkum. *The Power of Gender and the Gender of Power: Explorations in Early Indian History.* New Delhi: Oxford University Press. Sangari K., ' Mirabai and the Spiritual Economy of the Bhakti' Economic and Political Weekly, July 7, 1990, 1464-75 and july 14,1990,1537-52	

	Sangari Kumkum and Sudesh Vaid (eds.).1989. *Recasting Women: Essays in Colonial History*. New Delhi: Kali for Women. Scott Joan Wallach (ed). 1996. *Feminism and History*. New York: Oxford University Press. Spivak Gayatri C.1985. 'Subaltern Studies: Deconstructing Historiography'*, in Writings on South Asian History and society*, Ranajit Guha (ed).New Delhi: Oxford University Press. pp 330-363. Stearns Peter N. 2010. *Gender in World History*. New York: Routledge. Thapar R., Shakuntala: Text Readings, Histories, New Delhi, Kali for Women/Women Unlimited 2005
Learning Outcomes	1. Students will learn about the women's contribution to Indian history. 2. Students will learn to analyze critically the process of writing history. 3. They will develop the skills to use unconventional research tools to understand women's contribution in the society.

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Programme: M. A. Women's Studies
Title of the Course: GENDER AND POLITICAL PROCESSES
Course Code for Optional Generic Course: WSOGC2
Number of Credits: 4
Effective from Academic Year: 2022 - 2023

Course prerequisite:	Registration for any Masters Programme at Goa University	
Objective:	This course will introduce students to the perspectives and challenges around Panchayati Raj Institutions in India and will help students understand the key determinants and barriers to women's political participation in India. The course will cover issues of women's agency, autonomy and political empowerment. The politics of reservation (the 73rd and 74th Constitutional Amendments) and current debates around the Women's Reservation Bill including the Quota Campaign. The course will also introduce students to the role of civil society and the role women play in governance through participation in social movements, activist groups and NGO's. The concept of leadership through women's collective action will be discussed. The Kerala Kudumbashree experience will be discussed.	
Content:	**Module 1**: Concept of Democracy. What is politics and political participation. Relationship between democracy and citizenship (historical exploration). Women's struggle for political participation; women's suffrage movement and importance of women voters. Women in Indian Nationalist Movement.	15 hours
	Module 2: Indian Constitution and provisions for women. Women's political participation and Indian democracy. A history of local self-government in India. Women in local self-government: Prospects and challenges. Politics of Reservation. Quota campaign. Analytical reflections on case studies of women in panchayats.	15 hours

	Module 3: Governance through civil society movements and organisations. The Kudumbashree experience in Kerala **Module 4:** Women in politics in Goa. Experiences from the field.	15 hours 15 hours
Pedagogy:	lectures/assignments/self-study/ documentaries and discussion/ group readings and discussions/ presentations/ quiz/framing policies and schemes/Interviews with women in politics	
Recommended Readings	Dasarathi Bhuyan (ed.) 2008.*Women in Politics*. New Delhi: Discovery Publishing House Gill Rajesh.2009. *Contemporary Indian Urban Society - Ethnicity, Gender and Governance*. Delhi: Bookwell. Krook Mona Lena, 2009. *Quotas for women in Politics*. Oxford: Oxford University Press. Meehan Elizabeth. 1991.*Equality Politics and Gender*. London : Sage Publications. Menon Nivedita.1999.*Gender and Politics in India*. New Delhi: Oxford University Press. Monro Surya, 2005.*Gender Politics*. London: Pluto Press 2005. Stacey Margaret.1981.*Women, Power and Politics*. London: Tavistock Publications.	
Learning Outcome	Basic political awareness from a gendered perspective.	

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Programme: M. A. Women's Studies
Title of the Course: GENDER, ENVIRONMENT AND ECOLOGY
Course Code for Discipline Specific Core Course: WSOGC3
Number of Credits: 4
Effective from Academic Year: 2022-2023

Prerequisites for the course:	Student should be registered with Goa University Post Graduate Programme
Objective:	This course looks at the relationship between society, gender and the environment and will draw from literature from the growing field of feminist political ecology and ecofeminism. Women's role in various Environmental conflicts and environment movements such as the Chipko, Narmada Bachao Andolan, and other such cases will be used to aid the understanding of the relationship between political economy, society, gender and the environment. This course will introduce students to some of the key environmental issues and what is meant by ecofeminism. Questions of sustainable use of natural resources, environment management practices and grassroots level conservation, eco-consciousness, relationship between women and nature, livelihood vs environment conflicts, environment and women's agency, knowledge of traditional healing systems, gender and water, women's role as farmers, environmental stewards, activists and women's contributions to scientific research will be studied.

Content:	**Module 1:** What is Feminist Political Ecology. Ecofeminism. Theories and debates on gender and environment	5 Hours
	Module 2: Mapping Environment Movements across the country: Development, Environment, Livelihoods and Conflict: Chipko, Narmada Bachao Andolan, Silent Valley – A People's Movement that Saved a Forest, Nagaland and Amur Falcons- Bano Haralu, Stork lady of Aasam-Purnima Barman, Female forest Guards of Gir, Goa Bachao Abhiyan, SEZ Movement, Agitations against mining, tourism , etc.	15 hours
	Module 3: Environment and Women's Agency: Relationship of Women with Environment. Women, Land and Agriculture. Women's Knowledge of Traditional Health Care and Practices. Impact of natural calamities on gender.	10 hours
	Module 4: Women and nature conservation in India - workshops on Solid Waste Management: Segregation, Vermicompost, Recycling/ Outreach Programmes: Street play, Awareness sessions in schools and villages / campus walk for basics of natural history: flora and Fauna and rain water harvesting. Case studies of movements /Example: Traditional knowledge systems for biodiversity conservation: Vegetation management**,** Sacred Groves**,** Agriculture**,** cultivation of medicinal plants**,** traditional ethos**,** water and biodiversity**. Women and Environmental activism:** Finding and supporting passion for change**,** Online Activism/Media Journalism, Informed Activist**,** Pursuing a career in activism**,** Challenges for women wildlifer/Environment activist **Environment NGO's in India:** Greenpeace**,** Ashoka Trust for Research in Ecology and the Environment**,** Nature Conservation Foundation**,** Wildlife Conservation Society**,** Wildlife Conservation Trust**,** Bombay Natural History Society, World Wide Fund for Nature**,** International Union for conservation of Nature and Natural Resources, Wetlands International**,** Convention on International Trade in Endangered Species, etc.	30 hours
Pedagogy:	lectures/assignments/workshops/Outreach Programmes/Street play/ campus walk /documentaries and discussion/ presentations	
Recommended Readings	Agarwal Bina.2010. Gender and Green Governance: Political Economy of Women's Presence within and beyond Community Forestry. NY: Oxford University Press Alvares Claude 2002. *Fish curry and rice: A sourcebook on Goa, its ecology and life-style*. Goa: The Goa Foundation. Biswal Tapan. 2006. *Human rights, Gender and Environment*. New Delhi: Viva books. Buckingham-Hatfield Susan. 2006. *Gender and Environment.* London, New York : Routledge.	

	Krishna Summi.2003. *Livelihood and Gender:Equity in Community Resource Management.* New Delhi: Sage. Krishna Summi, De Arprita. 2013. Women Water Professionals. New Delhi: Zubaan. McCully Patrick. 1998. *Silences rivers: The ecology and politics of large dams.* Hyderabad: Orient Longmans. Rocheleau D., B. Thomas-Slayter and E. Wangari (eds.).1996. *Feminist Political Ecology: Global Issues and Local Experiences*. London: Routledge. Shiva Vandana. 1992. *The Violence of the Green Revolution: Third World Agriculture Ecology and Politics.* Mapusa: The Other India Press. Shiva Vandana.1998. *Staying Alive: Women, Ecology and Survival in India*. New Delhi: Kali for Women.
Learning Outcomes	1. Students will understand the impact of the political economy on the local realities affecting the environment. 2. Students will understand the vital role that women play in conservation of nature, sustainable use of natural resource, mitigating environmental conflicts and addressing environmental issues through activism. 3. Hands-on training in solid waste and water management practices while building their capacities to conduct outreach programmes and environmental activism.

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Programme: M. A. (Women's Studies)
Title of the Course: GENDER AND MEDIA
Course Code for Discipline Specific Core Course: WSOGC4
Number of Credits: 4
Effective from Academic Year: 2022-2023

Prerequisites for the course:	Student should be registered with Goa University Post Graduate Programme	
Objective:	The media (film, television, magazines, newspapers and the internet) plays a major role in "constructing" gender, and "popular" views of what appropriate behavior is. The course will examine various images of gender in media with examples from the late 20th century to the present. Using theories from cultural studies, film and gender studies, and communication studies, students will explore different processes and practices of gender, specifically in terms of media representations of femininity and masculinity.	
Content:	**Module 1**: Theories from cultural studies, film and gender studies, and communication studies: media and representation of femininity and masculinity. Male gaze. Media and construction of gender norms and stereotypes: Film screenings and discussion on Stereotypes: Portrayals of the rural woman, woman in paid employment, morality and the bad woman, popular culture and interpretation of gender. **Module 2**: Critical analysis of Gender in Magazines and Newspapers. Advertising and the image of women. Women's magazines. Politics of paid news.	12 hours 12 hours

	Module 3: Internet and its social impacts. Internet and women: empowering or a tool for disempowerment. Role of Information Communication Technology in women empowerment.	12 hours
	Module 4: Media, gender, and its intersections with caste and class. How social norm about gender gets enacted, represented and has an impact on identity formations and communication. Media as a socio-cultural mechanism that shapes individual and collective notions of identity: essentially what it means to be male or female.	12 hours
Pedagogy:	lectures/assignments/self-study/ films, documentaries and discussions/ group readings and discussions/ presentations/ short film making	
Recommended Readings	Bhasin Kamla and Beena Aggarwal (ed.) 1984. *Women and Media: Analysis, Alternatives and Action*. ISIS International Berger John. 1972. *Ways of Seeing.* UK*:* Penguin. Creedon Pamela. 1994. *Women, Media and Sport: Challenging Gender Values*. Thousand Oaks: Sage Das Mallika. 2000. *Men and Women in Indian Magazine Advertisements*: *A Preliminary Report*. November. Joseph Ammu. 1994. *Whose News? : The Media and Women s Issues*. New Delhi: Sage. Kosambi Meera.1994. *Women's Oppression in the Public Gaze: An Analysis of Newspaper Coverage, State Action and Activist Response*. Bombay: Research Centre for Women s University. Mulvey Laura. 1999. 'Visual Pleasure and Narrative Cinema'.*in Film Theory and Criticism: Introductory Readings.* Leo Braudy and Marshall Cohen. New York: Oxford University Press. pp 833-844. Prasad Kiran (ed.) 2005. *Women and Media, Challenging Feminist Discourse*. New Delhi:The Women Press. Tannen Deborah. 1994. *Gender and Discourse.* New York: Oxford University Press. Valdivia Angharad. 1995. *Feminism, Multiculturalism & the Media Global Diversities*. London: Sage Publications.	
Learning Outcomes	Students will develop a critical understanding of how gender is constructed, contested and subverted in different forms of media.	

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D 3.21 Minutes of the Board of Studies in French and Francophone Studies meeting held on 22.04.2022.

Annexure I

M.A. Programme Structure -80 credits

SEMESTER I

Course code	COMPULSORY COURSES	No. of Credits
FRC 102	Theory and Practice of Translation	4
FRC 106	French Culture and Civilisation	4
FRC 107	General Linguistics	4
FRC 109	Literary Movements	4
	DISCIPLINE SPECIFIC OPTIONAL COURSES	
FRO 118	French Language Level 3	4
FRO 134	Textual Analysis	4
FRO 101	A Study of French Romanticism	4
FRO 119	French for Tourism and Hospitality	4

SEMESTER II

Course code	COMPULSORY COURSES	No. of Credits
FRC 101	Advanced Language Skills	4
FRC 105	Francophone Literature and Culture	4
FRC 108	Phonetics, Morphology and Syntax	4
FRC 110	Modern French Literary Criticism	4
	DISCIPLINE SPECIFIC OPTIONAL COURSES	
FRO 135	Study of the French Novel	4
FRO 105	Didactics of French Language Teaching-Learning	4
FRO 113	Scientific and Technical Translation	4
FRO 127	Literature through Cinema	4

SEMESTER III

Course code	RESEARCH SPECIFIC OPTIONAL COURSES	No. of Credits
FRO 106	Research Methodology	4
FRO 136	Academic Writing	4
FRO 114	Literary translation	4
	OPTIONAL GENERIC COURSES	
FRO 116	French Language Level 1	4
FRO 117	French Language Level 2	4
FRO 132	Representation of French History in Visual Arts and literature	4
FRO 133	Mythology in literature and Popular Culture	4
FRO 124	Film Appreciation	2
FRO 128	History of French language	2
FRO 112	Multimedia for Foreign Language Acquisition	4
FRO 126	Theatre and Oral expression	2

SEMESTER IV

Course code	RESEARCH SPECIFIC OPTIONAL COURSES	No. of Credits
FRO 103	Women's Writings	4
FRO 104	Semantics and Lexicology	4
DSD	**DISCIPLINE SPECIFIC DISSERTATION**	**16**

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Annexure II

Programme: M. A. (French)
Course Code: FRC-102 **Title of the Course:** Theory and Practice of Translation
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne maîtrise du français et de l'anglais.	
Objective:	Le cours de théorie de la traduction a pour but de présenter les notions de base en traductologie, les modèles et approches qui décrivent ce domaine scientifique. À partir de la traduction de textes de styles et thématiques divers, le cours tente de définir les différences et spécificités propres à l'anglais et au français dans une perspective contrastive. Le cours propose une introduction aux techniques de traduction de textes et une approche des problèmes terminologiques de la traduction de spécialité de textes usuels. Le cours englobe également une analyse comparative des terminologies données ainsi que le perfectionnement linguistique du français langue étrangère.	
Content:	**1. Initiation à la traduction-** Définition et concepts de base- Les études de traduction – produit, processus et fonction. **2. Théories de la traduction** – modèles linguistiques, sociolinguistiques comparatives et interprétatives- la stylistique comparée et procédés techniques. **3. Problèmes théoriques de la traduction** - différences entre l'anglais/ les langues indiennes et le français – Génie de la langue- la traduction des expressions idiomatiques et clichés – lexique et culture – la vision du monde. **4. Traduction des textes généraux** –anglais et français, analyse des textes traduits et la traduction multimédia (sous-titrage des clips de films).	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. Baker, Mona (1992): In Other Words: A Coursebook on Translation, London/New York: Routledge. 2. Ballard, Michel (1984): La Traduction de la théorie — la didactique : études, Université de Lille III .	

3. Ballard, M. (ed.) (1990): La traduction plurielle, Lille: Presses universitaires de Lille.
4. Ballard, Michel (1995): De Cicéron à Benjamin: traducteurs, traductions, réflexions. Étude de la traduction, Lille: Presses universitaires de Lille.
5. Berman, Antoine (1999) : La traduction et la lettre ou l'Auberge du lointain, Paris: Seuil.
6. Brisset, Annie (1998) "L'identité culturelle de la traduction. En réponse à Antoine Berman", Palimpsestes 11, pp. 31-51.
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8. Chesterman, Andrew (1989): Readings in translation theory, Helsinki: Finn Lectura.
9. Delisle, Jean (1981): L'enseignement de l'interprétation et de la traduction: de la théorie a la pédagogie, Ottawa : Éditions de l'Université d'Ottawa.
10. Delisle, J. (1982): L'analyse du discours comme méthode de traduction : initiation — la traduction française de textes pragmatiques anglaise.
11. Théorie et pratique, Ottawa : Éditions de l'Université d'Ottawa. Holmes, James S. (1988): Translated! Papers on Literary Translation and Translation Studies, Amsterdam: Rodopi.
12. Holmes, James S. et al. (ed.) (1970): The Nature of Translation: Essays in the Theory and Practice of Literary Translation, The Hague: Mouton.
13. Holmes, J. S. et al. (eds.) (1978): Literature and Translation: New Perspectives in Literary Studies, Leuven: Acco.
14. Ladmiral, Jean-René (1979) Traduire : théorèmes pour la traduction. Paris: Payot.
15. Lederer, Marianne & D. Seleskovitch (1981): La traduction simultanée –Fondements théoriques, Paris: Minard Lettres Modernes.
16. Lederer, M. (1994): La traduction aujourd'hui - le modèle interprétatif, Paris:Hachette.
17. Lederer, M. & D. Seleskovitch (1993): Interpréter pour traduire, 3rd ed., Paris: Didier Erudition.
18. Lederer M. & D. Seleskovitch (2001): Pédagogie raisonnée de l'interprétation, Margot, Jean-Claude (1979): Traduire sans trahir : la theorie de la traduction et son application aux textes bibliques, Lausanne: Age d'homme.
19. Mounin, Georges (1955): Les belles infidèles, Paris: Cahiers du Sud.Mounin, G. (1963): Les problèmes théoriaues de la traduction, Paris: Gallimard.
20. Mounin, G. (1976) : Linguistique et traduction , Brussels: Dessartet & Mardaga1976.
21. Newmark, Peter (1981): Approaches to Translation Oxford. New York: Pergamon.
22. Newmark, P. (1988): A Textbook of Translation, New

	York/London: Prentice Hall. 23. Nida, Eugene (1964): Toward a Science of Translating, Leiden; E. J. Brill. 24. Nida, A. & C. R. Taber (1969): The Theory and Practice of Translation, Leiden: E. J. Brill. 25. Shuttleworth, M. & M. Cowie (1997): Dictionary of Translation Studies, Manchester: St Jerome Press. 26. Snell-Hornby, Mary et al. (ed.) (1994): Translation Studies: An Interdiscipline, Amsterdam: John Benjamins. 27. Snell-Hornby, M. (1995): Translation Studies. An Integrated Approach, Amsterdam, John Benjamins. 28. Steiner, George (1992): After Babel : Aspects of Language 29. and Translation, 2nd ed., Oxford University Press. 30. Toury, G. (1995): Descriptive Translation Studies and Beyond, Amsterdam:John Benjamins. 31. Van Hoof, Henri (1991): Histoire de la traduction en Occident: France, Venuti, Lawrence (ed.) (1992): Rethinking Translation: Discourse, Subjectivity, Ideology, London: Routledge. 32. Vinay, J.P. & J. Darbelnet (1967): Stylistique comparée du français et de l'anglais, Paris: Didier; Eng. Trans. J. M. Sager & M.-J. Hamel, Comparative Stylistics of French and English: A Methodology for Translation, Amsterdam: John Benjamins, 1995.	
Learning Outcomes	Par sa parfaite compréhension de la langue source, l'étudiant est censé - acquérir une palette de techniques lui permettant de surmonter les obstacles lors du passage de la langue source à la langue cible ; activer ou réactiver son vocabulaire passif et recourir spontanément aux usages. - maîtriser des grandes techniques de rédaction, et, à la fin de ce cours, être en mesure de traduire en français /anglais un texte.	

Programme: M. A. (French)
Course Code: FRC 106 **Title of the Course:** French Culture and Civilisation
Number of Credits : 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	Cours pour comprendre la culture et la civilisation française par le biais de schémas de comportements et d'attitudes, y compris la pensée, la communication, les actions, les coutumes, les croyances, les valeurs, les institutions, la famille et les autres groupes sociaux.	
Content:	**1. La société française :** connaissances de base et un rappel de la société française, les variations régionales et ethniques –la compréhension de la culture matérielle, le	15 hours

	consumérisme, les environnements matériels et technologiques. **2. Histoire de France et l'expression créative :** l'iconographie culturelle dans une perspective française et étrangère- Les stéréotypes culturels. **3. Institutions françaises :** politiques, économiques, socioculturelles et éducatives. **4. Diversité des cultures françaises :** différenciation entre les identités individuelles, collectives, nationales et internationales. Représentations dans les médias. **Textes : au choix**	15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. Roesch, Roselyne et Rolle-Harold, Rosalba, La France au quotidien , PUG, 2009 2. Ross, Steele, Civilisation Progressive du français 3. Bourgeois, Rene , La France des institutions : Le citoyen dans la nation 4. Albert, La Presse française. France, Ministère des Affaires étrangères, 1995 5. G. Bossuat, Pierre Mendès- France et le rôle de la France dans le monde, PUG, 1991 6. R. Bornecque, Initiation à l'architecture française,2013 7. P. Henry, Spectacle vivant et culture aujourd'hui, 2009 8. Y. Plasseraud, L'Europe et ses minorités, 2012 9. R. Badinter, Europe des cultures et culture européenne : communauté et diversité. 10. D. Borne, La politique en France - XIXe - XXe siècles 11. R. Coupe, Monuments célèbres niveau 4, 2012	
Learning Outcomes	À la fin de ce cours, l'étudiant sera capable - de s'exprimer de façon claire et détaillée sur différents aspects de la culture française. - d'identifier les institutions françaises - de comprendre la diversité des cultures françaises	

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Course Code: FRC 107 **Title of the Course:** General Linguistics
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	Initiation aux concepts de base et aux méthodes d'analyse de la linguistique. Ce cours vise à présenter les concepts fondamentaux de la linguistique générale issus des plus grands auteurs.	
Content:	**1. Linguistique générale** Concepts de base- pourquoi étudier la langue- histoire des théories linguistiques - le langage humain-Langue et parole – Langue parlée et langue écrite – langage humain et langage animal- la double articulation- langage et fonctions (Jakobson). **2. Langage et Communication** Sémiologie et Linguistique – Indice et Signal – Signe et Symbole – Le signe linguistique (Saussure) – Les systèmes sémiologiques et leur classement – La communication et l'interdépendance de codes – les registres de langue. **3. Langue et Culture** Variations et la diversité dans la langue française - Apport des linguistes- Saussure- Whorf et Sapir.	20 hours 20 hours 20 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. -BARTHES, R. (1966). « Introduction à l'analyse structurale des récits , Communications, 2. -BENVENISTE, É. (1966). Problèmes de linguistique générale, 1, Paris : Gallimard. – (1974). Problèmes de linguistique générale 2, Paris : Gallimard. – (1969). Le Vocabulaire des institutions indo-européennes, t. 1, Paris : Minuit. 3. -BRUNOT, F. (1922). La Pensée et la langue, Paris : Masson. 4. -CHERVEL, A. (1977). Histoire de la grammaire scolaire, Paris : Payot. 5. -CHISS, J.-L. & PUECH, C. (1987). « Derrida lecteur de Saussure : effets d'une —mise en crise‖ philosophique du Cours de linguistique générale » dans Fondations de la linguistique, Bruxelles : De Boeck, p. 91-104. – (1997). Fondations de la linguistique. Études d'histoire et	

	d'épistémologie (nouvelle édition), Louvain-la-Neuve : Duculot. – (1999). Le langage et ses disciplines XIXe-XXe siècles, Paris et Bruxelles : Duculot. 6. Dictionnaire des genres et notions littéraires (nouvelle édition augmentée), Paris : Encyclopaedia Universalis/Albin Michel, p. 793-820. 7. DERRIDA, Jacques. (1967). De la Grammatologie, Paris : Minuit. – (1967). L'Écriture et la différence, Paris : Seuil. 8. FOUCAULT, M. (1969). L'Archéologie du savoir, Paris : Gallimard. 9. HUMBOLDT VON, W. (1974). Introduction à l'œuvre sur le kavi, Traduit de l'allemand par Pierre Caussat, Paris : Seuil. 10. JAKOBSON, R. (1963 et 1970). Essais de linguistique générale 1 et 2, Paris : Minuit. – (1965). « Vers une science de l'art poétique » dans Théorie de la littérature, T. Todorov éd, Paris : Seuil, p. 9-13. – (1973). Questions de Poétique, Paris : Seuil. 11. MARTINET, A. (1955). Économie des changements phonétiques. Traité de phonologie diachronique, Berne : Francke. 12. MEILLET, A. (1921-1936). Linguistique historique et linguistique générale, Paris : Champion-Klincksieck. 13. SAUSSURE DE, F. (1916) [1962]. Cours de linguistique générale, Paris : Payot. – (1967-1974). Cours de linguistique générale. Édition critique par Rudolf Engler. Wiesbaden : – (1972) [1994]. Cours de linguistique générale. Édition critique préparée par T. de Mauro, Paris : Payot. 14. TODOROV, T. (1968). « Poétique » dans Ducrot, O., Safouan, M., Todorov, T., Wahl, F., Qu'est-ce que le structuralisme ?, Paris : Seuil. – (1985). Théories du symbole, Paris : Seuil.	
Learning Outcomes	Au terme de ce cours, les étudiants seront capables de: - définir les concepts fondamentaux de l'étude du langage; - décrire les différents modules du langage et en lister les caractéristiques ; - distinguer un message linguistique d'un message non linguistique.	

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Programme: M. A. (French)
Course Code: FRC 109 **Title of the Course:** Literary movements

Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	L'étudiant est censé être en mesure de connaitre les principaux mouvements littéraires français, de situer ces mouvements dans le temps, de définir ces mouvements, d'en donner des exemples d'auteurs et d'œuvres, de noter le rôle ou l'importance de ces mouvements.	
Content:	1. **Le Classicisme.** 2. **Le Romantisme.** 3. **Le Réalisme.** 4. **Le Symbolisme.** Note : Illustration des courants littéraires à travers des textes au choix.	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio- visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	**Suggested Readings** 1. Corneille, « Le Cid » 2. Lafayette, « La Princesse de Clèves » 3. La Fontaine, Fables 4. Molière, « Le Tartuffe », « L'Avare » 5. Racine, « Andromaque », « Phèdre » 6. Chateaubriand, « René » 7. Lamartine, « Méditations poétiques » 8. Hugo, « Les Contemplations », « Notre Dame de Paris » 9. Musset, « La Nuit de Mai », « Souvenir » 10. Stendhal, « Le Rouge et le Noir » 11. Balzac, « Le Père Goriot », « Eugenie Grandet » 12. Flaubert, « Madame Bovary » 13. Maupassant, Contes 14. Baudelaire, « Les fleurs du Mal » 15. Zola, « Germinal » 16. Verlaine, « Mon Rêve familier », « Chanson d'Automne », « Le Ciel est pardessus le toit » 17. Rimbaud, Arthur. « Le Bateau ivre », « Illuminations », « Voyelles » 18. Mallarmé, « L'Azur », « Le Vierge, le vivace », « Brise marine », « L'après-midi d'un faune » 19. Paul Verlaine, Fêtes galantes, Romances sans paroles, précédés de Poèmes 20. Mérimée, Prosper «La Vénus d'Ille »	

	Références 1. Antoine Adam, Histoire de la littérature française au XVIIe siècle, collection « Bibliothèque de l'Évolution de l'Humanité », Éditions Albin Michel, 1997, 3 vol. 2. Bertrand Marchal : Lire le Symbolisme, Dunod, 1993. 3. Max Milner, Le Romantisme I. 4. Henri Peyre, Qu'est-ce que le romantisme ? 5. Paul Verlaine, Poèmes saturniens, Paris, Le Livre de poche, 1996, présentés par Martine Bercot 6. Denoeu, François, Sommets Littéraires Français : Anthologie-Histoire de la Littérature- Française des Origines à nos Jours 7. Lagarde, André, XX Siècle : Les Grands Auteures Français	
Learning Outcomes	À la fin de ce cours l'étudiant est censé être en mesure : - d'identifier les principaux mouvements littéraires français - de situer ces mouvements dans le temps - de commenter sur ces mouvements, d'en donner des exemples d'auteurs et d'œuvres	

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Programme: M. A. (French)
Course Code: FRO-118 **Title of the Course:** French Language Level 3
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Ce cours de langue française a pour but d'améliorer les compétences linguistiques en français. Ce niveau correspond au niveau A2- B1 du Cadre Européen Commun de Référence pour les Langues (CECRL).	
Objective:	Ce cours vise à préparer l'étudiant à l'examen de niveau B2 selon le Cadre Européen Commun de Référence.	
Content:	**1. Développer la communication, la culture et la langue du savoir-faire**. Manier la langue française spontanément et avec aisance, être capable de suivre une argumentation complexe et de développer un point de vue. **2. Exprimer avec précision et sens clair tant dans les domaines personnels, professionnels ou académiques**. Suivre les émissions de télévision et de films **3. Travailler sur des documents longs sur des sujets bien connus**. Etude de documents décrivant la société française d'aujourd'hui, les attitudes et les comportements. **4. Rédiger un texte clair, structuré, de rapports ou essais** Documents, textes, visuels et des documents audio doivent être choisis en fonction du sujet enseigné.	15 hours 15 hours 15 hours 15 hours

Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/Readings	1. À Propos B1-B2, Christine Andant, Marie –Laure Chalaron, Langers, PUG 2. Version Originale 3, Maison des langues 3. Saison3 Niveau A3, Didier 4. Alter Ego 3, Hachette 5. Echo A2. CLE Internationale 6. Panorama 3, CLE 7. Connexions 2, Didier 8. Compréhension écrite B1/B2, CLE 9. DELF B1 200 activités, CLE 10. Grammaire progressive du français-Avancée, CLE	

Learning Outcomes	À la fin de ce cours, l'étudiant sera capable de communiquer en français avec une certaine aisance sur des thèmes abordés pendant le cours, de sorte qu'il puisse : - dégager le sens d'un message oral qui traite de sujets de la vie courante; - comprendre des textes français (journaux, revues, ...) destinés aux lecteurs moyens; - employer correctement les structures les plus usuelles de la langue.	

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Programme: M. A. (French)
Course Code: FRO-134 **Title of the Course:** Textual Analysis
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	La partie théorique du cours expose, à partir d'exemples d'analyse, les principes de base de l'analyse textuelle qui seront mis en œuvre dans la partie pratique. Les notions métriques et narratologiques de base seront également présentées. La partie pratique permet l'analyse des textes choisis dans différents genres. Ce cours fournit des outils pour l'analyse des différents types de textes ou de discours :	
Content:	**1. Introduction au texte littéraire et à l'analyse littéraire**. Les genres littéraires et leurs spécificités, Les grands auteurs et	15 hours

	œuvres de la littérature française. **2. Les outils d'analyse** Les verbes, la dénotation et la connotation, les réseaux lexicaux, les tonalités, registres d'un texte. **3. L'esthétique du texte littéraire** Comparaison et métaphore, les images, les sonorités, le rythme, la versification, les figures de style. **4. Les notions littéraires** Les types de texte- narratif, descriptif, explicatif, argumentatif. L'auteur, le narrateur, les personnages du récit, le point de vue, la focalisation, style direct, indirecte, monologue intérieur, les notions du temps et de l'espace. **Textes : au choix**	15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. G. Genette (sous la dir. de), Théorie des genres. 2. N. Toursel et J. Vassevière, Littérature : textes théoriques et critiques, 3. Colin. N. Ricalens-Pourchot, Lexique des figures de style 4. Dupriez, Gradus, les procédés littéraires. 5. D. Bergez, L'explication de texte littéraire 6. A. Colin Y. Reuter, Introduction à l'analyse du roman 7. D. Ducros, Lecture et analyse du poème 8. A. Lesot, M. Joyeux. Profil pratique- Les figures de style 9. M. Duras, Moderato Cantabile 10. Pilote, Carde, Méthodologie de l'Analyse littéraire et du commentaire composé	
Learning Outcomes	À la fin de ce cours l'étudiant sera capable - d'analyser des textes littéraires français modernes. - de proposer une analyse d'un texte littéraire non vu.	

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Programme: M. A. (French)
Course Code: FRO 101 **Title of the Course:** A Study of French Romanticism
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	Ce cours vise à étudier de façon approfondie un mouvement littéraire et culturel du XIXe siècle : le romanticisme. Il propose	

	une étude plus approfondie des œuvres représentatives et des principales thématiques.	
Content:	**1. Compréhension du mouvement romantique** : les caractéristiques et les enjeux du mouvement romantique. L'étude des origines du romantisme français. **2. L'étude des textes de Stendhal, Balzac, Hugo et autres** et la recherche romantique de l'inspiration dans la vie affective du sujet, dans des décors exotiques, et dans la richesse de la légende nationale. **3. Une étude de la littérature pertinente :** La poésie. Le drame romantique Le cours peut aussi conduire à la recherche dans d'autres expressions artistiques du mouvement romantique en France. **Textes : au choix**	15 hours 30 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio- visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. Chateaubriand, René. 2. Lamartine, Méditations poétiques 3. Hugo, poèmes dans Lagarde et Michard. 4. Musset, "La Nuit de Mai," "Souvenir" et autres (au choix) 5. Stendhal, Le Rouge et le Noir. 6. Balzac, Le Père Goriot. 7. Nerval, (au choix) 8. Flaubert, Madame Bovary. 9. Maupassant, Contes 10. Baudelaire, Les fleurs du Mal 11. Zola, Germinal. 12. Verlaine, "Mon Rêve familier," "Chanson d'Automne," "Le Ciel est pardessus le toit," Rimbaud, "Voyelles," 13. "Le Bateau ivre," 14. Mallarme, "L'Azur," "Le Vierge, le vivace," "Brise marine" 15. Max Milner, Le Romantisme I. 16. Henri Peyre, Qu'est-ce que le romantisme ?	
Learning Outcomes	À la fin de ce cours l'étudiant est censé être en mesure : -de connaitre le mouvement romantique, : l'origine, l'impact -de définir ce mouvement, d'en donner des exemples d'auteurs et d'œuvres, -de produire des analyses pertinentes, éclairantes sur les plus grandes œuvres du romantisme français.	

Programme: M. A. (French)
Course Code: FRO 119 **Title of the Course:** French for Tourism and Hospitality
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	Le Français du tourisme permet : - L'enrichissement et le perfectionnement des compétences communicatives, professionnelles dans le domaine du tourisme et de l'hôtellerie à travers la présentation de nombreux documents écrits et oraux ; - Le développement de stratégies de travail en autonomie ou en groupe pour réaliser des tâches concrètes grâce à des mises en situation et à des activités variées.	
Content:	**1. Découvrir le monde du tourisme** - les acteurs, les métiers, les lieux. Le marché du travail **2.Accueillir et assister le touriste**- L'accueil et l'assistance, les transports, les horaires, les programmes, l'hôtellerie, la restauration, la gastronomie **3.Concevoir un produit touristique**- L'offre d'itinéraires, d'excursions, de circuits. l'offre d'animations culturelles et de loisirs, l'offre d'hébergement et de restauration. **4. Assurer la vente et l'après-vente**, la vente des prestations et des services, le paiement, les réclamations **5. Promouvoir le produit et fidéliser le client** - Promouvoir l'entreprise, son image, ses produits, connaître et faire connaître le pays, fidéliser le client	15 hours 15 hours 15 hours 7 hours 8 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. CALMY Anne Marie, Le Français du Tourisme, Hachette, Paris 2004 2. CORBEAU S et al.Hôtellerie-restauration.com : Méthode de français professionnel de l'hôtellerie et de la restauration,CLE,Paris,2006 3. DESCOTES-GENON C, E ,Service Compris,Pratique du Français de l'Hotellerie et de la restauration et de la cuisine **Sitographie** 1. Le journal de l'éco-tourisme http://www.lejournaldelecotourisme.com/ 2. Voyageons autrement: http://www.voyageons-autrement.com/index/tourisme-durable.html 3. Voyages pour la planète :	

	http://www.voyagespourlaplanete.com/ Page Facebook du tourisme durable : http://www.facebook.com/Tourisme.Durable 4. La cité de la culture et du tourisme durable : http://www.cctd.eu/ Association Agir pour un tourisme responsable : http://www.tourisme-responsable.org/ 5. Trophées du tourisme responsable : http://www.tropheesdutourismeresponsable.com/ 6. TER durable, la lettre des professionnels du tourisme durable : http://www.terdurable.com/ 7. ETourisme et tourisme durable francophone : http://etourismedurable.org/ 8. The international ecotourism society : http://www.ecotourism.org/ Tourism Vision : http://www.tourism-vision.com/ 9. Tourisme autrement : http://www.tourisme-autrement.be/	
Learning Outcomes	À la fin de ce cours, l'étudiant sera capable de -créer et proposer des circuits touristiques -faire une réservation de voyage, hôtelier -répondre à une demande d'information d'un client -rédiger une fiche d'informations générales sur son pays, à l'usage des visiteurs étrangers -accueillir et installer le client dans sa chambre, expliquer les conditions de réservation, faire modifier ou annuler une réservation (individuel ou groupe) - accueillir et installer le client (individuel ou groupe) à la table, - prendre la commande des clients, - proposer des menus spéciaux ou personnalisés (groupe, forfait, enfants, régimes alimentaires)	

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Programme: M. A. (French)
Course Code: FRC 101 **Title of the Course:** Advanced Language Skills
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français (Niveau A2-B1).	
Objective:	Ce cours de langue française a pour but d'améliorer les compétences linguistiques en français. Ce niveau correspond au niveau B2-C1 du Cadre Européen Commun de Référence pour les Langues (CECRL).	
Content:	1. **Compréhension écrite**- Les textes sur la culture, la civilisation, et la littérature. Les types de textes- journalistiques et littéraires - narratifs, argumentatifs et descriptifs. Dictées et résumés. **Pratique de la compréhension orale**- des exercices pour s'entrainer à la compréhension orale- documents audio	15 hours

	et vidéo, extraits d'émissions de radio / télévision, interviews, et conversations dans un milieu francophone. **2. Composition**- Production des textes écrits sur la culture and la civilisation (sujets – situations réelles et imaginaires, compositions argumentatives, narratives, expressives and explicatives). **3. Grammaire avancée**- Analyse et usage des temps, modes, voix et discours. Expression de la cause, la conséquence, l'opposition, la concession et le but. Identification et usage des expressions idiomatiques, des expressions imagées, des proverbes and des clichés (expressions sur la nature, les animaux et les parties du corps.). **4. Pratique de l'expression orale**- expression libre, dialogue guidés, simulations, présentations orales, débats.	15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. Gevisse, Le Bon Usage, Ed. Duculot (régulièrement mis à jour) 2. Petit Larousse illustré, édition annuelle 3. Petit Robert , édition annuelle 4. Le Robert. Dictionnaire des expressions et locutions 5. Le Robert , Dictionnaire Historique de la langue française (3 tomes) 6. Dictionnaire des expressions idiomatiques françaises, Ed. Le Livre de Poche, 1995 7. Genevieve-Dominique de Salins, Adriana Santomauro. 8. Cours de grammaire française. Paris :Didier, 1997 Michele Boulares, Jean-Louis Frerot. Grammaire progressive du Français. Paris : CLE International	
Learning Outcomes	À la fin de ce cours, l'étudiant sera capable de - s'exprimer de façon claire et détaillée sur une grande gamme de sujets. -Développer un point de vue sur un sujet d'actualité et expliquer les avantages et les inconvénients de différentes possibilités. -Communiquer avec un degré de spontanéité et d'aisance qui rende possible une interaction normale avec un locuteur natif. -Participer activement à une conversation dans des situations familières, présenter et défendre ses opinions.	

Programme: M. A. (French)
Course Code: FRC 105 **Title of the Course:** Francophone Literature and Culture
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	L'étude portera sur les domaines de la littérature et la culture francophones de l'espace francophone	
Content:	**1. La francophonie**- les pays, l'historique, l'organisation, les fêtes. La présence et le statut de la langue française, les cultures, l'histoire et les littératures francophones en Amérique, en Afrique, en Europe, aux Antilles et en Asie. **2. Littérature francophone :** L'étude de la littérature francophone se fera par la lecture de 3 œuvres francophones au choix. a) l'Europe (au choix) b) Les Antilles (au choix) c) l'Amérique (au choix) d) l'Afrique (au choix) Textes : au choix	15 hours 45 hours (15 hrs x 3)
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. Boivin, Dufour. Les identités francophones 2. Overmann. Histoire et abécédaire pédagogique du Quebec 3. M.Condé. Ségou. Les murailles de terre 4. M.Condé. Ségou. La terre en miettes 5. A.Begag. Béni ou le paradis privé 6. A.Begag.le gone du Chaaba. 7. Kourouma. Les soleils des indépendances. 8. C.F.Ramuz. La grande peur dans la montagne. 9. Tétu de Labsade, Françoise, Le Québec : Un pays, une culture 10. Rioux, Marcel, Un peuple dans le siècle 11. Lemieux, Denise (sous la dir.de) Traité de la Culture 12. Beaudoin, Réjean, Le Roman québécois 13. Bouchard, Chantal, La Langue et le nombril.	

	Histoire d'une obsession québécoise 14. Gauvin, Lise, Langagement. L'écrivain et la langue au Québec 15. Gauvin, Lise, Gaston Miron, Écrivains contemporains du Québec, Anthologie 16. Harel, Simon, Le Voleur de parcours : Identité et cosmopolitisme dans la littérature québécoise contemporaine 17. Mailhot, Laurent, Pierre Nepveu, La poésie québécoise des origines à nos jours, anthologie 18. Marcotte, Gilles, Le roman à l'imparfait : la « Révolution tranquille » du roman québécois 19. Nepveu, Pierre, L'écologie du réel : mort et naissance de la littérature québécoise contemporaine 20. Saint-Martin, Lori et al, L'Autre lecture : la critique au féminin et les textes québécois Simon, Sherry et al, Fictions de l'identitaire au Québec.	
Learning Outcomes	À la fin de ce cours l'étudiant sera capable -de produire une analyse pertinente d'un texte francophone ; - de comprendre la présence et le statut de la langue française dans le monde	

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Programme: M. A. (French)
Course Code: FRC 108 **Title of the Course:** Phonetics, Morphology and Syntax
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	
Objective:	Ce cours vise à présenter et approfondir les fondements de la théorie linguistique et à faire acquérir la terminologie de base nécessaire à toute analyse linguistique dans divers domaines tels que phonétique, phonologie, morphologie et syntaxe.	
Content:	**1. Phonétique et Phonologie** La phonologie et la phonétique - La transcription phonétique - Les organes d'articulation - Voyelles et Consonnes -Les voyelles -Les consonnes - Les semi-voyelles - Le `e muet' ou schwa -La variation phonétique. **2. Morphologie**	30 hours 15 hours

	Critères en morphologie la recherché des morphèmes-morphèmes libres et liés -Flexion et dérivation - Morphologie de l'oral et de l'écrit -Les allomorphes -La morphologie du genre -La morphologie verbale – Morphologie comme trait distinctif- la morphologie lexicale. 3. **Syntaxe** La notion de phrase - Langue orale et langue écrite - La créativité - Règles de réécriture et arbres syntaxiques - Syntagmes - Analyse fonctionnelle, thématique et structurelle - Le syntagme nominal - Le syntagme adjectival (SADJ) - Le syntagme prépositionnel: (SP) - Le syntagme verbal (SV) - Les phrases complexes -Les phrases enchâssées - Les phrases coordonnées- Arbres syntaxiques.	15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio- visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. BÉCHADE, H.-D. (1989). Phonétique et morphologie du français moderne et contemporain, Paris, Presses Universitaires de France. 2. BLOOMFIELD, L. (1970). Langage, traduction de J. Gazio, Paris, Payot. 3. BOUDREAULT, M. et al. (1967). Prononciation du français par le rythme,Québec, Presses de l'Université Laval. 4. CALAQUE, A. (1969). Trente-deux exercices de phonétique française, StGermain-en-Laye, Maison des instituteurs. 5. CARTON, F. (1974). Introduction à la phonétique du français, Paris, Bordas. 6. CASSARD, D. (1993-1994). Méthodologie de la correction phonétique, 7. Cours destiné à la formation du Prof-Clef, Centre de Linguistique Appliquée de Besançon, France. 8. CHAMPAGNE-MUZART, C. et BOURDAGES, J. S. (1993). Le point sur la phonétique en didactique des langues, Anjou, Centre éducatif etculturel. 9. CL), D. T. et al. (1977). Ngu am hoc tieng Viet hien dai, Hanoi, NXB Giao duc. 10. DELL, F (1970). Les règles phonologiques tardives et	

	la morphologie dérivationnelle du français, Ph. D. Diss., MIT, inédit. 11. DUCHET, J-L La Phonologie, coll. Que sais-je ?, P.U.F., Paris, 1981 (rééd. 1998) 12. FLAUX, N La Grammaire, coll. Que sais-je ?, P.U.F., Paris, 1993 13. LEBEL, J. G. (1987). «Le conditionnement phonétique, l'enjeu d'une nouvelle pédagogie en correction phonétique», Revue de Phonétique Appliquée 1987, pp. 183-189. 14. MALMBERG, B. (1958). La phonétique, Paris, Presses Universitaires de France, Collection «Que sais-je ?» 637. 15. MARCHAL, A. (1980). Les sons et la parole, Montréal, Guerin. 16. MARTIN, P. (1985). «La description phonologique», La linguistique, Paris, pp. 159-175. 17. SOUTET, O La Syntaxe du français, , 1989 (rééd. 2005). 18. DUBOIS Jean (1963). Étude sur la dérivation suffixale en français moderne et contemporain. Paris: Larousse. 19. SAUVAGEOT, Aurélien (1962). Français écrit, français parlé. Paris: Larousse. [PC 2073 S3] 20. WAGNER, R. L. Les vocabulaires français. Paris: Didier. [PC 2585 W3 Frost] 21. Walter, Henriette (1988). Le français dans tous les sens. Paris: Éditions Robert Laffont.	
Learning Outcomes	Au terme de ce cours, les étudiants seront capables de: -définir les concepts fondamentaux de l'étude du langage; -analyser un fragment et identifier les unités linguistiques qui le composent; -décrire de manière appropriée une situation linguistique donnée; -lister et décrire les différents critères de classification linguistique	

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Programme: M. A. (French)
Course Code: FRO-102 **Title of the Course:** Modern French Literary Criticism
Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français	

Objective:	Des sujets se rapportant à des questions importantes de la littérature française et de la littérature francophone. Le thème choisi peut varier et inclure l'étude d'un genre, mouvement littéraire, la période historique, ou d'un thème. Les sujets possibles incluent études de genre, le théâtre, la littérature orale, traditionnelle, l'existentialisme, les études cinématographiques. Introduire les étudiants à la connaissance des principales écoles critiques actives au XXème siècle, et les entraîner à l'écriture.	
Content:	**Les courants littéraires du 20e siècle :** 1. Le Surréalisme 2. L'Existentialisme, le théâtre de l'Absurde 3. Le roman français / francophone du 20 siècle 4. Théâtre et poésie. Entrainer les étudiants à la critique littéraire. Textes : au choix	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. Bonnefoy, Claude, Dictionnaire de littérature française contemporaine / Claude Bonnefoy, Tony Cartano, 2. Daniel Oster ; avec la collaboration de Jean-Louis Ézine ... [et al.]. Boly, Joseph, La voix au coeur multiple, petite anthologie mondiale de la littérature française contemporaine. 3. Boisdeffre, Pierre de, Métamorphose de la littérature 4. Brochier, Jean-Jacques, L'aventure des surréalistes : 1914-1940 Marcotte, Gilles, Le roman à l'imparfait : la « Révolution tranquille » du roman québécois 5. Nepveu, Pierre, L'écologie du réel : mort et naissance de la littérature québécoise contemporaine 6. Saint-Martin, Lori et al., L'Autre lecture : la critique au féminin et les textes québécois 7. Simon, Sherry et al., Fictions de l'identitaire au Québec	
Learning Outcomes	Au terme de ce cours l'étudiant est censé être en mesure: -de connaitre les courants littéraires du 20e siècle -de définir ces courants littéraires, d'en donner des exemples d'auteurs et d'œuvres, -de noter le rôle ou l'importance de ces mouvements.	

Programme: M. A. (French)
Course Code: FRO 135 **Title of the Course:** Study of the French Novel
Number of Credits: 4
Effective from AY: 2022-23

Pre-requisites for the course:	Bonne connaissance du français	
Objective:	Le cours propose un panorama de la littérature française à travers le roman depuis le 17e siècle jusqu'au 20e siècle. Les auteurs marquants et leurs œuvres majeures sont présentés dans leur contexte historique et social. Ce voyage littéraire initiatique a pour ambition d'une part de donner des repères, de creuser des pistes de réflexion, de proposer des lectures, et d'autre part d'approfondir une sélection d'œuvres représentatives de plusieurs courants littéraires ayant marqué leur siècle.	
Content:	1. **Survol de l'évolution du genre romanesque** : (le roman courtois, le roman de l'époque classique- baroque, psychologique, le conte philosophique du 18e siècle, le roman du 19e siècle- romantique, réaliste, le roman du 20e siècle…) Traits caractéristiques du conte et de la nouvelle. Typologie du roman. Les époques et les types de romans seront étudiés par des romans choisis 2. **Roman classique :** Un roman de l'époque classique au choix/ Un roman philosophique. 3. **Roman réaliste/romantique** : un roman du 19e siècle au choix /Un conte réaliste 4. **Roman moderne/contemporain :** Un roman du 20e /21è siècle **Textes : au choix**	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	

References/ Readings	1. Mme De Lafayette, La princesse de Clèves 2. Voltaire, Candide 3. H. de Balzac, Eugénie Grandet, 4. H. de Balzac, Le Père Goriot 5. G. Flaubert, Madame Bovary 6. Stendhal, Le rouge et le noir 7. Maupassant, Les contes 8. Camus, La Peste 9. Introduction à la vie littéraire…, Bordas (un volume par siècle) 10. Barthes, R. Le Degré zéro de l'écriture 11. Genette, Figures I, II, III. 12. Raimond, M., Le Roman 13. Reuter, Y., Introduction à l'analyse du roman 14. Boisdeffre, Pierre de, Métamorphose de la littérature 15. Lukacs, A G., La Théorie du roman 16. Antoine, M., Le roman français au XVIIe siècle 17. Bafaro, G. Le roman réaliste et naturaliste	
Learning Outcomes	Au terme de sa formation, l'étudiant devra être capable : - de produire une analyse pertinente d'un texte romanesque - de le situer aux plans esthétique, historique, et culturel	

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Programme: M. A. (French)
Course Code: FRO 105 **Title of the Course:** Didactics of French Language Teaching-Learning
Number of Credits: 4
Effective from AY: 2022-23

Pre-requisites for the course:	Bonne connaissance du français	
Objective:	Ce cours consiste en une incitation aux bases théoriques, pédagogiques et techniques de l'enseignement et de l'apprentissage du français.	

Content:	**1. Notions de base**- La définition de la Didactique et les choix pédagogiques. Les différents types d'apprenants. Les attitudes et les stratégies d'apprentissage.	15 hours
	2. L'histoire de la méthodologie de l'antiquité jusqu'à nos jours- L'antiquité- la méthode traditionnelle- la méthode traduction-la méthode directe- la méthode structuro-globale- la méthode communicative- l'approche actionnelle dans l'enseignement du français - la situation de l'enseignement d'une langue étrangère aujourd'hui. Les méthodes non-conventionnelles - Caractéristiques de la langue française- la diversité du vocabulaire français- les caractéristiques du français du point de vue de son phonétisme, son accent et son écriture	15 hours 30 hours
	3. Les pratiques de classe- La fiche pédagogique - l'approche communicative et la compétence communicative- les documents authentiques.	
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. BARBOT (M.-J.), Les auto-apprentissages, Paris, CLÉ International, 2001. 2. BÉRARD (E.), L'Approche communicative - Théorie et pratiques, Paris, CLÉ International, 1991. 3. BERTOCCHINI (P.) et COSTANZO (E.), Manuel d'autoformation à l'usage des professeurs de langue, Paris, Hachette, 1989. 4. BLANCHE-BENVENISTE (Cl.), Approches de la langue parlée en français, Paris, Ophrys, 1997. 5. BOUCHER (A. M.), DUPLANTIE (M.) et LEBLANC (R.), Pédagogie dans l'enseignement d'une langue étrangère, Bruxelles, De Boeck, 1988. 6. Cadre européen commun de référence pour les langues (Apprendre, enseigner, évaluer), Conseil de l'Europe, Didier, 2002. 7. COLLÈS (L.), DUFAYS (J.-L.), FABRY (G.) et MAEDER (C.), Didactique des langues romanes : le développement de compétences chez l'apprenant, Bruxelles, De Boeck/Duculot, 2001. 8. CUQ (J.-P.), Dictionnaire de didactique du français langue étrangère et seconde, Paris, CLÉ International, 2003. 9. CUQ (J.-P.) & GRUCA (I.), Cours de didactique du français langue étrangère et seconde, Grenoble, Presses universitaires de Grenoble, 2002.	

	10. DABÈNE (L.), Repères sociolinguistiques pour l'enseignement des langues, Paris, Hachette, 1994. 11. DALGALIAN (G.), LIEUTAUD (S.) et WEISS (F.), Pour un nouvel enseignement des langues et une nouvelle formation des enseignants, Paris, CLÉ International, 1981. 12. DEFAYS (J.-M.), DELCOMINETTE (B.), DUMORTIER (J.-L.) et LOUIS (V.), L'enseignement du français aux non francophones. Le poids des situations et des politiques linguistiques, Fernelmont, E.M.E., 2003. 13. DENYER (M.), FURNEMONT (J.), POULAIN (R.) et VANLOUBBEECK (G.), Les compétences : où en est-on ? L'application du décret « Missions » en Communauté française de Belgique, Bruxelles, De Boeck,2004. 14. GIRARD (D.), Enseigner les langues : méthodes et pratiques, Paris, Bordas, 1995. 15. MARTINEZ (P.), La Didactique des langues étrangères, Paris, PUF, 1996 (coll. « Que sais-je ? »). 16. MICHAUD (D.), La communication formative. Vers une 17. nouvelle didactique des langues secondes, Montréal,Les Presses de l'Université de Montréal, 1996. 18. MOIRAND (S.), - Enseigner à communiquer en langue étrangère, Paris, Hachette, 1982 (coll. « F »). 19. PUREN (C.), • Histoire des méthodologies de l'enseignement des langues, Paris, CLÉ International, 1991. 20. RENARD (R.), Variations sur la problématique SGAV - Essais de didactique des langues, Mons, Centre international de phonétique appliquée, Didier Érudition, 1993. 21. RICHTERICH (R.) et WIDDOWSON (H. G.), Description, présentation et enseignement des langues étrangères, Paris, Hatier, 1982. 22. TAGLIANTE (C.), La Classe de langue, Paris, CLÉ International, 1994.	

Learning Outcomes	A la fin de ce cours l'étudiant sera capable -d'identifier différents stratégies d'apprentissage de l'antiquité jusqu'à nos jours -de créer des fiches pédagogiques -de répondre aux besoins d'apprentissage individuels de leurs étudiants - d'adapter leur enseignement au contexte local - d'être un observateur sensible et réfléchi de ce qui se passe en salle de classe.	

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Programme: M. A. (French)
Course Code: FRO 113 **Title of the Course:** Scientific and Technical Translation

Number of Credits: 4
Effective from AY: 2022-23

Pre requisites for the course:	Bonne connaissance du français et de l'anglais.	
Objective:	Analyse et traduction des textes portant sur des sujets scientifiques et techniques. Renforcer la capacité de produire des traductions conformes aux exigences de la traduction professionnelle ainsi que la capacité de réviser des traductions.	
Content:	**1. La traduction scientifique et technique**s- notions de base et définitions- Style et registre dans la traduction scientifique- la simplicité et la complexité- la compétence linguistique et technique **2. La typologie des textes**- les types de textes- l'analyse textuelle-la situation de communication – textes vulgarisés et spécialisés– les limites personnelles et professionnelles **3. La traduction technique et la terminologie** – les ressources terminologiques les outils humains et technologiques- le rôle de l'internet- les outils de traduction en ligne- le champ sémantique et notionnel- les collocations- la cohésion **4. La traduction du français et la traduction de l'anglais et la traduction des courts textes** **Textes aux choix**	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	1. Jean Maillot La traduction scientifique et technique, 1981, Technique et documentation, 11, rue 2. Lavoisier, 75 384 Paris Cedex 08, France, ISBN 2-85206-099-X, 264 pages. 3. Daniel Gouadec Terminologie, constitution des données, 1990, AFNOR Tour Europe, Cedex 7, 92 4. 049 Paris La Défense, ISBN 2-12-484811-9, 218 pages. 5. Daniel Gouadec Le traducteur, la traduction et l'entreprise, , 1989, AFNOR Tour Europe, Cedex 7, 6. 92 049 Paris La Défense, ISBN 2-12-484711-2, 181	

	pages 7. Elisabeth Pradez Dictionnaire des gallicismes, 1962, Payot, Paris, 106 Boulevard Saint-Germain, 387 pages. 8. Actes de tous les congrès de la F.I.T. (Fédération Internationale des Traducteurs) 9. Actes d'un congrès intitulé "terminologie et enseignement des langues" organisé à Paris en 1991 par 10. l'association Européenne des Linguistes et des Professeurs de Langues (AELPL), la TILV Editeur, 11. Paris, 1991, 182 pages Tout est terminologie, Jean-Bernard Quicheron Page 9 12. La traduction au Canada, les acquis et les défis, Actes du 2e congrès du Conseil des traducteurs et 13. interprètes du Canada, Montréal, 31 mai - 2 juin 1990, Diffusion Linguatech, ISBN 2-920929-10-0 14. Dictionnaire des faux amis français-anglais, , 1998, ISBN 2- 8011-0765-4 15. Jacques Van Roey, Sylviane Granger, Helen Swallow, Duculot Dictionnaire des faux amis allemand-français, François Vanderperren, Duculot, 1994, ISBN 2- 8011-1079-5	
Learning Outcomes	À la fin de ce cours, l'étudiant -maîtrisera des exigences spécifiques de la traduction professionnelle -fournira des traductions de qualité en respectant les contraintes propres au métier. -saura utiliser le vocabulaire spécifique dans les domaines scientifiques	

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Programme: M. A. (French)
Course Code: FRO 127 **Title of the Course:** Literature through Cinema
Number of Credits: 4
Effective from: 2022-23

Pre requisites for the course:	Good knowledge of French	
Objective:	This course provides students with foundational knowledge of the academic study of film and literature. It focus on studying the differences and similarities between the ways that filmed narratives and written narratives tell their stories	
Content:	1. Study of literary and cinematographic techniques	10 hours

	2. Analysis of any 3 literary classics and their cinematographic adaptations. 3. Analysis of any 2 modern literary works and their cinematographic adaptations.	30 hours 20 hours
Pedagogy:	Teaching methods and syllabus are based on the introduction of students to principles of autonomous and self-directed learning and LSP methodologies. This module will contain LSP in various media and forms of presentation (oral: lectures; audio-visual: TV, video; ICT: Internet, CD-ROMs). Independent work (group and individual). Exercises in task setting and fulfilling.	
References/ Readings	**References** 1. Bazin, André, 'Pour un cinéma impur. Défense de l'adaptation', in qu'est-ce que le cinéma ? (Paris : Les Editions du Cerf, 1999), pp. 81-106. 2. Bazin, André, 'Le 'Journal d'un curé de campagne' et la stylistique de Robert Bresson', in qu'est-ce que le cinéma ? (Paris : Les Editions du Cerf, 1999), pp. 107-27 3. Cartmell, Deborah and Imelda Whelehan, eds., The Cambridge Companion to Literature on Screen (Cambridge: CUP, 2007) (e-book) 4. ---, Adaptations: From Text to Screen, Screen to Text (Routledge, 1999) 5. Cléder, Jean, 'L'Adaptation cinématographique', Fabula LHT, http://www.fabula.org/atelier.php?Adaptation 6. Corrigan, Timothy, Film and Literature: An Introduction and Reader (Prentice Hall, 1998) 7. Dudley, Andrew, 'Adaptation', in Film Theory and Criticism, ed. by Leo Braudy and Marshall Cohen (Oxford: Oxford University Press: 2004), pp. 461-469. 8. Hutcheon, Linda, A Theory of Adaptation (London: Routledge, 2006) 9. Leitch, Thomas, 'Adaptation Studies at a Crossroads', Adaptation, 1 http://filmadaptation.qwriting.qc.cuny.edu/files/2012/08/Le itch-Adaptation-at-Crossroads.pdf 10. Sanders, Julie, Adaptation and Appropriation (Routledge, 2005) 11. Stam, Robert, Literature Through Film: Realism, Magic and the Art of Adaptation (Wiley-Blackwell, 2004) 12. Stam, Robert and Alessandra Raengo, eds., Literature and Film: A Guide to the Theory and Practice of Film Adaptation (Wiley-Blackwell, 2004) 13. Truffaut, François, 'Une certaine tendance du cinéma français', Cahiers du cinéma, http://nezumi.dumousseau.free.fr/trufcahier.htm **Suggested works** 1. Arsène Lupin	

	2. Les Misérables 3. Notre Dame de Paris 4. Madame Bovary 5. Trois Mousquetaires 6. Conte de monte Cristo 7. Le Tour du monde en 80 jours 8. Le fantôme de l'Opera 9. Le Rouge et le Noir	
Learning Outcomes	At the end of the course students will have examined adaptations of textual narratives into film.	

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D 3.22 Minutes of the Board of Studies in Microbiology meeting held on 19.07.2022.

Annexure I

Course structure of M.Sc. Microbiology Part 1 for Semester I and Semester II as per 80 credits

M.Sc. Microbiology - Course structure

M.Sc. MICROBIOLOGY Part 1 (Semester I and Semester II)

COURSE STRUCTURE

CORE COURSES

CODE	COURSE	CREDIT(S) Theory	Practical	Contact Hours
	Semester I			
MIC 101	Microbial Biochemistry [T]	3	-	45
MIC 102	Microbial Biochemistry [P]	-	1	30
MIC 103	Microbial Genetics [T]	3	-	45
MIC 104	Microbial Genetics [P]	-	1	30
MIC 105	Techniques and Instrumentation in Microbiology [T]	3	-	45
MIC 106	Techniques and Instrumentation in Microbiology [P]	-	1	30
MIC 107	Biostatistics [T]	3	-	45
MIC 108	Biostatistics [P]	-	1	30
	Semester II			
MIC 201	Microbial Taxonomy and Systematics [T]	3	-	45
MIC 202	Microbial Taxonomy and Systematics [P]	-	1	30
MIC 203	Industrial Microbiology [T]	3	-	45
MIC 204	Industrial Microbiology [P]	-	1	30
MIC 205	Molecular Biology [T]	3	-	45
MIC 206	Molecular Biology [P]	-	1	30
MIC 207	Archaea – Ecology, Physiology, Biochemistry, and Genetics [T]	3	-	45
MIC 208	Archaea – Ecology, Physiology, Biochemistry, and Genetics [P]	-	1	30

Discipline Specific Optional Courses (Semester I and Semester II)

CODE	COURSE	CREDIT(S)		Contact Hours
		Theory	Practical	
MIO 101	Environmental Microbiology and Bioremediation [T]	3	-	45
MIO 102	Environmental Microbiology and Bioremediation [P]	-	1	30
MIO 103	Immunology [T]	3	-	45
MIO 104	Immunology [P]	-	1	30
MIO 105	Agriculture Microbiology [T]	3	-	45
MIO 106	Agriculture Microbiology [P]	-	1	30
MIO107	Mycology [T]	3	-	45
MIO108	Mycology [P]	-	1	30

Under Discipline specific Optional Courses theory course is a prerequisite for respective practical course.

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Annexure II

Course content of M.Sc. Microbiology Part 1 for Semester I and Semester II as per 80 credits Course content

M.Sc. MICROBIOLOGY Part 1 (Semester I and Semester II)

CORE COURSES

CODE	COURSE	CREDIT(S) Theory	Practical	Contact Hours
	Semester I			
MIC 101	Microbial Biochemistry [T]	3	-	45
MIC 102	Microbial Biochemistry [P]	-	1	30
MIC 103	Microbial Genetics [T]	3	-	45
MIC 104	Microbial Genetics [P]	-	1	30
MIC 105	Techniques and Instrumentation in Microbiology [T]	3	-	45
MIC 106	Techniques and Instrumentation in Microbiology [P]	-	1	30
MIC 107	Biostatistics [T]	3	-	45
MIC 108	Biostatistics [P]	-	1	30
	Semester II			
MIC 201	Microbial Taxonomy and Systematics [T]	3	-	45
MIC 202	Microbial Taxonomy and Systematics [P]	-	1	30
MIC 203	Industrial Microbiology [T]	3	-	45
MIC 204	Industrial Microbiology [P]	-	1	30
MIC 205	Molecular Biology [T]	3	-	45
MIC 206	Molecular Biology [P]	-	1	30
MIC 207	Archaea – Ecology, Physiology, Biochemistry, and Genetics [T]	3	-	45
MIC 208	Archaea – Ecology, Physiology, Biochemistry, and Genetics [P]	-	1	30

Discipline Specific Optional Courses (Semester I and Semester II)

CODE	COURSE	CREDIT(S) Theory	Practical	Contact Hours
MIO 101	Environmental Microbiology and Bioremediation [T]	3	-	45
MIO 102	Environmental Microbiology and Bioremediation [P]	-	1	30
MIO 103	Immunology [T]	3	-	45
MIO 104	Immunology [P]	-	1	30
MIO 105	Agriculture Microbiology [T]	3	-	45
MIO 106	Agriculture Microbiology [P]	-	1	30
MIO107	Mycology [T]	3	-	45
MIO108	Mycology [P]	-	1	30

Under Discipline specific Optional Courses theory course is a prerequisite for respective practical course.

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CORE PAPERS

MIC 101 MICROBIAL BIOCHEMISTRY [T]
Theory Course Credit : 3
Contact Hours : 45

Prerequisites	The student should be familiar with the different biomolecules and their metabolism.	
Objective:	This course deals with the characteristics, properties and biological significance of the biomolecules of life. In depth knowledge of the energetics and regulation of different metabolic processes in microorganisms.	
Content:		
1.	**Biological Molecules**	**(15)**
1.1	**Protein**	
A.	Amino acids: features and properties.	
B.	Protein: structure, principles of separation and purification, molecular weight determination; sequencing and chemical synthesis.	
C.	Enzymes: activity, inhibition, mechanism of action; regulatory – allosteric and covalently modulated enzymes and their significance in metabolism.	
1.2	**Carbohydrate**	
A.	Monosaccharides: types, characteristics and properties.	
B.	Disaccharides, oligosaccharides, polysaccharides – biological significance.	
1.3	**Lipid**	
A.	Fatty acids: saturated and unsaturated, structure and properties.	
B.	Lipids: classification, structure (phospholipids, sphingolipids), properties; biological significance; lipid composition of microorganisms.	
2.	**Bioenergetics and Carbohydrate Metabolism**	**(15)**
2.2	**Bioenergetics**	
	Thermodynamics, exergonic and endergonic reactions, redox potential, high energy compounds, ATP structure and significance.	
2.3	**Oxidative Phosphorylation**	
	Redox enzymes, aerobic electron transport and oxidative phosphorylation, Proton Motive Force	
2.1	**Carbohydrate metabolism**	
A.	Carbohydrates: Central pathways of metabolism – regulatory mechanisms, bioenergetics and significance – EMP, TCA cycle (glucose aerobic and anaerobic metabolism, malate metabolism), Homolactic and Heterolactic acids pathway, Glyoxylate cycle. Utilization of sugars such as lactose, galactose, maltose and of polysaccharides such as starch, glycogen, cellulose, pectin.	
B.	Gluconeogenesis from TCA intermediates / amino acids / acetyl-CoA; biosynthesis of polysaccharides (Peptidoglycan, starch and glycogen) and sugar inter-conversions.	

3.	**Lipids, Amino Acids, Nucleotides and other Metabolic Paths**	**(15)**
3.1	**Lipid Metabolism**	
A.	Catabolism: Oxidation of fatty acids and the bioenergetics involved.	
B.	Anabolism: Biosynthesis of fatty acids: saturated and unsaturated, triglycerides, phospholipids, sterol.	
3.2	**Amino Acid and Nucleotide Biosynthesis**	
A.	Amino acid biosynthetic pathways and their regulation.	
B.	Purine and pyrimidine nucleotides, Deoxyribo nucleotides: biosynthesis and regulation.	
C.	Biosynthesis of nucleotide coenzymes.	
3.3	**Photosynthetic Metabolism**	
A.	Microorganisms and photosynthetic pigments, fundamental processes in Photosynthesis.	
B.	Photosynthetic electron transport; Oxygenic and anoxygenic Photosynthesis; photophosphorylation.	
3.4	**Bioenergetics of Chemolithotrophic microorganisms**	
3.5	**Antimetabolites of Microbial Origin**	
	Structure, biosynthesis, types and mechanism of action	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Lehninger, A., Cox, M. and Nelson, D. L., Principles of Biochemistry, W. H. Freeman & Company.	
(Latest Edition)	Moat, A. G., Foster, J. W. and Spector, M. P., Microbial Physiology, A. John Wiley & Sons Inc. Publication.	
	Bull, A. T. and Meadow, P., Companion to Microbiology, Longman Group Limited, New York.	
	Voet, D., Voet, J. G. and Pratt, C. W., Principles of Biochemistry, John Wiley and Sons Inc.	
	Murray, R. K., Bender, D. A., Botham, K. M., Kennelly, P. J., Rodwell, V. W. and Weil, P. A., Harper's Illustrated Biochemistry, The McGraw-Hill Companies, Inc.	
	Plummer, D. T., An Introduction to Practical Biochemistry, Tata McGraw Hill Publishing Company.	
	Sadasivam, S., Manickam, A., Biochemical Methods, New Age International (P) Limited.	
	Jayaraman, J., Laboratory Manual in Biochemistry, John Wiley & Sons, Limited, Australia.	
	Berg, J.M., Tymoczko, J.L., Gatto, G.J. and Stryer, L. Biochemistry. W. H. Freeman & Company.	
Learning Outcomes	1. Apply the knowledge to understand the microbial physiology. 2. Understand the regulation of the biochemical pathway and possible process modifications for improved control over microorganisms for microbial product synthesis.	

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MIC 102 MICROBIAL BIOCHEMISTRY [P]
Practical Course Credit : 1
Contact Hours : 30

Prerequisites	The student should be familiar with the different biomolecules and their metabolism.	
Objective:	This course deals with the characteristics, properties and biological significance of the biomolecules of life. In depth knowledge of the energetics and regulation of different metabolic processes in microorganisms.	
Content:		**(30)**
1.	Standard curve for reducing sugar, total sugar and polysaccharide (starch).	
2.	Standard curve for protein (Folin Ciocalteau method).	
3.	Enzyme assay (Amylase), determination of *Km* and *Vmax*.	
4.	Precipitation of protein from solution by salting out and dialysis	
5.	Size exclusion (Gel filtration) chromatography.	
6.	Specific activity, fold purification, percentage yield of enzyme.	
7.	Molecular weight determination by SDS-PAGE.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIC 101	
Learning Outcomes	Apply the knowledge for the estimation of various bio-macromolecules. Understand the handling of metabolites of microbial origin.	

MIC 103 MICROBIAL GENETICS [T]
Theory Course Credit : 3
Contact Hours : 45

Prerequisites	It is assumed that students have basic knowledge of Mendelian genetics, structure of DNA and RNA, Prokaryotic and eukaryotic genome organisation, mutation concept, basic knowledge about replication, transcription.	
Objective:	This course develops concept of Classical Mendelian genetics and deviation from Mendelian principles, Microbial genome organization (Prokaryotic and Eukaryotic), Viral Genetics, Mutagenesis and Bacterial plasmids. Understanding the concepts of replication, transcription and their regulation in prokaryotes and microbial eukaryotes.	
Content:		
1.	**Microbial genome organization, gene regulation and genetic transfer**	**(15)**
1.1	Classical Mendelian genetics; deviation from Mendelian principles; Origin of mitochondria and plastids – Endosymbiotic theory, DNA in Mitochondria and plastids, Mitochondrial and plastid genes inherited	

	by Non-Mendelian mechanism; Introduction to epigenetic inheritance.	
1.2	Prokaryotic & Eukaryotic genome size & structure, exceptions in prokaryotic genome (linear chromosome in *Borrelia burgdorferi*); Introduction to synthetic genome (*Mycoplasma genitalium*), pseudogenes and their significance, C-value paradox, polyploidy in prokaryotes. Prokaryotic and Eukaryotic replication, transcription and regulation. Structure of Prokaryotic genes (lac and trp operon) and Eukaryotic Genes (interrupted Genes, intron splicing mechanisms). Microbial gene transfer (Conjugation, transformation, transduction).	
1.3	Genomic organization, replication and regulation of Lytic and Lysogenic Phages - T4 and Lambda Phage	
2.	**Genomic Rearrangements and Mutagenesis**	**(15)**
2.1	Mechanism of General and programmed DNA rearrangements, Antigenic and phase variation in bacteria. Transposons: IS elements – Composite transposons (Tn3, Tn10), Ty, Copia and P type, Mechanism of transposition. Role of transposons in DNA rearrangements, microbial genome evolution and drug resistance. Deletion, duplication, inversion, translocation. Integrons and Genomic islands - pathogenicity islands.	
2.2	**Mutagenesis, mutation and mutants**: Somatic and germinal mutation, spontaneous and induced mutations, site directed mutagenesis using PCR and cassette mutagenesis, and random mutagenesis. Tautomeric shift, transition, transversion; Concept of clustered regularly interspaced short palindromic repeats (CRISPR) - Cas9. **DNA Damage:** Thymine dimer, apyrimidinic site and apurinic site, cross linking, deamination of base, base mismatch. **Types of mutations:** silent mutation, missense mutation, nonsense mutation, Read through mutation, frameshift- insertion and deletion mutation, suppressor mutation, leaky mutation. **Mutagenic chemicals and radiations and their mechanism of action**: Base analogues (5-Bromouracil and 2-amino purines), alkylating agents (EMS, NTG), Intercalating agents (acridines, Acriflavins), Hydroxylamine; mutagenic radiations- UV, X-rays and gamma rays. Ames test; Auxotrophy. Importance of mutations.	
3.	**Fungal Genetics**: Yeast - *Saccharomyces cerevisiae/ Schizosaccharomyces pombe* and *Neurospora* genomes as model genetic systems; Chromosome replication, 2µ plasmid, Yeast Artificial Chromosomes (YAC), tetrad analysis, genetic compatibility and non-compatibility genes, heterokaryosis, Parasexuality, Petite mutants of yeast, Killer yeast.	**(07)**
4.	**Bacterial plasmids**: Types of plasmids, F plasmids and their use in genetic analysis-F^+/Hfr cells/ F'cells, Col plasmids, R plasmids- plasmids with genes encoding metal resistance and antibiotic resistance - efflux pump/MDR bacteria, degradative plasmids, Ti plasmid. Replication in plasmids. Concept of copy number (Col Plasmid) and compatibility; Bacterial plasmids as research tools.	**(08)**

Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Gardner, E. J., Simmons, M. J. and Snustad, D. P., Principles of Genetics, John Wiley & Sons.	
(Latest Editions)	Krebs J. E., Lewin B., Goldstein E. S. and Kilpatrick, S.T., LEWIS Genes XI, Jones and Bartlett Publishers.	
	Maloy, S. R., Cronan, J. E. and Freifelder, D., Microbial Genetics, Jones and Bartlett Publishers.	
	Streips, U. N. and Yasbin, R. E., Modern Microbial Genetics, John Wiley.	
	Synder, L., Peters, J. E., Henkin, T. M. and Champness, W., Molecular Genetics of Bacteria, ASM Press.	
	Dale, J. W. and Park, S. F., Molecular Genetics of Bacteria, John Wiley	
	Trun, N. and Trempy, J., Fundamental Bacterial Genetics, John Wiley & Sons.	
	Peter, J. R., *i*Genetics: A Molecular Approach, Pearson Education.	
	Freifelder, D. Molecular biology, a comprehensive introduction to prokaryotes and eukaryotes. JANE'S PUBLISHING INC., BOSTON, MA(USA).	
	Sambrook, J., Fritsch, E. F. and Maniatis, T., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, New York.	
	Green, M. R. and Sambrook, J., Molecular Cloning: A laboratory manual, Cold Spring Harbour Laboratory Press, New York.	
	Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K. and Walter, P., Molecular Biology of the Cell, Garland Science.	
	Watson, J. D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., Losick, R. Molecular Biology of the Gene, Pearson/Benjamin Cummings	
	Birnboim, H. C. and Doly, J., (1979) A rapid alkaline extraction procedure for screening recombinant plasmid DNA. Nucleic Acid Research, 7: 1513-1523.	
	Holmes, D. S.andQuigley, M., (1981) A rapid boiling method for the preparation of bacterial plasmids. Anal Biochem., 114(1): 193-197.	
Learning Outcomes	1) Explains principles/concept of prokaryotic and eukaryotic genetics, viral genetics and their application. 2) Learn Mutagenesis, mutation and mutants and their significance in evolution. 3) Understanding the concepts of bacterial and eukaryotic plasmids.	

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Practical Course Credit : 1
Contact Hours : 30

Prerequisites	Students should have basic knowledge of DNA and RNA structure and Prokaryotic and eukaryotic genome.	
Objective:	To learn the basic principles and techniques of microbial genetics.	
Content:		**(30)**
1.	Isolation of genomic DNA from bacteria.	
2.	Isolation of plasmid DNA from bacterial cells by Alkaline Lysis method.	
3.	Spectrophotometric quantification and determination of purity of bacterial plasmid and genomic DNA.	
4.	Agarose gel electrophoresis, visualization and documentation of plasmid and genomic DNA using Gel Doc system.	
5.	UV mutagenesis and screening of pigment deficient mutants of *Serratia marcescens*.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIC 103	
Learning Outcomes	1. Understanding the principles and concept of Prokaryotic DNA isolation and purification. 2. Exposure to the basic techniques of Mutagenesis.	

MIC 105 TECHNIQUES AND INSTRUMENTATION IN MICROBIOLOGY [T]

Theory Course Credit : 3
Contact Hours : 45

Prerequisites	The student should be familiar with the concepts in chemistry and Microbiology.	
Objective:	This course develops the concepts of methodology and instruments involved in studying the different components of microbial cells and their products.	
Content:		
1.		**(15)**
1.1	**Chromatographic techniques:**	
	Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), detectors, column/s matrix- Ion-exchange, affinity and molecular exclusion. (using examples for separation of microbial lipids, fatty acids, pigments, nucleic acids and proteins/enzymes).	
1.2	**Centrifugation:**	
	Principles, methodology, application, types: low speed, high speed and Ultracentrifugation (preparative and analytical) Density gradient centrifugation; Differential centrifugation	
1.3	**Spectroscopy:**	

	Atomic Absorption Spectrophotometry (AAS), UV-Visible, fluorimetry, Fourier transformation infra-red spectroscopy (FTIR), NMR, MS:MALDI-TOF.	
2.		**(15)**
2.1	**Microscopy:**	
	Phase Contrast, Epifluorescence filter technique (DEFT), SEM, TEM, Confocal and AFM.	
2.2	**Radio-isotope and tracer techniques:**	
	Isotope and types of isotopes, Radio-activity counters, Autoradiography, Radiorespirometry.	
2.3	**Cell and tissue culture techniques:**	
	Biohazards and Biosafety cabinet; Primary and secondary/established cell lines, Monolayer and suspension cultures, Fluorescence activated cell sorting (FACS).	
3.		**(15)**
3.1	**Electrophoretic technique:**	
	PAGE, IEF, Agarose gel electrophoresis, PFGE, DGGE, TGGE, Capillary electrophoresis, Single stranded conformation polymorphism (SSCP), Electroporator, Micro-array technique.	
3.2	**Isolation of cell organelles:**	
	Different methods of cell lysis/ breakage and isolation and purification of various cell organelles - Cell surface structures, cell envelopes, plasma membranes, peptidoglycan, Outer membrane, ribosomes, protoplasts, vesicles, spheroplast, DNA, RNA. Separation of ribosomal subunits of bacteria	
3.3	**Other Bio-Instrumentation Techniques:**	
	X-ray diffraction, Oxygen analyser, Biosensors.	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Wilson, K. and Walker, J., Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, N.Y., USA.	
(Latest Edition)	Goswami, C., Paintal, A. and Narain, R., Handbook of Bioinstrumentation, Wisdom Press, New Delhi.	
	Cooper, T. G., The Tools of Biochemistry, Wiley India Pvt. Ltd.	
	Norris, J. R. and Ribbons, D. W., Methods in Microbiology, Volume 5, Part B, Academic Press.	
	Colowick, S. P. and Kaplan, N. O., Methods in Enzymology, Vol. VI, Academic Press, N.Y.	
	Parakhia, M. V., Tomar, R. S., Patel, S. and Golakiya, B. A., Molecular Biology and Biotechnology: Microbial Methods, New India, Pitampura.	
	Sambrook, J., Fritsch, E. F. and Maniatis, T., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, USA.	
	Jayaraman, J., Laboratory Manual in Biochemistry, John Wiley & Sons Limited, Australia.	
	Arora MP.Biophysics, Himalaya Publishing House, New Delhi	
	Bajpai P.K. Biological Instrumentation & methodology, 2nd revised edition, S.Chand and Co.	

	Mahesh S. Biotechnology-3. Including Molecular Biology and Biophysics, New Age International Pvt. Ltd Publishers, New Delhi	
Learning Outcomes	Understand the use of various techniques and instruments involved in the study of microorganisms and their products.	

MIC 106 TECHNIQUES AND INSTRUMENTATION IN MICROBIOLOGY [P]
Practical Course Credit : 1
Contact Hours : 30

Prerequisites	The student should be familiar with the concepts of biochemistry and Microbiology.	
Objective:	This course develops the concepts of various techniques, methodology and instruments involved in studying the microbial cells and their products.	
Content:		**(30)**
1.	Analysis of the microbial cell structure using Phase contrast Microscopy.	
2.	Counting of bacterial cells using epifluorescence microscopy.	
3.	Cell disruption by sonicator and efficacy of sonication.	
4.	Density gradient separation of microbial cells.	
5.	Extraction of microbial pigments and profiling using UV-Vis spectroscopy.	
6.	Silica gel based adsorption chromatography for separation of pigments	
7.	Native Polyacrylamide gel electrophoresis (PAGE) for protein separation and Zymogram (Amylase or Protease).	
8	Demonstration of HPLC, FT-IR, GC and spectral analysis.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIC 105	
Learning Outcomes	To use various instruments for analysis of microbial cell and products. Develop and apply various methods for the processing of microbial cells and their products.	

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MIC 107 BIOSTATISTICS [T]
Theory Course Credit : 3
Contact Hours : 45

Prerequisites	Basic ability to handle numbers and calculation.	
Objective:	The paper develops concepts about types of data observed in biological experiments, its handling and processing. It develops concepts of hypothesis and formulation of experiments. It gives understanding of various statistical operations needed to carryout and process the biological data.	
Content:		

1.		**(15)**
1.1	**Characteristics of biological data:** Variables and constants, discrete and continuous variables, relationship and prediction, variables in biology (measurement, ranked, attributes), derived variables (ratio, index, rates), types of measurements of biological data (interval scale, ratio scale, ordinal scale, nominal scale, discrete and continuous data).	
1.2	**Elementary theory of errors:** exact and approximate numbers, source and classification of errors, decimal notation and rounding off numbers, absolute and relative errors, valid significant digits, relationship between number of valid digit and error, the error of sum, difference, product, quotient, power and root, rules of calculating digits.	
1.3	**Data handling:** Population and samples, random samples, parameter and statistics, accuracy and precision, accuracy in observations Tabulation and frequency distribution, relative frequency distribution, cumulative frequency distribution. **Graphical representation:** types of graphs, preparation and their applications.	
2.		**(15)**
2.1	**Measures of central tendency:** characteristics of ideal measure, Arithmetic mean – simple, weighted, combined, and corrected mean, limitations of arithmetic mean; Median – calculation for raw data, for grouped data, for continuous series, limitations of median; Mode – computation of mode for individual series, by grouping method, in a continuous frequency distribution, limitations of modes; Relationship between mean, median and mode; mid-range, geometric mean,harmonic mean, partition value, quartiles, deciles, percentiles.	
2.2	**Measure of dispersion:** variability, Range, mean deviation, coefficient of mean deviation, standard deviation (individual observations, grouped data, continuous series), variance, coefficient of variance, limitation. Skewness – definition, positive, negative, purpose, measure, relative measure, Karl Pearson's Coefficient, Bowley's Coefficient, Kelly's Measure, Moments.	
2.3	**Correlation analysis** – Correlation, covariance, correlation coefficient for ungrouped data, Pearson's Rank Correlation coefficient, scatter and dot diagram (graphical method). **Regression analysis -** Linear and exponential function **-** DNSA conversion by reducing sugar, survival/growth of bacteria, regression coefficients, properties, standard error of estimates, prediction, regression analysis for linearequation.	
3.		**(15)**
3.1	Probability: Probability, Combinatorial Techniques, Elementary Genetics, Conditional Probability, Bayes' Rule, Statistical Independence, Binomial, Poisson, Normal Distributions.	
3.2	Hypothesis Testing – parameter and statistics, sampling theory, sampling and non-sampling error, estimation theory, confidence limits testing of hypothesis, test of significance; Students' T-test, t-distribution, computation,paired t-test.	
3.3	Chi-square test, F-test and ANOVA.	

Pedagogy:	Lectures/tutorials/assignments/self-study/MOODLE/Videos	
References/ Readings	Kothari, C. R., Quantitative Techniques, Vikas Publishing House.	
(Latest editions)	Arora, P. N. and Malhan, P. K., Biostatistics, Himalaya Publishing House.	
	Danilina, N.I., Computational Mathematics, Mir Publishers.	
	Surya, R. K., Biostatistics, Himalaya Publishing House.	
	Cochran, WG and Snedecor, GW Statistical Methods. Iowa State University Press.	
Learning outcomes	Able to collect, handle, process, present and analyse the biological data. Apply the principles of statistics to biological experiments.	

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MIC 108 BIOSTATISTICS [P]
Practical Course Credit: 1
Contact Hours : 30

Prerequisites	Basic ability to handle numbers and calculation.	
Objective:	The paper develops concepts about types of data observed in biological experiments, its handling and processing. It develops concepts of hypothesis and formulation of experiments. It gives understanding of various statistical operations needed to process the biological data.	
Content:		**(30)**
1.	Excel spreadsheet and data analysis	
2.	Linear equation analysis (regression analysis).	
3.	Normal distribution.	
4.	Hypothesis testing (T Test, Z test)	
5.	Application of other software (graphpad / systat) for statistical analysis	
Pedagogy:	Experiments in the laboratory, data collection and processing.	
References/ Readings	As given under respective Theory Course MIC 107	
Learning outcomes	Able to collect, handle, process and present the microbiology-related data. Apply the principles of statistics to biological experiments.	

MIC 201 MICROBIAL TAXONOMY AND SYSTEMATICS [T]
Theory Course Credit : 3
Contact Hours : 45

Prerequisites	It is assumed that students should have a basic understanding of binomial nomenclature, the basis of classification systems and be familiar with the distinguishing features of different groups of microorganisms.	
Objective:	To introduce the concepts, tools and techniques of taxonomy and systematics of the microbial world.	

	To introduce the salient features of various microbial groups and their underlying diversity.	
Content:		
1.		**(30)**
1.1	**Microbial taxonomy and systematics** Concepts of taxonomy (characterization, classification and nomenclature) and systematics; binomial classification and taxonomic hierarchy of microorganisms, three domain, six-kingdom, 8-kingdom systems, Endosymbiotic theory.	
1.2	**Phenotypic characters** - Morphology, Biochemical tests (e.g. API, BIOLOG), Bacteriophage typing, Serotyping.	
1.3	**Chemotaxonomic markers** - Cell wall components, lipid composition, cellular fatty acid (FAME analysis), isoprenoid quinones, protein profiles (e.g. MALDI-TOF), cytochrome composition, polyamines.	
1.4	**Nucleic acid based techniques** – T-RFLP, G+C content (T_m and HPLC); 16S rRNA / 18S rRNA / ITS gene sequencing; phylogenetic analysis; DNA-DNA hybridization; DNA barcoding.	
1.5	Concepts of species, numerical taxonomy and polyphasic taxonomy.	
2.	Salient features of phylum, class and orders with representative examples of the following – Archaea, Eubacteria (bacteria, cyanobacteria, actinomycetes), Mycota, Protista (algae, protozoa, diatoms); and viruses.	**(15)**
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Sneath, A. H. P., Mair, S. N. and Sharpe, E. M., Bergey's Manual of Systematic Bacteriology Vol. 2. Williams & Wilkins Bacteriology Symposium, Series No 2, Academic Press, London/New York.	
	Goodfellow, M., Mordarski, M. and Williams, S. T., The biology of the actinomycetes, Academic Press.	
	Goodfellow, M. and Minnikin, D. E., Chemical Methods in Bacterial Systematics, The Society for Applied Bacteriology. Technical Series No. 20, Academic Press.	
	Barlow, A., The prokaryotes: A Handbook on the Biology of Bacteria: Ecophysiology, Isolation, Identification, Applications, Volume 1, Springer-Verlag.	
	Kurtzman, C. P., Fell, J. W. and Boekhout, T., The Yeasts - A Taxonomic Study, Elsevier.	
	Prescott, L. M., Harley, J. P. and Klein, D.A., Microbiology. McGraw Hill, New York.	
	Norris, J. R. and Ribbons, D. W., Methods in Microbiology, Vol. 18 & 19, Academic Press.	
	Reddy, C. A., Methods for General and Molecular Microbiology, ASM Press.	
Learning Outcomes	1. Apply knowledge of the standard rules of classification systems to categorize microorganisms. 2. Appreciate and explain the dynamic and ever developing nature of	

	the field of microbial taxonomy and systematics.	

MIC 202 MICROBIAL TAXONOMY AND SYSTEMATICS [P]
Practical Course Credit : 1
Contact Hours : 30

Prerequisites	It is assumed that students should have a basic understanding of binomial nomenclature, the basis of classification systems and be familiar with the distinguishing features of different groups of microorganisms.	
Objective:	To understand the tools and techniques of taxonomy and systematics of the microbial world.	
Content:		**(30)**
1.	Morphological, physiological and biochemical characterization of bacteria.	
2.	Chemotaxonomic analysis of cell wall amino acids.	
3.	Characterization of actinomycetes (*Streptomyces* sp.).	
4.	Characterization of yeast (*Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*).	
5.	Characterization of cyanobacteria.	
6.	Phylogenetic analysis of bacterial 16S rRNA sequences – retrieval of sequences from standard databases, BLAST analysis, construction of phylogenetic tree using bioinformatics tools.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIC 201	
Learning Outcomes	Apply knowledge of the standard techniques of classification systems to categorize and identify microorganisms.	

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MIC 203 INDUSTRIAL MICROBIOLOGY [T]
Theory Course Credit: 3
Contact Hours: 45

Prerequisites	Basic knowledge about the types of microbes and their products of industrial relevance. Knowledge of microbial biochemistry, physiology, genetics and statistics.	
Objective:	To comprehend concepts of the processes, instruments, management and quality used in the industries to produce the products using microorganisms.	
Content:		
1.		**(15)**

1.1	History of Industrial Microbiology, fermentation processes, descriptive layout and components of fermentation process for extracellular and intracellular microbial products.	
1.2	Microbial growth kinetics: Batch kinetics – Monod's model (single substrate), deviations from Monod's model, dual substrates – sequential utilization, multiple substrates – simultaneous utilization, substrate inhibition, product synthesis (primary and secondary metabolite), toxic inhibition, death constant.	
1.3	Microbial growth kinetics: Fed-batch kinetics – fixed volume, variable volume and cyclic fed-batch, applications and examples of fed-batch systems. Continuous cultivation system – relationship between specific growth rate (μ) and dilution rate, multistage systems, feedback systems (internal and external feedback), applications and examples of continuous cultivation system; comparison between various cultivation systems.	
2.		**(15)**
2.1	Optimization and modeling of fermentation process – single variable design, multivariate screening designs, critical factor analysis, optimization designs for two or more factor, singlet method; Metabolic and flux control analysis.	
2.2	**Bioreactor design and operation:** classification of reactors; Ideal mixed v/s plug flow reactor; designing parameters for reactors (stirred tank reactor, airlift reactor, plug flow reactor), rheology of fermentation broth.	
2.3	**Bioreactor design and operation:** gas-liquid mass transfer, heat transfer, analysis of dimension less parameters and their application (aeration number, power number and Reynold's number; Scale-up of bioprocesses: parameters used in scale-up and problems associated with scale-up.	
3.		**(15)**
3.1	**Solid substrate fermentation (SSF):** Principles and application; Comparison between SSF and Submerged Fermentation (SmF), Bioreactor for SSF. Problems in fermentation process and handling (foam, contamination, strain degeneration, etc), Immobilized enzymes and cell systems.	
3.2	**Fermentation monitoring and control:** Common measurement and control systems (speed, temperature, gas, pH, Dissolved oxygen, foam, redox, air flow, weight, pressure, biomass), On-line and off-line analysis, Digital controllers, control algorithm, flow charting, incubation control, advanced fermentation control and computer-based automation of process.	
3.3	**Industrial scale Down-stream processing and product recovery**: principle and general description of instrumentation, Recovery of particulates (cells and solid particles), recovery of intracellular products, primary isolation (extraction, sorption), precipitation, industrial processes for chromatography and fixed bed adsorption,	

	membrane separations; Type Processes - Antibiotic (Penicillin including semi-synthetic), Ethanol.	
Pedagogy:	Lectures/tutorials/assignments/self-study/Moodle/Videos	
References/ Readings (Latest editions)	1. Demain, A. L., Davies, J. E. and Atlas, R. M. Manual of Industrial Microbiology and Biotechnology, ASM Press. 2. Vogel, H. C. and Tadaro, C. M., Fermentation and Biochemical Engineering Handbook: Principles, Process Design and Equipment, William Andrew Publisher. 3. Atkinson, B. and Mavituna, F., Biochemical Engineering and Biotechnology Handbook, Stockton Press. 4. Flickinger, M. C. and Drew S. W., The Encyclopedia of Bioprocess Technology: Fermentation, Biocatalysis and Bioseparation, Volumes 1 - 5, John Wiley Publisher. 5. Stanbury, P. F., Whitaker, A. and Hall, S.J., Principles of Fermentation Technology, Butterworth-Heinemann Publishers.	
Learning Outcomes	1. Apply the principle of management and controls on the microbial processes in industrial settings. 2. Apply the understanding of physiological principles in improvement of the industrial processes.	

MIC 204 INDUSTRIAL MICROBIOLOGY [P]
Practical Course Credit : 1
Contact Hours : 30

Prerequisites	Basic knowledge about the types of microbes and their products of industrial relevance. Knowledge of microbial biochemistry, physiology, genetics and statistics.	
Objective:	Development of concepts in the processes, instruments, management, quality, etc.being used in the industries to produce the products using microorganisms.	
Content:		(30)
1.	Designing of fermentor – stirred tank reactor.	
2.	Fermentation kinetics – growth of *E.coli/S.cerevisiae* and determination of μ_{max}, Ks, Yx/s, m.	
3.	Rheology of substrate solutions.	
4.	Immobilization of microbial cells using alginate.	
5.	Baker's yeast – ISI/BSI quality assurance.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIC203	
Learning Outcomes	Able to manage the microbial process under industrial settings.	

MIC 205 MOLECULAR BIOLOGY [T]
Theory Course Credit: 3
Contact Hours: 45

Prerequisites	It is assumed that the students have a basic knowledge of DNA (structure and replication), transcription and protein synthesis	
Objective:	To enhance the comprehension of concepts in molecular biology.	
Content:		
1.	**Chromosome architecture and eukaryotic DNA replication**	**(15)**
1.1	**Nucleic acids, types of DNAs and DNA packaging**	
A.	Structure of DNA and RNA.	
B.	Types of DNA (A-DNA, B-DNA, Z-DNA and triplex DNA) and their structural characteristics.	
C.	DNA packaging in bacteria (nucleoid) and viruses.	
1.2	**Chromosomes, genomes and their evolution**	
A.	Fundamental functions of DNA.	
B.	Chromosomal DNA and its packaging in the chromatin fibre, chromatin organization.	
C.	Structural features (telomere, centromere and repetitive sequences) of chromosomes and their functions. Lampbrush and polytene chromosomes.	
D.	Evolution of genomes, paralogous and orthologous evolution of duplicated genes	
1.3	**DNA replication in eukaryotes**	
	DNA replication in the context of the cell cycle; Structure and functions of eukaryotic DNA polymerases, functions of other enzymes (helicase, gyrase, topoisomerase, primase, ligase, telomerase); Steps involved in DNA replication; Similarities and differences between prokaryotic and eukaryotic DNA replication.	
2.	**DNA damage, repair and recombination**	**(15)**
2.1	**DNA damage and repair mechanisms**	
A.	Types of DNA damage: spontaneous and induced DNA damage.	
B.	Mechanisms / pathways to remove damaged DNA: Excision repair, mismatch repair, recombination repair, SOS Repair, photoreactivation repair.	
2.2	**Mechanisms of genetic recombination**	
A.	General and site-specific recombination.	
B.	Homologous recombination, Non-homologous end joining (NHEJ).	
C.	Synaptonemal complex, Bacterial RecBCD system and its stimulation of chi sequences.	
D.	Role of RecA / RAD51 in repair and recombination	

3.	**Gene expression and its regulation in prokaryotes and eukaryotes**	**(15)**
A.	The central dogma concept, DNA to RNA to protein	
B.	The RNA world and the origin of life.	
C.	An overview of gene expression control, DNA binding motifs in gene regulatory proteins, genetic switches and their role in the control of gene expression, combinatorial gene control.	
D.	Structure and function of prokaryotic and eukaryotic RNA: Prokaryotic and eukaryotic mRNA, tRNA, rRNA and ribosomes, processing of eukaryotic hnRNA, snRNA.	
E.	Post-transcriptional controls: Transcriptional attenuation, riboswitches, alternate splicing, RNA editing, RNA interference.	
F.	Synthesis and processing of proteins: The genetic code, aminoacylation of tRNA, mechanism of protein synthesis, translational proof-reading, translational inhibitors.	
G.	Protein folding, post-translational modifications of proteins, leader sequences, protein localization and secretion.	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	*Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K. and Walter, P., Molecular Biology of the Cell, Garland Science.*	
(Latest editions)	*Darnell, J. E., Lodish, H. F. and Baltimore, D., Molecular Cell Biology, Scientific American Books, Spektrum Akademischer Verlag.*	
	Watson, J. D., Molecular Biology of the Gene, Pearson/Benjamin Cummings.	
	Malacinski, G.M., Freifelder's Essentials of Molecular Biology, Narosa Book Distributors Private Limited.	
	Krebs J. E., Lewin, B., Goldstein, E. S. and Kilpatrick S.T., LEWIS Genes XI., Jones and Bartlett Publishers.	
	E. J., Simmons, M. J. and Snustad, D. P. Principles of Genetics, John Wiley	
	Tamarin, R. H., Principles of Genetics, McGraw-Hill Higher Education.	
	Twyman, R. M. and Wisden, W., Advanced Molecular Biology: A Concise Reference, BIOS Scientific Publishers.	
	Green, M. R. and Sambrook, J., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, New York.	
	Davis, L. G., Dibner, M. D. and Battey, J. F., Basic Methods in Molecular Biology, Elsevier.	

	Gerhardt, P., Methods for General and Molecular Bacteriology, Elsevier.	
Learning Outcomes	*Understanding of gene structure, expression and regulation of gene expression in both prokaryotes and eukaryotes for application in molecular research.*	

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MIC 206 MOLECULAR BIOLOGY [P]

Practical Course Credit : 1
Contact Hours : 30

Prerequisites	It is assumed that the students have a basic knowledge of DNA (structure and replication), transcription and protein synthesis	
Objective:	This course develops concepts in molecular biology: DNA packaging, DNA damage and repair, gene structure, expression and regulation in both prokaryotes and eukaryotes	
Content:		**(30)**
1.	Isolation of genomic DNA of eukaryotic microorganisms, estimation of quantity and purity of DNA by spectrophotometry, and agarose gel electrophoresis.	
2.	Recovery of genomic DNA from agarose gel.	
3.	Extraction of mRNA / total RNA.	
4.	cDNA synthesis from mRNA.	
5.	PCR amplification of a specific gene using genomic DNA as a template and agarose gel analysis of PCR product to determine amplicon size.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIC 205	
Learning Outcomes	*Able to handle molecular biology tools for gene expression studies.*	

MIC 207 ARCHAEA - ECOLOGY, PHYSIOLOGY, BIOCHEMISTRY AND GENETICS [T]

Theory Course Credit : 3
Contact Hours : 45

Prerequisites	Basic knowledge of the three domains of life.	
Objective:	This course gives the understanding of the ecology, diversity, cell structure, physiology and genetics of Archaea.	
Content:		
1.	**Ecology, Taxonomy and Significance of the Domain Archaea**	**(15)**

1.1	**Evolution of the Domain Archaea:** Three domains of life – Archaea, Eubacteria and Eukarya. a) Carl Woese classification of archaea based on 16S rRNA analysis. b) Similarities and dissimilarities - archaea, eubacteria and eukaryotes. c) Uniqueness of archaea versus other extremophilic microorganisms.	
1.2	**Ecology and Diversity of Archaea**	
	a) Ecology and Global econiches: Deep Sea, Hydrothermal vent, Dead Sea, solar salterns, geothermal vents, solfataras, Antarctica, soda lake, alkaline hot springs, marshy land. b) Strategies to cultivate, preserve and maintain Thermophilic and Halophilic Archaea. c) Studies of unculturable archaea by metagenomics.	
1.3	**Archaeal Taxonomy**	
	Nutrition, growth Characteristics and physiological versatility, Stress response of Major Archaeal Physiological Groups a) Phyla Euryarchaeota : (i) Methanogens (*Methanobacterium thermoautotrophicum*), (ii) Haloarchaea (*Halobacterium halobium*) and (iii) Thermophiles (*Thermoplasma acidophilum*); (iv) Psychrophilic archaea (*Methanogenium frigidum*) b) Phyla Crenarchaeota : (i) *Sulfolobus and* (ii) *Thermoproteus* c) Phyla Thaumarchaeota : Archaeal ammonia oxidizers d) Phyla Korarchaeota e) Phyla Thermoproteota : thermoacidophilic (*Sulfolobus acidocaldarius*), *Ignicoccus hospitalis* f) Phyla Nanoarchaeota: *Nanoarchaeum equitans*	
1.4	**Cell structure and architecture of Archaea:** a) Shape Arrangement and size : *Haloquadratum walsbyi* b) Comparison Between Archaeal and Bacterial Cells c) Cellular organization: cell morphotypes, cell envelopes –Envelopes; membrane lipids and cell wall, ribosomes, histones-nucleosomes appendages -pili, flagella, cannulae, hami. d) Novel bio-molecules: Glycerol diether moieties and macrocyclic lipid, enzymes, co-enzymes: methanopterin, formaldehyde activation factor, Component B, Coenzyme M, F420, F430, corrinoids.	
1.5	**Significance of Archaea** in Biotechnology and Biogeochemical cycling a) *Pyrococcus furiosus- Pfu* Polymerase in Molecular studies b) *Halobacterium salinarum* – Bacteriorhodopsin c) *Thermococcus gammatolerans* - To improve DNA repair and reduce cellular aging d) *Methanosarcina* – Methane production	
2.	**Metabolism and Energetics of Archaea**	**(15)**
2.1	Modified anabolic pathways: a) Gluconeogenesis b) Lipid biosynthesis c) Methanogenesis: from CO_2 and methanol d) Acetoclastic reactions in *Methanosarcina* - H_2 dependent and H_2 independent; and *Methanothrix*	

	e) Carbon dioxide reduction pathways: 3-hydroxypropionate pathway, and reverse Kreb cycle f) Bacterioruberin pathway	
2.2	Modified catabolic pathways: a) EMP b) ED: Semiphosphorylative and Nonphosphorylative ED pathway c) Chemolithoautotrophy: S oxidation	
2.3	Bioenergetics: ATP synthesis (i) respiration-driven : Anaerobic a) light-driven:bacteriorhodopsin b) chloride-driven: halorhodopsin c) cation-driven.	
3.	**Genome of Archaea**	**(15)**
3.1	Size of genome, G + C content, archaeal histones (Sul7d, MC1), chaperonins and heat shock proteins in archaea, introns in archaea, archaeal RNA polymerases, reverse DNA gyrase.	
3.2	DNA replication, transcription and translation in archaea. Plasmids, transposons and insertion elements, AT-rich-islands, Modifications in tRNA and rRNA structure. Novel 7S rRNA.	
3.3	Gene organization in Archaea: Operons (*fdh, his and mcr*). DNA repair in archaea.	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Woese, C. R., Fox, G. E., (1977) Phylogenetic structure of the prokaryotic domain: the primary kingdoms. Proc Natl Acad Sci USA. 74: 5088–5090.	
(Latest editions)	Blum, P., Archaea: New Models for Prokaryotic Biology, Academic Press.	
	Cavicchioli, R., Archaea**:** Molecular and Cellular Biology, ASM Press.	
	Garrett, R. A. and Hans-Peter, K., Archaea: Evolution, Physiology and Molecular Biology, John Wiley and Sons.	
	Howland, J. L., The Surprising Archaea: Discovering Another Domain of Life, Oxford University Press.	
	Barker, D. M.,Archaea: Salt-lovers, Methane-makers, Thermophiles and Other Archaeans, Crabtree Publishing Company.	
	Munn,C.,MarineMicrobiology:EcologyandApplications,GarlandScienc e,TaylorandFrancisGroup,N.Y.	
	Boone, D. R. and Castenholz, R. W., Bergey's Manual of Systematic Bacteriology: The Archaea and The Deeply Branching and Phototrophic Bacteria, Springer Science and Business Media.	
	Corcelli, A. and Lobasso, S., (2006) Characterization of Lipids of Halophilic Archaea. Methods in Microbiology, 35: 585-613.	
	Rothe, O. and Thomm, M., (2000) A simplified method for the cultivation of extreme anaerobic archaea based on the use of sodium sulfite as reducing agent,Extremophiles. 4: 247-252.	

Learning Outcomes	1. Comprehending the ecology, physiology and biochemistry of the domain Archaea. 2. Understanding of the Principle of Archaeal Genetics. 3. Envisage the application of Archaea and archaeal bioactive compounds in Industry.	

MIC 208 ARCHAEA - ECOLOGY, PHYSIOLOGY, BIOCHEMISTRY AND GENETICS [P]
Course Credit: 1
Contact Hours: 30

Prerequisites	It is assumed that students have basic knowledge of 3 domains of life and basic microbiology techniques.	
Objective:	To introduce the methods in sampling and isolation of archaea from different econiches; identification of archaea and study of archaeal bio-molecules.	
Content:		**(30)**
1.	Isolation and culturing of halophilic archaea.	
2.	Identification of the isolates	
2.1	Biochemical tests for characterization of the halophilic archaea.	
2.2	Extraction of archaeal pigment and characterization using UV-Vis spectroscopy.	
2.3	Cellular lipids - Extraction and chromatographic resolution of lipids.	
3.	Screening for hydrolytic enzymes.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIC207	
Learning Outcomes	1. Skill development for Isolation, culturing of Archaea and identification of archaea. 2. Screening the archaea for bioactive molecules.	

Discipline Specific Optional Courses

MIO 101 ENVIRONMENTAL MICROBIOLOGY AND BIOREMEDIATION [T]
Theory Course Credit : 3
Contact Hours : 45

Prerequisites	It is assumed that the students have a basic knowledge of ecosystem structure and environmental pollution.	
Objective:	To introduce the concepts of microbial diversity, community structure, role of microorganisms in biogeochemical cycles, sustainable development and bioremediation.	
Content:		
1.	**Microbial Ecology**	**(15)**

	Ecosystems: Concept of ecosystem, habitat, econiche. Components and functioning of ecosystem, Microbial interactions with biotic environment. Ecological pyramids, energy flow, food chain and food web. Concepts of microbial guild, *r* and *k* selection concept, role of microbes in ecological succession. **Microbial diversity in ecosystem and Community structure:** The expanse and estimates/measurement of microbial diversity- Rank-abundance curve (species richness and eveness), indices of diversity (Shannon index, simpson index, Gini-simpson index), Culture based microbial diversity, Newer high throughput approaches (extinction culture, diffusion chamber/ichip, gel micro droplet method, co-culture method, flow cytometry) for exploring microbial diversity from environmental samples. Culture independent molecular methods (DGGE, FISH, phylochips, metagenomic library) for understanding microbial community structure. Metabolic diversity of microbial communities in diverse environments (aquatic and terrestrial). **Microbial biofilms in environment**: Quorum sensing in bacteria; Nature and significance, Microbial mat.	
2.	**Biogeochemical processes, Pollution and sustainable devvelopment**	**(15)**
	Biogeochemical cycles: Physiological, biochemical, microbiological aspects of carbon, nitrogen, phosphorous, sulphur, Fe and Mn cycles.	
	Impacts of pollution on ecosystem and Concepts of sustainable development: Effect of marine pollutants on productivity and sustainability of aquatic and terrestrial econiche. Eutrophication, HABs, biomagnification. Ballast water and significance of invasive microorganisms. Climate change and occurrence of microbial diseases. Environment impact assessment (EIA) studies. Concept of sustainable development and application of microorganisms towards sustainable development; Microorganisms for clean energy.	
3.	**Biomonitoring and microbial bioremediation of pollutants.**	**(15)**
	Application of microorganisms for pollution Biomonitoring-biotracers and biosensors, microbes as Bioindicators. **Bioremediation technologies**: Microorganisms for bioremediation of oil spills (biodegradation, bioaugmentation, biostimulation, biosurfactants) heavy metals, xenobiotics (biotransformation, co-metabolism) and recalcitrant pesticides. **Waste water treatment plants**: Primary, secondary and tertiary treatment of waste water. Concept of microbial consortia and microbial biofilms in waste management and pollution abatement. **Valorization of agro waste**: Containing lignin, cellulose and pectin. Intimate coupling of photocatalysis and microbial biodegradation (ICPB) for advanced treatment of organic pollutants.	
Pedagogy:	Lectures/tutorials/assignments/self-study	

References/ Readings	Scragg, A. H., Environmental Biotechnology, Longman Publishers.	
(Latest editions)	Sharma, P. D., Environmental Microbiology, Alpha Science International.	
	Osborn, A. M. and Smith, C. J., Molecular Microbial Ecology, Taylor and Francis.	
	Liu, W-T. and Jansson, J. K., Environmental Molecular Microbiology, Caister Academic Press.	
	Norris, J. R. and Ribbons, D.W., Methods in Microbiology, Vol. 18 & 19, Academic Press	
	Murugesan, A. G. and Rajakumari, C., Environmental Science and Biotechnology: Theory and Techniques, MUP Publishers.	
	Naik, M. and Dubey, S. K., Marine Pollution and Microbial Remediation, Springer Publications.	
	Munn, C., Marine Microbiology: Ecology and Applications, Garland Science, Taylor and Francis Group, N.Y.	
	Mitchell, R. and Kirchman, D. L., Microbial Ecology of the Oceans, Wiley Publishers.	
	Satyanarayana, T., Johri, B. and Anil, T., Microorganisms in Environmental Management, Springer Publishers	
	Kennish, M. J. Practical Handbook of Estuarine and Marine Pollution. CRC Press, Francis and Taylor.	
	King, R. B., Sheldon, J. K. and Long, G. M. (1997) Practical Environmental Bioremediation: The Field Guide, Lewis Publishers.	
	Willey, J. M., Sherwood, L. M., & Woolverton, C. J. (2017). Reference/ Readings Prescott's Microbiology. McGraw-hill Education. 10th Edition	
	Medigan, M. T., Bender, K. S., Bukley, D. H., Sattley, W. M., & Stahl, D. A. (2019). Brock Biology of Microorganisms. Pearson. 15th Edition.	
	Cavicchioli, R., Ripple, W. J., Timmis, K. N., Azam, F et al. (2019). Scientists' warning to humanity: microorganisms and climate change. Nature reviews microbiology, 17, 569- 586.	
	King, R. B., Sheldon, J. K., & Long, G. M. (2019). Practical Environmental Bioremediation: The Field Guide. CRC Press. second edition.	
Learning Outcomes	Applying the understanding of the microbial diversity, community structure and role of biogeochemical cycling of nutrients, for bioremediation and sustainable development.	

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MIO 102 ENVIRONMENTAL MICROBIOLOGY AND BIOREMEDIATION [P]
Practical Course Credit : 1
Contact Hours : 30

Prerequisites	It is assumed that the students have a basic knowledge of environmental pollution and microbiology.	
Objective:	To familiarize with the techniques of waste water analysis, biodegradation of aromatic pollutants and bioremediation of metal/metalloid pollutants.	
Content:		**(30)**
1.	Analysis of water samples for COD, BOD and microbial load.	
2.	Isolation of hydrocarbon degrading microorganism (degradation of sodium benzoate/Naphthalene).	
3.	Isolation of biosurfactant producing microorganisms.	
4.	BATH assay for microbial adherence.	
5.	Isolation of selenite/tellurite resistant microorganisms for application in bioremediation.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIO 102	
Learning Outcomes	1. Able to perform waste water analysis; biodegradation of aromatic pollutants 2. Able to demonstrate the role of microorganisms in bioremediation.	

MIO 103: IMMUNOLOGY [T]
Theory Course Credit : 3
Contact Hours : 45

Prerequisites	Basic knowledge on pathogens, serology, and general principles of immunology.	
Objective:	1. To understand the concepts and mechanisms in the functioning of immunological cells and their interactions. 2. To get acquainted with the regulations of molecule synthesis, signalling, immune responses and allied activities of immune system at the molecular level.	
Content:		
1.		**(15)**
1.1	**Phagocytosis** – Cell surface receptors/markers and their role, killing mechanisms; **NK cells** – Cell to cell recognition for normal and modified cells, receptors, initiation of apoptosis and killing of target cells, malfunctioning of NK cells; role of mast cells in immunity.	
1.2	Classification and concepts of immunoglobulin domain, distribution of immunoglobulin domain, superfamily member, structure and function of TCR and BCR, diversity of antigen binding domain, concept of segmented gene, gene organization of Ig and TCR, rearrangement and generation of gene during differentiation	

	and development of B and T Cells, expression of Ig and TCR Cistrons, class switch and regulation of expression, B and T Cell ontogeny.	
1.3	Major Histocompatibility Cluster – Introduction to MHC I, II and III, structure and function of MHC I and II, distribution and recognition of MHC I and II, gene organisation and concept of polymorphism, expression and its regulation, processing of extracellular antigen by APC, presentation of intracellular antigen by nucleated cells, recognition of MHC I and II by TCR/CD3 complex; Members of MHC III and their roles (in brief).	
2.		**(15)**
2.1	Immunocompetent T and B cells, recognition, signaling and activation of T cells by APC, control and regulation of activated T-Cells, B-cell activation – Type 1 thymus-independent antigen, Type 2 thymus-independent antigen, thymus dependent antigen, co-operation with T-cells and activation of resting B-cells, antigen processing by B-cells, stimulation by cross-linking surface Ig.	
2.2	Cytokine as messengers, receptor for cytokine – gp130 subfamily, beta-c and gamma-c receptor subfamily, signal transduction and effects, network interactions; TH1 and TH2 responses; Cytokine mediated chronic inflammatory response; Killer T Cell and its regulation; effect of antigen dose and maturation of affinity of antibodies; role of memory cells.	
2.3	Antigen as major factor in control, feedback control of antibody production, T cell regulation – T-helper cells, T-cell suppression; Idiotypic networks, influence of genetic factors, immune regulation through hormone; T-cell tolerance.	
3.		**(15)**
3.1	Concept of inflammation (self-study), complement fixation (self-study), defense against intracellular bacterial pathogen, immunity to viral infection, immunity to fungi, immunity to parasitic infections; Passively acquired immunity, vaccination – herd immunity, strategies, killed organisms as vaccines, live attenuated vaccines, subunit vaccine, epitope vaccines, vaccines in use and experimental vaccines, Adjuvant and new approaches in vaccine development.	
3.2	**Immuno-techniques**: Antigen antibody interactions in solution (self study), identification and measurement of antigen (self study), epitope mapping, hybridoma technology and monoclonal antibody revolution, catalytic antibodies, engineering antibodies, antigen-antibody based affinity chromatography (self study), isolation of leukocyte and subpopulations, localization of antigen *in cyto* and *in tissue*, assessment of functional activity, genetic engineering of experimental animal for immune response investigation. **Immuno-assays and their application**: ELISA, SRID RIA, Immuno-fluorescence, Western Blotting.	
3.3	**Clinical immunology (Immunodeficiency)**: phagocytic cell defects, complement system deficiency, primary B-cell deficiency, primary	

	T-cell deficiency, combined immunodeficiency, secondary immunodeficiency, comparison between SCID and AIDS, recognition of immunodeficiency.	
Pedagogy:	Lectures/tutorials/assignments/self-study/Moodle/videos	
References/ Readings (Latest edition)	1. Goldsby, R. A., Kindt, T. J. and Osborne, B. A., Kuby Immunology. W.H. Freeman 2. Bona, C. A. and Bonilla, F. A., Textbook of Immunology, Fine Arts Press 3. Janeway, C. A., Travers, P., Walport, M. and Shlomchik, M. J., Immunobiology, Garland Science. 4. Delves, P., Martin, S., Burton, D. and Roitt, I., Roitt's Essential Immunology. Wiley-Blackwell. 5. Chakraborty, P. and Pal, N. K., Manual of Practical Microbiology and Parasitology, New Central Book Agency (P) Ltd, Delhi, India. 6. Goldsby, R. A., Kindt, T. J. and Osborne, B. A., Kuby Immunology. W.H. Freeman 7. Bona, C. A. and Bonilla, F. A., Textbook of Immunology, Fine Arts Press 8. Janeway, C. A., Travers, P., Walport, M. and Shlomchik, M. J., Immunobiology, Garland Science. 9. Delves, P., Martin, S., Burton, D. and Roitt, I., Roitt's Essential Immunology. Wiley-Blackwell. 10. Chakraborty, P. and Pal, N. K., Manual of Practical Microbiology and Parasitology, New Central Book Agency (P) Ltd, Delhi, India. 11. Abbas, A. K., Lichtman, A. H., & Pillai, S. Cellular and molecular immunology. Elsevier Health Sciences.	
Learning Outcomes	1. Comprehend the mechanisms of immunological responses. 2. Apply the principles of cellular ontogeny and the gene rearrangement to understand the novel and complex immune system.	

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MIO 104 IMMUNOLOGY [P]
Practical Course Credit : 1
Contact Hours : 30

Prerequisites	Basic knowledge of pathogens, haematology and principles of immunology.	
Objective:	Hands-on practice for various techniques used in immunology.	
Content:		**(30)**
1.	Haemagglutination: Blood grouping - ABO and Rh systems	
2.	Immunodiffusion slide technique	
3.	Agglutination tests for *Salmonella*-antigens	
4.	Complement fixation test	
5.	C-reactive protein determination	
6.	ELISA	
7.	Rapid tests – Malaria antigens Pv/Pf, IgM/IgG antibodies for Dengue, Hepatitis HBsAg	
8.	Rheumatoid Arthritis Factor determination	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIO 103	
Learning Outcomes	Apply techniques in immuno-diagnosis.	

MIO 105 AGRICULTURE MICROBIOLOGY [T]

Theory Course Credit : 3

Contact Hours : 45

Prerequisites	It is assumed that the students have knowledge about microorganisms and their diversity.	
Objective:	The course deal with the information about Inter-relationship of soil and microorganisms, different groups of beneficial microorganisms in agriculture, microbes as biofertilizer, plant pathogen and biocontrol agent.	
Content:		
1.	**Soil Microbiology**	**(15)**
1.1	**Microbial ecology:** Terrestrial Ecosystem, Pyramids and Econiches.	
1.2	**Soil Biogeochemistry**	
A.	Types of soil, soil Profile, Physico-Chemical (abiotic) and biotic characteristics.	
B.	Factors influencing microbial survival and establishment of inoculants.	
C.	Significance of microbial metabolism/enzymes on soil chemistry (nutrient cycling) & humus formation (humic and fulvic acids).	
1.3	**Plant and soil Microbiology:** Microbiology of the above and below ground parts of the plant (Phytosphere; Rhizosphere and Rhizoplane Microflora, phyllosphere, spermosphere)	
2.	**Plant-Microbe interactions (beneficial)**	**(15)**
A.	Plant growth promoting bacteria as biofertilizers	

	Direct Mechanisms: Nutrient acquisition (nitrogen fixation, phosphate, Zinc, Potassium mobilization, siderophores, plant growth promoting hormones-Auxins, ACC Deaminase) Indirect Mechanisms: ISR, disease suppression	
B.	Mycorrhiza – Ectomycorrhiza, Endomycorrhiza, VAM structure & significance.	
C.	Nitrogen Fixing Microbes – Free living nitrogen (*Azotobacter, Azospirillum*), associative (Cyanobacteria, *Anabaena azollae)* and symbiotic (*Frankia*, *Rhizobium)*	
D.	Biochemistry and Genetics of Nitrogen fixation with reference to symbiotic and non symbiotic nitrogen fixers Significance of *nif* H, D, K, A, L, nod, nodulin and fix genes in the process of microbial nitrogen fixation.	
E.	Manure and compost as a soil amendment.	
G.	Microbial Pesticides-Biocontrol agents for agriculturally important crop plants-Development and their significance; Source Organisms: Bacteria-*Bacillus thuringiensis*, Bt based commercial products, other Bacilli producing pesticides; Fungi—*Beauveria bassiana*, *Metarhizium anisopliae*, *Trichoderma,* Viruses- Baculoviruses for insect pest control.	
3.	**Plant-Microbe interactions (Harmful)**	**(15)**
A.	Plant Pathogens and Genetic basis of pathogenesis, symptoms and plant defense response	
	Causative agents, pathogenesis symptoms, control of common bacterial pathogens, fungal, algal, viral, nematodes.	
B.	Plant Defense Response	
(i)	Phytoalexins and their induction.	
(ii)	Plant defense responses or mechanisms of control (anatomical changes and biochemical synthesis of toxins, alkaloids and other biocontrol molecules).	
C.	Other means of pathogen control.	
(i)	Application of Viral proteins in controlling viral diseases.	
(ii)	Antisense RNA technology in disease control.	
(iii)	Mycoviruses acting against fungal plant pathogens.	
(iv)	Integrated pest management, post harvest management, agri-entrepreneurship development(steps for starting small industry)	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Alexander, M., Introduction to Soil Microbiology, Wiley.	
(Latest edition)	Dadarwal, K. R., Biotechnological Approaches in Soil microorganisms for sustainable crop production, Scientific Publishers.	
	Subba Rao, N. S., Advances in Agricultural Microbiology, Oxford & IBH Publishers.	
	Carr, N. G. and Whitton, B. A., The Biology of Blue-green algae, University of California Press.	
	Mahanta, K. C., Fundamentals of Agricultural Microbiology, Oxford & IBH Publishers.	

	Veeresh, G. K. and Rajagopal, D., Applied Soil Biology and Ecology, Oxford & IBH Publishing Company Pvt. Limited.	
	Somani, L. L., Biofertilizers in Indian Agriculture, Concept Publishing Company.	
	Subba Rao, N. S., Biofertilizers in Agriculture and Forestry, International Science Publishers.	
	Bilgrami K. S. (1987) Plant Microbe Interactions, Proceedings of Focal Theme Symposium, Indian Science Congress Association, Narendra Publishing House.	
	Madigan, M. T., Martinko, J. M., Bender, K. S., Buckley, D. H. and Stahl, D. A., Brock Biology of Microorganisms, Pearson Education Limited.	
	Kumar, H. D., Modern Concepts of Microbiology, Vikas Publishing House Pvt. Ltd.	
	Agrios G.N. Plant Pathology. Academic Press, San Diego	
Learning Outcomes	1. Apply the knowledge of soil chemistry and significant biochemical processes of microbes to improve agricultural practices. 2. Apply the understanding of role of microorganisms in plant growth promotion and control of disease and pests.	

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MIO 106 AGRICULTURE MICROBIOLOGY [P]

Practical Course Credit : 1

Contact Hours : 30

Prerequisites	It is assumed that the student have knowledge about the soil properties and microbial interactions with plants.	
Objective:	Assessing the diverse parameters influencing the soil health. Studying the plant growth promoters and plant pathogens.	
Content:		**(30)**
1.	Isolation of plant growth promoting bacteria from rhizosphere and screening for phosphate/zinc solubilisation, IAA production, K mobilisation, siderophore activity and seedling vigour test.	
2.	Detection of microbial enzymes – amylase, phosphatase, lipase, protease, catalase, urease from various soils such as sandy soil and garden soil.	
3.	Isolation of microbial plant pathogen(s)-bacterial/fungal.	
4.	Preparation of biofertilizer using cyanobacteria	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MIO 105	

Learning Outcomes	Integrate the knowledge of soil microorganisms for the betterment of agriculture.	

MIO 107 MYCOLOGY [T]

Theory Course Credit : 3

Contact Hours : 45

Prerequisites	The student should be familiar with basic microbiology.	
Objective:	This course deals with classification and identification offungi, fungal diversity, genetics and their applications.	
Content:		
1.	**Fungal diversity and distribution**	**(15)**
1.1	**Origin and phylogeny**; **classification**	
1.2	**Fungi – Terrestrial and Aquatic**	
A.	Terrestrial fungi; Aquatic Fungi: Fresh water fungi; Marine fungi: Coastal and Mangrove, Estuarine, Open Ocean, Polar regions.	
B.	Fungal diversity in Hypersaline waters – Thalassohaline and Athallasohaline: Solar salterns, Salt Lake, Dead Sea.	
1.3	**Extremophilic Fungi**	
	Oligotrophs, Alkaliphiles, Acidophiles, Barophiles, Psychrophiles, Thermophiles, Halophiles, Osmophiles, Xerophiles.	
	Fungal adaptation to extreme environments.	
2.	**Physiology and Genetics**	**(15)**
2.1	**Physiology of fungi**	
A.	Growth and development.	
B.	Fungal hormones- attractants, morphogenesis and differentiation.	
C.	Microbial interactions.	
D.	Secondary metabolites: antimicrobials, mycotoxin, pigments.	
2.2	**Fungal genetics**	
	Neurospora and *Saccharomyces*: Life-cycle; Tetrad analysis, gene conversion; Deuteromycotina: parasexuality, cytoplasmic inheritance; Electrophoretic karyotyping.	
2.3	**Identification of fungi**	
A.	Colonial and morphological characteristics, standard keys for identification of fungi.	
B.	Molecular finger printing.	
3.	**Pathogenesis - Antifungal Therapy**	**(08)**
3.1	**Pathogenesis**	
A.	Mycoses - Systemic, sub-cutaneous, cutaneous and superficial, Opportunistic	
B.	Plant pathogens.	
3.2	**Antifungal Therapy**	
	Drugs acting on cell membrane, protein synthesis inhibitors;fungicides.	
4.	**Applications**	**(07)**

A.	Industrially important enzymes.	
B.	Bioprospecting of secondary metabolites: Antimicrobials, antitumour agents, nutraceuticals, pigments,.	
C.	Biodegradation and bioremediation.	
D.	Biocontrol	
E.	Edible Mushrooms	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Alexopoulus, C. J., Mims, C. W. and Blackwell, M., Introductory Mycology, John Wiley & Sons (Asia) Pvt. Ltd.	
(Latest editions)	Mehrotra, R. S. and Aneja, K. R., An Introduction to Mycology, Wiley Eastern Limited.	
	Cooke, R. C. and Whipps, J. M., Ecophysiology of fungi, Blackwell Scientific Publications, Oxford.	
	Deacon, J. W., Introduction to Modern Mycology, Volume 7 of Basic Microbiology, Blackwell Scientific Publications.	
	Kendrick, B., The Fifth Kingdom, Focus Publishers.	
	Davis, B. D., Dulbecco, R., Eisen, H. N. and Ginsberg, H. S., Microbiology, Harper and Row.	
	Strickberger, M. W., Genetic, The MacMillan Company, New York.	
	Domsch, K. H., Gams, W. and Anderson, T-H., Compendium of Soil Fungi, IHW-Verlag.	
	Gilman, J. C. and Joseph, C., A Manual of Soil Fungi, Daya Books.	
	Onions, A. H. S., Allsop, D. and Eggins, M. O. W., Smith's Introduction to Industrial Mycology, Edward Arnold, London.	
Learning Outcomes	Apply the knowledge in identification and bioprospecting of fungi.	

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MIO108 MYCOLOGY[P]

Practical Course Credit : 1

Contact Hours : 30

Prerequisites	It is assumed that students have basic knowledge of microbiology techniques.	
Objective:	To familiarize with techniques related to fungal isolation, identification and application.	
Content:		**(30)**
1.	**Study and Identification of fungi:** Study of standard cultures and identification - Observation of colonial and morphological characteristics, Reference to identification keys	
2.	**Fungal Genetics:** Isolation of fungal DNA	
3.	**Application of fungi for bioremediation:** Fungal degradation of azo dye	
4.	Degradation of plant polymer by fungal enzyme (crude)	
5.	Mushroom cultivation	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	

References/ Readings	As given under Theory Course MIO 107	
Learning Outcomes	To apply the knowledge gained- i. For isolation and identification of fungal isolate ii. For diverse applications in biotechnology	

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D 3.23 Minutes of the Board of Studies in Electronics meeting held on 21.07.2022.

Annexure I

M.Sc. Electronics Programme Course Syllabus as per NEP 2020

Semester	Course Code	Course Title	Theory/ Lab	Course Credits	Contact Hours
Semester I	**Discipline Specific Core Courses (DSCC)**				
	ELC 101	Micro Electronics and VLSI Design	Theory	4	60
	ELC 102	Instrumentation & Control Theory	Theory	4	60
	ELC 103	Advanced Digital Communication System	Theory	4	60
	ELC 104	Electronics Practical I	Lab	4	120
	Discipline Specific Optional Courses (DSOC)				
	ELO101	Numerical Computation and Algorithms	Theory	4	60
	ELO102	EDA Tools	Theory	4	60
Semester II	**Discipline Specific Core Courses (DSCC)**				
	ELC201	Embedded System Design	Theory	4	60
	ELC 202	Real Time Operating System	Theory	4	60
	ELC 203	Digital System Design	Theory	4	60
	ELC204	Electronics Practical II	Lab	4	120
	Discipline Specific Optional Courses (DSOC)				
	ELO 201	Internet of Things	Theory	4	60
	ELO 202	Switching and Routing	Theory	4	60
Semester III	**Research Specific Optional Courses (RSOC)**				
	ELR 301	Signals and Systems	Theory	4	60
	ELR 302	Data Science and Machine Learning	Theory/ Lab	4	60
		Elective V		4	60
	Optional Generic Course (OGC)				
	ELG 301	Optical Communication Systems	Theory	4	60
	ELG 302	Robotics	Theory	4	60
	ELG 303	Biomedical Instrumentation	Theory	4	60
		Elective VI		4	60
Semester IV	**Research Specific Optional Courses (RSOC)**				
	ELR 401	Laser System Engineering	Theory	4	60
	ELR 402	Elective VII	Theory/ Lab	4	60
	ELR 402	Elective VIII	Theory	4	60
	Discipline Specific Dissertation (DSD)				
	ELD 401	Project	--	16	

Semester I

Course Code: ELC 101 **Course Title: Micro Electronics and VLSI Design**		
Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**
Prerequisites for the course		
Should have graduate level knowledge in analog and digital electronics		
Objectives of Course		
This course is intended to: ● Introduce to the VLSI Technology, various fabrications processes involved in IC design , ● Analysis of Electronics circuits, Design examples of VLSI circuits, Circuit Optimization techniques ● Advance circuits designs: Memory, Registers, Synchronous circuits etc.		
Course Content		
Unit I	An overview of VLSI, Modern CMOS Technology	**4 Hours**
Unit II	Silicon Logic, Logic design with MOSFET.	**6 Hours**
Unit III	Physical structure of CMOS Integrated circuits	**6Hours**
Unit IV	Fabrication Technologies of CMOS Integrated Circuits	**8 Hours**
Unit V	Elements of Physical Design	**4 Hours**
Unit VI	Electrical characteristics of MOSFETS	**6 Hours**
Unit VII	Electronic analysis of CMOS Logic gates	**6 Hours**
UNIT VIII	Advanced Techniques in CMOS Logic Circuits	**6 Hours**
UNIT IX	System specifications using HDL, General VLSI components	**5 Hours**
UNIT X	Memories and Programmable Logic	**10 Hours**
Pedagogy		
Lectures/Experiential Learning		
Course Outcome		
Students will, ● Design fundamental gates and customize them for specific electrical and electronics application, ● Understand the fabrications processes involved in VLSI technology, ● Write the Hardware descriptive form of circuits, Synchronize the combinational and sequential circuits, design a static and dynamic memory cell, ● Understand the Programmable logics building blocks		
References/Readings		
1. Introduction to VLSI Circuits and Systems, John P. Uyemura, WILLEY.		

2. Principles of CMOS VLSI Design, N.H.E. W. &Eshahiraghian, Addison Wesley
3. Modern VLSI Design System on Silicon, Pearson Education Asia. By W. Wolf.
4. VLSI Technology, S.M. Sze, McGraw -Hill (1995). 5.Basic VLSI Design, Douglas Pucknell, K. Eshraghian, Prentice Hall India.

Course Code: ELC 102 **Course Title: Instrumentation & Control Theory**		
Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**
Prerequisites for the course		
knowledge of analog and digital electronics, Basics of differential equations.		
Objectives of Course		
This course is intended to: ● Introduce principles of transduction and actuator. ● Explain the important parameters used in instrument characterization, Types of error committed by a user and how to deal with them. ● Describe various standards followed for accurate measurement. ● Explain the techniques used to convert analog data into digital domain and its analysis and storage. ● Understand instruments such as Oscilloscope, spectrum analyzers, wave analyzers, Lock in amplifiers depth. ● Fundamentals of control theory and working of PID controller tuned for a given application.		
Course Content		
Unit I	**Introduction**	**8 Hours**
Basic Concepts of measurements, Calibrations and standards, Transducers: Types and parameters, Sensors - Displacement, Strain, Vibration, Pressure, Flow, Temperature, Force and Torque		
Unit II	**Signal Conditioning**	**8 Hours**
Introduction, Amplification, Simple ended amplifier, Instrumentation amplifier, Types of Filters		
Unit III	**Sampling**	**8 Hours**
Fundamental concepts, Anti-aliasing, Multiplexers, Sample and Hold, Track and Hold.		
Unit IV	**Computer Interfaces**	**08 Hours**
Serial (RS-232), Parallel, GPIB (IEEE-488), Universal Serial Bus (USB) and Variants, Bluetooth		
Unit V	**Display Devices**	**10 Hours**
Review of LED, LCD, Plasma display devices, segmental and dot matrix displays, MEMS display		
Unit VI	**General Purpose Test Equipments**	**08 Hours**
CRO, Digital storage oscilloscope, Digital voltmeter, Wave Analyser, Spectrum analysis, Lock-in-amplifiers, Pulse generators and waveform generators		
Unit VII	**Control System**	**10 Hours**
Types of control system - open loop, closed loop, linear, non-linear, continuous, discrete, frequency and time response, open loop motor control, Principles of PD, PI, PID		
Pedagogy		
Lectures/Experiential Learning		
Course Outcome		
students will:		

- Explain measurement parameters, calibrations and standards in electronic instrumentation.
- Comprehend the significance of signal conditioning and sampling theorem.
- Gain the knowledge of various computer interfaces, and understand the construction, working principle of different display devices and general-purpose equipments used in signal analysis.
- Explain the working principle of different types of control systems.

References/Readings

1. H. S. Kalsi, 'Electronic Instrumentation', Tata MacGrow-Hill
2.Joseph J. Carr, 'Elements of Electronic Instrumentation and Measurement', Prentice Hall India.
3.Albert Helfnick and William Cooper, 'Modern Electronic Instrumentation and Measurement Techniques', Prentice Hall India.
4.Robert Northrop, 'Introduction to Instrumentation and Measurements', CRC Press

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Course Code: ELC 103
Course Title: ADVANCED DIGITALCOMMUNICATION SYSTEMS

Number of Credits: 04 **Total Hours: 60** **Total Marks: 100**

Prerequisites for the course

Graduate level understanding in basics of Electronic Communications

Objectives of Course

This course is intended to:

- Introduce to students with basics of wireless systems – concepts, theory.
- Covers various modulation techniques, to enable the student to synthesize and
- analyse wireless and mobile cellular communication systems over a stochastic fading channel
- Mitigation and diversity techniques

Course Content

Unit I	**Introduction to Mobile and Cellular Communication Systems:**	**5 Hours**

Definitions, impact of Mobile and Cellular Radio Communication Historical overview. Fundamental of Radio Mobile and Cellular Practices Radio mobile links and cells, Frequency re-use, Principles of Cellular Com. Mobile Telephone Switching Subsystem, The mobile frequency spectrum, Hand-off, Cochannel and adjacent channel interference limitations, Near-far problem, Power Control.

Unit II	**Mobile Communication Channel including antennas**	**10 Hours**

The mobile wireless propagation channel, Notions on antennas especially the near and far field concept, Line of Sight (LOS) propagation, Multipath fading , outdoor and Indoor Propagation, Flat and selective fading, Special antennas for base stations and headsets, Deterministic, Empirical and Statistical Methods for propagation link computations.

Unit III	**Overview of Mobile and Cellular Radio Communication Modulation and Detection Techniques:**	**15 Hours**

Analog modulations and detection: AM, FM, PM, ACSB, Hybrid and Digital modulation: PCM, ASK, FSK, QPSK, QAM, MSK, etc, Coherent and noncoherent detection, C/N, S/N, Eb/No and BER relations, Probability concepts, Mobile Radio links parameters.		
Unit IV	**Overview of Multiple Accesses Techniques**	**12 Hours**
Simplex, Duplex TDD and Time Division Duplex, Time division multiple access (TDMA) FDMA and OFDM, Code Division multiple access (CDMA), Hybrid multiple access, Management of voice, Data and Video (Multimedia) information.		
Unit V	**Modern Digital Radio Systems**	**10 Hours**
standards, proposals and comparisons GSM (Europe and all over the world) - TDMA, IS-54 (U.S.A.)- TDMA, IS-95 (U.S.A., Korea) CDMA-, PHS (Japan) - TDMA, Frequency Hopping (FH) (U.S.A.) - CDMA, PCS, PCS Cordless telephone 2nd generation (CT-2), Cellular digital packet data (CDPD), and Wireless LAN, New standard trends Edge, 3rd and 4th generation beginning, LTE,		
Unit VI	**Mitigation Techniques for Mobile System**	**4 Hours**
Overview of Natural and manmade external noise sources, Radiation hazards effects from base stations, Mobile and portable equipments.		
Unit VII	**Diversity Techniques for Mobile Radio Systems**	**4 Hours**
Dispersive channels, Space diversity, Frequency diversity, Equalizer techniques		
Pedagogy		
Lectures/Experiential Learning		
Course Outcome		
Students will ● understand the design, specifications and the performances of various wireless communication systems ● Apply the cellular concepts to evaluate the signal reception performance in a cellular network. ● Apply the traffic analysis to design cellular network with given quality of service constraints. ● Determine the appropriate model of wireless fading channel based on the system parameters and the property of the wireless medium. ● Analyze and design receiver and transmitter diversity techniques.		
References/Readings		
1. Steele, R., Hanzo, L., "Mobile Radio Communication" 3rd Edition Wiley 2005. 2. Rappaport, T.S., "Wireless Communications: Principles And Practice, 2/E,Pearson 3. Wireless Communications (WIRELESS COMMUNICATIONS, 2ND ED, Molisch A F),Wiley		

Course Code: ELC 104 **Course Title:** ELECTRONICS PRACTICALS – I		
Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**
Prerequisites for the course		
Should have studied graduate level basic level electronic subject. It is assumed that students have a working knowledge of passive and active components and digital circuits.		

Objectives of Course

This course is intended to:

- Give the hands-on experience to design the basic digital and analog circuits
- Simulate the various digital modulation techniques and data correction and detection used in general communication system.
- Expose students to design digital circuits using microwind.
- Implement numerical algorithm.

Course Content

Practical Title	**120 Hours**

Unit I

1. Design of counters for digital clock (using Microwind s/w)
2. Multiplexer and Demultiplexer (using Microwind s/w)
3. Encoder and Decoder (using Microwind s/w)
4. 2nd order Butter-worth Notch Filter (p-Spice)
5. Buffer design using SPICE (p-Spice)
6. Memory design using 6T cell

Unit II

7. Design of variable voltage supply @ 2 Amps.
8. Design of Function Generator.
9. Design of Power Amplifier 10 Watts.
10. Design of Stepper driver using Monoshot& 555 Timer.
11. Design of S/C circuit for Strain gauge /Glucose strip @ 3.3V.
12. Design of 4-bit UP-DOWN Counter.

Unit III

13. Implementation of MSK modulation and demodulation.
14. ASK, FSK, QPSK modulation & demodulation.
15. QPSK, modulation & demodulation
16. DS-CDMA simulation.
17. Channel Coding methods. a. Convolution b. Block code
18. Error detection and correction Algorithm
    a. CRC
    b. Hamming code

Unit IV

19. Numerical Programming 1 (Trapezoid method)
20. Numerical Programming 2 (Bisection method)
21. Numerical Programming 3 (Runge Kutta method)
22. Numerical Programming 4 (Newton Raphson method)
23. Numerical Programming 5 (Regula falsi method)
24. Numerical Programming 6 (Secant method)

Pedagogy

Presentations /assignments/Experiential learning

Course Outcome

The Students will :

- learn the basics of a communication system for modulation, data coding , error coding channel coding methods.
- Design signal conditioning and VLSI circuits for various applications.

	Course Code: ELO101 **Course Title: Numerical Computation and Algorithms**
	Number of Credits: 04 **Total Hours: 60** **otal Marks: 100**
	Prerequisites for the course
	Students should have a knowledge of programming
	Objectives of Course
	The course is intended to, ● **Develop the basic understanding of numerical computation and algorithm.** ● **Develop skills to implement algorithms to solve mathematical problems on the computer and Data Bases.**
	Course Content

Unit I	**Computer Programming**	**8 Hours**
Introduction to Algorithms, Elements of Computer Programming language, Basics of algorithm design, general model, Dynamic programming model, principle of optimality, backtracking models.		

Unit II	**Data Structures**	**12 Hours**
Introduction to Data Structures, Vectors and Lists, Stack, Queue, Binary Trees, Graphs, Hashing.		

Unit III	**Theory of Numerical programming**	**25 Hours**
Numerical Integration: Theory of numerical errors, Trapezoidal & Simpsons rule, Romberg method, Improper integrals; Numerical Solution of linear equations: Gauss-Jordon elimination and Lu decomposition; Numerical Solutions of nonlinear equations: Bracketting, bisection, Secant & Regula falsi method, Newton Raphson method; Numerical Solutions to Ordinary differential equations: Runge-Kutta method, Modified midpoint method, Richardson extrapolation.		

Unit IV	**Database**	**15 Hours**
Basic Concepts, Relational Data Model, Database Design, DBMS storage structures and access methods, Query Processing, Transaction Processing, Security & Integrity, Distributed Databases, Client Server Computing		

Pedagogy

lectures/ Experiential Learning

Course Outcome

The students will:

- Use numerical methods for solving a problem, locate and use good mathematical software to achieve the required accuracy for a particular application, get the accuracy you need from the computer, assess the reliability of the numerical results.
- Solve a linear system of equations using an appropriate numerical method.
- Use data structures like Lists, Stack, Queue, Binary Trees.

References/Readings

1. Data structures using C and C++ by YedidyahLangsam, Moshe J Augenstein, Aaron M Tenenbaum, Prentice Hall of India, 1995
2. Data Abstraction and Problem solving in Java by Frank M Carrano, Janet J Prichard ,Addison-Wesley, 2001
3. Numerical Recipes in C, William H. Press, Brain P. Flannery, William T. Vetterling, Saul A. Teulosky, Cambridge University Press, 1990.
4. Numerical Mathematical Analysis, J. B. Scarborough, Oxford and IBM Publishing Company (1979).
5. Numerical Recipes in C: The Art of Scientific Computing by William H Press, Brian P Flannery, Saul A Teukolsky - Mathematics – 1992.
6. Fundamentals of Database Systems, 4th Edition by R Elmasri, S Navathe Addison-Wesley, 2003

Course Code: ELO 102
Course Title: EDA Tools

Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**

Prerequisites for the course

Should have studied Digital Communication Systems

Objectives of Course

This course is intended to:

- Familiarize the students with industry oriented EDA tools.
- Teach Quartus, ISE compilations and programming and its use for design and analysis.
- Enable the student to extract various design parameters from simulation results.

Course Content

Study of JTAG, Modelsim Syntax study.

1. Study of Phases of Quartus compilations.
2. Study of phases of ISE compilations
3. Testing logic using ChipScope-I.
4. Testing logic using ChipScope-II
5. Parallel implementation of CRC.
6. Serial implementation of CRC.
7. FIFO implementation
8. Pulse stretcher
9. Test bench using Modelsim-I
10. Test bench using Modelsim-I
11. Test bench using Modelsim-I
12. Test bench using Modelsim-I

Pedagogy

Lectures/FLIPPED CLASSROOM/Experiential Learning

Course Outcome

The students will,

- Perform compilation using Quartus and ISE software.
- Analyse logic using Chipscope-I and II.
- Develop the Test benches using Modelsim-I

References/Readings

1. Design through Verilog HDL By T. R> Padmanabhan & Sundari. IEEE press, Wiley Interscience.
2. http://www.xilinx.com/itp/xilinx7/help/iseguide/html/ise_fpga_design_flow_overview.htm
3. Hands on experience on altera development board by J.S.Parab,etal: Springer Netherland 2018(ISBN 978-81-322-3769-3)

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SEMESTER II

Course Code: ELC 201
Course Title: EMBEDDED SYSTEMS DESIGNS

Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**

Prerequisites for the course

Should have studied microprocessor and C programming at graduate level

Objectives of Course

This course is intended to:

- Introduce with Architectures of Microcontroller and its programming with Interfacing various Interfaces is discussed in depth in this paper.
- Programming in assembly as well as in C for 8/16/32 bit controller

Course Content

Unit I	**Introduction to Controller Architecture**	**5 Hours**
Computer Architecture, RISC/CISC and Princeton Architectures		
Unit II	**Embedded system**	**5**
Definition, Basic Block, Designing of System, Applications		
Unit III	8-bit Micro controllers	**20**
Introduction to various 8-Bit microcontroller, 8051 features, Architecture , Memory organization, Instruction set, Interrupts, Timer/counter, LED, Switches, ADC, DAC, LCD Interfacing, Programming in Assembly and C,		
Unit IV	**16 bit microcontroller**	**15**
PIC controller Introduction, Architecture, Instruction set, Peripheral interfaces: LED, LCD, Serial RS232,Programming in C		
Unit V	**32-bit Microcontroller**	**15**
ARM architecture, THUMB/ARM instruction, ARM Exception Handling, Timers/Counters, UART, SPI, PWM, WDT, Input Capture, Output Compare Modes, I2C ,Instruction set, Programming in Assembly and C.		

Pedagogy

Lectures/Experiential Learning

Course Outcome

The students will:

- Students will learn the architecture of 8051,PIC and ARM .
- students will write an assembly and C program for 8051,PIC and ARM .
- students will write an assembly and C program for
- Students will be able to develop their own embedded platform using 8051, PIC and ARM

References/Readings

1. JivanParabetal., Exploring C for microcontroller (Springer 2007)
2. Lipovski G. J. Single and multiple Chip Microcontroller interfacing. Prentice Hall, USA 1998.
3. Beginning Android 4 Application Development
4. Professional Android 4 Application Development

Learning Android Game Programming : A Hands-On Guide to Building Your First Android Game 1st Edition

5 .Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand,StamatisKarnouskos, David Boyle, **"**From Machine-to-Machine to theInternet of Things: Introduction to a New Age of Intelligence**",** 1st Edition, Academic Press, 2014.

6. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet ofThings", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

7. Vijay Madisetti and ArshdeepBahga, **"**Internet of Things (A Hands-onApproach)**",** 1st Edition, VPT, 2014.

Course Code: ELC 202
Course Title: Real Time Operating System

Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**

Prerequisites for the course

Should have studied microprocessor and C programming at graduate level

Objectives of Course

This course is intended to:

- To focus on concept of highlighting the various methods of improvising speed of computing machine through the operating system organization and various entity managements.
- To analyse the small embedded system developments through the Real Time Operating Systems for task management efficiency.
- Porting RTOS on embedded platform

Course Content

Unit I	**Introduction to Computer Organization and Architecture**	**7 Hours**
hardware vs. software -the virtual machine concept, the concept of von Neumann architecture, hardware components and functions, trends in hardware development, system configurations and classifications.		
Unit II	**Process Description and Control:**	**6**
Processes, process states, processor modes, context switching, CPU scheduling algorithms, threads		
Unit III	Concurrency Control:	**6**
Concurrent processes, critical section problem and solutions, mutual exclusion solution requirements, semaphores and monitors.		
Unit IV	**Deadlocks:**	**6**
Characterization, detection and recovery, avoidance, prevention		
Unit V	**Inter Process Communication**	**7**
classical IPC problems and solutions, IPC techniques.		
Unit VI	The Input/Output and File Subsystem:	**7**
I/O devices, controllers and channels, bus structures, 1/0 techniques (programmed, interrupt-driven and DMA), I/O subsystem layers. Concepts of files and directories, issues and		

techniques for efficient storage and access of data. I/O and file system support for graphics, multimedia, databases, transaction processing and networking.		
Unit VII	**The Memory Subsystem**	**7**
Memory types and hierarchy, module level Organization, cache memory. Memory partitioning, swapping, paging, segmentation, virtual memory.		
Unit VIII	**The Central Processing Unit**	**7**
CPU components, register sets, instruction cycles, addressing modes, instruction sets, the concept of micro-programming, Basics of RISC approach, pipelined and super-scalar approaches, vector processors and parallel processors, hardware support for the OS.		
Unit IX	**µCOS case study**	**8**

Pedagogy

Lectures/Experiential Learning

Course Outcome

The Student Will:

- Generalize the understanding of the computing machine and various entities associated with the enhancement of the efficiency.
- Handle the operating system management process, memory, I/O, Secondary Disk and organizations of various.
- Handle any operating system for process and task managements if follows the documentations of the same.

References/Readings

1.Operating system principles, 3rd Edition,by Willian Stallings –PHI(1998)
2. Operating system concepts by Silberchatz and Galvin - Addisionwesley
3. Operating system by Tanaumbuam, PHI New Delhi

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Course Code: ELC 203
Course Title: Digital System Design

Number of Credits: 04 **Total Hours: 60** **Total Marks: 100**

Prerequisites for the course

Should have studied digital electronics at the graduate level

Objectives of Course

This course is intended to,

- Teach principles of combination and sequential logic design
- Develop implementation skills using hardware description languages.
- Teach and familiarize with industry technologies such as Memory, CPLDS, FPGA.

Course Content

Unit I	**Introduction**	**6 Hours**
About Digital Design, Analog versus Digital, Electronic Aspects of Digital Design, PLD's, ASIC, Digital Design level. Digital Concept and Number System: General Positional number system conversions, Operation, BCD, Gray Code,Character Codes, Codes for Actions, Conditions, and States nCubes and Distance, Codes for Detecting and Correcting Errors, Error-Detecting Codes, Error-Correcting and Multiple Error-Detecting Codes, Hamming Codes, CRC Codes, Two Dimensional Codes, Checksum Codes, m-out-of-n Codes, Codes for Serial Data Transmission and Storage, Parallel and Serial Data, Serial Line Codes		
Unit II	**Combinational Logic Design Principles**	**4 Hours**
Switching Algebra, Combinational-Circuit Analysis, Combinational-Circuit Synthesis, and Timing Hazards.		
Unit III	**Hardware Description Languages**	**4 Hours**
HDL-Based Digital Design, The VHDL Hardware Description Language, The Verilog Hardware Description Language		
Unit IV	**Combinational Logic Design Practices**	**4 Hours**
Documentation Standards, Circuit Timing, Combinational PLDs, Decoders, Encoders, Three-State Devices , Multiplexers, Exclusive-OR Gates and Parity Circuits , Comparators, Adders, Subtractors, and ALUs , Combinational Multipliers, Exclusive-OR Gates and Parity Circuits , Comparators, Adders, Subtractors, and ALUs , Combinational Multipliers.		
Unit V	**Sequential Logic Design Principles & Practices**	**12 Hours**
Bistable Elements, Latches and Flip-Flops, Clocked Synchronous State-Machine Analysis, Clocked Synchronous State-Machine Design, Designing State Machines Using State Diagrams, State-Machine Synthesis Using Transition Lists, Another State-Machine Design Example, Decomposing State Machines, Feedback Sequential-Circuit Analysis, Feedback Sequential-Circuit Design, Features ,Sequential-Circuit Design with VHDL , Sequential- Circuit Design with Verilog, Sequential-Circuit Documentation Standards , Latches and Flip-Flops ,Sequential PLDs , Counters, Shift Registers, Iterative versus Sequential Circuits , Synchronous Design Methodology , Impediments to Synchronous Design , Synchronizer Failure and Metastability		
Unit VI	**Memory, CPLDS**	**10 Hours**
Read-Only Memory, Read/Write Memory, Static RAM, Dynamic RAM, Complex Programmable Logic Device		
Unit VII	**Field Programmale Gate Array**	**10 Hours**

Introduction, FPGA Architectures, Configuration: SRAM-Based FPGAs and Antifuse Permanently Programmed FPGAs, Chip I/O, Circuit Design of FPGA Fabrics, Architecture of FPGA Fabrics, FPGA Soft-core Processor Development flow.

VIII	Neural Networks on FPGA	10 Hours

Introduction, Designing a Neuron, Activation functions, Design of layers, Training and validations, Hardware verification, Case study using PYNQ/VITIS AI framework.

Pedagogy

lectures/ Experiential Learning

Course Outcome

The student will,

- Understand principles of combination and sequential logic design
- Leverage Hardware description languages for realization of combinational and sequential designs
- Understand the architecture of field programmable gate array.

References/Readings

1. Digital Design Principles and Practices, by John F. Wakerly, Prentice Hall's Fourth Edition.
2. Digital System Design using VHDL: Charles. H.Roth ; PWS (1998)
3. Scott Hauck and Andre DeHon , Reconfigurable Computing, Morgan Kaufmann, 2008
4. Srinivas Devadas, Abhijit Ghosh, and Kurt Keutzer, "Logic Synthesis," McGraw-Hill, USA, 1994.
5. Neil Weste and K. Eshragian,"Principles of CMOS VLSI Design: A System Perspective,2nd edition, Pearson Education, 2000.
6. Kevin Skahill, "VHDL for Programmable Logic," Pearson Education, 2000. M.N.O. Sadiku, Elements of Electromagnetics 2nd Edition) , Oxford University press, 1995.

Course Code: ELC 204
Course Title: ELECTRONICS PRACTICALS – II

Number of Credits: 04 **Total Hours: 120** **Total Marks: 100**

Prerequisites for the course

Should have studied microcontrollers, embedded system, OS and EDA tools

Objectives of Course

This course is intended to,

- Develop skills in handling controllers like 89C51/52, PIC and ARM controller derivatives .
- Input Output operation, Various communication interfaces, data acquisition, task management and Robotic applications.
- Cover experiments using LabVIEW with MyRIO and NI ELVIS Platform

Course Content

Practical Title	120 Hours

Unit I

1. 7-segment Interfacing to ATMEL 89C52 (BCD counter)
2. Display Temperature using ATMEL 89C52 on LCD
3. Obstacle Avoidance using 89V52 based Robot
4. Serial Transmission and reception PIC16F877
5. Configuring On – chip ADC PIC16F877
6. Hex Keypad Interfaced to ARM controller & display on LCD

Unit II

7. Switching of LED using µ - COS
8. Switching of LED using RTX
9. Switching of LED using FPGA
10. KEY pad and ADC interfacing using RTOS
11. Shell programming – Web Application.
12. Shell programming – System Management

Unit III

13. VHDL implementation for the Multiplexer & Demultiplexer
14. VHDL Implementation for Encoder & Decoder
15. VHDL implementation for the Counter.
16. LCD and 7 -segment Interfacing using DE2 board
17. UART Interface using DE2 board
18. Echo & Reverberation implementation on speedy33 kit(lab view)

Unit IV

19. Automated Street lighting
20. Smart Irrigation System
21. Home Automation
22. Smart water monitoring system
23. Surveillance System
24. Smart Parking System

Unit V

25. Switch basic setup
26. Virtual LAN
27. Spanning tree protocol
28. Routing
29. DHCP (Dynamic Host Configuration Protocol)
30. Switch stacking

Pedagogy

Presentations /Experiential Learning/laboratory design and implementation

Course Outcome

The Students will be,

- Able to analyze the architectures of any controller.
- Designs application using embedded system using tasks for real time applications.
- Handle any computing machine using shell script for computing and management.
- Develop and design some applications based on SPEEDY 33 using LABView , NI ELVIS , MYRio, Altera DE2 Board.
- Develop an android app.

References/Readings

1. Digital Design Principles and Practices, by John F. Wakerly, Prentice Hall's Fourth Edition.Lipovski G. J. Single and multiple Chip Microcontroller interfacing. Prentice Hall, USA 1998.

2. Beginning Android 4 Application Development
3. Professional Android 4 Application Development
4. Learning Android Game Programming : A Hands-On Guide to Building Your First Android Game 1st Edition

Course Code: ELO 201
Course Title: Internet of Things

Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**

Prerequisites for the course

Students should know the basic knowledge about passive electrical and electronics components, and programming

Objectives of Course

This course is intended to:

- Introduce the fundamentals of Internet of Things and its building blocks along with their characteristics.
- understand the protocols and standards designed for IoT and the current research on it.
- know the other associated technologies like cloud and fog computing in the domain of IoT.
- provide the recent application domains of IoT in everyday life.

Course Content

Unit I	**Introduction**	**05 Hours**
Evolution, Addressing strategies, Sensing and Actuation -Type, Characteristics, Processing topologies and types		
Unit II	**IOT Networking**	**10 Hours**
Basics of Networking, Networking Components, Connectivity Protocol: 6LoWPAN and RFID, Data Protocol – MQTT, SMQTT, CoAP, XMPP and AMQP, Communication protocols – IEEE 802.15.4, Zigbee, HART & Wireless HART, NFC, Bluetooth, Z-wave and ISA 100.11A		
Unit III	**Sensing Network**	**15 Hours**
Wireless Sensor Networks, Sensor nodes, Sensor web, Node Behavior in WSNs, Applications of WSNs, Coverage of WSNs, Stationary and Mobile Wireless Sensor Network, UAV Network, Flying Ad Hoc Network, Interoperability		
Unit IV	**Software Defined Networking**	**10 Hours**
Basic concept, SDN architecture, SDN in IOT, Software Defined WSN, SDN for Mobile Networking		
Unit V	**Cloud and Fog Computing**	**10 Hours**
Cloud Computing: Fundamentals, Components & Characteristics, Architecture, Service Models, Cloud types, Service Management & Security and Sensor Cloud, Fog Computing: Fog nodes, Architecture, Fog Computing in IOT and Application		
Unit VI	**IOT case studies and Future Trends**	**05 Hours**
Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IOT, Agriculture, Healthcare, Paradigms, Challenges and the future.		
Unit VII	**Hands-on**	**05 Hours**
Integration of sensors and actuators with Ardunio, Introduction to Python programming, Introduction to Raspberry Pi, Implementation of IOT with Raspberry Pi		

Pedagogy

Lectures/Experiential Learning

Course Outcome

On completion of the course, students will be able to:

1. Explain the of IOT enabling components, such as sensors, connectivity protocols, and communication protocols.
2. Describe the IOT architecture and its component details.
3. Explain the associated technologies including cloud computing, fog computing and its applications.
4. Gain practical knowledge about the integration of sensor and actuators, coding structure, and implementation of IOT in various applications.

References/Readings

1. S. Misra, A. Mukherjee, and A. Roy, 'Introduction to IoT', Cambridge University Press.
2. S. Misra, C. Roy, and A. Mukherjee, 'Introduction to Industrial Internet of Things and Industry 4.0', CRC Press.
3. Pethuru Raj and Anupama C. Raman, 'The Internet of Things: Enabling Technologies', Platforms, and Use Cases", CRC Press.
4. ArshdeepBahga and Vijay Madisetti, 'Internet of Things: A Hands-on Approach', Universities Press.

Course Code: ELO 202
Course Title: Switching and Routing

Number of Credits: 04	**Total Hours: 60**	**Total Marks: 100**

Prerequisites for the course

Students should know the basic knowledge about network, basic terminologies and security at graduate level

Objectives of Course

This course is intended to:

- Introduce the student to the broader understanding of computer networks
- Cover Extensive learning in switching and routing technologies.
- Comprehensive understanding in LAN switching environment.

Course Content

Unit I	**Computer Networking**	**05 Hours**
Introduction, Network Components, Network types: LAN, PAN, MAN & WAN, Connection type: Point-to-point & Point-to-multipoint, Physical Topology: Star, Mesh, Bus and Ring, Data Communication		
Unit II	**Network Models**	**10 Hours**
OSI Model, TCP/IP Model, OSI and TCP/IP model comparison, Critique of OSI and TCP/IP model, Internet and Internet Architecture		
Unit III	**IP Addressing and Subnets**	**15 Hours**
IP Addressing: Composition, Types & Classes, Private and Public IP addresses, Subnetting, Variable Length Subnet Masks (VLSM), Troubleshooting IP addressing		
Unit IV	**Switching and Spanning Tree Protocol**	**15 Hours**
Switching and Switches, Switch Operation, Virtual Local Area Network (VLAN) and VLAN Trunding Protocol (VTP), Spanning Tree Protocol (STP), Switch Stacking, Network Address Translation (NAT)		
Unit V	**Routing**	**10 Hours**
IP Routing, Types, Classes of Routing, Distance Vector Routing Protocol (DVRP), Routing Information Protocol (RIP)		
Unit VI	**Network Security**	**05 Hours**
Cryptography, Digital Signatures, Communication Security, Web Security, Virtual Private Network (VPN),		

Pedagogy

Lectures/Experiential Learning

Course Outcome

The students will:

- Explain in detail the concepts of Computer networking, OSI and TCP/IP model architecture along with the comparison.
- Gain the knowledge about the Switching and Routing
- Understand the basic device configuration and troubleshooting.
- Explain the Network security principles and its applications

References/Readings

1. Andrew S.Tanenbaum, 'Computer Networks', 3rd Edition, Prentice Hall.
2. James F. Kurose and Keith W. Ross, 'Computer Networking: A Top-Down Approach', 7th Edition, Pearson Education.
3. D-Link Certified, DCS Switching Training Guide.

4. D-Link Certified, DCS Switching Lab Manual
5. Cisco Certified Network Associate Training Guide

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Annexure II

B. Voc. in Electronics, Instrumentation and Computer Networking

Course Structure

NSQF Level 4: Certificate in Electronics, Instrumentation and Computer Networking (Semester I)

Job Role:Field Technician

Course Outcome: Field Technician provides after sale support services to customers, typically, at their premises. The individual at work is responsible for attending to customer complaints, installing newly purchased appliances and basic troubleshooting.

NSQF Level / Semester	Course Code	Course Title		Course Credits	Contact Hours		Evaluation Scheme		
	General component					**ISA**	**SEA**	**Practical**	**Total**
Level 4 / Semester I	**EIGC 101**	**Communication Skills- I**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 102	**Aptitude Training**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 103	**Fundamentals of Computer**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 104	**Fundamentals of Computer Lab**	**Lab**	3	84	-	-	75	75 Marks
	Skill component								
	EISC 101	**Basic Electrical and Electronics**	**Theory**	3	42	75 Marks			
	EISC 102	**Basic Electrical and Electronics Lab**	**Lab**	3	84	75 Marks			
	EISC 103	**Maintenance and Repair of Home Appliances- I**	**Theory**	3	42	75 Marks			
	EISC 104	**Maintenance and Repair of Home Appliances- I Lab**	**Lab**	3	84	75 Marks			
	EISC 105	**Computer Networking- I**	**Theory**	3	42	75 Marks			
	EISC 106	**Computer Networking- I Lab**	**Lab**	3	84	75 Marks			
	EISC 107	**Basics of Troubleshooting**	**Theory**	3	42	75 Marks			
	EISC 108	**Basics of Troubleshooting Lab**	**Lab**	3	84	75 Marks			

General Education: 12 Credits, 210 Hours and 300 Marks

Skill Development: 18 Credits, 378 Hours and 450 Marks

Total: 30 Credits, 588 Hours and 750 Marks.

NSQF Level 5: Diploma inElectronics, Instrumentation and Computer Networking(Semester II)
Job Role: Service Technician
Course Outcome: The individual at work is responsible for attending to customer complaints, installing newly purchased appliances, troubleshooting system problems and, configuring hardware equipment and related networking devices.He/she identifies the minor problem and recommends factory repairs for major faults.

NSQF Level / Semester	Course Code	Course Title		Course Credits	Contact Hours		Evaluation Scheme		
	General component					**ISA**	**SEA**	**Practical**	**Total**
Level 5 / Semester II	**EIGC 201**	**Fundamentals of IT**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 202	**Communication Skills- II**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 203	**Computer Maintenance and Troubleshooting-Hardware**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 204	**Computer Maintenance and Troubleshooting- Hardware Lab**	**Lab**	3	84	-	-	75	75 Marks
	Skill component								
	EISC 201	**Analog Electronics**	**Theory**	3	42	75 Marks			
	EISC 202	**Analog Electronics Lab**	**Lab**	3	84	75 Marks			
	EISC 203	**Maintenance and Repair of Home Appliances- II**	**Theory**	3	42	75 Marks			
	EISC 204	**Maintenance and Repair of Home Appliances- II Lab**	**Lab**	3	84	75 Marks			
	EISC 205	**Computer Networking- II**	**Theory**	3	42	75 Marks			
	EISC 206	**Computer Networking- II Lab**	**Lab**	3	84	75 Marks			
	EISC 207	**Sensors and Transducers**	**Theory**	3	42	75 Marks			
	EISC 208	**Sensors and Transducers Lab**	**Lab**	3	84	75 Marks			

General Education: 12 Credits, 210 Hours and 300 Marks
Skill Development: 18 Credits, 378 Hours and 450 Marks
Total: 30 Credits, 588 Hours and 750 Marks.

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NSQF Level 6: **Advanced Diploma in Electronics, Instrumentation and Computer Networking(Semester III & IV)**

Job Role: Senior Technician

Course Outcome: The Senior Technician is responsible for managing the Electronic/Computer Hardware and related software systems either at customer's premises or remotely.He/she will be able to handle general laboratory and Industrial instruments.The jobholder also interacts with customers to install the appliance like refrigerator, air conditioner and diagnose problems to assess possible causes of malfunction.Once a problem is identified, the technician rectifies the minor problem or replaces faulty modules for failed parts or recommends factory repair for major faults.

NSQF Level / Semester	Course Code	Course Title		Course Credits	Contact Hours		Evaluation Scheme		
	General component					**ISA**	**SEA**	**Practical**	**Total**
Level 6 / Semester III	**EIGC 301**	**General Instrumentation**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 302	**Communication Skills- III**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 303	**Computer Maintenance and Troubleshooting- Software**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 304	**Computer Maintenance and Troubleshooting- Software Lab**	**Lab**	3	84	-	-	75	75 Marks
	Skill component								
	EISC 301	**Digital Electronics- I**	**Theory**	3	42	75 Marks			
	EISC 302	**Digital Electronics- I Lab**	**Lab**	3	84	75 Marks			
	EISC 303	**Refrigeration and Air Conditioning**	**Theory**	3	42	75 Marks			
	EISC 304	**Refrigeration and Air ConditioningLab**	**Lab**	3	84	75 Marks			
	EISC 305	**Computer Networking- III**	**Theory**	3	42	75 Marks			
	EISC 306	**Computer Networking- III Lab**	**Lab**	3	84	75 Marks			
	EISC 307	**Power Electronics**	**Theory**	3	42	75 Marks			
	EISC 308	**Power Electronics Lab**	**Lab**	3	84	75 Marks			

General Education: 12 Credits, 210 Hours and 300 Marks

Skill Development: 18 Credits, 378 Hours and 450 Marks

Total: 30 Credits, 588 Hours and 750 Marks.

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NSQF Level 6: **Advanced Diploma in Electronics, Instrumentation and Computer Networking (Semester III & IV)**
Job Role: Senior Technician
Course Outcome: The Senior Technician is responsible for managing the Electronic/Computer Hardware and related software systems either at customer's premises or remotely. He/she will be able to handle general laboratory and Industrial instruments. The jobholder also interacts with customers to install the appliance like refrigerator, air conditioner and diagnose problems to assess possible causes of malfunction. Once a problem is identified, the technician rectifies the minor problem or replaces faulty modules for failed parts or recommends factory repair for major faults.

NSQF Level / Semester	Course Code	Course Title		Course Credits	Contact Hours		Evaluation Scheme		
	General component					**ISA**	**SEA**	**Practical**	**Total**
	EIGC 401	**Environmental Studies**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 402	**Communication Skills- IV**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 403	**Computer Peripherals and Troubleshooting**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 404	**Computer Peripherals and Troubleshooting Lab**	**Lab**	3	84	-	-	75	75 Marks
Level 6/ Semester IV	**Skill component**								
	EISC 401	**Digital Electronics- II**	**Theory**	3	42	75 Marks			
	EISC 402	**Digital Electronics- II Lab**	**Lab**	3	84	75 Marks			
	EISC 403	**Industrial Instruments**	**Theory**	3	42	75 Marks			
	EISC 404	**Industrial InstrumentsLab**	**Lab**	3	84	75 Marks			
	EISC 405	**Computer Networking- IV**	**Theory**	3	42	75 Marks			
	EISC 406	**Computer Networking- IV Lab**	**Lab**	3	84	75 Marks			
	EISC 407	**Laboratory Instruments**	**Theory**	3	42	75 Marks			
	EISC 408	**Laboratory Instruments Lab**	**Lab**	3	84	75 Marks			

General Education: 12 Credits, 210 Hours and 300 Marks
Skill Development: 18 Credits, 378 Hours and 450 Marks
Total: 30 Credits, 588 Hours and 750 Marks.

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NSQF Level 7: B. Voc. Degree in Electronics, Instrumentation and Computer Networking(Semester V & VI)
Job Role: System Administrator
Course Outcome: The System administrator is responsible to determine an organization's system needs, make needed upgrades and repairs to ensure that systems are operating correctly, Evaluate and optimize network or system performance, Interpret and solve problems when a user or an automated monitoring system alerts them that a problem exists.

NSQF Level / Semester	Course Code	Course Title		Course Credits	Contact Hours		Evaluation Scheme		
	General Education					**ISA**	**SEA**	**Practical**	**Total**
	EIGC 501	**Basic Accounting**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 502	**Value Education**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 503	**Introduction to Multimedia Technology**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 504	**Introduction to Multimedia Technology Lab**	**Lab**	3	84	-	-	75	75 Marks
	Skill component								
Level 7 / Semester V	**EISC 501**	**Microcontroller**	**Theory**	3	42	75 Marks			
	EISC 502	**Microcontroller Lab**	**Lab**	3	84	75 Marks			
	EISC 503	**Computer Programming**	**Theory**	3	42	75 Marks			
	EISC 504	**Computer ProgrammingLab**	**Lab**	3	84	75 Marks			
	EISC505	**Computer Networking- V**	**Theory**	3	42	75 Marks			
	EISC 506	**Computer Networking- V Lab**	**Lab**	3	84	75 Marks			
	EISC 507	**Operating Systems**	**Theory**	3	42	75 Marks			
	EISC 508	**Operating Systems Lab**	**Lab**	3	84	75 Marks			

General Education: 12 Credits, 210 Hours and 300 Marks
Skill Development: 18 Credits, 378 Hours and 450 Marks
Total: 30 Credits, 588 Hours and 750 Marks.

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NSQF Level 7: B. Voc. Electronics, Instrumentation and Computer Networking(Semester V&Semester VI)
Job Role: System Administrator
Course Outcome: TheSystem administrator is responsible to determine an organization's system needs, make needed upgrades and repairs to ensure that systems are operating correctly, Evaluate and optimize network or system performance, Interpret and solve problems when a user or an automated monitoring system alerts them that a problem exists.

NSQF Level / Semester	Course Code	Course Title		Course Credits	Contact Hours	Evaluation Scheme			
Level 7 / Semester VI	**General component**					**ISA**	**SEA**	**Practical**	**Total**
	EIGC 601	**Entrepreneurship**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 602	**Web Designing**	**Theory**	3	42	60	60	-	75 Marks
	EIGC 603	**Android Development**	**Theory**	3	42	15	60	-	75 Marks
	EIGC 604	**Android Development Lab**	**Lab**	3	84	-	-	75	75 Marks
	Skill component								
	EISC 601	**Robotics**	**Theory**	3	42	75 Marks			
	EISC 602	**Robotics Lab**	**Lab**	3	84	75 Marks			
	EISC 603	**Electric Vehicle and Battery Technology**	**Theory**	3	42	75 Marks			
	EISC 604	**Electric Vehicle and Battery Technology Lab**	**Lab**	3	84	75 Marks			
	EISC 605	**Internship/ON Job Training /project**	**-**	12	336	300 Marks			

General Education: 12 Credits, 210 Hours and 300 Marks
Skill Development: 18 Credits, 462 Hours and 450 Marks
Total: 30 Credits, 672 Hours and 750 Marks.

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Annexure III

B. Voc. in Electronics, Instrumentation and Computer Networking
Course Syllabus

Semester I

Course Code: EIGC 101 **Course Title: Communication skills-I**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Individual who want to develop or improve their skills for listening effectively within the workplace		
Objectives of Course		
To achieve successful receivers' role in communication through input of hearing		
Course Content		
Unit I	**Listening basics**	**10 Hours**
Introduction, Types of Listening. Traits Of Good Listener: Being Non-Evaluate, Paraphrasing, Reflecting Hidden Feelings, Inviting Further, Contributions, Responding Non-Verbally,Exercises		
Unit II	**Barriers to Communication-I: organizational**	**11 Hours**
Definition Of Noise, What Is Noise, Classification of Barriers, Information Overload, Exercises		
Unit III	**Barriers to Communication-II: human**	**11 Hours**
Intrapersonal Barriers: Wrong Assumptions, Varied Perceptions, Differing Backgrounds, Wrong Inferences, Impervious Categories, Categorical Thinking. Interpersonal Barriers: Limited Vocabulary, Incongruity of Verbal, And Nonverbal Messages, Emotional Outburst, Communication Selectivity, Cultural Variations, Poor Listening Skills, Noise in The Channel,Exercises		
Unit IV	**Effective Listening**	**10 Hours**
Active Versus Passive Listening: Paying Attention, Dealing with Distractions, Implications of Effective Listening, Exercises		
Pedagogy		
Lectures/Tutorial/Assignments/ Practice Sessions		
Course Outcome		
Challenges of Listening effectively and efficiently in workplaces will be overcome; since real-life example and strategies oriented to practical scenario are given		
References/Readings		
1. Technical-Communication-Principles-And-Practice: Meenakshi Raman, Sangeeta Sharma Oxford-University-Press-2004 2. The Zen of Listening- Mindful Communication in the Age of Distraction : Rebecca Z.Shafir 3. Powerful Listening. Powerful Influence - Work Better. Live Better. Love Better: Tim Hast 4. The Five Keys to Mindful Communication- Using Deep Listening and Mindful Speech to Strengthen Relationships, Heal Conflicts, and Accomplish Your Goals: Susan Gillis Chapman 5. Power Listening- Mastering the Most Critical Business Skill of All: Bernard T Ferrari 6. The Compassionate Connection-The Healing Power of Empathy and Mindful Listening : David Rakel 7. The Dynamics of Effective Listening: Tony Alessandra		

Course Code: EIGC 102

Course Title: Aptitude Training		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**

Prerequisites for the course

Interest to augment aptitude power

Objectives of Course

This course is intended to train students in ability to

1. Interpret different data
2. Establish relationship between numbers
3. Solve different logical problems
4. Perform Reasoning efficiently

Course Content

Unit I	**Data Analysis**	**10 Hours**

Data sufficiency, Measurement, Time and distance, Arithmetic, Relationship between numbers

Unit II	**Data process**	**11 Hours**

Basic mathematical relations and formula, Computation, Data interpretation

Unit III	**Solving**	**11 Hours**

Differences, Discrimination, Decision making, Judgment, Problem-solving, Analogies, Analysis

Unit IV	**Reasoning**	**10 Hours**

Arithmetic reasoning, Relationship concept, Arithmetic number series, Similarities, Verbal and figureclassification, Space visualization, Observation

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

At the end of the course the students will be able to:

1. Interpret different data
2. Establish relationship between numbers
3. Solve different logical problems
4. Perform Reasoning efficiently

References/Readings

1. How to Prepare for Data Interpretation for the CAT by Arun Sharma.
2. Modern Approach to Verbal & Non-Verbal Reasoning by R.S Aggarwal.
3. A New Approach to Reasoning Verbal & Non-Verbal by B.S. Sijwalii
4. Verbal Reasoning by Bhupendra Kumar Singh
5. How to Prepare for Logical Reasoning for the CAT by Arun Sharma
6. Logical and Analytical Reasoning by A.K. Gupta
7. How to Crack Test of Reasoning by Jaikishan and Premkishan
8. R.S. Aggarwal - Quantitative Aptitude for Competitive Examinations.
9. Arun Sharma - Quantitative Aptitude for CAT.
10. Arihant Publications - Fast Track Objective Arithmetic.
11. The Pearson Guide To Quantitative Aptitude For Competitive Examination by **Dinesh Khattar**

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Course Code: EIGC 103 **Course Title: Fundamentals of Computer**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**

Prerequisites for the course		
Student should be English literate		
Objectives of Course		
1. To understand fundamentally the general scope of the computer system 2. To interact effectively with the computer 3. To know the computer peripherals 4. To manage the storage fundamentals 5. To know the basics of Operating System 6. To know some basic PC Specifications		
Course Content		
Unit I	**Introduction to Computers**	**2 Hours**
Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer.		
Unit II	**Computer Peripherals: Internal Components**	**8 Hours**
IDE and SATA Devices: Hard Disk Drive and CD/DVDs Drives, Floppy Disk, Zip Drive, Backup Drive. Expansion Cards: LAN Card, IDE Card , VGA and SVGA Cards, Sound Card, Interface Cards, I/O cards, Video Cards, USB Card, Fire-Wire Cards, Internal Ports, Cables and Connector Types.		
Unit III	**Computer Peripherals: External Components**	**8 Hours**
Monitors: CRT, LCD and LED Displays. Printers: Dot-Matrix Printer, Inkjet Printer, Laser Printer Scanner: Photo Scanner, Documents Scanner, Bar Cord Scanner. Keyboards, Mouse, External Modem, Ports and Connectors, Batteries, Power supply, Pen Drives, SCSI interface devices, Laptop Computers, Digital Advance storage technology.		
Unit III	**Storage Fundamentals**	**8 Hours**
Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAMROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives.		
Unit V	**Operating System Basics**	**8 Hours**
Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.		
Unit VI	**PC Specifications**	**8 Hours**
CPU: Generation, core, threads, RAM, Storage, System type OS Specifications, Ports available, Battery specifications, Comparison of Competitive brands		
Pedagogy		
Lectures/Tutorial/Assignments		
Course Outcome		
On completion of the course, students will be able to: 1. Bridge the fundamental concepts of computers with the present level of knowledge of the students 2. Familiarise with operating systems, programming languages, peripheral devices. 3. Understand storage fundamentals		
References/Readings		
1. Reema Thareja, Fundamentals of Computers. 2. V. Rajaraman, 6th Edition Fundamentals of Computers, NeeharikaAdabala. 3. Anita Goel, Computer Fundamentals. 4. Deborah Morley and Charles S. Parker; Fundamentals of Computers; Cengage Learning, India edition; 2009.		

5. Alexis Leon and Mathews Leon; Fundamentals of Information Technology; Vikas Publication, Chennai.
6. Peter Nortons- Introduction to Computers, Sixth Edition, Published by Tata McGraw Hill
7. P K Sinha &Priti Sinha – Computer Fundamentals , Fourth Edition, BPB Publications.
8. Fundamentals of Computers, V Rajaraman 6th edition PHI Learning Private Limited 2014
9. Nasib Singh Gill: Handbook of Computer Fundamentals, Khanna Books Publishing Co.(P) Ltd., New Delhi, 2016.
10. Data communications and Networking, Behrouz A Forouzan, Tata Mc Graw-Hill 5th edition, 2013

Course Code: EIGC 104
Course Title: Fundamentals of Computer Lab

Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**

Prerequisites for the course

Computer Basic Theory

Objectives of Course

1. This course is intended to introduce to students into the basics of computer – concepts, theory.
2. To interact effectively with the computer
3. To know the Operating system basics
4. To know the computer peripherals
5. To manage the storage fundamentals
6. To know some basic PC Specifications

Lab Content

Exp.1 : Understanding different components of PC.
Exp.2 : Dismantling and reconnecting components of PC.
Exp.3 : Identify the internal and external hardware/peripheral components
Exp.4 : Introduction to DOS.
Exp.5 : Familiarisation with operating system along with file management commands like create, copy, move, delete and rename files and folders.
Exp.6 : Introduction to Linux.
Exp.7 : Installation of Windows OS.
Exp.8 : Implementation of Memory Partitioning.
Exp.9 : Explore Control Panel.
Exp.10 : Explore Windows Tools / Applications.
Exp.11 : To understand different Computer Peripherals.
Exp.12 : Demonstrate the usage of various storage devices (data copying, CD/DVD burning)

Pedagogy

Experiments

Course Outcome

On completion of the course, students will be able to:
1. Identify different PC Components and their connection
2. Understand basic concepts of different OS
3. Use different system utilities
4. Know computer peripherals

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Course Code: EISC 101 **Course Title: Basic Electrical and Electronics**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Should have basic knowledge of current, voltage concept, AC and DC voltage.		
Objectives of Course		
This course is intended to introduce to students into the basics of electrical circuits, concepts, theory The electrical experiments give a student hands-on experience to design the basic.		
Course Content		
Unit I	**Basic Electrical concepts**	**5 Hours**
Concept of electric charge, potential difference, current and voltage, AC source and DC source, measuring circuit voltage and current using voltmeters and ammeters positive cycle, negative cycle, Frequency, Single phase and Three phase supply, grounding.		
Unit II	**Introduction to Resistors**	**8 Hours**
Resistor, different types of resistors, colour coding of resistors, tolerance value, Wattage of resistors, series and parallel concept, Ohms law.		
Unit III	**Introduction- Capacitor- Capacitance and Resonance circuits**	**8 Hours**
Working principle of capacitors, dielectric constant, capacitive reactance, types of Capacitors, measuring capacitance and capacitive reactance, series and parallel, resonance		
Unit IV	**Introduction to Inductor and Inductance**	**8 Hours**
Definition of inductance, types, Inductive reactance, measuring inductance, series and parallel, self and mutual inductance, coefficient of coupling, transformers, turns ratio, transformer winding.		
Unit V	**Circuit Breaker and Its Importance**	**5 Hours**
Circuit breaker working and construction, types of circuit breakers, air Circuit Breaker, plain air circuit breaker, air blast circuit breaker, axial blast breaker.		
Unit VI	**Switches and Relays**	**8 Hours**
Types of Switches: one-way (single-pole) electrical switch, two-way (double-pole) do not disturb switch, light dimmer, SPST, SPDT, DPST, DPDT, pushbutton switches, selector switches, limit switches. Design of a Relay, working and construction of relay, relay in normally closed and normally opened condition.		
Pedagogy		
Lectures/Tutorial/Assignments/		
Course Outcome		
On completion of the course, students will be able to understand the basic electrical components such as resistor, capacitor, inductor etc. Apply knowledge to solve basic electrical circuits.		
References/Readings		
1. Basic Electrical engineering by V. K Mehta 2. Principle of electronics by V. K. Mehta 3. Electrical circuit action by Henry C Veatch 4. Textbook of electrical technology, B. L. Theraja, Volume 1 and 2 5. Electrical relays: Principle and application by Vladimir Gurevech 6. Basic electronics components, Instruction manual, by Arthur Seymour		
Course Code: EISC 102 **Course Title: Basic Electrical and Electronics Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**

Prerequisites for the course	
Should have some basic knowledge of electrical components such as resistor, capacitor, inductor, transformer, relay, switches etc.	
Objectives of Course	
This course is intended to provide the laboratory training and designing of basic electrical circuits	
Course Content	**84 Hours**
Expt. 1: Getting familiar with measuring instruments (Voltmeter, Ammeter, DMM, Current source, Voltage Source) **Expt. 2:** Study of AC waveform parameters **Expt. 3:** Finding the values of resistance based colour codes **Expt. 4:** Parallel and series combination of resistor **Expt. 5:** Verifying Ohm's law and Kirchhoff's law **Expt. 6:** Series and parallel combinations of capacitor **Expt. 7:** Charging and discharging of capacitors **Expt. 9:** Series and parallel combinations of inductor **Expt. 10:** Measuring voltage across different step down transformer **Expt. 11:** Study of different types circuit breaker **Expt. 12:** Turning light/lamp/led ON and OFF using relay **Expt. 13:** Implementation of switch in the electrical circuit	
Pedagogy	
Lab experiments	
Course Outcome	
On completion of the course, students will be able to perform the experiments with a given circuit diagram and maintain the lab work book. Students will be also able to plot the results on the graph and analyse it.	

Course Code: EISC 103 **Course Title: Maintenance and Repair ofHome Appliances– I**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Students should have basic understanding of electrical and electronic components.		
Objectives of Course		
This course is intended to provide the knowledge of low power home appliances devices, their working principle and some basic troubleshooting procedures.		
Course Content		
Unit I	**Heating based devices**	**16 Hours**
Working principle, parts, thermostat heat controls, wiring diagram of steam iron, Electric kettle, Geyser, Electric rice cooker.		
Unit II	**Mixer Grinder and Hand blender**	**8 Hours**
Various parts & functions of Mixer/Grinder, speed control circuit & automatic overload protector, wiring diagram, parts of hand blender.		
Unit III	**Grill oven**	**5 Hours**
Principle of grill oven, parts of oven, heating rod, control knobs, wiring diagram		
Unit IV	**Electric fan**	**4 Hours**
Ceiling fan, motor, capacitor, table fan		
Unit V	**Electric drill**	**3 Hours**
Parts of electric drill, motor, wiring diagram		
Unit VI	**Water Purifier**	**6 Hours**
Types of water purifiers, Internal structure, electronics parts, sediment filters.		
Pedagogy		
Lectures/Tutorial/Assignments/		
Course Outcome		
On completion of the course, students will have working knowledge of low power home appliances devices. Students will be able to identify the different parts and trace to the wiring diagram.		
References/Readings		

1. Troubleshooting and Repairing Major Appliances Hardcover by Eric Kleinert
2. Complete Guide to Home Appliance Repair Hardcover – June 1, 1990
3. Electrical Appliances: The Complete Step-by-step Guide to the Repair and Maintenance of a Wide Range of Domestic Electrical Appliances (Haynes for Home DIY) Paperback – January 1, 1995 by Graham Dixon
4. Handbook of Repair and Maintenance of Domestic Electronics Appliances Paperback by Shashi Bhushan Sinha

Course Code: EISC 104 **Course Title: Maintenance and Repair ofHome Appliances– ILab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Should have basic knowledge of electricity and working knowledge of low power home appliance devices.		
Objectives of Course		
This course is intended to provide the laboratory training of repairing home appliances. Identify the faults of each part and repair it or replace the part.		
Course Content		**84 Hours**
Expt. 1: Dismantle and identification of various parts of electric iron, wiring, tracing of various controls, testing of wire, thermostat. **Expt. 2:** Identify various components of the Electric rice cooker, controls and trace the circuit and rectify the simulated faults. **Expt. 3:** Identify various components of Electric kettle, control and trace the circuit and rectify the simulated faults. **Expt. 4:** Dismantle and identification of various parts, wiring, tracing of various controls, Electronic circuits in various types of Mixer. Identify the faults in various types of Mixers/grinders & rectify **Expt. 5:** Identify various components of the Electric geyser, controls and trace the circuit and thermostat. **Expt. 6:** Dismantle and identification of various parts of grill oven, wiring, tracing of various controls, testing of wire, thermostat. **Expt. 7:** Installation of ceiling fan, replacing capacitor and motors. Assembling and disassembling table fan. **Expt. 8:** Identify various components of electric drill and troubleshooting. **Expt. 9:** Identify the parts of the water purifier, filters and power supply unit.		
Pedagogy		
Lab experiments		
Course Outcome		
On completion of the course, students will be able to identify different important parts of the devices and perform the basic action on the faulty home appliance. If necessary student will be able to replace the faulty parts.		

Course Code: EISC 105 **Course Title: Computer Networking- I**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Fundaments of computer, Computer basics		
Objectives of Course		
1. To understand basic concepts about internet 2. To understand switching in networking 3. To know the history of networking 4. To understand data communication		
Course Content		
Unit I	**Internet**	**4 Hours**
Overview, Protocol, Network edge		
Unit II	**Network Core**	**10 Hours**

Packet switching, Circuit Switching, Network of Networks, Overview of delay in Packet switched networks, Queuing delay and packet loss, End to end delay, Throughput in computer networks.		
Unit III	**Protocol Layers and their service models**	**8 Hours**
Layered Architecture, Encapsulation, Networks under attack		
Unit IV	**History of Computer Networking and Internet**	**10 Hours**
Development of packet switching, Proprietary networks and Internetworking, Proliferation of Networks, The Internet Explosion: The 1990s, The New Millennium		
Unit V	**Data Communication**	**10 Hours**
Introduction to Data Communication, Analog and Digital Signals, Simplex, Half- Duplex and Full-Duplex transmission mode.		

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to:

1. Understand basic concepts about internet and protocols
2. Understand switching in networking
3. Know the history of networking
4. Understand data communication

References/Readings

1. Bell, C. G., Habermann, A. N., McCredie, J., Rutledge, R., & Wulf, W. (1970). Computer networks. In *Computer* (Vol. 3, Issue 5).
2. Tanenbaum, A. S., &Wetherall, D. J. (2005). Computer Networks. In Computers, Software Engineering, And Digital Devices. https://Doi.Org/10.4337/9781784711603.00023
3. D-Link Certified, DCS Switching Training Guide
4. D-Link Certified, DCS Switching Lab Manual
5. Cisco Certified Network Associate Training Guide
6. James F. Kurose, Keith W. Ross, Computer Networking A Top down Approach, 7th Edition, Pearson, 2001.
7. Data communications and Networking, Behrouz A Forouzan, Tata Mc Graw-Hill 5th edition, 2013
8. Larry Peterson and Bruce S Davis “Computer Networks :A System Approach” 5 thEdition , Elsevier -2014
9. Douglas E Comer, **“** Internetworking with TCP/IP, Principles, Protocols and Architecture” 6th Edition, PHI - 2014
10. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
11. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

Course Code: EISC 106 **Course Title: Computer Networking- I Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Students should know to use the computer.		
Objectives of Course		
1. Understand basic concepts about internet and protocols 2. Understand switching in networking 3. Know the OSI Model 4. Understand data communication and transmission modes.		
Lab Content		
Exp.1 : Introduction to internet **Exp.2 :** Introduction to Protocols used in internet **Exp.3 :** Packet Switching **Exp.4 :** Circuit Switching **Exp.5 :** Understanding OSI Model **Exp.6 :** Devices at different layers of OSI Model **Exp.7 :** Understanding TCP/IP Model **Exp.8 :** Devices at different layers of TCP/IP Model **Exp.9 :** Data Communication : Analog-Digital Signals **Exp.10 :** Transmission Modes		
Pedagogy		
Experiments		
Course Outcome		
On completion of the course, students will be able to: 1. Understand basic concepts about internet and protocols 2. Understand switching in networking 3. Know the OSI Model 4. Understand data communication and transmission modes.		

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Course Code: EISC 107
Course Title: Basics of Troubleshooting

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Should have some basic knowledge of electrical concepts.

Objectives of Course

To give students an idea of maintenance, tools, techniques used in any dealing with electrical circuits. Students will be also introduced to the different measuring instruments.

Course Content

Unit I	**Maintenance concept**	**8 Hours**

Introduction, Modern electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), potential problems, preventive maintenance, corrective maintenance. Tools and Aid for servicing and maintenance, study of basic procedure of service and maintenance, circuit tracing techniques, concepts of shielding, grounding and power supply considerations in instruments.

Unit II	**Installation Procedure**	**8 Hours**

Environmental Considerations, Humidity, altitude, Shock and Vibrations, Protection from EMI, Safety.Service and Maintenance Laboratory: Workbench, Lighting, Storage. Documentation: Maintenance of System Overview, Sample of a Work Order for Repairs, Information Tags, Personal Safety.

Unit III	**Troubleshooting basics**	**11 Hours**

Fundamental Troubleshooting Procedure: Making of an electronics equipment, electronic circuits, Understanding of diagram: Block diagram, circuit diagram, wiring diagram, Equipment Failures: Causes, design, Production Deficiencies, Careless Storage and Transport, Inappropriate conditions during working life. Getting Inside electronic equipment: Disassembly, Re -assembly. Troubleshooting Process. Fault Finding Aids: Service and maintenance Manuals and Instruction manuals. Troubleshooting techniques: Preliminary observation, troubleshooting methods, systematic troubleshooting checks.

Unit IV	**Soldering techniques**	**5 Hours**

Soldering, Soldering tools, Soldering materials, Soldering procedure, Soldering technique, Replacement of components, Soldering of leadless capacitors, Good and bad Soldering joints, De-soldering techniques.

Unit V	**Tools for servicing**	**10 Hours**

Hand tools: Pliers, cutters, spanners, screwdrivers, nut drivers, drill. Test Equipments: Multimeters, Oscilloscope, Logic Analyser, Signal Generators, Power Supplies etc. Mechanical and Electromechanical Components: Fuses and Fuse Holders, Switches, Wires and Cables, Connectors, Circuit Boards,Electromagnetic Relays. Chemicals: Solvents, Adhesive and Lubricants.

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

On completion of the course, students will be able to understand the maintenance and troubleshooting procedure. He will understand different parameters of electrical voltage and different measuring instruments.

References/Readings

1. Manual of laboratory experiments and workshop practice by B. S Nair
2. Electronics measurements and instrumentation by K. Lal Kishore
3. Troubleshooting Electronic Equipment, Dr R. S. Khandpur.
4. Troubleshooting& Maintenance of Electronic Equipment by K. Sudeep Singh.
5. Handbook of Repair and Maintenance of Domestic Electronics Appliances Paperback by Shashi Bhushan Sinha.

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Course Code: EISC 108 **Course Title: Basics of TroubleshootingLab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Should have some knowledge of electrical components and measuring devices such as DMM and DSO		
Objectives of Course		
This course is intended to provide the laboratory training and designing electrical circuits		
Course Content		**84 Hours**
Expt. 1: Study different tools required for servicing of device **Expt. 2:** Case study of installation of device **Expt. 3:** Study of given circuit, wiring and block diagram. **Expt. 4:** Tracing faults in the circuits **Expt. 5:** Study of current and voltage source **Expt. 6:** Study of digital multimeter **Expt. 7:** Measuring AC and DC voltage source using multimeter **Expt. 8:** Mounting of electronics components on the test board and soldering **Expt. 9:** Generation of Square wave, sign wave and triangular waves using function generator and their measurement **Expt. 10:** Understanding of CRO and DSO **Expt. 11:**Case study of wiring diagram any device **Expt. 12:**Making a PCB and soldering		
Pedagogy		
Lab experiments		
Course Outcome		
On completion of the course, students will be able to perform the experiments with given measuring instruments and maintain the lab work book. He/she will be also able to record the observation from different measuring instruments.		

Semester II

Course Code: EIGC 201
Course Title: Fundamentals of IT

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Student is expected to have basic understanding of computer and basic mathematics.

Objectives of Course

To learn the specified foundational concepts of Information Technology

Course Content

Unit I	**Number System**	**7 Hours**

Non-Positional Number System, positional Number System, Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number, Number Conversion

Unit II	**Computer Codes**	**8 Hours**

Data Types, Computer Codes. BCD: Coding of Alphabetic and Numeric Characters in BCD, BCD Coding Scheme Examples. EBCDIC: Coding of Alphabetic and Numeric Characters in EBCDIC. ASCII: Coding of Numeric and Alphabetic Characters in ASCII, ASCII-7 Coding scheme, ASCII-8 Coding scheme.

Unit III	**Computer Arithmetic**	**10 Hours**

Reasons for using binary instead of Decimal Numbers, Basic arithmetic operations using binary numbers: Addition, Subtraction, Multiplication, Division. Binary over decimal, Examples of a few devices that work in binary mode, Binary arithmetic, Binary addition, Binary subtraction, Complement of a number, Complement of a binary number, Complementary method of subtraction, Binary multiplication, Binary division, Rules for binary division, Additive method of multiplication and division

Unit IV	**Computer languages**	**10 hours**

Some popular Computer languages or programming languages. Categories of programming languages: machine, assembly, and high level languages. Programming language tools: assembler, linker, and interpreter. Concepts: object oriented programming languages, subprogram, characteristics of a good programming language, and factors to consider while selecting a language for coding an application.

Unit V	**Business Data Processing**	**7 Hours**

Standard methods of organizing data: Database system and File Management System. Data Processing, Data storage Hierarchy, Relationship Among character, Field, Record, And File. File Organizations, Organization Of an Indexed Sequential File, File Utilities, Sorting on One Key, Sorting on Two Keys, Merging of two Files. Database Models: Hierarchical Database, network Database, Relational Database, Object-Oriented Database, Creating Reports, Sample Output of Reports.

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

The core topics in Information Technology as enlisted will be studied

References/Readings

1. Computer Fundamentals –P.K. Sinha &Priti Sinha
2. ITIL for Beginners (The Complete Beginner's Guide to Itil by ClydeBank Technology
3. Open Source for the Enterprise (Managing risks, raping rewards) by Dan Woods, Gautam Guliani
4. Technology in Action Complete by Alan Evans, Jonathan Weyers, Mary Anne Poatsy
5. ITSM (Quickstart Guide — The Simplified Beginner's Guide to IT Service Management) by ClydeBank Technology

Course Code: EIGC 202 **Course Title: Communication skills- II**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Keen interest to develop the technical writing		
Objectives of Course		
To achieve successful receiver's role in communication through input of text		
Course Content		
Unit I	**Reading Comprehension**	**11 Hours**
Introduction, Purpose of Reading, Reading Rates, What is Reading Comprehension, Reasons for Poor Comprehension, Improving Comprehension Skills, Exercises		
Unit II	**Enhanced Comprehension**	**11 Hours**
Techniques for Good Comprehension: skimming and scanning, non-verbal signals, Structure of text, Structure of Paragraph, Punctuation, Authors Viewpoint (Inference), Exercises		
Unit III	**Reading Nuances-I**	**10 Hours**
Reader Anticipation: Determining the meaning of words, Summarizing, Typical Reading - Comprehension Questions Worked Out Sample Passages, Exercises		
Unit IV	**Reading Nuances-II**	**10 Hours**
Words Commonly Misspelt Words and Phrases from Foreign Languages Proofreading Symbols		
Pedagogy		
Lectures/Tutorial/Assignments/ Practice Sessions		
Course Outcome		
Completion of any given reading tasks with ease and confidence by learning: the content, writing style, text organization and format of various types of technical documents via amalgamation of theory and practice of this subject.		
References/Readings		
1. Reading Development And Difficulties By Kate Cain 2. Bringing Words To Life: Robust Vocabulary Instruction By Isabel L. Beck, Margaret G. Mckeown, LindaKucan 3. Ending The Reading Wars: Reading Acquisition From Novice To Expert By Castles, A., Rastle, K., & Nation, K. (2018) Psychological Science In The Public Interest, 19(1), 5–51. 4. Understanding Reading Development By Colin Harrison 5. Understanding Reading Comprehension: Processes And Practices By Wayne Tennent 6. Developing Reading Comprehension By Paula J. Clarke, Emma Truelove, Charles Hulme, Margaret J. Snowling 7. How To Read A Book: The Classic Guide To Intelligent Reading By Mortimer J. Adler, Charles Van Doren		

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Course Code: EIGC 203

Course Title: Computer Maintenance and Troubleshooting-Hardware

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Students should know the basics of computer Hardware

Objectives of Course

Computer Maintenance and Troubleshooting is frequently required for smooth functioning of computer system. The Objective of this subject is :

1. To make the students capable to understand the functioning of hardware parts
2. To develop skills in diagnosing the faults
3. To troubleshoots the computer system.

Course Content

Unit I	**Safety Measures**	**6 Hours**

Hand Tools Basics and Specifications. Types of cabinets: relation with mother board form factor. Precautions to be taken while opening and closing PC cabinet. Main devices: components- Cards- boards inside a PC (to card or device level only).

Unit II	**Introduction to PC Hardware**	**10 Hours**

Basic terms, concepts, and functions of system modules (System board, firmware, storage devices, monitor, boot process, ports). CMOS and BIOS, Overview of system components, Motherboard: definition, Components/connections in motherboard, Knowing motherboard of PC, Identifying types of motherboard, SMPS: Circuit diagrams and pin assignments, working of SMPS Input and load requirements.

Unit III	**Assembling Hardware 05Hrs**	**10 Hours**

Specifications of processors, Memory devices- types- principle of storing. Data organization 4bit- 8 bit- word. Semiconductor memories- RAM- ROM- PROM- EMPROM- EEPROM- Static and dynamic. Example of memory chips, pin diagram, pin function. Concept of track- sector- cylinder. HDD Drive components read write head, head actuator, spindle motor, sensors, PCB. Precaution and care to be taken while dismantling Drives. Drive bay: sizes, types of drives that can be fitted. Precautions to be taken while removing drive bay from PC. Concept of SATA and PCI INTEFACE SSD. Precautions to be taken while fitting drives into bays and bay inside PC cabinet CMOS setting (restrict to drive setting sonly). Meaning and need for Using Scan disk and defrag

Basic blocks of SMPS- description of sample circuit. Vendor/sources of PC hardware components.

Unit IV	**Introduction to Hard disk Partition, formatting and installation**	**10 Hours**

Introduction to hard drive, working of hard disk: Hard Drive Motherboard Desktop Hard Drive Buyer's Guide, RAID, Using Multiple Hard Drives for Performance and Reliability Partitioning a hard disk (primary and extended partitions). Bad Sectors in Hard disk- Master Boot Record- in-place installation- Registry fixing- performance level check- Shortcut fixing- Fixing Start up process- log- difference between MBR and GPT etc. Cloning of Secondary Storage.

Unit V	**Troubleshooting and Preventive Maintenance**	**6 Hours**

Troubleshooting basics, Troubleshooting by visual Inspection, Preventative Maintenance, Using Preventative Maintenance Tools, POST : Functions, Test Sequence, Error messages, Troubleshooting Procedures and Preventative Maintenance: Identifying Troubleshooting Tools, Hardware tools, Diagnostic software, Materials and equipment, Software utilities, Maintaining Environmental Controls, Ventilation and airflow, Humidity and liquids, Dirt and dust, Power, UPS, and suppressors, Completing Maintenance Tasks, Case and components, Power supplies

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to:

1. Understand Basics of Hardware Components.
2. Acquire knowledge of Finding Faults in Components
3. Install, Configure and maintain various components in computer system and peripherals.
4. Diagnose faults of Different Component
5. Repair and maintain computer system and its peripherals.

References/Readings

1. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B.Govindarajalu, Tata McGraw Hill
2. PC Upgrade & Repair Bible , Wiley India.
3. PC Systems, Installation and Maintenance, Second Edition by R. P. Beales,
4. PC Upgrade & Repair Black Book by Ron Gilster.
5. Computer Installation and Servicing by D Balasubramanian
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, Pearson Education.
8. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
9. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
10. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B.Govindarajalu, Tata McGraw Hill
11. Computer Installation and Servicing by D Balasubramanian

Course Code: EIGC 204
Course Title: Computer Maintenance and Troubleshooting-Hardware Lab

Number of Credits: 03 **Total Hours: 84** **Total Marks: 75**

Prerequisites for the course

Students should know the basics of computer Hardware

Objectives of Course

The Objective of this course is

1. To make the students capable to understand the functioning of hardware parts
2. To develop skills in diagnosing the faults
3. To troubleshoots the computer system

Lab Content

Exp.1 : Study assembling and disassembling the PC.
Exp.2 : Study computer I/O ports.
Exp.3 : Identify the on-board features of the motherboard and installation of drivers and hardisk.
Exp.4 : Study of components of power supply (SMPS).
Exp.5 : Perform formatting of Hard Disk.
Exp.6 : Installation of Computer Input devices and troubleshooting.
Exp. 7 : Installation of Computer Output devices and troubleshooting.

Exp.8 : Preventive Maintenance of Computers.
Pedagogy
Experiments
Course Outcome
On completion of the course, students will be able to: 1. Understand Basics of Hardware Components. 2. Acquire knowledge of Finding Faults in Components 3. Install, Configure and maintain various components in computer system and peripherals. 4. Diagnose faults of Different Component 5. Repair and maintain computer system and its peripherals.

Course Code: EISC 201
Course Title: Analog Electronics

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Students should have some basic idea of electrical concepts and some basic knowledge of electronics.

Objectives of Course

This course is intended to give fundamentals of electronics components such as diodes, transistors, power supply and amplifiers. To understand the working of different circuits based on these electronics components.

Course Content

Unit I	**Introduction to semiconductor diode**	**10 Hours**
Intrinsic and extrinsic semiconductors, P and N type semiconductor, P.N. junction, barrier potential, effect of temperature, breakdown voltage, Forward and reverse bias, Half wave, full wave rectifiers and bridge rectifiers, filters for rectifiers, Zener diode.		
Unit II	**Introduction to Transistor and Amplifiers**	**6 Hours**
Working principle of Transistor, NPN and PNP transistor, transistor amplifier (CE, CB and CC).		
Unit III	**Introduction to Power Supply**	**6 Hours**
Unregulated and regulated DC power supply specifications, Application of different types of power supply, Short circuit protection, Overload protection, Fixed and variable voltage regulators, SMPS.		
Unit IV	**Basic Amplifier and feedback**	**12 Hours**
Gain, I/O resistance, Classes of amplifier, Decibel, Amplifier bandwidth. Types of feedback, Voltage and current feedback, series and shunt feedback. Barkhausen criterion, types of oscillators.		
Unit V	**Linear IC's and Operation Amplifiers**	**8 Hours**
Differential Amplifier, OP-Amp characteristics, Differential and Common mode gains, CMRR, Slew rate, virtual ground, inverting and non Inverting amplifier, Applications of op-amps.		

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to understand the basic electronics components such as diodes, transistors, power supply Op-amps etc. Students will be able to design the amplifiers using transistor and op-amps.

References/Readings

1. Principle of electronics by V. K. Mehta
2. Electronics devices by Thomas. L. Floyd
3. Basic electronics for scientist and engineers by Dennis Eggleston
4. The Art of electronics by Thomas c Hayes and Paul Horowitz
5. J. Millman and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Mc Graw Hill International Student Ed. (1972).

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Course Code: EISC 202 **Course Title: Analog Electronics Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Working knowledge of analog electronics devices		
Objectives of Course		
This course is intended to provide laboratory training and designing electronics circuits such as transistor amplifiers, power supply and operational amplifiers. Identify different sections and components in the circuit diagram.		
Course Content		**84 Hours**
Expt. 1: Identifying and testing of diode, NPN and PNP transistors. **Expt. 2:**Study of bridge rectifier **Expt. 3:**Study of Zener diode and its characteristics **Expt. 4:**Unregulated and regulated power supply **Expt. 5:**Load regulation of regulated and unregulated power supply **Expt. 6:**Line regulation **Expt. 7:**Study of Wien's bridge oscillator **Expt. 8:**Phase shift oscillator **Expt. 9:**Hartley oscillator and Colpitts oscillator **Expt. 10:**Non-inverting and inverting amplifier **Expt. 11:**Integrator and differentiator using OP-AMP **Expt. 12:**Adder and subtractor using OP-AMP **Expt. 13**: Design of class A amplifiers		
Pedagogy		
Lab experiments/Assignment		
Course Outcome		
Should be able to design and construct electronic circuits by identifying different components. Plot the graph and analyse the results. Students are expected to learn how to maintain lab record.		

Course Code: EISC 203 **Course Title: Maintenance and Repair of Home Appliances– II**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Basic knowledge of working of home appliances devices		
Objectives of Course		
This course is intended to provide the knowledge of home appliances devices, their working principle and some basic troubleshooting procedure.		
Course Content		
Unit I	**UPS/Inverter**	**10 Hours**
Working principle, specifications, block diagram. Types of inverter and UPS. Various types of batteries used in UPS and Inverters and their maintenance.		
Unit II	**SMPS**	**4 Hours**
Block Diagram of Switch mode power supplies and their working principles, main parts.		
Unit III	**Washing Machine**	**8 Hours**
Working principle, types of machines, washing techniques, working of motors, different types of timers, power supply circuits.		
Unit IV	**Microwave oven**	**4 Hours**
Working principle, Different types of oven, study the various functions of Oven, Electrical wiring diagram of microwave oven, working of Power supply		
Unit V	**Induction cooktops**	**6 Hours**
Working Principle of Induction cooktops, eddy current, electrical induction, Advantages of induction cooktops, the limitations of induction cooktop.		
Unit VI	**OTG**	**4 Hours**
Working of OTG, Internal parts of OTG, heating principle, Control knobs: Timer, temperature. Wiring diagrams.		
Unit VII	**Dish TV and CCTV**	**6 Hours**
Working of CCTV and DISH TV, Antenna of Dish TV, Set top box, LNB, Types of cameras, DVR		
Pedagogy		
Lectures/Tutorial/Assignments/		
Course Outcome		
On completion of the course, students will be able understand the working principle of home appliance devices. Student should be able to identify the various faults leading to non-working of the device.		
References/Readings		
1. Troubleshooting and Repairing Major Appliances Hardcover by Eric Kleinert 2. Complete Guide to Home Appliance Repair Hardcover – June 1, 1990 3. Electrical Appliances: The Complete Step-by-step Guide to the Repair and Maintenance of a Wide Range of Domestic Electrical Appliances (Haynes for Home DIY) Paperback – January 1, 1995 by Graham Dixon. 4. Handbook of Repair and Maintenance of Domestic Electronics Appliances Paperback by Shashi Bhushan Sinha.		

Course Code: EISC 204 **Course Title: Maintenance and Repair of Domestic Appliances– II Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Basic knowledge of electronics and understanding working principle of home appliance devices		
Objectives of Course		
This course is intended to provide the laboratory training of repair and maintenance of home appliance devices. Their basic troubleshooting, identifying the faults and replacing the faulty parts.		
Course Content		**84 Hours**
Expt. 1: UPS and Inverters I. **Expt. 2:** UPS and Inverters II. **Expt. 3:**Study SMPS. **Expt. 4:**Repairing of SMPS: simulating various faults diagnosing and rectifying it. **Expt. 5:**Installation of Dish TV and CCTV. **Expt. 6:**Identify the internal and external parts of microwave oven **Expt. 7:** Troubleshooting of OTG **Expt. 8:**Identifying different parts and Installation of front/top load Washing machine **Expt. 9:**Troubleshooting various faults in the washing machine. **Expt. 10:**Working of induction cooktop, auxiliary power supply unit, MCU section		
Pedagogy		
Lab experiments/ Assignment/Self study		
Course Outcome		
On the successful completion of the subject student will be able to identify the faults, troubleshoot the device and basics of servicing.		

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Course Code: EISC 205 **Course Title: Computer Networking- II**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Students should know the concepts taught in Computer Networking- I		
Objectives of Course		
1. To introduce the basics of computer networking– concepts, theory 2. To Identify different network components and tools 3. To know techniques of crimping and punching 4. To understand basics of OSI and TCP/IP Model 5. To understand the basic home appliances		
Course Content		
Unit I	**Components of the Computer Network**	**4 Hours**
Identify various Network tools: Wire crimper, Wire Map Testers, Multifunction Cable Tester, LAN Tester, Tone Generator etc. Identify various Network devices: Switch (Normal and Managed), Router(Normal and wireless), Rack, Patch Panel, I/o box, Access Point etc. Understand the Layout of network on your lab and campus.		
Unit II	**Networking Cables**	**10 Hours**

Network cable Types and specifications. UTP Cables : Electrical and Mechanical Properties, Construction, colour codes Applications, Patch Cords		
Unit III	**Crimping & Punching**	**8 Hours**
Communication Media and Connectors – Unshielded twisted-pair (UTP), shielded twisted-pair (STP), Fibre Optic and coaxial cable: RJ-45, RJ-11, BNC. Understanding colour codes of CAT5 cable. 568A and 568B convention. Network Cabling : Crimping and punching		
Unit V	**Configuration of Data communication equipment**	**10 Hours**
Network Components: Modems, Firewall, Hubs, Bridges, Routers, Gateways, Repeaters, Transceivers, Switches, Access point, etc. Types, functions, advantages and applications of Network Component. Layer 2 manage switch configuration and use it on network, Latest configurations. Understand the use of Network simulation software and the process of use it.		
Unit VI	**Basic Home Network Hardware Components, Devices and Services**	**10 Hours**
Modem, dongle, Broadband, Home Switch, Home Router, Home Router with Landline, Repeater, Firewall and NAT Router, Combination of various devices, WAP, PoE Injector		

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to:

1. Identify different network components and tools
2. Understand techniques of crimping and punching
3. Understand basics of OSI and TCP/IP Model
4. Know the basic Home Network appliances

References/Readings

1. Bell, C. G., Habermann, A. N., McCredie, J., Rutledge, R., & Wulf, W. (1970). Computer networks. In *Computer* (Vol. 3, Issue 5).
2. TANENBAUM, A. S., & WETHERALL, D. J. (2005). Computer networks. In *Computers, Software Engineering, and Digital Devices*. https://doi.org/10.4337/9781784711603.00023
3. D-Link Certified, DCS Switching Training Guide
4. D-Link Certified, DCS Switching Lab Manual
5. Cisco Certified Network Associate Training Guide
6. James F. Kurose, Keith W. Ross, Computer Networking A Top down Approach, 7th Edition, Pearson, 2001.
7. Data communications and Networking, Behrouz A Forouzan, Tata Mc Graw-Hill 5th edition, 2013
8. Larry Peterson and Bruce S Davis “Computer Networks :A System Approach” 5 thEdition , Elsevier -2014
9. Douglas E Comer, “ Internetworking with TCP/IP, Principles, Protocols and Architecture” 6th Edition, PHI - 2014
10. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
11. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

Course Code: EISC 206 **Course Title: Computer Networking- II Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Student should know to use the computer.		

Objectives of Course

1. To introduce the basics of computer networking– concepts, theory
2. To Identify different network components and tools
3. To know techniques of crimping and punching
4. To implement cable testing
5. To implement small group of computer networking
6. Install and configure basic home appliances

Lab Content

Exp.1 : Introduction to different tools of computer network
Exp.2 : Introduction to different components/devices of computer network
Exp.3 : Understand the network on the campus
Exp.4 : To implement Crimping
Exp.5 : To Implement Punching
Exp.6 : Cable Testing
Exp.7 : Study of different types of networking cables
Exp.8 : Study of basic network command and Network configuration commands.
Exp.9 : Create a Small Physical Network using Computers, Network Connecting Devices and cables
Exp.10 : Install &Configure a Peer to-Peer Network using Windows
Exp.11 : Connect computers using Bluetooth, WI-FI, hotspot.
Exp.12 : Study of network IP
Exp.13 : Install and configure basic home networking appliances

Pedagogy

Experiments

Course Outcome

On completion of the course, students will be able to:

1. Identify different network components and tools
2. Implement crimping and punching
3. Implement cable testing
4. Implement basic communication between local PCs
5. Install and configure basic home appliances

Course Code: EISC 207 **Course Title: Sensors and Transducers**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
The student should have basic knowledge of electrical concepts.		
Objectives of Course		
Various principles of transduction action will be discussed in this course. Make students familiar with different types of sensor used in the industry.		
Course Content		
Unit I	**Mechanical and Electromechanical sensor**	**9 Hours**
Definition, principle of sensing & transduction, classification Resistive (potentiometric type): Characteristics of sensors,Construction, working and types: Strain gauge, Inductive sensor, transformer action type, LVDT, Proximity sensor.		
Unit II	**Capacitive sensors**	**9 Hours**
Capacitive sensors and its types, Stretched diaphragm type: microphone, response characteristics. Piezoelectric sensors working, construction, types and applications, ultrasonic sensors.		
Unit III	**Thermal sensors**	**9 Hours**
Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistor material, shape, ranges and accuracy specification. Thermo emf sensor: types, thermoelectric power, Pyroelectric type.		
Unit IV	**Magnetic and Radiation sensors**	**08 Hours**
Villari effect for assessment of force, torque, proximity, Hall effect, LDR, Photovoltaic cells, photodiodes, photo emissive cell types, materials, construction, response.		
Unit V	**Advances in sensor technology**	**7 Hours**
Semiconductor sensor, smart sensor, micro-sensor, IR radiation sensor, Ultrasonic sensor, Fiber optics sensor, chemical sensor, bio-sensor.		
Pedagogy		
Lectures/Tutorial/Assignments/		
Course Outcome		
On completion of the course, students will gain basic understanding of different types of sensors and transducers. The course empowers a student who is likely to go for higher studies in electronics and Instrumentation technology.		
References/Readings		
1. Transducers and instrumentation, D. V. Murthy 2. Sensors and Transducers, Ian Sinclair 3. Sensors and Transducers, M.J. Usher 4. Handbook of Modern Sensors by Jacob Fraden 5. Sensors and Transducers by Patranabis		

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Course Code: EISC 208 **Course Title: Sensors and Transducer Lab**	
Number of Credits: 03 **Total Hours: 84** **Total Marks: 75**	
Prerequisites for the course	
Working knowledge of sensor and analog electronic	
Objectives of Course	
This course is intended to provide laboratory training using sensors for measuring real life applications.	
Course Content	**84 Hours**
Expt. 1: Measurement of temperature by RTD. **Expt. 2:** Temperature measurement using AD590 Semiconductor temperature sensor. **Expt. 3:** Torque measurement by Strain Gauge Transducers. **Expt. 4:** Measurement of temperature by thermocouple **Expt. 5:** Measurement of displacement using LVDT. **Expt. 6:** Measurement of load using strain gauge based load cell. **Expt. 7:** Study of LDR **Expt. 8:** Study of Photo Diodes &Photovoltaic cells **Expt. 9:** Ultrasonic sensor **Expt. 10:**Piezoelectric sensor	
Pedagogy	
Lab experiments	
Course Outcome	
Students will have working knowledge of different sensors. Students should be able to plot the input and output parameter relation. Expected to design a solution based on the requirement.	

Semester III

Course Code: EIGC 301
Course Title: General Instrumentation

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Student should have basic knowledge of electronics and different instruments

Objectives of Course

This course is intended to provide the basic understanding of the working principle behind any electronics measuring instruments. Students will be made familiar with the importance of instrumentation. He/ She will learn how to acquire the signal and process those signals.

Course Content

Unit I	**Plan and perform routine trade activities**	**5 Hours**

Protective equipment: Hard hat, goggles, face, Ear plug & Ear muffs, Hand (gloves), foot (boots with sole), Personal Breathing Apparatus, hand and power tools, Trade specific hand and power tools, Manufacturer instructions, mounting hardware, Location for installation of mounting hardware.

Unit II	**Scope of Instrumentation**	**5 Hours**

Scope of Instrumentation, block diagram of measurement system, calibration, secondary and working standards, metric system base and supplementary units, Characteristics of instruments.

Unit III	**Signal conditioning and display**	**10 Hours**

Single ended and differential amplifier instrumentation amplifiers, block diagram of AC signal conditioning and DC signal conditioning, sampling circuits, analog indicators, alphanumeric devices: 7-seg and dot array.

Unit IV	**Data acquisition system and computer interfaces**	**10 Hours**

Data acquisition system, pre-amplification and filtering, single channel and multichannel data acquisition system, multiplexing, sample and hold, A/D and D/A converter, data logger, Interfaces: RS-232, GPIB, USB.

Unit V	**Control System**	**12 Hours**

Basic idea of feedback control systems (open and control), basics of P, PI, PD, PID controllers, ON/OFF pneumatic control systems, ON/OFF electric controllers.

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

On completion of this course student is expected to gain good knowledge of instrumentation. Student will understand the importance of data acquisition system control system.

References/Readings

1. Electronics instrumentation, H.S. Kalsi
2. Electronics measurements and instrumentation, R. S. Sedha
3. R.K.Jain, “Mechanical & Industrial Measurements”, Khanna Publishers, 11th Edition, 2004.
4. Ernest O. Doeblin, Dhanish. N. Manik, “Measurement Systems Application & Design”, TMH, 5th Edition, 2004.
5. Electrical and Electronics Measurements and Instrumentation by PrithwirajPurakait.

Course Code: EIGC 302 **Course Title: Communication skills- III**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Keen interests to improve quality of technical writing		
Objectives of Course		
To achieve successful sender's role in communication via script means		
Course Content		
Unit I	**Writing messages**	**10 Hours**
Business Letters: Significance, Purpose, Structure, Layout, Principles, Types and Samples, Claims Letters, Adjustment Letters, Sales Letters, Job Application Letters. E-Mails: Advantages and Limitations of E-Mail, Style Structure and Content, E-Mail Etiquettes, Sample E-Mail Messages, Effectiveness and Security,Exercises		
Unit II	**Writing for documentation I**	**11 Hours**
Reports: Introduction, Objectives, Characteristics of a Report, Types of Reports, The Importance of Reports, Formats, prewriting, structure of reports. Writing the reports: First Draft, Visual Aids, revising, editing, and proofreading, samples,exercises.		
Unit III	**Writing for documentation-II**	**13 Hours**
Instruction Manuals: Types of Instructions- Oral Instructions, Written Instructions. Writing Instructions: Preliminary Steps, Components, Illustrations, Content Formatting, Checklist, User's Manuals, Cover,Precautions, Table of Contents, Introduction, Abbreviation, Technical Specification, Warranties, Accessories Technical Description: Introduction, Naming, Definition, Description, Illustrations, Process Description, Guidelines for Writing Good Descriptions, Examples.		
Unit IV	**Nuances of writing**	**8 Hours**
Common Errors: Usage, Punctuation and Capitalization, Words Commonly Misspelt.		
Pedagogy		
Lectures/Tutorial/Assignments/ Practice Sessions		
Course Outcome		
Firm grasp of effective writing of variety of technical documents: letters, reports and manuals		
References/Readings		
1. Technical-Communication-Principles-And-Practice :*Meenakshi Raman* , Sangeeta Sharma Oxford-University-Press-2004 2. Technical Writing Process by Kieran Morgan. 3. The Insider's Guide to Technical Writing by Krista Van Laan 4. Managing Your Documentation Projects by JoAnn T. Hackos 5. Technical Communication, 9th edition by Mike Markel. 6. Technical Writing for Dummies by Sheryl Lindsell-Roberts.		

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Course Code: EIGC 303 **Course Title: Computer Maintenance and Troubleshooting- Software**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Students should know to use the computer and understand basics of computer hardware.		
Objectives of Course		
Computer Maintenance and Troubleshooting is frequently required for smooth functioning of computer system. The Objective of this subject is:		

1. To understand the functioning of computer software
2. To develop skills in diagnosing the faults
3. To troubleshoots the computer system.
4. To install various device drivers
5. To manage junk files
6. To understand basics of Linux Operating System

Course Content

Unit I	**OS features, System utilities**	**6 Hours**
Functions of an operating system, Disk operating system. Concept of GUI, Modes of starting on different occasions, Desktop: Icon- selecting- choosing- drag and drop, My computer (User folder in Desktop), network places, Recycle bin, task bar, start menu, tool bar and menus. Windows Explorer, Properties of files and folders, Executing application programs.		
Unit II	**Device Driver, OS Update and Firewall Security**	**8 Hours**
Properties of connected devices, Applications under windows accessories, Windows Help, Finding files- folders- computers, Control panel, Installed devices and properties Updating of OS, Different configurations of Computer system and its peripherals, Compatible with different hardware/software, Pre-installation Prerequisites, Install procedure, Rollback or Uninstall procedure, Tests of various device driver software.		
Unit III	**User Account in Windows**	**5 Hours**
Users and user account, Types of user accounts, user access levels, Privileges: types of privileges, various scope, permissions, permission parameters, user and group permission, time based permission, expiration of permission etc.		
Unit IV	**Junk File**	**2 Hours**
Junk files deleted files, un-deleting files, configuration of internet browser.		
Unit V	**Data backup and data recovery software**	**3 Hours**
Maintenance of Temp folder, internet history, cookies, bookmark, Concepts of SAN- NAS and cloud storage.		
Unit VI	**Introduction To Mail Client Software (Outlook)**	**8 Hours**
Add and use contacts, Calendar basics, Recall and replace sent messages, Send automatic replies when you're out of the office, The ins and outs of BCC, Use Instant Search to find Calendar items, Use Instant Search to find contacts, Use Instant Search to find messages and text, Add holidays to your calendar, Create or delete a search folder, Import and export v Cards to Outlook contacts.		
Unit VII	**Linux operating system**	**10 Hours**
Basic Linux commands, Linux file system, The Shell- Users and fill permissions, vi editor, X window system, Filter Commands, Processes, Shell Scripting, Concept of UNIX.		

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to:

1. Understand Basics of Computer software.
2. Develop skills in diagnosing the faults
3. Troubleshoots the computer system.
4. Install various device drivers
5. Manage junk files
6. Understand basics of Linux Operating System

References/Readings

1. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B.Govindarajalu, Tata McGraw Hill
2. PC Upgrade & Repair Bible , Wiley India.
3. PC Systems, Installation and Maintenance, Second Edition by R. P. Beales,
4. PC Upgrade & Repair Black Book by Ron Gilster.
5. Computer Installation and Servicing by D Balasubramanian
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, *Pearson Education.*
8. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
9. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
10. IBM PC & Clones: Hardware Trouble Shooting and Maintenance by B.Govindarajalu, Tata McGraw Hill
11. Computer Installation and Servicing by D Balasubramanian

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Course Code: EIGC 304
Course Title: Computer Maintenance and Troubleshooting- Software Lab

Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**

Prerequisites for the course

Students should know the basics of computer Hardware

Objectives of Course

Computer Maintenance and Troubleshooting is frequently required for smooth functioning of computer system. The Objective of this subject is:

1. To understand the functioning of computer software
2. To develop skills in diagnosing the faults
3. To troubleshoots the computer system.
4. To install various device drivers
5. To manage junk files
6. To understand basics of Linux Operating System

Lab Content

Exp.1: Operating system Installation
Exp.2: Creating User account in Windows
Exp.3: Study of different Anti-Virus software.
Exp.4: Working with BIOS settings.
Exp.5: Recognize common symptoms associated with diagnosing and troubleshooting PCs and utilize Windows built-in diagnostic tools.
Exp.6: Define registry file operation and maintenance.
Exp.7: Installation of drivers of various devices from the internet. Demonstrate to remove unwanted software applications.
Exp.8: Study on Mail Client Software
Exp. 9: Install and Configure Dual OS Installation
Exp.10: Data backup and recovery
Exp.11: Linux Operating system
Exp.12: Junk files management

Pedagogy
Experiments
Course Outcome
1. On completion of the course, students will be able to: 2. Understand Basics of Computer software. 3. Develop skills in diagnosing the faults 4. Troubleshoots the computer system. 5. Install various device drivers 6. Manage junk files 7. Understand basics of Linux Operating System

Course Code: EISC 301 **Course Title: Digital Electronics- I**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Should have studied basic level electronic subjects. It is assumed that students have a working knowledge of passive, active components and basics of Boolean algebra.		
Objectives of Course		
This subject will introduce the basics of digital electronics. Student will be introduced to the different gates, Boolean algebra and logic families.		
Course Content		
Unit I	**Transistors and multivibrator**	**6 Hours**
Transistor multivibrators, types of multivibrators, construction and working of FET		
Unit II	**Logic gates**	**4 Hours**
Basic logic gates, OR, AND, NOR, NAND, and EX-OR gates, NAND and NOR gates as universal building blocks in logic circuits,		
Unit III	**Digital fundamentals**	**12 Hours**
De Morgan's Law's, Boolean Algebra, Sum of Products methods and Product of Sum methods, Minterms and Maxterms, Karnaugh map Minimization.		
Unit IV	**Combinational circuits**	**10 Hours**
Half adder and Full adder, Multiplexer and Demultiplexer, Encoders and decoders.		
Unit V	**Logic families**	**10 Hours**
TTL Standard, TTL NAND, ECL, MOS gates and CMOS gates, propagation delay, power dissipation, fan-out and fan-in, noise margin.		
Pedagogy		
Lectures/Tutorial/Assignments/		
Course Outcome		
On completion of the course, students will be able to understand the basic electronics components such as FET, multivibrator, combinational circuits. Students will gain knowledge of basics of digital electronics and number system.		
References/Readings		
1. Digital Principles and Applications: Malvino and Leach TMH 4th edition 1986. 2. Electronics Devices and Circuits An Introduction: Allen Mottershed PHI 1997 3. Integrated Electronics: Millman and Halkias TMH 1972 4. Electronic Devices and Circuits: Millman and Halkais Mc Graw Hill 1967 5. Modern Digital Electronics: R. P. Jain TMH 3rd edition 2003. 6. Principles of Electronics: V.K.Metha, S.Chand& Company 8th edition 2003		

Course Code: EISC 302 **Course Title: Digital Electronics- I lab**	
Number of Credits: 03 **Total Hours: 84** **Total Marks: 75**	
Prerequisites for the course	
Student should have working knowledge of basic digital electronics.	
Objectives of Course	
Students will be able to understand the basic block of digital electronics. He/she will able to design different digital electronics circuits.	
Course Content	**84 Hours**
Expt. 1: Astable multivibrator **Expt. 2:** Monostable multivibrator **Expt. 3:** Bi-stable multivibrator **Expt. 4:** DTL logic gate using transistors **Expt. 5:** TTL logic gate using transistors **Expt. 6:** Verification of logic AND, OR, NOR, NAND, EX-ORE and EX-NOR gates **Expt. 7:** Universal logic gates **Expt. 8:** Half adder and full adder circuits **Expt. 9:** Multiplexer/Demultiplexer **Expt. 10:** Encoder/decoder	
Pedagogy	
Lab experiments/Assignment	
Course Outcome	
Should be able to design and construct digital electronic circuits by identifying different integrated circuits. Plot the graph and analyse the results.	

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Course Code: EISC 303
Course Title: Refrigeration and Air Conditioning

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Student should have basic knowledge of temperature, pressure.

Objectives of Course

Learning the fundamental principles and different methods of refrigeration and air conditioning. Study of the various equipment operating principles, operating and safety controls employed in refrigeration air conditioning systems.

Course Content

Unit I	**Psychrometry**	**5 Hours**

Psychrometric Processes: Sensible Cooling, Sensible Heating, Cooling with dehumidification, Cooling with adiabatic Humidification, Chemical dehumidification, heating and humidification, Mixing of air- streams, Air Washers.

Unit II	**Heat transfer and air-distribution**	**10 Hours**

Principles of heat transfer, Conduction, Convection and Radiation. Properties of insulating materials, Air Distribution, Systems of air distribution, Duct systems, and cooling load and air quantities pressure in ducts, duct layout & construction.

Unit III	**Components of refrigeration system**	**10 Hours**

Condensers, Air cooled and water cooled Evaporative Condensers, Heat Rejected in condensers, construction of condensers, Driers, receivers, Purging, Cleaning of Condensers, Refrigerant Controls, Types of expansion devices and sensible heat factor, construction and operation of Automatic expansion valve, thermostatic expansion valve, and capillary tube, low side float valve, High Side float valve. Solenoid valves, testing and adjusting thermostatic expansion valves, Evaporators, types of evaporators, Heat absorbed in evaporators, water chillers, brine coolers, Methods of defrosting.

Unit IV	**Electrical controls**	**7 Hours**

Refrigeration Controls, H.P and L.P cut-outs, Oil Pressure failure safety switch, Motor Starters, capacitors, Relays, over load protectors and servicing of motors.

Unit V	**Air conditioning system and maintenance**	**10 Hours**

Air-Conditioning systems and equipments, classification of air-conditioning systems-all air systems, all water system types, Fans, Blowers, grills, resistors, filters, compressors, cooling coils, condensers Air-Handling Units, Fan coil Units, Central Air Conditioning plants. Ventilation Systems, Leak Detection, Pressure testing and charging.

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

Students will gain knowledge of the working principle behind refrigeration and AC. Operate and analyze the refrigeration and air conditioning systems.

References/Readings

1. Refrigeration & Air-conditioning, CP Arora, TMG
2. Refrigeration & Air-conditioning, Manohar Prasad, NAI
3. Refrigeration & Air-conditioning, Stoecker&Jons, MGH
4. Principles of Refrigeration, RC Dosset, LPE
5. ASHRAE Handbook (Fundamentals), ASHRAE

Course Code: EISC 304 **Course Title: Refrigeration and Air Conditioning Lab**	
Number of Credits: 03	**Total Hours: 84 Total Marks: 75**
Prerequisites for the course	
Working knowledge of AC and refrigeration system	
Objectives of Course	
To provide students with working of domestic refrigeration. This course is intended to provide the hand on experience with refrigeration and air conditioning devices.	
Course Content	**84 Hours**
Expt. 1: Testing of Thermostats. **Expt. 2:** Experiment on an Evaporative Cooler. **Expt. 3:** Study of expansion-valves, testing and adjusting. **Expt. 4:** Pressure testing and leak detection methods. **Expt. 5:** Charging Procedure and charging a refrigerator correctly. **Expt. 6:** Study of low and high Pressure cut-outs. **Expt. 7:** Study of Capacitors, Relays, Overloads, Chokes, etc. **Expt. 8:** Study of different thermal insulating materials **Expt. 9:** Servicing of a Refrigerator. **Expt. 10:** Servicing of an Invertor and non-inverter air-Conditioner. **Expt. 11:** Wiring diagrams of an Air-Conditioner and central Plants. **Expt. 12:** Wiring diagrams of a Multi-cylinder Compressor for capacity control.	
Pedagogy	
Lab experiments	
Course Outcome	
He will be able to locate the faults in the non-working RAC system. Student should be able to identify the tools required to service and repair the RAC system.	

Course Code: EISC 305 **Course Title: Computer Networking- III**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Students should know the topics covered in Computer Networking I, II		
Objectives of Course		
1. To understand OSI and TCP/IP Models In depth 2. To understand IP Addressing 3. To understand Subnet mask 4. To understand VLAN 5. To understand STP, RSTP 6. To understand IP Routing		
Course Content		
Unit I	**OSI Model**	**5 Hours**
Application layer (layer 7), Presentation layer (layer 6), Session layer (layer 5), Transport layer (layer 4), Network layer (layer 3), Data Link layer (layer 2) and sublayers, Physical layer (layer 1). Data Encapsulation Protocols used at each layer		
Unit II	**TCP/IP Model**	**5 Hours**
Process/Application layer, Host-to-Host layer, Internet layer, Network Access layer, Protocols used at each layer		

Unit III	IP Addressing	4 Hours
Network addressing, Classes of IP Addressing. • Setting IP Address (IP4/IP6) & Subnet Mask, Private IP Addressing, IPv4 Address Types, Troubleshooting IP Addressing		
Unit IV	**Subnet Mask**	**7 Hours**
Subnet Mask, CIDR, Subnetting Class A, B, C Addresses		
Unit V	**VLAN**	**7 Hours**
VLAN basics, types of VLAN, VLAN Trunking protocol, Routing between VLAN, VLAN Configuration		
Unit VI	**STP, RSTP**	**7 Hours**
BPDU, Selecting the Root Switch, Port States, Timer, Topology change, Convergence, Configuration		
Unit VII	**IP Routing**	**7 Hours**
Routing basics, routing Table, Routing methods, Routing preference, Classful and classless routing, DVRP, Routing protocols, Routing configuration.		

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to:

1. Understand OSI and TCP/IP Models In depth
2. Understand IP Addressing
3. Understand Subnet mask
4. Understand VLAN
5. Understand STP, RSTP
6. Understand IP Routing

References/Readings

1. Bell, C. G., Habermann, A. N., McCredie, J., Rutledge, R., & Wulf, W. (1970). Computer networks. In *Computer* (Vol. 3, Issue 5).
2. TANENBAUM, A. S., & WETHERALL, D. J. (2005). Computer networks. In *Computers, Software Engineering, and Digital Devices*. https://doi.org/10.4337/9781784711603.00023
3. D-Link Certified, DCS Switching Training Guide
4. D-Link Certified, DCS Switching Lab Manual
5. Cisco Certified Network Associate Training Guide
6. James F. Kurose, Keith W. Ross, Computer Networking A Top down Approach, 7th Edition, Pearson, 2001.
7. Data communications and Networking, Behrouz A Forouzan, Tata Mc Graw-Hill 5th edition, 2013
8. Larry Peterson and Bruce S Davis "Computer Networks :A System Approach" 5 thEdition , Elsevier -2014
9. Douglas E Comer, " Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014
10. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
11. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

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Course Code: EISC 306 **Course Title: Computer Networking- III Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**

Prerequisites for the course
Students should know the topics covered in Computer Networking I, II Lab
Objectives of Course
This course is intended to introduce: 1. Basic switch configuration 2. Access switch via web browser 3. Implement VLAN 4. Understand STP
Lab Content
Exp.1: Accessing Switch via HyperTerminal **Exp.2:** Creating/ deleting user account on switch **Exp.3:** Resetting accounts and password of a switch **Exp.4:** Setting IP address of switch **Exp.5:** Getting information about switch **Exp.6:** Change name of switch **Exp.7:** To enable/disable ports of switch **Exp.8:** To access switch via web browser **Exp.9:** Creating static VLAN **Exp.10:** Configuring Tagged/untagged ports **Exp.11:** Configuring GVRP Dynamic VLAN **Exp.12:** Configuring STP on switches **Exp.13:** Configuring primary and secondary root bridge **Exp.14:** Monitoring STP Convergence **Exp.15:** Configuring static routes **Exp.16:** Configuring RIP **Exp.17:** Configuring route preference
Pedagogy
Experiments
Course Outcome
On completion of the course, students will be able to: 1. Implement basic switch configuration 2. Access switch via web browser 3. Implement VLAN 4. Implement STP

Course Code: EISC 307
Course Title: Power Electronics

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Basic understanding of electronics, semiconductor devices

Objectives of Course

To provide strong foundation of high power electronic components
Familiarize students to the principle of operation and design of different power conversion circuits and their applications. To give overview of practical application of power electronics.

Course Content

Unit I	**Power electronic system**	**4 Hours**
Power electronics vs. linear electronics, scope and applications, safety and maintenance.		
Unit II	**Power semiconductor devices**	**10 Hours**
Thyristors – Silicon Controlled Rectifiers (SCR's), Two transistor analogy, characteristics, Turn on and turn off methods, Snubber circuit, Power MOSFET, Power IGBT, UJTand their characteristics.		
Unit III	**Power converters**	**10 Hours**
Basics of AC-AC (AC voltage controllers, cyclo-converter) converter AC-DC Single phase and 3 phase full bridge rectifiers, DC-DC (choppers) step-up (boost) and step down (buck) converter DC-AC (Inverter) single and three phase inverter		
Unit IV	**Control of AC and DC drives**	**10 Hours**
Basic principle and operation of speed control of induction motor, rotor resistance control, synchronous motor drives, drive selection, DC motor speed control, DC chopper drives, PLL control of DC drives, computer control DC drives.		
Unit V	**Applications of power electronics**	**8 Hours**
Switch mode power supply, RF heating, Switch mode welding, Electronic lamp ballast, Emergency lighting system		

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

Students are expected to have a good understanding of high power electronics devices. Student should be able to describe basic operation and compare performance of various power semiconductor devices, passive components and switching circuits

References/Readings

1. POWER ELECTRONICS: Converters, Applications, and Design Second Edition by Ned Mohan
2. Power electronics by M. D Singh and K. B. Khanchandani
3. Fundamentals of power electronics by Robert W. Erickson and Dragan Maksimović
4. Power electronic by Bhimbra
5. Modern power electronic by P C Sen

Course Code: EISC 308 **Course Title: Power Electronics Lab**	
Number of Credits: 03 **Total Hours: 84 Total Marks: 75**	
Prerequisites for the course	
Basic understanding of power electronics and semiconductor devices	
Objectives of Course	
To give practical exposure of the field by conducting various experiments based on high power electronics components.	
Course Content	**84 Hours**
Expt. 1: Study the SCR characteristics **Expt. 2:** StudyIGBT characteristics **Expt. 3:** AC-AC conversion **Expt. 4:** AC-DC conversion **Expt. 5:** DC-AC conversion **Expt. 6:** To study V-I characteristics of SCR and measure latching and holding currents **Expt. 7:** To study UJT trigger circuit for half wave and full wave control **Expt. 8:** To study single phase cyclo-converters. **Expt. 9:** To study triggering of (i) IGBT (ii) MOSFET (iii) power transistors. **Expt. 10:** To study operation of IGBT/MOSFET chopper circuit. **Expt. 11:** AC voltage control using TRIAC and DIAC **Expt. 12:**Speed control of universal motor **Expt. 13:** Step-up and step-down converter	
Pedagogy	
Lab experiments	
Course Outcome	
Students are expected to identify the faults in the given circuit. Analyze a power electronic design at the system level. He/ She should be able to demonstrate the working of high power electronics elements.	

Semester IV

Course Code: EIGC 401
Course Title: Environmental Studies

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Concern and watchfulness about current status of environment

Objectives of Course

To provide various awareness programs required for the welfare of the environment apart from the emphasis on the general and conventional issues surrounding the environment

Course Content

Unit I	**Introduction**	**10 Hours**

Definition, scope, and importance, need for public Awareness, Renewable and non- renewable resources. Natural resources: associated problems, Role of an individual in conservation, Equitable use for sustainable lifestyles.Ecosystems: Concept, Structure, and function of an ecosystem. Producers, consumers, and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids.

Unit II	**Biodiversity and its conservation**	**11 Hours**

India as a mega diversity Nation, Bio-geographically classification of India. Biodiversity: Hotspots, Value of biodiversity, Biodiversity at global, National, and local levels. Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In– situ and Ex- situ conservation of biodiversity.

Unit III	**Pollution**	**11 Hours**

Environmental Pollution: Definition, Cause, effects, and uncontrolled measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management: Causes, effects, and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

Unit IV	**Social Issues and Ethics**	**10 Hours**

Social Issues and the Environment: From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation: rainwater harvesting, watershed management. Resettlement and Rehabilitation of people; its problems and concerns. Case Studies.Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Issues involved in enforcement of environmental legislation. Public awareness.

Pedagogy

Lectures/Tutorial/Assignments/ Practice Sessions

Course Outcome

Vigilance and actions to prevent degradation of environment will be inculcated

References/Readings

1. Mike Hulme, Climates and Cultures.
2. Mark Garrett, Encyclopaedia of Transportation Social Science and Policy.
3. Steel, Science An A - to - Z Guide to Issues and Controversies.
4. John A Matthews, Encyclopaedia of Environmental Change.

Course Code: EIGC 402 **Course Title: Communication skills- IV**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Interest to strengthen oratory skills		
Objectives of Course		
To achieve successful sender's role in communication via verbal means		
Course Content		
Unit I	**Speaking Nuances: preparation**	**14 Hours**
Words and Phrases:A Brief History of Words, Dictionary and Thesaurus, Elements of Style guidelines for Effectiveness, Exercises. Sentence Construction:Introduction, Guidelines for Effectiveness, Exercises. Paragraph Development:Introduction, Central Components of a Paragraph Length, Techniques for Paragraphs, Exercises. The Art of Condensation:Introduction, Steps to Effective Précis Writing, Samples, Guidelines,Exercises.		
Unit II	**Effective Presentation Strategies**	**14 Hours**
Introduction, Defining Purpose, Analyzing Audience and Locale. Organizing Contents, Understanding Nuances of Delivery, Kinesics, Proxemics, Paralinguistics, Sample Speech, Exercises		
Unit III	**Interviews**	**14 Hours**
Introduction, Objectives, A Types of Interviews. Job Interviews: Face- To–Face, Employer's Expectations, Ten Success Factors, Ten Failure Factors, Preparation, Process, Follow Up, Tips for Success, Telephone Interviews,Preparation,Guidelines, Exercises		
Unit IV	**Group Communication**	**14 Hours**
Organizational Group Discussion: Brainstorming. Group Discussion as Part ofa Selection Process: Meetings: Purposes, Preparation, Procedure, Follow-Up. Conferences: Significance, Planning and Preparation, Procedure, Exercises		
Pedagogy		
Lectures/Tutorial/Assignments/ Practice Sessions		
Course Outcome		
Certain techniques to improve confidence and effectiveness in oratory domain, while - 1) specifically making presentations, answering interviews, Group Discussion and 2) generally working in a team.		
References/Readings		
1. Technical-Communication-Principles-and-Practice :*Meenakshi Raman* , Sangeeta Sharma Oxford-University-Press-2004 2. The Quick And Easy Way To Effective Speaking by Dale Carnegie 3. Do You Talk Funny?: 7 Comedy Habits To Become A Better Public Speaker by David Nihill 4. Confessions Of A Public Speaker by Scott Berkun 5. The Art Of Public Speaking by Stephen Lucas 6. Talk Like Ted: The 9 Public-Speaking Secrets Of The World's Top Minds by Carmine Gallo 7. Ted Talks: The Official Ted Guide To Public Speaking by Chris Anderson		

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Course Code: EIGC 403 **Course Title: Computer Peripherals and Troubleshooting**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		

Students should know the basics of computer system.

Objectives of Course

1. To learn and understand different computer peripherals
2. To know to install computer peripherals
3. To diagnose faults in computer peripherals
4. To troubleshoot faults in computer peripherals
5. To maintain the computer peripherals

Course Content

Unit I	**Computer Peripherals: Internal Components**	**14 Hours**

IDE and SATA Devices: Hard Disk Drive and CD/DVDs Drives, Floppy Disk, Zip Drive, Backup Drive. Expansion Cards: LAN Card, IDE Card , VGA and SVGA Cards, Sound Card, Interface Cards, I/O cards, Video
Cards, USB Card, Fire-Wire Cards, Internal Ports, Cables and Connector Types.

Unit II	**Computer Peripherals: External Components**	**14 Hours**

Monitors: CRT, LCD and LED Displays, Printers: Dot-Matrix Printer, Inkjet Printer, Laser Printer. Scanner: Photo Scanner, Documents Scanner, Bar Cord Scanner. Keyboards, Mouse, External Modem, Ports and Connectors, Batteries, Power supply, Pen Drives, SCSI interface devices, Laptop Computers, Digital Advance storage technology.

Unit III	**Maintenance and Troubleshooting**	**14 Hours**

Monitors, Printers, Scanner, Keyboards, Mouse, External Modem, Ports and Connectors, Batteries, Power supply, Pen Drives, SCSI interface devices, Laptop Computers, Digital Advance storage devices

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course students will be able to:

1. Know different computer peripherals
2. To install computer peripherals
3. Diagnose faults in computer peripherals
4. Troubleshoot faults in computer peripherals
5. Maintain the computer peripherals

References/Readings

1. Operating System Concepts, 9th edition Peter B. Galvin, Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc.
2. Modern Operating Systems -By Andrew S. Tanenbaum (PHI)
3. Operating Systems 5th Edition, William Stallings, Pearson Education India
4. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
5. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.
6. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI
7. Operating System A Design Approach- Crowley, TMH.
8. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
9. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
10. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

Course Code: EIGC 404
Course Title: Computer Peripherals and Troubleshooting Lab

Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**

Prerequisites for the course

Students should know the basics of computer system.

Objectives of Course

1. To learn and understand different computer peripherals
2. To know to install computer peripherals
3. To diagnose faults in computer peripherals
4. To troubleshoot faults in computer peripherals
5. To maintain the computer peripherals

Lab Content

Exp.1: Study of different computer peripheral ports
Exp.2: Study of Input Peripherals
Exp.3: Study of Output Peripherals
Exp.4: Study on sound card, video card, VGA Card, network card
Exp.5: Installation of various peripheral device drivers
Exp.6: Installation and troubleshooting of Printer
Exp.7: Installation and troubleshooting of Scanner
Exp.8: Study of Monitor
Exp.9: Study of Keyboard
Exp.10: Study of Mouse
Exp.11: Study of Laptop

Pedagogy

Experiments

Course Outcome

On completion of the course students will be able to:

1. Know different computer peripherals
2. To install computer peripherals
3. Diagnose faults in computer peripherals
4. Troubleshoot faults in computer peripherals
5. Maintain the computer peripherals

Course Code: EISC 401
Course Title: Digital Electronics II

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Basic knowledge of digital electronics and logic gates.

Objectives of Course

To acquire basic knowledge of advanced digital electronics. To prepare students to perform the analysis and design of various digital electronic circuits.

Course Content

Unit I	**Flip flops**	**7 Hours**

Basic FF: RS, Clocked RS, JK, D-type and T-type, Master Slave Concept, Shift register (shift left, shift right), Schmitt trigger. Applications of FF.

Unit II	**Counters**	**7 Hours**

Binary ripple counter, modulus of counter, BCD Decade Counter, cascade BCD decade counters, principle of digital counter and digital clock.

Unit III	**Asynchronous and synchronous sequential circuits**	**10 Hours**

Triggering of FF, Analysis and design of clocked sequential circuits, Design of Moore/Mealy models, state minimization, state assignment, circuit implementation, Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments.

Unit IV	**Memory devices**	**8 Hours**

Basic memory structure, ROM, PROM, EPROM, EEPROM, EAPROM, RAM, Static and dynamic RAM, Programmable Logic Devices.

Unit V	**AD and DA converter**	**10 Hours**

Digital to Analog Converters,Specifications, types and applications of D/A converter, Analog to Digital converters, Specifications, Types and applications of A/D converters.

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

To understand and examine the structure of various flips-flops, counters and its application in digital design. The ability to understand, analyze and design various sequential circuits.

References/Readings

1. Digital Principles and Applications: Malvino and Leach TMH 4th edition 1986.
2. Electronics Devices and Circuits An Introduction: Allen Mottershed PHI 1997
3. Integrated Electronics: Millman and Halkias TMH 1972
4. Electronic Devices and Circuits: Millman and Halkais Mc Graw Hill 1967
5. Modern Digital Electronics: R. P. Jain TMH 3rd edition 2003.
6. Principles of Electronics: V.K.MethaS.Chand& Company 8th edition 2003.

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Course Code: EISC 402
Course Title: Digital Electronics II Lab

Number of Credits: 03 **Total Hours: 84** **Total Marks: 75**

Prerequisites for the course

Should have studied basic level digital electronic subjects. It is assumed that students have a working knowledge of passive and active components and digital circuits

Objectives of Course

The objective of this course is to understand advanced digital electronics concept through experiments.

Course Content	**84 Hours**

Expt. 1: Design of clocked RS flip-flop
Expt. 2: Design of clocked SR flip-flop
Expt. 3: Design of D-flip flop
Expt. 4: Testing truth table of J-K flip flop
Expt. 5: Universal shift register
Expt. 6: BCD counter using 74LS90
Expt. 7: 7 segment display using BCD counter
Expt. 8: Using ic 0808 demonstrate analog to digital conversion
Expt. 9: Interfacing sensor data to AD converter
Expt. 10: Demonstrate digital to analog conversion
Expt. 11: Application of DA converter for driving electrical load

Pedagogy

Lab experiments/assignments

Course Outcome

Ability to identify basic requirements for a design application and propose a cost effective solution. To develop skill to build, and troubleshoot digital circuits.

Course Code: EISC 403
Course Title: Industrial Instruments

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Basic knowledge of electronics and instrumentation

Objectives of Course

This course is intended to provide the knowledge of instruments used in the industry. To provide the knowledge of Pressure, Flow, Temperature, Level, Humidity, Torque, Viscosity and Vibration measurements.

Course Content

Unit I	**Explain codes, standards and regulations**	**5 Hours**

Safety and regulations, OHS Regulation: Chemical and biological agents, Noise, vibration, radiation and temperature. Tools machinery and equipment safety, Ladders, scaffolds and temporary work platforms, Rigging, cranes and hoists, Mobile equipment, Electrical safety in different industry.

Unit II	**Metrology**	**5 Hours**

Dimensional measurement, Dial gauges, Gauge blocks, Comparators, Flatness measurement, Optical flats, Sine bar, Angle gauges, Planimeter, Translational and rotational displacement using potentiometers, Strain gauges, Differential transformer, Different types of tachometers, Accelerometers

Unit III	**Installs & Maintains Safety and Process Monitoring Systems**	**10 Hours**

ESD control systems, types, Levels of Shutdown: Unit Shutdown, Process Shutdown, Emergency Shutdown, Emergency Depressurize Shutdown. Electric Pneumatic, Hydraulic, Mechanical, Purposes of different types of ESD, Protection: Personnel, Environmental, Equipment. ESD testing procedures, Partial Stroke Test, Time test, Valve integrity, Interlock checks

Unit IV	**Measurements of physical parameters**	**10 Hours**

Pressure measuring instruments and its types, Level sensing devices and types, Flow measurement instruments, Temperature measuring devices and types, pH measurement and viscosity.

Unit V	**Programmable controllers**	**12 Hours**

Evolution of PLC, architecture and block diagram, Basic Ladder logic, logic functions, electrical wiring diagram, scan cycle, Types of PLC, CPU unit architecture, Input/output devices and it's interfacing, Digital-Analog modules, Communication modules, Special function modules, Programming languages for PLC.

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

Student is expected to learn the construction and working of various industrial devices used to measure temperature, level, vibration, viscosity and humidity.

References/Readings

1. Fundamentals of Industrial Instrumentation and Process Control William C. Dunn
2. Principles of Industrial Instrumentation Third Edition, Dipak Patranabis
3. Nakra, B. C. and Chaudhry, K. K., Instrumentation Measurement and Analysis, Tata McGraw Hill (2003).
4. Programmable logic controller: Principle and applications NIIT
5. S. K. Singh, "Industrial Instrumentation & Control" 3rd Edition, Tata McGraw Hill, Reprint 2009.

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Course Code: EISC 404 **Course Title: Industrial Instruments Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Understanding of basic electronics and instrumentation		
Objectives of Course		
Students will be introduced to practical aspects of different sensors. They will also take some examples for understanding the PLC controller used in the industry.		
Course Content		**84 Hours**
Expt. 1: Understanding of pressure gauge **Expt. 2:** Working of Thermocouple **Expt. 3:** Demonstration of Level sensing **Expt. 4:** Humidity sensor **Expt. 5:** pH measurement **Expt. 6:** Understanding of PLC **Expt. 7:** Simple load such as relay and switches **Expt. 8:** Logic function implementation **Expt. 9:** Interfacing of PLC **Expt. 10:** Case study of PLC for industrial application		
Pedagogy		
Lab experiments		
Course Outcome		
In this course students will learn practical aspects of instrumentation by using sensors and controllers. After finishing this module they will get more exposure of the industrial instrumentation processes.		

Course Code: EISC 405 **Course Title: Computer Networking- IV**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Students should know the topics covered in Computer Networking I, II, III		
Objectives of Course		
1. To understand Switch stacking 2. To understand NAT 3. To understand WAN 4. To understand Network Management 5. To understand Wireless Technologies		

Course Content		
Unit I	**Switch Stacking**	**6 Hours**
Physical Stacking Architecture, Stacking Features, Stacking Configuration, Full utilization of ring bandwidth, Master switch selection, Backup Master selection, Box ID Assignment Rules, Stacking topology change, Single IP (SIM) Management, SIM Group, SIM Topology, SIM Operation, Stacking guidelines, Stacking Configuration		
Unit II	**NAT**	**10 Hours**
NAT Basics, Types of NAT, NAT Configuration		
Unit III	**WAN**	**10 Hours**
Introduction, WAN Bandwidth, Connection types, WAN Support, WAN Cable		
Unit IV	**Network Management**	**6 Hours**
Network management, Infrastructure for Network management, The Internet standard management framework.		
Unit V	**Wireless Technologies**	**10 Hours**
Wireless Access Points, Wireless Network Interface Card, Wireless Antennas, Wireless regulations, Wireless topologies.		

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to:

1. Understand Switch stacking
2. Understand NAT
3. Understand WAN
4. Understand Network Management
5. Understand Wireless Technologies

References/Readings

1. Bell, C. G., Habermann, A. N., McCredie, J., Rutledge, R., & Wulf, W. (1970). Computer networks. In *Computer* (Vol. 3, Issue 5).
2. TANENBAUM, A. S., & WETHERALL, D. J. (2005). Computer networks. In *Computers, Software Engineering, and Digital Devices*. https://doi.org/10.4337/9781784711603.00023
3. D-Link Certified, DCS Switching Training Guide
4. D-Link Certified, DCS Switching Lab Manual
5. Cisco Certified Network Associate Training Guide
6. James F. Kurose, Keith W. Ross, Computer Networking A Top down Approach, 7th Edition, Pearson, 2001.
7. Data communications and Networking, Behrouz A Forouzan, Tata Mc Graw-Hill 5th edition, 2013
8. Larry Peterson and Bruce S Davis "Computer Networks :A System Approach" 5 thEdition , Elsevier -2014
9. Douglas E Comer, " Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014
10. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
11. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

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Course Code: EISC 406
Course Title: Computer Networking- IV Lab

Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**

Prerequisites for the course

Students should know the topics covered in Computer Networking I, II, III Lab

Objectives of Course

1. To understand Switch stacking
2. To understand NAT
3. To understand WAN
4. To understand Network Management
5. To understand Wireless Technologies

Lab Content

Exp.1 : Configuring physical stacking
Exp.2 : Configuring logical stacking
Exp.3 : Static NAT Configuration
Exp.4 : Dynamic NAT Configuration
Exp.5 : Testing and troubleshooting NAT
Exp.6 : Network Management
Exp.7 : Understanding network management on the campus
Exp.8 : Wireless Access Point
Exp.9 : Wireless Antennas

Pedagogy

Experiments

Course Outcome

On completion of the course, students will be able to:

1. Understand Switch stacking
2. Understand NAT
3. Understand Network Management
4. Understand Wireless Technologies

Course Code: EISC 407
Course Title: Laboratory Instruments

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Basic knowledge of electronic and measuring instruments

Objectives of Course

Develop the understanding of subject knowledge. Students will be made familiar with different instruments used in laboratory environment.

Course Content

Unit I	**Troubleshooting procedure**	**8 Hours**
Nature of faults, What is troubleshooting?, Fault location, Fault finding aids, Troubleshooting Technique, Troubleshooting procedure, Approaching components for tests, Grounding system in electronic equipments, Systematic troubleshooting check, Temperature intermittent problems, Corrective action, Preventive maintenance, Service and maintenance of instrument.		
Unit II	**Electronic test equipments**	**8 Hours**
Multimeters, types of multimeter, Measurement of resistance, AC/DC Voltage, Current, continuity test, transistor and diode. The oscilloscope, Logic analyser, Signal analyser, Signal generator.		
Unit III	**Earthing**	**5 Hours**
Types of earthing, Components of Earthing, how to check Earthing using Multimeter and Bulb, Calculate the total leakage.		
Unit IV	**Stirrer**	**5 Hours**
Different types of Stirrer. Block Diagram of Stirrer, different types of Speed controllers, motors.		
Unit V	**Water Bath**	**6 Hours**
Types of Water Bath, Components of Water bath, Heater, Stirrer to circulate water to maintain uniform temp, Temperature sensor, Thermostat		
Unit VI	**Temperature controlled Oven and electrical heater**	**10 Hours**
Types of laboratory Ovens, Working Principle of Oven, dryers, Types of Electric Heaters, Distribution for Heating Systems, types of electric resistance heating wires, Pro and Cons of Using Electric heater.		

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

After successful completion of the course students will develop good understanding of instrument. He will be confident in handling these instruments.

References/Reading

1. Fundamentals of Industrial Instrumentation and Process Control William C. Dunn
2. Principles of Industrial Instrumentation Third Edition, Dipak Patranabis
3. Nakra, B. C. and Chaudhry, K. K., Instrumentation Measurement and Analysis, Tata McGraw Hill (2003).

Course Code: EISC 408 **Course Title: Laboratory Instruments Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Basic understanding of instruments and electronics		
Objectives of Course		
Apply concepts learned in class to new situations. Learn to use scientific apparatus.		
Course Content		**84 Hours**
Expt. 1: Basic troubleshooting of DMM **Expt. 2:** Testing of electronic components **Expt. 3:** Understanding of signal generator **Expt. 4:** Testing of various electronics components using DMM **Expt. 5:** Troubleshooting of water bath **Expt. 6:** Troubleshooting of water heater **Expt. 7:** Study of Temperature controlled oven **Expt. 8:** Study of Important parts of stirrer **Expt. 9:** Troubleshooting of electrical heater **Expt. 10:** Study of CRO **Expt.11:** Study Earthing		
Pedagogy		
Lab experiments/Assignment/self study		
Course Outcome		
Should be able to repair the device by identifying and fetching different components. Students will gain a good understanding of subject knowledge by carrying out experiments. Should be able to draw the wiring diagram by looking at the device from outside.		

Semester V

Course Code: EIGC 501 **Course Title: Basic Accounting**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Interest to develop financial literacy theory		
Objectives of Course		
The course will ensure the students to gain a comprehensive knowledge on the various areas of accounts		
Course Content		
Unit I	**Accounting Process**	**14 Hours**
Define the accounting process, Describe the role of accounts- Explain accounting concepts and principles, Discuss the concept of the accounting equation, Use the accounting equation to analyse basic transactions in terms of increases and decreases, Reporting financial information on a balance sheet, Determine how transactions change owner's equity in an accounting equation,		
Unit II	**Worksheet**	**14 Hours**
Describe and prepare the worksheet, Plan and adjust entries on a worksheet, Extend financial statement information on a worksheet, Find and correct errors on a worksheet, Describe the content and purpose of the three basic financial statements and how they are related.		

Unit III	Payroll	14 Hours
Prepare payroll records, Preparing payroll time cards, Calculating total earnings, Determining payroll tax withholding, Preparing payroll checks, Record, and journalize the payroll for a merchandising business, Record employer payroll taxes, Reporting, and paying withholding and payroll taxes		
Pedagogy		
Lectures Sessions		
Course Outcome		
Knowledge on the various areas of accounts will be studied		
References/Readings		
1. Basic Accounting: The step-by-step course in elementary accountancy, By Nishat Azmat, Andy Lymer, Hachette UK. 2. Basic Accounting, By Rajni Sofat, PHI Learning Pvt. Ltd. 3. Basic Accounting, By Sofat, Rajni , Hiro, Preeti, Phi Learning Pvt. Ltd. 4. Accounting for Beginners, By Kokab Rahman, Createspace Independent Pub, 2013		

Course Code: EIGC 502 **Course Title: Value Education**		
Number of Credits:03	**Total Hours:42**	**Total Marks: 75**
Prerequisites for the course		
Interest to strengthen ethics and morals.		
Objectives of Course		
To provide a sharp insight into the importance of human values, ethics, morality and above all the full growth of personality to ensure some total development of the human mind.		
Course Content		
Unit I	**Human Values**	**10 Hours**
Concept of Human Values, Value Education Towards personal development, Aim of value education; Evolution of value oriented education; Concept of Human values; types of values; Components of value education. Social Values, Professional Values , Religious Values, Aesthetic values.		
Unit II	**Factors influencing Human values**	**11 Hours**
Impact of Global Development on Ethics and Values, Conflict of cross–cultural influences, mass media, cross–border education, materialistic values, professional challenges and compromise, Modern Challenges of Adolescent Emotions and behaviour.		
Unit III	**Therapeutic Measures**	**11 Hours**
Therapeutic Measures: Control of the mind through: Simplified physical exercise, Meditation: Objectives, types, effect on body, mind and soul, Yoga: Objectives, Types, Asanas, Activities: Moralisation of Desires, Neutralisation of Anger, Eradication of Worries, Benefits of Blessings		
Unit IV	**Human Rights**	**10 Hours**
Human Rights: concepts & evolution, Broad classification of Human rights and Relevant Constitutional Provisions, Human Rights of Women and Children, HIV/AIDS. Women and Child Welfare. Case Studies		
Pedagogy		
Lectures Sessions including Motivational classes on values and ethics, PPT presentation on selected areas, case studies.		
Course Outcome		
Personality with morals, ethics, balanced mindset and civic sense will be inculcated		
References/Readings		

1. Value education and human rights, By R. P. Shukla, Sarup& Sons
2. Value Education And Education For Human Rights, By V.C. Pandey, Gyan Publishing House.
3. Education for Values, Environment and Human Rights, By Y. K. Sharma, Published by Deep and Deep Publications.
4. Human Rights: Twenty First Century Challenges, edited by V.N. Viswanathan (ed. By), Gyan Publishing House.
5. Education for Values, Environment and Human Rights, By J. C. Aggarwal, Shipra Publications, 2005
6. Human Rights Education: A Global Perspective, edited by HemlataTalesra, Nalini Pancholy, Mangi Lal Nagda, Published by Daya Books.

Course Code: EIGC 503
Course Title: Introduction to Multimedia Technology

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Artistic(aesthetic) inclination augmented with technicalities

Objectives of Course

This course is aimed at learning introduction, terminologies, technologies, different types and forms ofmultimedia, storage and access mechanism of each multimedia file type.

Course Content

Unit I	**Introduction to Multimedia**	**10 Hours**
Multimedia: Types, Multimedia Design Principles. Multimedia Technologies: Image(Graphic), Sound(Audio), Motion Picture(Video), Applications all each one		
Unit II	**Graphic Media**	**10 Hours**
Definition, Types, Colour Modes: RGB, CMYK, Grayscale. Common Graphic Formats:purpose, characteristics, advantages and disadvantage, correct usage. Compression Techniques: Definition, types, advantages, disadvantages, and use.Graphic manipulation effects. Introduction to 3D : creating, editing		
Unit III	**Audio Media**	**11 hours**
Basic understanding of audio/sound media, Principles of Audio Recording, Analogue to digital, and digital to analogue conversion. Common audio Formats and Codecs: purpose, characteristics, advantages and disadvantage, correct usage, Uncompressed audio, Compressed audio. Audio Streaming & Podcasting, Audio effects & editing platforms		
Unit IV	**Video Media**	**11 Hours**
Basic concepts of video media, Common Video Formats and Codec: purpose, characteristics, advantages and disadvantage, when to use and when not use), Principles of Video Production: Making, Pre-Production: concept, outline, and Post Production: Visual effects, Distribution, editing, Colour Correction, Uncompressed video, Compressed video		

Pedagogy

Lectures (via multi-media projector, black board, group activities, demonstrations) etc. assignment/ mini-project

Course Outcome

The different types, forms, issues and principles in Multimedia, concepts of graphic media and colour modes, Design 3D models, choosing the best suitable file formats of graphic media, with focus on its storage and representation.

References/Readings

1. Tay Vaughan, Multimedia: Making It Work, Tata Mc-Graw Hill., 9th Edition
2. Buford, Multimedia Systems, Pearson edition, 2003
3. Vasuki Belavadi, Video Production, Oxford University Press India; 2nd Edition
4. Ted Alspach, Jennifer Alspach, Illustrator CS Bible, John Wiley & Sons, 1st edition
5. Ranjan Parekh, Principles of Multimedia, TMH, 2nd Edition, 2017
6. Ralf Steinmetz and Klara Nahrstedt, Multimedia: Computing, Communication and applications, Springer, 2004

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Course Code: EIGC 504
Course Title: Introduction to Multimedia Technology Lab

Number of Credits:03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Interest to develop multimedia skills with practical's

Objectives of Course

Learning : processing of the different types of multimedia files, graphics editing through a graphic manipulation tool, recording and manipulate audio files, capturing and process video streams, computer based animations

Course Content

Exp.1: Graphics capturing
Exp.2: Conversion from one format to another
Exp.3: Audio recording
Exp.4: Audio storage and conversion
Exp.5: Audio mixing
Exp.6: Video Capturing and Editing
Exp.7: Video Effects and transitions
Exp.8: Video composition
Exp.9: story boarding, rendering
Exp.10: 2D/3D character modelling
Exp.11: 2D/ 3D Animation Techniques
Exp.12: Watermarking Graphics, Audio, Video and animations.

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

1. Explain the various image editing features on images.
2. Design and edit audio streams
3. Capture videos and apply different editing effects on videos
4. Design 2D, 3D animations

References/Readings

1. Ranjan Parekh, Principles of Multimedia, TMH, 2nd Edition, 2017
2. Brie Gyncild, Adobe Photoshop CS6,Pearson Education
3. Adobe Creative Team, Adobe Audition CS6 Classroom in a Book, Adobe
4. Ted Alspach, Illustrator Bible, John Wiley & Sons
5. Robert Reinhardt, Macromedia Flash 8 Bible, John Wiley & Sons Web

Course Code: EISC 501
Course Title: Microcontroller

Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**

Prerequisites for the course

Basic understanding of digital electronics

Objectives of Course

To introduce students with the architecture and operation of typical microcontrollers.To provide foundation for designing real world applications

Course Content

Unit I	**Introduction toMicrocontroller**	**5 Hours**

Definition of microcontroller, block diagram, internal parts: CPU, RAM, ROM, Timers, I/O ports, Serial port.Basicsofadvanced microprocessor

Unit II	**Architecture**	**8 Hours**

Special Function Registers (SFRs), I/O Pins Ports and Circuits, Instruction set, Addressing modes

Unit III	**Programming**	**10 Hours**

Serial Port Programming, Interrupts Programming, LCD & Keyboard Interfacing, ADC, DAC & Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation

Unit IV	**Memory Interfacing and I/O interfacing**	**10 Hours**

Parallel communication interface, Serial communication interface**,** D/A and A/D Interface, Timer, Keyboard /display controller, Programming and applications Case studies: Traffic Light control, and Alarm Controller.

Unit V	**Advanced microprocessors**	**9 Hours**

Introduction to Raspberry pi, Architecture, Functionality of Raspberry pi board, Interfacing and basics of programming.

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

Design electrical circuitry to the microcontroller I/O ports in order to interface to the external devices.
Solve basic binary math operations using the Microcontroller. At the end of this course student will basic architecture of the microcontrollers.

References/Readings

1. The 8051 microcontroller by Kenneth Ayala
2. The 8051 microcontroller and embedded system by Muhammad Ali Zaidi and Janice GillispieMazidi
3. 8051 microcontroller: An application based introduction by David Calcutt, Fred Cowan and Hassan Parchizadeh
4. 8051 microcontroller by Sampath K Venktesh
5. 8051 microcontroller by Udayshankara
6. Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, August 2016, 4th edition, John Wiley & Sons.
7. Alex Bradbury and Ben Everard, “Learning Python with Raspberry Pi”, Feb 2014, JohnWiley& Sons.

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Course Code: EISC 502 **Course Title: Microcontroller Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Understanding of digital electronics and basics of microcontrollers		
Objectives of Course		
To familiarize the students with the programming and interfacing of microcontrollers.		
Course Content		**84 Hours**
Expt. 1: Interfacing LEDs using 8051 **Expt. 2:** Interfacing Keyboards using 8051 **Expt. 3:** Interfacing Seven-Segment Displays using 8051 **Expt. 4:** Interfacing LCD Displays using 8051 **Expt. 5:** Interfacing stepper motors using 8051 **Expt. 6:** Read sensor data using microcontroller using 8051 **Expt. 7:** Home automation using Raspberry pi **Expt 8:** Speed control of motor using Raspberry pi **Expt 9:** Sensor interfacing to using Raspberry pi **Expt 10**: IoT Applications based on pi		
Pedagogy		
Lab experiments		
Course Outcome		
Design electrical circuitry to the microcontrollers I/O ports in order to interface the external devices. Provide solutions to real world control problems.		

Course Code: EISC 503 **Course Title: Computer Programming**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Fundamentals of computer, Fundamentals of IT, Logical thinking		
Objectives of Course		
To learn the theory of Python Programming language		
Course Content		
Unit I	**Python programming set-up**	**8 Hours**
Introduction to Python Language : What is Python, Uses of Python Programming Language / Python Applications, Python for Software development, Python for Networking, Python for Automated Testing, Features of Python Programming Language, Implementations of Python, and Python career opportunities. **Download & Install Python :**Download your operating system compatible Python Interpreter, install Python, set environment variable, customize Python shell, write & execute Python programs using Interactive mode and script mode. Python PyCharm or IDE, set Python for PyCharm IDE, configure PyCharm IDE, write & execute Python programs. **Python Language Syntax :** Modes of Programming in Python, Interactive mode programming, Script mode programming, Creating Python program file, Python Identifiers, Python keywords, Lines and Indentation, Spilt Python statements, Join Python Statements, Writing code blocks, Comments in Python, and Quotation in Python.		

Python Keywords and Identifiers: Python keywords or Reserved words, Python keywords define the syntax and structure of the Python language, Python keywords are case sensitive, Python literals (True, False, Null), Python Identifiers, class names, variable names, function names, method names, and Identifier naming rules.

Python Comments : Purpose/use of comments in Computer Programming, Comments for Understanding Python code, Python Comment Syntax, Python Single line comment, Multiline comment in Python, and writing Python comments.

Unit II	**Data Types and Input/Output Operators**	**10 Hours**

Python Variables : Introduction, Declaration of Variables, Assign Values to Variables, Initialization, Reading, Variable naming restrictions, and Types of Python Variables.

Python Data Types : Introduction**,** Implicit Declaration of Data Types,

Python Operators : Python Arithmetic, Comparison/Relational Operators, Increment Operators, Logical operators, Python Identity Operators, and Python Operators Precedence.

Python Numbers : integers, floats, and complex numbers

Python Strings : Alphabets, Numbers, and Special Characters. Operations on Strings, Finding String length, Concatenating Strings, print a String multiple times, Check whether the String has all numeric characters, Check whether the String has all alphabetic characters

Unit III	**Python Control Flow**	**8 Hours**

Decision Making : Simple If Structure, if-else structure, if else-if structure, and nested If Structure. Execute a block of Statements when the condition is true, execute a block of Statements when a compound condition is true, Execute a block of Statements when the condition is true otherwise execute another block of Statements, Decide among several alternates(else-if), and Execute a block of Statements when more than one condition is true (Nested if))

Flow – Looping : Python while loop, Python for loop, Python range (), Python Nested Loop Structures, and Inserting conditions in Loops and vice versa.

Flow – Branching: break, continue, pass

Unit IV	**Functions**	**8 Hours**

Python user-defined Functions
Python Built-in Functions

Unit V	**Storage Classes**	**8 Hours**

Python – Modules
Python User Input: input() built-in function, read as a string and assign to a variable.
Python Lists : Python Data Structures, Create Python Lists, Update Python Lists, Delete Elements from Python Lists, and Built-in Functions & Built-in Methods for Python Lists.
Python Tuples: differences between tuples and lists
Python Sets
Python Dictionaries

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

The theory of pythonProgramming language will be learnt

References/Readings

1. Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming
2. Learning Python, 5th Edition
3. Automate the Boring Stuff with Python, 2nd Edition: Practical Programming for Total Beginners
4. Python for Everybody: Exploring Data in Python 3
5. Python (2nd Edition): Learn Python in One Day and Learn It Well. Python for Beginners with Hands-on Project. (Learn Coding Fast with Hands-On Project Book 1)
6. Python Pocket Reference: Python In Your Pocket
7. Elements of Programming Interviews in Python: The Insiders' Guide
8. Head First Python: A Brain-Friendly Guide

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Course Code: EISC 504 **Course Title: Computer Programming Lab**		
Number of Credits: 3	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Fundamentals of computer, Fundamentals of IT, Logical thinking		
Objectives of Course		
To implement and practice the theoretical concepts in Python programming language		
Course Content		
Exp.1: Write program for understanding the concept of Constants, Integer Constants, Real Constants, Character Constants, String Constants, Backslash Character Constants, Concept of an Integer and Variable, Rules for naming Variables and assigning values to variables **Exp.2:**Write programs for various Operators, **Exp.3:**Write program for Converting Integers to Floating-point and vice-versa, **Exp.4:**Write programs for all Python Control Flow **Exp.5:**Write program for Fibonacci series using Recursion Function. **Exp.6:**Write program for understanding the concept of Pointers, **Exp.7:**Write program for understanding Structures concept, Structures and Functions, Arrays of Structures, Pointers to Structures, Self-referential Structures, Unions. **Exp.8:**WAP to reverse a number, **Exp.9:**WAP to compute the factors of a given number. **Exp.10:**Write a program that swaps two numbers. **Exp.11:**WAP that prints a table. **Exp.12:**Write a program that computes the area and the circumference of the circle. **Exp.13:**Write a function that checks whether a given string is Palindrome or not. **Exp.14:**Write a function to find whether a given no. is prime or not.		
Pedagogy		
Lectures/Tutorial/Assignments/ Practice Sessions		
Course Outcome		
The theoretical concepts in C programming language were practised by implementing		

Course Code: EISC 505 **Course Title: Computer Networking- V**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**

Prerequisites for the course

Students should know the topics covered in Computer Networking I, II, III, IV

Objectives of Course

In this course you will explore information security through some introductory material and gain an appreciation of the scope and context around the subject. This includes a brief introduction to cryptography, security management and network and computer security that allows you to begin the journey into the study of information security and develop your appreciation of some key information security concepts.

Course Content

Unit I	**Computer Security**	**15 Hours**
Secure Password, Password manager, Two step verification, Antivirus, Firewall, Gateway, Internet browsing security, wireless security, social media security, Smartphone security, VPN		
Unit II	**Network Security**	**15 Hours**
Network Security, Principles of cryptography, Message Integrity and Digital Signatures, End point authentication, Securing Email, Securing TCP Connections: SSL, Network Layer Security, ACL, Securing wireless LAN, Operational Security : Firewalls and Intrusion Detection System		
Unit III	**Web Security**	**6 Hours**
Threats, Secure naming, Secure socket layer, Mobile code security		
Unit IV	**Security Management**	**6 Hours**
Security and Management: Conceptual Definitions, Philosophical and Legal basis of Security 3. Principles of Security. Basic Types of Security: Personnel, Physical, Information, Document Security, Important Assets and Threats to them. Historical perspective of Security: UK, USA, INDIA. Security Management Principles: Developing Security Policy, Organizing Security Resources, Implementing Security Plans / Programmes.		

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to:

1. Develop Concept of Security needed in Communication of data through computers and networks along with Various Possible Attacks
2. Understand Various Encryption mechanisms for secure transmission of data and management of key required for required for encryption
3. Understand authentication requirements and study various authentication mechanisms
4. Understandnetwork security concepts and study different Web security mechanisms.

References/Readings

1. Hill D.A & Rockley I.E, 1981, Security: Its management and control, Business Books.
2. Haldar, Dipak, 1986, Industrial Security in India, Ashish Publishing House.
3. Sabharwal, O.P., 2006, Security Management, Alpha Publications, New Delhi.
4. William Stallings: Cryptography and Network Security, Pearson 6th edition. 2013
5. V K Pachghare: Cryptography and Information Security, PHE ,2013.
6. Castoldi, & Mario. (2018). *Cybersecurity - Protecting Critical* (Issue May).
7. Pande, J. (2017). *Introduction to Cyber Security (FCS)*. http://uou.ac.in
8. D-Link Certified, DCS Switching Training Guide
9. D-Link Certified, DCS Switching Lab Manual
10. Cisco Certified Network Associate Training Guide
11. Lehto, M., &Neittaanmaki, P. (2015). Cyber Security: Analytics, Technology and Automation. In *Intelligent Systems, Control and Automation: Science and Engineering* (Vol. 78).

Course Code: EISC 506 **Course Title: Computer Networking- V Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Students should know the topics covered in Computer Networking I, II, III, IV Lab		
Objectives of Course		
1. To know Network security 2. To Implement Computer security 3. To implement Web security 4. To implement Browser security 5. To understand Wireless security		
Lab Content		
Exp.1 : Configuring DHCP Server on SWR11 and SWR12 Switches **Exp.2 :** Configuring Access Control list **Exp.3 :** Configuring LLDP **Exp.4 :** System Maintenance **Exp.5 :** Install and Configure Antivirus software **Exp.6 :** Wireless Security **Exp.7 :** Web security **Exp.8 :** Smartphone security **Exp.9 :** Internet browser security **Exp.10 :** Firewall		
Pedagogy		
Experiments		
Course Outcome		
On completion of the course, students will be able to: 1. To know Network security 2. To Implement Computer security 3. To implement Web security 4. To implement Browser security 5. To understand Wireless security		

Course Code: EISC 507 **Course Title: Operating Systems**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Students should know the basics of computer system.		
Objectives of Course		
1. To learn and understand the Concepts of operating system 2. To Learn and understand operating system services 3. The core structure, functions and design principles of operating system 4. Interposes communications and basic concepts of virtualization		
Course Content		
Unit I	**Introduction**	**3 Hours**

Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S.		
Unit II	**Process Management**	**7 Hours**
Process Concept, Process states, Process control, Threads, Uni-processor Scheduling: Types of scheduling: Pre-emptive, Nonpreemptive, Scheduling algorithms: FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.		
Unit III	**Concurrency control**	**7 Hours**
Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of **S**ynchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock**:** Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal, kill.		
Unit IV	**Memory Management**	**7 Hours**
Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging. Virtual Memory: Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.		
Unit V	**I/O management &Disk scheduling:**	**6 Hours**
I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache.		
Unit VI	**Inter Process Communication**	**6 Hours**
Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter-process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization		
Unit VII	**Multi-Processor Based and Virtualization Concepts**	**6 Hours**
Virtual machines; supporting multiple operating systems simultaneously on a single hardware platform; running one operating system on top of another. Reducing the software engineering effort of developing operating systems for new hardware architectures. True or pure virtualization. Para virtualization; optimizing performance of virtualization system; hypervisor call interface.		
Pedagogy		
Lectures/Tutorial/Assignments		
Course Outcome		
On completion of the course, students will be having understanding of following concepts of Operating System: 1. Process Management 2. Memory Management 3. File & I/O Management		
References/Readings		
1. Operating System Concepts, 9th edition Peter B. Galvin, Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc. 2. Modern Operating Systems -By Andrew S. Tanenbaum (PHI) 3. Operating Systems 5th Edition, William Stallings, Pearson Education India 4. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley 5. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.		

6. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI
7. Operating System A Design Approach- Crowley, TMH.
8. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
9. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
10. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

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Course Code: EISC 508
Course Title: Operating Systems Lab

Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**

Prerequisites for the course

Students should know the basics of computer system.

Objectives of Course

1. To learn and understand the Concepts of operating system
2. To Learn and understand operating system services
3. The core structure, functions and design principles of operating system

Lab Content

Exp.1 : Basics of Unix Commands
Exp.2 : Program for system calls of unix operating system (fork, getpid, exit)
Exp.3 : C programs to simulate UNIX commands like cp, ls, grep.
Exp.4 : Simple shell programs
Exp.5 : CPU scheduling algorithms- Priority, Round Robin Scheduling, FCFS, SJF Scheduling,
Exp.6 : IPC using shared memory
Exp.7 : Algorithms for Deadlock
Exp.8 : Threading & synchronization applications
Exp.9 : Memory allocation methods
Exp.10 : Page replacement algorithm
Exp.11 : File organization technique
Exp.12 : File allocation strategies

Pedagogy

Experiments

Course Outcome

On completion of the course, students will be able to:
1. Identify different PC Components and their connection
2. Understand basic concepts of different OS
3. Use different system utilities

Semester VI

Course Code: EIGC 601 **Course Title: Entrepreneurship**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Interest to explore and learn the requirements to begin entrepreneurship		
Objectives of Course		
to understand the concepts and validity of various entrepreneurship development programs		
Course Content		
Unit I	**Introduction**	**10 Hours**
Entrepreneurship: Meaning and Importance, Evolution of term, Factors, Characteristics of an entrepreneur. Types of entrepreneurs: based on Business, Use of Technology, Motivation, Growth, Stages. New generations of entrepreneurship viz. social entrepreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc.,Barriers to entrepreneurship		
Unit II	**Creativity**	**10 Hours**
Creativity and entrepreneurship, Steps in Creativity, Innovation, and inventions, using left brain skills to harvest right brain ideas, Legal Protection of innovation, Skills of an entrepreneur, steps in decision making and Problem Solving.		
Unit III	**Organization Assistance**	**12 Hours**
Assistance to an entrepreneur, New Ventures. Meaning, features &examples: Industrial Park, Special Economic Zone. Financial assistance: by different agencies, to MSME. Modernization assistance to small scale unit,Government Stores Purchase scheme (e-tender process). Excise exemptions and concession, Exemption from income tax, Export oriented units, Incentives and facilities to exports entrepreneurs, Export oriented zone,Registration categories, Registration Procedure. Environmental Clearance. Institutions supporting small business enterprise		
Unit IV	**Tutorials on Entrepreneurship Development Programme**	**10 Hours**
Case studies on Men/Women entrepreneurs, Seminar on successful entrepreneurs, small business project formulation: Meaning, contents, formulation, planning, commissions guidelines & specimen of a project report,Problems of entrepreneurs.		
Pedagogy		
Lectures/Tutorial/Assignments/ Practice Sessions		
Course Outcome		
The various entrepreneurship development programs will be understood		
References/Readings		

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
2. Entrepreneurship, A South – Asian Perspective, D. F. Kuratko and T.V.Rao, 3e, Cengage, 2012.
3. Entrepreneurship, Arya Kumar, 4 e, Pearson 2015.
4. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.

Course Code: EIGC 602 **Course Title: Web designing**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Basic Programming Concepts		

Objectives of Course

To learn the concepts of web designing

Course Content

Unit I	**Introduction**	**10 Hours**

Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing.

Unit II	**Core Java**	**20 Hours**

Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.

Programs for:Displaying a message "Welcome to JAVA", generates student grade sheet, prints Fibonacci series from 1 to 10, displaying factorial of a number.

Unit III	**Web Page Designing**	**16 Hours**

HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.

Create a basic HTML file, Create a static webpage using table tags of HTML, Create a static web page which defines all text formatting tags of HTML in tabular format, Create webpage using list tags of HTML, Create webpage to include image using HTML tag, Create employee registration webpage using HTML form objects, Apply style sheet in Web page. [inline, embedded and linked

Unit IV	**Internet & web browser**	**10 hours**

Web browser, Web search engine, electronic mail, Cloud computing

Write a script which creates and retrieves Cookies information, Create a dynamic web page which displays Ads using AdRotator Component.

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

Web designing concepts were learnt

References/Readings

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, " Web Technology and Design" , New Age International
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication
4. Bhave, "Programming with Java", Pearson Education
5. Herbert Schieldt, "The Complete Reference:Java", TMH.
6. Hans Bergsten, "Java Server Pages", SPD O'Reilly
7. Tanveer Alam, Internet and Java Programming, Khanna Publishing House
8. Margaret Levine Young, "The Complete Reference Internet", TMH
9. Naughton, Schildt, "The Complete Reference JAVA2", TMH
10. Balagurusamy E, "Programming in JAVA", TMH
11. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGrawHill, 2007.
12. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications. 13) D. Comer, "The Internet Book", Pearson Education, 2009. SUPPLEMENTARY READING
13. M. L. Young,"The Complete reference to Internet", Tata McGraw Hill, 2007
14. Godbole AS &Kahate A, "Web Technologies", Tata McGrawHill,2008
15. 16) B. Patel & Lal B. Barik, " Internet & Web Technology ", Acme Learning Publishers

Course Code: EIGC 603 **Course Title: Android Development**		
Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**
Prerequisites for the course		
Basic Programming Concepts		
Objectives of Course		
To construct an interface and handle the interactions at backend in Android		
Course Content		
Unit I	**Android Basics**	**11 Hours**
Overview, Environment Setup, Architecture. Resources: application components, Fragments, Intents/Filters,Broadcast Receivers. Services, Content Providers, Hello World Example		
Unit II	**Android User Interface**	**11 Hours**
UI design, UI layouts, UI Controls, UI Patterns. Event Handling,Styles and Themes, Custom Components		
Unit III	**Android Advanced Concepts**	**11 Hours**
Drag and Drop, Notifications, Location based services, Sending Email, SMS, Phone calls, Publishing Android Application		
Unit IV	**Android Examples**	**11 Hours**
Alert, Dialog, Custom Fonts, Auto Complete, Animations, Audio Capture, Camera, Clipboard, Image Effects, Media Player, Navigation: Login Screen, Progress bar, Push Notifications, Multitouch, Internal Storage		
Unit V	**Android Advanced Examples**	**12 Hours**
Network Connection, Google Maps, LinkedIn Integration, Twitter Integration. Bluetooth, Wi-Fi, Widgets. Data Backup, Best Practices		
Pedagogy		
Lectures/Tutorial/Assignments/ Practice Sessions		
Course Outcome		
Concepts to create a standard functional Android application for general use will be learnt		
References/Readings		
1. Headfirst Android Development by Dawn Griffiths 2. Android App Development For Dummies by Michael Burton 3. Hello, Android Introducing Googles Mobile Development Platform by Ed Burnette 4. Android Programming The Big Nerd by Brain Hardy 5. Busy Coder's Guide To Android Development – Mark M Murphy 6. Android Cookbook by Ian Darwin 7. Android Programming Pushing The Limits by Eric Hellman		

Course Code: EIGC 604 **Course Title: Android Development Lab**		
Number of Credits: 3	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Handling any IDE of any programming language		
Objectives of Course		
To create a standard functional Android application for general use		

Course Content
Exp.1: Create Hello World application: to display “Hello World” in the middle of the screen in the emulator & in the middle of the screen in the Android Phone. **Exp.2:**Create- HELLO SKILLS, when the button is clicked **Exp.3:**Create 4 buttons which displays four values **Exp.4:** Create an application with login module. (Check username and password). **Exp.5:** Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change. **Exp.6:** Create a menu with 5 options and selected option should appear in text box. **Exp.7:** Create a list of all courses in your college and on selecting a particular course teacher-incharge of that course should appear at the bottom of the screen. **Exp.8:** Create an application with three option buttons, on selecting a button colour of the screen will change. **Exp.9:** Create and Login application as above. On successful login, pop up the message.
Pedagogy
Lectures/Tutorial/Assignments/ Practice Sessions
Course Outcome
A standard functional Android application for general use was created

Course Code: EISC 601
Course Title: Robotics

Number of Credits: 03	**Total Hours: 42**	**Total Marks: 75**

Prerequisites for the course

Students should know basic mathematics, basic electrical and electronic components, basic electrical and electronic concepts.

Objectives of Course

1. To learn and understand the Concepts of Robotics and its anatomy
2. Understand the various electronic controls in robotics
3. Understand sensor technology
4. Know basic python programming

Course Content

Unit I	**Basic Concepts in (fundamentals of) robotics**	**04 Hours**

Automation and robotics, Robots in history, Robots today, Robot applications, Laws of Robotics. Robot Classification: By application, coordinate system, actuation system, control method, programming method.

Unit II	**Robot anatomy**	**06 Hours**

Links and joints, joint notation scheme, degree of freedom, Robot resolution, accuracy and repeatability, concept of workspace

Unit III	**Drive Systems**	**10 Hours**

Pneumatic and hydraulic systems. Electric: Relation between torque and voltage, AC and DC Servo motors, Stepper motor, BLDC Motors.Electronic control of motors: controllers

Unit IV	**Sensors**	**08 Hours**

Characteristics of sensors, Classification, touch sensor, position sensors, potentiometer, LVDT, Optical encoder, Force/moment sensor, Range sensor, Proximity sensor: Inductive, capacitive, hall effect sensor, Passive sensor: RCC

Unit V	**Basics of Python for Robotics**	**10 Hours**

Essentials, conditional statements, loops, classes, writing simple codes.

Unit VI	**Robot End Effectors**	**04 Hours**

Grippers and tools

Pedagogy

Lectures/Tutorial/Assignments

Course Outcome

On completion of the course, students will be able to :

1. Identify different Robotic Components and their anatomy.
2. Understand basic concepts in Robotics.
3. Understand the various electronic controls in robotics.
4. Understand sensor technology.
5. Know basic python programming.

References/Readings

1. John J. Craig; Introduction to Robotics, Mechanics and control; Pearson Education Inc.
2. Roland Siegwart, Illah R. Nourbakhsh- Introduction to Autonomous mobile robots, MIT Press, 2nd Edition
3. S.K. Saha, Introduction to Robotics, 2nd Edition; McGrawHill
4. Peter Corke, Robotics Vision and Control; Springer
5. M.P. Groover, M. Weiss, R. N. Nagel, N. G. Odrey; Industrial Robotics Technology: Programming and Applications, McGrawHill
6. Mittal &Nagrath; Robotics and Control; McGrawHill

Course Code: EISC 602 **Course Title: Robotics Lab**		
Number of Credits: 03	**Total Hours: 84**	**Total Marks: 75**
Prerequisites for the course		
Students should know the basics of Robotics		
Objectives of Course		
1. To learn and understand the Concepts of Robotics 2. To implement basic mini projects to develop interest in Robotics field 3. To know the basics of Python programming		
Lab Content		
Expt. 1: Introduction to robotic components **Expt. 2:** Sensors in Robots **Expt. 3:** Line follower Robot **Expt. 4:** Simple codes on Python Programming I **Expt. 5:** Simple codes on Python Programming II **Expt. 8:** Simple Robotic Buggy/vehicle **Expt. 9:** Obstacle avoiding Robot **Expt. 10:** Line follower Robot **Expt. 11:** Human following Robot **Expt. 12:** Build an edge avoiding Robot **Expt. 13:** Pick and place Robot **Expt. 14:** Gesture controlled Robot		
Pedagogy		
Experiments		
Course Outcome		
On completion of the course, students will be able to: 1) Identify different Robotic Components and their connection 2) Understand basic concepts in Robotics 3) Implement mini Projects in Robotics 4) Know basic python programming		

Course Code: EISC 603
Course Title: Electric Vehicle and Battery Technology

Number of Credits: 03 **Total Hours: 42** **Total Marks: 75**

Prerequisites for the course

Basic understanding of the electrical concepts, working of motors

Objectives of Course

Explain the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals. Analyze various electric drives suitable for hybrid electric vehicles

Course Content

Unit I	**Electric vehicle**	**6 Hours**
Componentsand layout of electric vehicles, comparison with internal combustion engine, Basics of the HEV, Basics of Plug-In Hybrid Electric Vehicle (PHEV), Basics of Fuel Cell Vehicles (FCVs). HEV Fundamentals: Introduction, Model, performance, types.		
Unit II	**Power Electronics in HEVs**	**9 Hours**
Power electronics: AC-DC, DC-AC conversion, electronic devices and circuits for control and distribution of electric power, Thermal Management of HEV.		
Unit III	**Electric Machines and Drives in HEVs**	**9 Hours**
Introduction, BLDC motors, Induction Motor Drives, Permanent Magnet Motor Drives, Switched Reluctance Motors, Doubly Salient Permanent Magnet Machines, Design and Sizing of Traction Motors.		
Unit IV	**Integration of Subsystems**	**9 Hours**
Sizing of propulsion motor and power electronics, selecting the energy storage technology, Communications, supporting subsystems.Energy management strategies in hybrid and electric vehicle, different energy management strategies.		
Unit V	**Batteries**	**9 Hours**
Ultracapacitor, Fuel Cells, Different batteries for EV, Battery Characterization, Comparison of Different Energy Storage Technologies for HEVs, Battery Charging Control.		

Pedagogy

Lectures/Tutorial/Assignments/

Course Outcome

After completion of this course student will have a deeper understanding of electric vehicles, power electronics, motors, different types of batteries and fuel cell.

References/Readings

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press , 2003
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press , 2004
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley , 2003
4. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, John Wiley & Sons Ltd. , 2011
5. Build your own electric vehicles by Seth Leitman and Bob Brant
6. Modern electric vehicles by C. C. Chan and K. T. Chau

Course Code: EISC 604 **Course Title: Electric Vehicle and Battery Technology Lab**	
Number of Credits: 03	**Total Hours: 84 Total Marks: 75**
Prerequisites for the course	
Understanding of electric vehicles, motors and high power electric components.	
Objectives of Course	
Hybrid electric vehicle architecture, design and component sizing and the power electronics devices used in hybrid electric vehicles. Study of different electronic components required for electric vehicles.	
Course Content	**84 Hours**
Expt. 1: Control circuit of induction motors **Expt. 2:** MOSFET based step-up and step-down chopper **Expt. 3:** Study of 3-phase induction motors **Expt. 4:** Battery monitoringandchargingcontrol **Expt. 5:** V/f control of three phase induction motors **Expt. 6:** Three phase induction motor control using IGBT **Expt. 7:** Speed control of DC motors using IGBT **Expt. 8:** Wiring diagram of electric vehicle **Expt. 9:** PWM inverter control **Expt. 10:** Speed control of BLDC motor	
Pedagogy	
Lab experiments	
Course Outcome	
After completing this course, students are expected to understand the major functional blocks of the electric vehicle. He/ She should be able to work on high power electrical components used in electrical vehicle.	

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D 3.24 Minutes of the Board of Studies in Portuguese meeting held on 01.07.2022 and 22.07.2022.

Annexure I

Programme: B.A. PORTUGUESE (Honours)
Course Code: UPRC-111
Title of the Course: LISTENING COMPREHENSION AND ORAL INTERACTIONS - I
(Compreensão e Interações orais-I)

Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites:	Any student pursuing his/her undergraduate program in Portuguese (Hons.) at Goa University or an affiliated college, is eligible to take the course as a discipline specific elective paper.	
Objectives:	– Recognize the sounds of the Portuguese language. – Identify the tonic syllable and graphical accentuation. – Read sentences appropriately respecting orthographic, phonetic and orthoepic rules. – Classify words according to their accentuation. – Interpret oral enunciations in different communicative situations. – Act according to certain oral enunciations. – Distinguish various communicative situations in different written, audio and video media. – Interact verbally in simple communication situations.	
Content:	Module 1: The sounds of the Portuguese language; tonic syllables; words with stress on the last, second last and pre-penultimate syllable. Practical exercises in reading and dictation. Module 2: Personal identification, characterization of people, and social relationships. Module 3: Family and home. Health and meals. Module 4: School. Leisure; trips and vacations.	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Communicative approach and teaching-learning process based on classroom tasks. The emphasis in a communicative task is on successful task completion and consequently the primary focus is on meaning as learners realize their communicative intentions. However, in the case of tasks designed for language learning or teaching purposes, performance is concerned both with meaning and the way meanings are comprehended, expressed and negotiated.	

References/ Readings:	- Português XXI Nível 1 (book and CD), by Ana Tavares (Coord. By Renato Borges de Sousa), edited by LIDEL, Lisboa-Portugal; - Português XXI Nível 1 - Caderno de Exercícios (Livro segundo o novo Acordo Ortográfico) by Ana Tavares, edited by LIDEL, Lisboa-Portugal. - Compreensão Oral em Ação A1/A2 by Carla Oliveira & Luísa Coelho, edited by LIDEL, Lisboa, 2022. - Ora Viva! – Curso rápido de iniciação ao Português língua estrangeira (Portuguese crash course for beginners) by Ana Margarida Abrantes, edited by LIDEL, Lisboa, 2019.	
Learning outcomes:	- At the end of these modules, students will have gained knowledge of the basic lexical and grammatical structures and their uses in oral communication. - In addition, they will have gained experience in: reading for information using material of appropriate complexity and length; listening for information; developing study skills; using audio and video aids. - Student will be able to understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type; introduce him/herself and others and ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has; interact in a simple way provided the other person talks slowly and clearly and is prepared to help.	

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Programme: B.A. PORTUGUESE (Honours)
Course Code: UPRC-112
Title of the Course: LISTENING COMPREHENSION AND ORAL INTERACTIONS - II
(Compreensão e Interações orais-II)
Number of Credits: 4
Effective from AY: 2022-2023

Prerequisites:	Any student pursuing his/her undergraduate program in Portuguese (Hons.) at Goa University or an affiliated college, is eligible to take the course as a discipline specific elective paper.	

Objectives:	– Read enunciations appropriately respecting orthographic, phonetic and orthoepic rules. – Act according to certain oral enunciations. – Interpret oral enunciations in different communicative situations. – Distinguish several communicative situations in different written, audio and video media. – Interact verbally in simple communicative situations. – Interpret the global and thematic meaning of musical compositions.	
Content:	Module 1: The internet and the media; written press, radio and television. Module 2: Means of transportation; orientation in space; planning and preparing a trip. Module 3: Shopping in the market and other establishments; going to the restaurant Module 4: Listening and exploring vocabulary and themes from songs and music videos.	15 hours 15 hours 15 hours 15 hours
Pedagogy:	Communicative approach and teaching-learning process based on classroom tasks. The emphasis in a communicative task is on successful task completion and consequently the primary focus is on meaning as learners realize their communicative intentions. However, in the case of tasks designed for language learning or teaching purposes, performance is concerned both with meaning and the way meanings are comprehended, expressed and negotiated.	
References/ Readings:	- Português XXI Nível 1 (book and CD), by Ana Tavares (Coord. By Renato Borges de Sousa), edited by LIDEL, Lisboa-Portugal; - Português XXI Nível 1 - Caderno de Exercícios (Livro segundo o novo Acordo Ortográfico) by Ana Tavares, edited by LIDEL, Lisboa-Portugal. - Compreensão Oral em Ação A1/A2 by Carla Oliveira & Luísa Coelho, edited by LIDEL, Lisboa, 2022. - Ora Viva! – Curso rápido de iniciação ao Português língua estrangeira (Portuguese crash course for beginners) by Ana Margarida Abrantes, edited by LIDEL, Lisboa, 2019.	

Learning outcome:	- At the end of these modules, students will have gained knowledge of the basic lexical and grammatical structures and their uses in oral communication. - In addition, they will have gained experience in reading for information using material of appropriate complexity and length; listening for information; developing study skills using audio and video aids. - Student will be able to understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type; introduce him/herself and others and ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has; interact in a simple way provided the other person talks slowly and clearly and is prepared to help. - He/she will be also able to communicate in simple and routine task requiring a simple direct exchange of information on familiar topics and activities; able to handle very short social exchanges even though usually unable to understand enough to keep conversation going.	

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30.07.2022

Annexure II

SEMESTER WISE FLOW CHART OF M.A. PORTUGUESE WITH EFFECT FROM ACADEMIC YEAR 2022-23

COURSES	SEM 1	SEM 2	SEM 3	SEM 4	TOTAL CREDITS
DISCIPLINE SPECIFIC CORE COURSE **[DSCC]**	**DSCC-PRC- 01** General and Portuguese Linguistics **DSCC-PRC-02** History of Portuguese Language **DSCC-PRC-03** Introduction to Literary Studies **DSCC-PRC-04** Portuguese Literature I	**DSCC-PRC-05** Portuguese Literature II **DSCC-PRC-06** Goan Literature in Portuguese Language **DSCC-PRC-07** Brazilian Literature **DSCC-PRC-08** Writing and Oral Communication Skills			**32**
DISCIPLINE SPECIFIC OPTIONAL COURSE **[DSOC]**	**DSOC-PRO-01** Multimedia and Technical Translation **DSOC-PRO-02** Application of Writing Techniques **DSOC-PRO-03** Introduction to Portuguese Culture	**DSOC-PRO-04** Didactics & Methodology of Teaching Portuguese as a Foreign Language **DSOC-PRO-05** Advanced Writing Techniques **DSOC-PRO-06** Literary Translation **DSOC-PRO-07** African Literature in Portuguese			**08**
TOTAL CREDITS	20	20			

COURSES	SEM 1	SEM 2	SEM 3	SEM 4	TOTAL CREDITS
RESEARCH SPECIFIC OPTIONAL COURSE **[RSOC]**			**RSOC-PRO-08** Academic Writing & Research Methodology **RSOC-PRO-09** Fieldwork & Language Documentation **RSOC-PRO-10** Applied Linguistics in Foreign Language Teaching **RSOC-PRO-11** Semiotics and new trends of Literary Analysis	**RSOC-PRO-12** Foreign Language Acquisition **RSOC-PRO-13** Pessoan Studies **RSOC-PRO-14** Camonian Studies **RSOC-PRO-15** Orientalism in accounts, chronicles and travelogues in Portuguese **RSOC-PRO-16** Performative Arts in Teaching Portuguese **RSOC-PRO-17** Contact Linguistics	**12**
OPTIONAL GENERIC COURSE **[OGC]**			**OGC-PRO-18** History of Portugal **OGC-PRO-19** Portuguese Cinema **OGC-PRO-20** Portugal in the context of European Union **OGC-PRO-21** Portuguese Art **OGC-PRO-22** Portuguese Language I **OGC-PRO-23** Portuguese Language II		**12**
DISCIPLINE SPECIFIC DISSERTATION **[DSD]**				DSD-PRC Dissertation	**16**
TOTAL CREDITS	**20**	**20**	**20**	**20**	**80**

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Annexure III

Course Code: DSCC-PRC- 01
Title of the Course: GENERAL and PORTUGUESE LINGUISTICS
(Linguística Geral e Portuguesa)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese programme with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– To recognize the language as a system that aims essentially to establish communication between people. – To distinguish between verbal and non-verbal language, grammar and speech. – To study the structure of the language and grammar. – To acquire a linguistic conscience and metalinguistic knowledge that allows the development of competences and knowledge, carrying out linguistic activities in Portuguese language in particular situations. – To acquire knowledge that permits the development of skills (linguistic, discursive/textual, sociolinguistic and strategic) in various levels of the language /Grammar (semantics, pragmatics, lexical, syntax and phonetics).	
Content:	1. Linguistics and verbal language: Linguistics and Semiotics. 2. Major linguistics schools of thought: Structuralism, Functionalism, Generativism, Cognitivism; The Prague School and The London School. 3. Levels of linguistic analysis: a. Phonetics, Phonology and Prosody b. Morphology c. Syntax d. Semantics e. Pragmatics 4. Cognitive Linguistics 5. Norm and linguistic variation, dialect, idiolects, sociolects and the varieties of Portuguese across space, time and social stratus.	8 hours 12 hours 24 hours 6 hours 10 hours
Pedagogy:	– Lectures – Research and reading of essays about different issues concerning Portuguese Linguistics. – Weekly written exercises.	
References/ Readings	– Faria, I.H., (Org.) (1996), *Introdução à Linguística Geral e Portuguesa,* Lisboa, Caminho – Searle, J.R., (1969), *Speech Acts. An Essay in the*	

Other sources	*Philosophy of Language*, Cambridge, Cambridge University. Press. –Cunha, C. e L.F.L. Cintra (1984), *Nova Gramática do Português Contemporâneo*, Lisboa, Edições Sá da Costa. – Austin, J.L., (1952), *How to do Things with Words*, Oxford, Oxford University Press. – Cuesta, Pilar Vasquez & M.A. Mendes da Luz (1971), *Gramática da Língua Portuguesa*, Lisboa, Edições 70 – Lakoff, George & Mark Johnson (2000), *Metaphors we live by*, Chicago, University of Chicago Press – Mateus, Maria Helena Mira, et al. *Gramática da língua portuguesa*. 7. ed, Caminho, 2006. – Raposo, Eduardo Paiva, et al. *Gramática do português*. Fundação Calouste Gulbenkian, Volume I, 2020 – Lopes, Ana Cristina M., and Graça Maria Rio-Torto. *Semântica*. Caminho, 2007. – Ducrot, O. & Todorov, T. *Dicionário das Ciências da Linguagem.* D.Quixote, Lisboa, 1982 – *Estudos de Sintaxe-Semântica e Pragmática do Português*, by Joaquim Fonseca, Porto, 1993 – *Fonética, Fonologia e Morfologia do Português*, Universidade Aberta, 1991 – *Sintaxe e Semântica do Português*, Universidade Aberta, Lisboa, 1991 – *Dicionário de Termos Linguísticos,* by Maria Francisca Xavier e Maria Helena Mateus, Edições Cosmos, 1990 – *Lexicologia do Português*, by Mário Vilela, Almedina, Coimbra, 1994 – *Gramática da Língua Portuguesa*, by Mário Vilela, Almedina, Coimbra, 1999 – *Gramática e Estudos de Pragmática-Estudos de Linguística Geral*, by Fernanda Irene Fonseca, Porto Editora, Porto, 1994 – *Introdução à Fonética do Português*, by Maria Raquel Delgado Martins, Caminho, Lisboa, 1998 – Eliseu, André. *Sintaxe do português*. Caminho, 2008. – Lima, José Pinto de. *Pragmática Linguística*. Editorial Caminho, 2006.	
Learning Outcomes:	At the end of this course students will have gained knowledge of: the lexical and grammatical structures and their uses in oral communication at an advanced level;	

	different concepts within the phonetic an morphological system of the Portuguese language; complex syntactic and semantic functions in Portuguese; complex structures used in literary texts, prose and poetry, and in essays.	

Course Code: DSCC-PRC-02
Title of the Course: HISTORY OF PORTUGUESE LANGUAGE
(História da Língua Portuguesa)
Number of Credits: 4

Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objective:	– reading, understanding and discussing texts or essays related to the origin and evolution of Portuguese language. – identifying the most characteristic aspects of Portuguese language; – understanding and comparing different internal and external aspects of Portuguese language within CPLP (Comunidade dos Países de Língua Portuguesa); – acquire the ability (techniques and methods) to interpret the most important writings of Portuguese from 16th century tradition;	
Content:	1. The roots of Portuguese; Substrates and pre-Latin and post-Latin periods. 2. From Latin to the first texts in Portuguese (13th century): historical events; phonetic evolution from Latin; evolution of the grammatical structures and vocabulary. 3. European Portuguese: autonomy and evolution since 14th century; Portuguese language as the official language of Portugal and its first written grammar. 4. Elementary concepts of Palaeography. 5. The standardization of Portuguese; the two phases of Modern Portuguese (from 16th to 18th century and 19th and 20th centuries).	10 hours 14 hours 14 hours 10 hours 12 hours
Pedagogy:	– lectures – Research and reading of essays about the history and evolution of Portuguese language.	
References/Readings	– Teyssier, Paul, *História da Língua Portuguesa*, Sá da Costa Editora, Lisboa.	

Other sources	– Neto, Serafim da Silva, *História da Língua Portuguesa*, MEC/Presença, Rio de Janeiro. – "Pequeno Curso de Língua Portuguesa", by Maria Inês Castelo Branco, Lisboa – Cunha, Celso & Cintra, Lindley, *Gramática do Português Contemporâneo*, Edições Sá da Costa, Lisboa – Machado, José Pedro, *Dicionário Etimológico da Língua Portuguesa*, Editora Confluência, Lisboa, 1977 – *Dicionário de Língua Portuguesa*, Academia das Ciências de Lisboa, Lisboa;	
Learning Outcomes	At the end of this course students will have gained knowledge of: the origin of Portuguese language; the cultural contributions to Portuguese language along the centuries; the history and evolution of Portuguese language; the cultural diversity that the Portuguese language entails as the official language of eight countries and as a language spoken worldwide.	

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Code: DSCC-PRC-03
Title of the Course: INTRODUCTION TO LITERARY STUDIES
(Introdução aos Estudos Literários)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese programme with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– to read, understand and discuss literary texts such as novels, short tales, memoirs and chronicles, as well as dramatic texts, literary essays and theoretical texts. – to identify the most characteristic aspects of Lusophone literature and culture (including those of Brazil, Portugal and Lusophone Africa). – to acquire technical and practical knowledge in order to enable the student to approach the literary text, considered as a communicative discourse and a semiotic system through reading, analysis and interpretation. – to recognize the indicators of literature in a written text. – to encourage quality productive written work adjusted to communicative intentionality.	

	– to relate figures of speech in the literary text with semantic and meaningful implications of the writing process. –	
Content:	1. Introduction to the concept of literature; the boundaries of a literary text; specifications of literary language; the socio-cultural dimension of literature; general forms of literature 2. Literary Language and Literary Texts; semiotics in literature 3. Poetry: creativity and factors; the lyric text: the main properties of the poem; poetic expression and metaphor 4. Literary narrative: diegesis and mimesis, levels and categories; the narrator's point of view 5. Short narratives: theories, structure and main characteristics 6. Dramatic literature; genres (comedy, tragedy), dramatic structure; literature intended for theatrical performances, intersemiotic translation as adaptation 7. Literary evolution, periods and trends: Classicism, Romanticism, Realism, Modernism and Post-Modernism 8. Introduction to Reception Theory: works and writers and their relation with the readers and the public	12 hours 8 hours 8 hours 8 hours 4 hours 8 hours 8 hours 4 hours
Pedagogy:	– Lectures – Reading of literary and theoretical texts in Portuguese: criticism and application of concepts. – Presentation of working material by the teacher. – Reading of selected literary texts. (functional, recreational, analytical and critical). – Audio-visual comprehension exercises.	
References/Readings **Other sources**	– Reis, Carlos, (1997), *O Conhecimento da Literatura,* Coimbra, Almedina. – Reis, Carlos, (1997), *Técnica e Análise Textual,* Coimbra, Almedina. – Frye, N., (1977), *The Anatomy of Criticism, Four Essays,* New Jersey, Princeton University Press. – Piglia, Ricardo. "Novas teses sobre o conto". In: Formas breves. São Paulo: Companhia das letras; 2004. – O último leitor. São Paulo: Companhia das Letras, 2006. – Victor Aguiar e Silva (1965), *Teoria da Literatura*, Coimbra, Almedina.	

	– Luís Carmelo (2003), *Semiótica, uma Introdução*, Lisboa – António José Saraiva and Óscar Lopes (1987), *História da Literatura Portuguesa*, Porto. – *A Poética*, by Aristóteles, Lisboa, Fundação Calouste Gulbenkian, 2002 – *História da Literatura Portuguesa* (7 Vols.), Alpha Editora, Lisboa, 1987 – Auerbach, Erick. Mimesis. A representação da realidade na literatura ocidental. São Paulo: Perspectiva, 1971. – Barthes, Roland. Inéditos. Vol. I – teoria. São Paulo: Martins Fontes, 2004. – O prazer do texto. São Paulo: Perspectiva, 2006. – Iser, Wolfgang. "A interação do texto com o leitor". A literatura e o leito. Rio de janeiro: Paz e Terra, 1979. – O ato da leitura. São Paulo: Ed. 34, 1999.	
Learning Outcomes	At the end of this course students will have gained knowledge of: concepts of literary texts and works; aesthetics and styles of the literary language; literary categories in prose and poetry; literary periods: characterization and dynamics; complex structures used in literary texts, prose and poetry, and in essays.	

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Course Code: DSCC-PRC-04
Title of the Course: PORTUGUESE LITERATURE I
(Medieval, Classicism and Romanticism periods)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– reading, understanding and discussing texts or essays related to the Portuguese Literature; – identifying the most important characteristic aspects of Portuguese literature and culture. – Reading and analysing Literary texts (poetry and prose).	

Content:	1. Introduction to the Portuguese society and environment in its relation to the Portuguese language and literature: characterization and evolution; literary expression and its classical roots: myths, values, concepts and formal characteristics. 2. The medieval Galician-Portuguese lyrics and Medieval prose; Crónicas by Fernão Lopes, the Demanda do Santo Graal and the novels of chivalry, Leal Conselheiro. 3. The Renaissance period: the theatre of Gil Vicente, Luís de Camões and the Epic poem of "Lusiads". 4. From the tradition to the Renaissance poetry: Redondilhas, Cantigas and Vilancetes, Medida Nova, sonnets of Camões, Sá de Miranda and António Ferreira 5. Baroque prose and poetry: Cultism and Conceptism in Padre António Vieira 6. Contours of the Portuguese Poetry in the Neo-Classicism; the Arcádia Lusitana; Bocage and pre-Romanticism poets. 7. The importance of Almeida Garrett and Alexandre Herculano in Portuguese Romanticism. 8. Camilo Castelo Branco and the Ultra-Romanticism´s generation.	4 hours 10 hours 8 hours 8 hours 6 hours 6 hours 8 hours 10 hours
Pedagogy:	– Lectures – Research and reading of essays about different issues concerning the History of Portuguese Literature. – Presentation of material by the teacher. – Reading of selected literary texts (functional, recreational, analytical e critical). – Audio-visual comprehension exercises. – Oral and written questions and commentaries. – Research and reading of essays about different issues concerning Portuguese Literature. – Reading of Portuguese poems and texts in prose.	
References/Readings **Other sources**	– Saraiva, António José and Lopes, Óscar, *História da Literatura Portuguesa*, Porto, 1987 – Buescu, Maria Leonor Carvalhão, *História da Literatura*, Lisboa, 1991 – Martinho, Fernando & others, *Literatura Portuguesa do Século XX*, Lisboa, 2004 – *Sermão da Sexagésima* by P. António Vieira – *Viagens na Minha Terra* by Almeida Garrett – A novel of Camilo Castelo Branco or another work of late Romanticism (to be selected) – *História da Literatura Portuguesa* (7 Vols.), Alpha Editora, Lisboa, 1987	

	– *Dicionário da Literatura Portuguesa,* by José Pedro Machado, Lisboa 1987 – *Perspectiva Histórica da Poesia Portuguesa*, by João Gaspar Simões, Lisboa, 1976 · http://www.instituto-camoes.pt/	
Learning Outcomes	At the end of this course students will have gained knowledge of: Historical and cultural contributions to Portuguese Literature along the centuries; different periods of the evolution of Portuguese Literature; the characteristics of literary works namely during the Pre-Renaissance, Classicism and Romanticism in Portugal.	

Course Code: DSCC-PRC-05

Title of the Course: PORTUGUESE LITERATURE II

(from Realism/Naturalism to Modernism)

Number of Credits: 4

Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– reading, understanding and discussing texts or essays related to the Portuguese Literature; – identifying the most important characteristic aspects of Portuguese literature and culture. – Reading and analysing Literary texts (poetry and prose).	
Content:	1. Main works and authors of Realism and Naturalism: Eça de Queirós, Antero de Quental, Guerra Junqueiro. 2. Literature of social criticism; Cesário Verde and the "Parnassians". 3. The tendencies of turn of the century: Neo-Romanticism, Saudosismo, Decadentismo. 4. Camilo Pessanha and the Symbolism in Portugal 5. The avant-garde tendencies and the Modernism; Modernist poets of Orpheu and Presença: Pessoa, Almada and Mário Sá-Carneiro, José Régio and Miguel Torga 6. The Neo-realist prose and poetry in the Novo Cancioneiro. 7. Mário Cesariny, Alexandre O´Neil and other surrealists in Portugal. 8. Contemporary trends: the Revolution of April 25th and its impact in literature; José Saramago as the Nobel Prize	12 hours 8 hours 6 hours 6 hours 12 hours 8 hours 4 hours 4 hours

	winner and its importance; Perspectives for the XXI Century.	
Pedagogy:	– Lectures – Research and reading of essays about different issues concerning the History of Portuguese Literature. – Presentation of material by the teacher. – Reading of selected literary texts (functional, recreational, analytical e critical). – Audio-visual comprehension exercises. – Oral and written questions and commentaries. – Preparation for research activities. – Research and reading of essays about different issues concerning Portuguese Literature. – Reading of Portuguese poems and texts in prose.	
References/Readings **Other sources**	– Saraiva, António José and Lopes, Óscar, *História da Literatura Portuguesa*, Porto, 1987 – Buescu, Maria Leonor Carvalho, *História da Literatura*, Lisboa, 1991 – Martinho, Fernando & others, *Literatura Portuguesa do Século XX* , Lisboa, 2004 – *História da Literatura Portuguesa* (7 Vols.), Alpha Editora, Lisboa, 1987 – *Dicionário da Literatura Portuguesa,* by José Pedro Machado, Lisboa 1987 – *Perspectiva Histórica da Poesia Portuguesa*, by João Gaspar Simões, Lisboa, 1976 · http://www.instituto-camoes.pt/	
Learning Outcomes	At the end of this course students will have gained knowledge of: cultural contributions to Contemporary Portuguese Literature; different periods of the evolution of Portuguese Literature; the characteristics of literary works namely during the from Realism/Naturalism to Modernism in Portugal.	

Course Code: DSCC-PRC-06
Title of the Course: GOAN LITERATURE IN PORTUGUESE LANGUAGE
(Literatura Goesa em Língua Portuguesa)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Student must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– reading, understanding and discussing literary texts produced by Portuguese speaking writers of Indian origin in different contexts such as novels, short tales and essays; – understanding and comparing different internal and external cultural aspects of the CPLP (Comunidade dos Países de Língua Portuguesa).	
Content:	1. A brief history of pre-Portuguese Goa and 451 years of Portuguese rule. 2. Indo-Portuguese Literature: identity, concepts and models; 3. Goan literature in Portuguese: first texts from 16th Century to 19th century. 4. Personalities who made an invaluable contribution. - J.H da Cunha Rivara - Tomás Ribeiro - Mons. Sebastião Rodolfo Dalgado 5. Prose (short stories): - José da Silva Coelho - Laxmanrao Sardessai - Vimala Devi - Epitácio Pais 6. Poetry: 19th & 20th century. - Paulino Dias - Nascimento Mendonça - Mariano Gracias - Adeodato Barreto - Laxmanrao Sardessai - Vimala Devi 7. Drama: - Ananta Rau Sardessai - Xavierito Coelho 8. Goan literature in Portuguese in the 19th & 20th century	4 hours 4 hours 10 hours 6 hours 10 hours 8 hours 6 hours 12 hours
Pedagogy:	– Lectures – Research and reading of essays about different issues concerning Indo-Portuguese Literature in Portuguese. – Reading of selected novels and poems.	
References/Readings	– Dias, Filinto Cristo, *Esboço da História da Literatura Indo-Portuguesa*, by Bastorá-Goa, Tipografia Rangel, 1963.	

Other sources	– Devi, Vimala & Seabra, Manuel, *A Literatura Indo-Portuguesa*, Lisboa, Junta de Investigações do Ultramar, 1971, 2 vols. – Miranda, Eufemiano de Jesus, *Oriente e Ocidente na Literatura Portuguesa,* Goa, 1556, Panjim, 2012 – *Dicionário de Literatura Goesa*, by Manuel da Costa, A., Macau, Instituto Cultural de Macau & Fundação Oriente; – Cunha, António Maria da, *A Índia Antiga e Moderna*, Nova Goa, 1935. – Pope, Ethel M., *India in Portuguese Literature*, New Delhi, Asian Educational Series, 1989. – Said, Eduard, *Orientalismo*, Lisboa, Cotovia, 2003	
Learning Outcomes	At the end of this course students will have gained knowledge of: concepts, varieties and diversification of social and cultural aspects among Portuguese Speaking Countries; the most characteristic aspects of the cultures of the Portuguese Speaking Countries and Regions; literary works produced by Goans in Portuguese Language.	

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Course Code: **DSCC-PRC-07**
Title of the Course: BRAZILIAN LITERATURE
(Literatura Brasileira)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objective:	– to read, understand and discuss literary texts produced by Brazilian writers in different contexts such as novels, short tales and poems; – to identify the characteristics of each historical period and literary current in the texts as well as the consequences of past events in the present time. – to develop a critical understanding of literary and theoretical texts and essays and the history of Brazilian Literature. – to understand and compare different internal and external cultural aspects of Brazil as a member of the CPLP (Comunidade dos Países de Língua Portuguesa).	
Content:	1. Introduction to the History of Brazil;	6 hours

	2. History of Brazilian Literature: the colonial period; 3. Barroco e Arcadismo 4. Romantismo e Realismo; Independence and identity; 5. Modernism and Postmodernism; 6. Contemporary trends.	4 hours 10 hours 14 hours 14 hours 12 hours
Pedagogy:	– Lectures – Research and reading of essays about different issues concerning the History of Brazil and Brazilian Literature. – Presentation of material by the teacher. – Reading of selected literary texts (functional, recreational, analytical e critical). – Audio-visual comprehension exercises. – Oral and written questions and commentaries (Taking into account the following stages: planning, drafting and revision). – Research and reading of essays about different issues concerning Brazilian Literature – Reading of poems and texts in prose – Each student will be asked to do a 30-minute presentation on a given novel, covering the main themes and characteristics that permeate the text, the historical and social context in which it was written as well as their personal impressions.	
References/Readings **Other sources**	– Moisés, Massaud, *A Literatura Brasileira Através dos Textos,* Cultrix, São Paulo, 2012 – Bosi, Alfredo, *História Concisa da Literatura Brasileira,* Cultrix, São Paulo, 2006 – Trigo, Salvato, *Ensaios de Literatura Comparada Afro-Luso-Brasileira*, Vega, Lisboa, 1985 – Neves, João Alves das*, As Relações Literárias de Portugal com o Brasil,* ICALP, Lisboa, 1992 – Schwarcz, L. M., & Starling, H. M. M. (2015). Brasil: uma biografia. São Paulo: Companhia das Letras.	
Learning Outcomes	At the end of this course students will have gained knowledge of: concepts, varieties and diversification of social and cultural aspects among Portuguese Speaking Countries; the most characteristic aspects of Brazilian culture; literary works produced in Brazil.	

Course Code: DSCC-PRC-08
Title of the Course: WRITING AND ORAL COMMUNICATION SKILLS
(Técnicas de Expressão Oral e Escrita)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objective:	– understand various types of texts – acquire writing techniques suitable to various types of texts. – understand writing as a medium of communication and various modes of enunciation. – recognize the modalities and the intentionality of the text.	
Content:	1. Communication: - Communicative act – interactive act - Components of the communicative act - Factors depending on the communicative act - Functions of communication 2. Communication and written expression: - Steps in the drafting of a passage: planning; selection; editing; - grammatical aspects of writing: orthography; punctuation, among others; - Principles consisting the text: coherence and cohesion; - Structure of some technical, scientific and administrative texts: summary; report; press note; briefing, commercial letter and others. 3. Text and discourse: - Types of discourses - Heterogeneous texts - Textual types: narrative, descriptive, argumentative, explanatory 4. Modes of enunciation: direct, recorded, reported 5. Norm and Use 6. Varieties and differentiation of spoken languages 7. Oral and written languages	10 hours 10 hours 12 hours 8 hours 8 hours 6 hours 6 hours
Pedagogy:	– Lectures – Presentation of pedagogic material by the teacher. – Writing and production of statements; rework texts (narrative or descriptive) on the same theme with another point of view. – Produce texts of specific formats. – Take notes and summarize.	

References/Readings **Other sources**	The essential bibliography consists of dictionaries, grammars and handbooks in Portuguese. Biblioteca Digital Instituto Camões http://cvc.institutocamoes.pt/conhecer/biblioteca-digital-camoes.html – Porto Editora – Infopédia http://www.infopedia.pt/default.jsp?qsFiltro=14	
Learning Outcomes	At the end of this course students will have gained knowledge to: understand various types of texts; acquire writing techniques suitable to various types of texts.	

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Course Code: DSOC-PRO-01
Title of the Course: MULTIMEDIA AND TECHNICAL TRANSLATION – THEORY AND PRACTICE (Tradução Multimídia e Técnica – Teoria e Prática)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Student must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– To translate scientific and technical texts of various types (eg. academic, industrial, promotional) paying special attention to terminology, phraseology, information structure, register and style from source to target language – to carefully select and make effective use of the multiple resources used by professional translators – to specialize in different areas, i.e., be autonomous learners of specialized languages, with emphasis on personal preferences and interests in a specific scientific and/or technical field – be familiar with the professional subtitling process and the different steps it involves – be able to locate and use the multiple resources available for subtitles on the Internet – practice the language and technical skills needed to subtitle an audio-visual programme	

Content:	1. Theory of Technical Translation: specificity of technical translation; referential, terminological, pragmatic and textual equivalences. 2. The translator as the producer of texts. 3. Scientific and technical translation. 4. The semiotics of audio-visual texts. 5. Audio-visual translation for TV, cinema and DVD: subtitling, dubbing, voice-over, simultaneous interpreting for TV.	12 hrs 12 hrs 12 hrs 12 hrs 12 hrs
Pedagogy:	– In-class work will be based on different text types (e.g., academic articles, abstracts, reports). The guided discovery on how to deal with these translation projects, from the pre-translation and research phase to the production and post-translation phase, will then serve as a model for students' own projects in other fields. – Translation exercises from various types of texts. – Audio-visuals documents for simultaneous translation. – Subtitling an audio-visual programme. – Students' individual projects may comprise an extended translation assignment on a specialized topic of their own choice as well as the making of specialized comparable corpora and a glossary with the help of Linguistic Corpus (Corpógrafo).	
References/Readings **Other sources**	– Vilela, Mário. (1994), *Tradução e Análise Contrastiva: Teoria e Aplicação*, Lisboa, Caminho, 1994. – Snell-Homby, Mary;*Translation Studies. An Integrated Approach*, John Benjamins, 1988 – Gentzler, Edwin; *Contemporary Translation Theories*, Routledge, 1993 – Diaz Cintas, Jorge and Aloine Remael; *Audiovisual Translation: Subtitling*, Manchester: St.Jerome Publishing, 2007. – Hartley, P.,(1992), *Manual Multilingue de Correspondência Comercial*, Lisboa, edições CETOP – Franco, A. C. (1997)"Cultura, Língua, Sociedade, Tradução.". *In: Atas das III Jornadas de Tradução: Tradução, Cultura, Sociedade*. Porto: ISAI. – Santos, A. N., (1997), *Novos Dicionários de Expressões Idiomáticas,* Lisboa, Edições João Sá da Costa.	

	– Baker, Mona (1992), *In Other Words: A Course book on Translation*. London and New York: Routledge. – Subtitling Workshop	
Learning Outcomes	At the end of this course students will be able to: translate from and to Portuguese various types of scientific and technical texts paying special attention to terminology, phraseology, information structure, register and style; select and make effective use of the multiple resources used by professional translators; be familiar with the professional subtitling process and the different steps it involves; locate and use the multiple resources available for subtitles on the Internet; produce adequate inter-lingual subtitles of an audio-visual programme on the basis of its purpose, type and audience.	

Course Code: DSOC-PRO-02
Title of the Course: APPLICATION OF WRITING TECHNIQUES (Práticas de Escrita)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– To develop written skills on various types of texts: academic texts, legal and multipurpose texts, journalistic, diary and personal writing. – To strengthen and deepen the knowledge of the student in writing, following the sentence structure and its main parts (word, accentuation, punctuation and paragraph), the grammatical and linguistic rules, keeping in view the stylistics and functional pragmatic aspects of the language. – To develop language knowledge of grammatical, discursive and lexical structures and social and cultural competences in order to interact in specific social and professional contexts.	
Contents:	1. Short narrative texts (action reports, activities, experiences).	12 hrs 12 hrs

	2. Short descriptive texts (descriptions of people, places, reactions, habits, plans and preparations); comics, subtitles. 3. Biographies (short) - The epistolary and diary genre; vacation postcards, e-mails, invitations. 4. News and other informative texts (interviews, reports and opinion articles). 5. Menus, recipes, instruction books; Reports, schemes, tables. 6. Summaries, minutes of meetings, invitations, notices, notes and messages. 7. Formal registration letters, requests, forms	8 hrs 8 hrs 8 hrs 6 hrs 6 hrs
Pedagogy:	– Writing practice taking into account: the specificity of the text, the theme and communicative intentionality, the recipient and the type of text. – Answering questionnaires. – Produce original statements of dialogical, narrative, descriptive, injunctive or expository sequences. – Produce texts of a specific format. – Summarise texts and construct a self-dictionary.	
References/Readings **Other sources**	– Norton, C. (2001). *Os Mecanismos da Escrita Criativa*. Lisboa, Temas e Debates. – Nascimento, Zacarias & Pinto, José Manuel de Castro (2005). *A Dinâmica da Escrita.* Lisboa, Plátano Editora. – Eco, U. (1991). *Como se Faz uma Tese em Ciências Humanas* (5a ed.). Lisboa, Editorial Presença. – Almeida, L. S. de. (2017). *Como escrever (Tudo) em português correto: Dicas E conselhos práticos para escrever 20 tipos de texto*. Manuscrito. – Sequeira Arminda Sá Moreira B. (2013). *Correspondência em Português: Comunique de Forma Eficiente*. Porto Editora. – Monteiro, Deolinda & Pessoa, Beatriz (1993) *Guia Prático dos Verbos Portugueses*, ed. 2002, Lisboa: Lidel. – Caseiro, Manuela & Ventura, Helena (2011) *Guia Prático de Verbos com Preposições*, Lisboa: Lidel. – Biblioteca Digital Instituto Camões	

	http://cvc.institutocamoes.pt/conhecer/biblioteca-digital camoes.html – CPLP - Comunidade dos Países de Língua Portuguesa http://www.cplp.org – Porto Editora - Infopédia http://www.infopedia.pt/default.jsp?qsFiltro=14	
Learning Outcomes	At the end of this Course the students will be able to: fill forms and responding to simple questionnaires; produce biographical texts; write texts reporting events and personal experiences with descriptions; produce fiction and non-fiction narratives incorporating detailed descriptions; present, in writing, ideas clearly and concisely, avoiding ambiguity or redundancy.	

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Course Code: DSOC-PRO-03
Title of the Course: INTRODUCTION TO PORTUGUESE CULTURE
(Introdução à Cultura Portuguesa)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objective:	– To understand and compare different aspects, internal and external, of Portuguese culture; their relation with the rest of the world, and in particular with the European Community. – acquainted with the main cultural, artistic and civilizational manifestation in Portugal in contemporary times. – To understand cultural manifestations of modern times with relation to Portuguese historical heritage. – To synthesize new and contemporary values emerging after 25th April 1974 and followed by its European integration. – To understand the promotion of good relationships among peoples and the intercultural dialogue. – To identify the main protagonists, works and events that marked Portuguese culture in the last 50 years.	

Content:	1. Introduction: Geography and Population; the genesis of the Portuguese nation: territory, foundation of the kingdom and settlement. 2. Humanism and the Renaissance in Portugal at the time of the Discoveries. 3. The Iberianism and the Restoration; the myths of sebastianism and the Fifth Empire. 4. Enlightened Despotism and the Pombaline reforms. 5. The French invasion; the Romanticism and the liberalism in Portugal; absolutist monarchy, the Human Rights and the new Constitution. 6. The 70's generation and other political-cultural quarrels at the end of the 19th century. 7. The 20th Century Portugal: State and Politics 8. Portugal as a European Nation: the geo-political aspects and the external politics. 9. The society and its values: the social and the cultural values; the myths and the identity; Being Portuguese. 10. Contemporary representations of Portuguese culture: Language, Literature, Art, Science and other important features and artistic events.	8 hours 6 hours 6 hours 4 hours 6 hours 6 hours 6 hours 6 hours 6 hours 6 hours
Pedagogy:	– Lectures – Research and reading of essays about different issues concerning the History of Portuguese Culture. – Presentation of material by the teacher. – Reading of selected texts. – Audio-visual inputs on Portuguese Culture	
References/Readings **Other sources**	– Reis, A., (Coord.), (2007), *Retrato de Portugal – Factos e Acontecimentos*, Lisboa, Temas e Debates – Melo, A., (2007), *Arte e Artistas em Portugal*, Lisboa, Bertrand Editora. – Telo, António J., (2007), *História Contemporânea de Portugal,* vol 1, Lisboa, Editorial Presença. – Mourão, Alda & Rodrigues, M.F. (2017), *História e Cultura Portuguesas para alunos de PLE.* Macau, Instituto Politécnico de Macau. – Saraiva, A.J., (1985) *A Cultura em Portugal – Teoria e História, livro I (Introdução Geral),* Lisboa, Bertrand Editora.	

	– Lourenço, Eduardo. *O Labirinto da Saudade.* pp.117-159. – Pinto, António Costa, *Portugal Contemporâneo*, D.Quixote, 2000 – Sousa Santos, Boaventura, *Pela Mão de Alice*, Porto, Edições Afrontamento, 1994 – Martins, Guilherme Oliveira, *Portugal, Institutions and Facts,* Lisboa, 1991 – Ribeiro, Orlando, *Introduções Geográficas à História de Portugal*, Lisboa, 2001 – Brito, Raquel Soeiro de, *Portugal, Perfil Geográfico*, Lisboa, 1997 – *História de Portugal* (3 Vols), by A. Oliveira Marques, Lisboa, 1990 – *Dicionário da História de Portugal* (5 Vols.), by José Mattoso, 1985 – *Dicionário da Literatura Portuguesa*, by José Pedro Machado, Lisboa 1987	
Learning Outcomes	At the end of this course students will have gained knowledge of: the distinct periods of evolution of Portuguese culture and the contemporary trends; the most important characteristics of Portuguese culture.	

Course Code: DSOC-PRO-04
Title of the Course: DIDACTICS & METHODOLOGY OF TEACHING PORTUGUESE AS A FOREIGN LANGUAGE
(Didática & Metodologia do Ensino de Português Língua Estrangeira)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objective:	– To acquaint with the evolution of the teaching – learning process of languages. – To identify linguistic theories applied to the teaching of foreign languages.	

	– To study the theory and practical work that forms the basis of different methodologies used in the teaching of foreign languages. – To understand the social, psycho-cognitive, technical factors that influence the teaching–learning process of languages. – To use new methodologies in the teaching of foreign languages adapted to the Indian context.	
Content:	1. Teaching-Learning Process: definition and characterization. 2. Skills and Teaching Competence. 3. Formulation of Aims and Objectives in the Teaching-Learning Process. 4. Evaluation: Testing of the pre-requisites, Continuous, Final. 5. Linguistic theories and methodologies of teaching languages. 6. Study of the language as mother tongue and as foreign language. 7. The stages of the units taught. 8. Planning and evaluation. 9. Audio-visuals and new technologies in the teaching of languages. 10. From communicative approach to tasks based learning.	4 hours 6 hours 8 hours 6 hours 6 hours 6 hours 6 hours 6 hours 6 hours 6 hours
Pedagogy:	– Lectures. – Research and reading of essays about different issues concerning the Teaching-Learning Process. – Presentation of material by the teacher. – Reading of selected texts (functional, recreational, analytical e critical). – Audio-visual comprehension exercises. – Oral and written questions and commentaries (Taking into account the following stages: planning, drafting and revision). – Preparation for research activities. – Lesson Planning and Practical teaching.	
References/Readings	– AAVV., (2000), *Didáctica da Língua e da Literatura,* Coimbra, Almedina.	

Other sources	– Guislan, G., (1990), *Didáctica e Comunicação,* Porto, Edições Asa. – Carvalho, Rómulo de, (1985), *A História do Ensino em Portugal,* Lisboa, Fundação Calouste Gulbenkian – Faria, I.H., (Org.)(1996), *Introdução à Linguística Geral e Portuguesa,* Lisboa, Caminho – Fonseca, F. I., (Org.) (2001), *A Linguística na formação do professor de Português,* Porto, CLUP. – Pedro, E.R. (1992), *O Discurso na Aula,* Lisboa, Caminho. – O Ensino-Aprendizagem do Português. Teoria e Práticas, Braga, Universidade do Minho. – Cerroloza, M (1999), *Cómo Trabajar con Libros de Texto,* Madrid, Edelsa GD – Willis, J., (1996), *A Framework for Task-based Learning,* Cambridge, Cambridge University Press. – Ellis, R., (1997), *The Second Language Acquisition*, Oxford, Oxford University Press.	
Learning Outcomes	At the end of this course students will have gained knowledge of: the theory and practical work that forms the basis of different methodologies used in the teaching of foreign languages.	

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Course Code: DSOC-PRO-05
Title of the Course: ADVANCED WRITING SKILLS
(Práticas de Escrita Avançada)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objective:	– To develop written skills on various types of texts: academic texts, legal and multipurpose texts, journalistic, diary and personal writing. – To strengthen and deepen the knowledge of the student in writing, following the sentence structure and its main parts (word, accentuation, punctuation and paragraph), the grammatical and linguistic rules,	

	keeping in view the stylistics and functional pragmatic aspects of the language. – To develop language knowledge of grammatical, discursive and lexical structures and social and cultural competences in order to interact in specific social and professional contexts.	
Content:	1. Narrative structure and the conversation flows; interviews, the lines of the dramatic text. 2. News, reports, accounts. Biographies (excerpts), diaries, letters of informal record (consolidation) 3. The descriptive structure; application forms, school forms, encyclopaedias, maps, summaries, reports, diaries, biographies. 4. The injunctive structure; notices, circulars, invitations, instructions for use (on product labels and packaging) 5. The argumentative structure; advertising texts, opinion articles (current affairs and topics of interest: sports, travel / leisure, cultural events...) 6. The expository structure; informative / expository texts from various sources (textbooks, curriculum, magazines on current affairs), scientific and technical articles (excerpts). 7. The literary text (brief notions); prose, poetry and theatre. Formal aspects of literary genres: short stories, biographies, dramatic text, lyric text.	8 hrs 8 hrs 8 hrs 8 hrs 10 hrs 10 hrs 8 hrs
Pedagogy:	– Lectures – Presentation of pedagogic material by the teacher. – Writing and production of statements; rework texts (narrative or descriptive) on the same theme with another point of view. – Produce texts of specific formats. – Take notes and summarize.	
References/Readings **Other sources**	– Norton, C. (2001). *Os Mecanismos da Escrita Criativa*. Lisboa, Temas e Debates. – Nascimento, Zacarias & Pinto, José Manuel de Castro (2005). *A Dinâmica da Escrita.* Lisboa, Plátano Editora. – Eco, U. (1991). *Como se Faz uma Tese em Ciências Humanas* (5a ed.). Lisboa, Editorial Presença. – Almeida, L. S. de. (2017). *Como escrever (Tudo) em Português Correto: Dicas E conselhos práticos para*	

	escrever 20 tipos de texto. Manuscrito. – Monteiro, Deolinda & Pessoa, Beatriz (1993) *Guia Prático dos Verbos Portugueses*, ed. 2002, Lisboa: Lidel. – Caseiro, Manuela & Ventura, Helena (2011) *Guia Prático de Verbos com Preposições*, Lisboa: Lidel. – Biblioteca Digital Instituto Camões http://cvc.institutocamoes.pt/conhecer/biblioteca-digital camoes.html – CPLP - Comunidade dos Países de Língua Portuguesa http://www.cplp.org – Porto Editora - Infopédia http://www.infopedia.pt/default.jsp?qsFiltro=14	
Learning Outcomes	At the end of this Course the students: will be able to respond to questionnaires making a good interpretation of texts based on their world knowledge; rewrite texts following texts pattern, expressing different points of view; will have the ability to summarise texts; write texts with narrative, descriptive, argumentative and explicative structures; write texts of various type (summaries, convocations, minutes and technical or scientific reports); present in writing, ideas clearly and concisely, avoiding ambiguity or redundancy.	

Course Code: DSOC-PRO-06
Title of the Course: LITERARY TRANSLATION
(Tradução Literária)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Students must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– To be introduced to the theory and practice of translating literature, with emphasis on short fiction, drama and poetry – To learn about different approaches to literary translation as well as a variety of techniques and strategies used by literary translators in their works – To read and discuss different translations of the same literary work by comparing excerpts	

	– To explore and develop stylistic and creative skills through practice in literary translation – To reflect on translatability, fidelity, invisibility and power relations affecting the translation – process.	
Content:	1. What is Literary Translation? 2. Introduction to the history of Literary Translation 3. Translation theory: (in)fidelity and the translator's (in)visibility 4. Language and Style in Literary Translation 5. Special problems in Literary Translation 6. Sociocultural elements in Literary Translation 7. Translating prose 8. Translating drama 9. Translating poetry	4 hours 4 hours 12 hours 4 hours 4 hours 4 hours 12 hours 4 hours 12 hours
Pedagogy:	– Lectures – Presentation of pedagogic material by the teacher – Reading of literary works in Portuguese and different translations to English of the same texts – Translation of selected texts and excerpts from Portuguese to English and their native languages – Comparison of texts and justification of choices – Writing and production of statements; rework texts (narrative or descriptive) on the same theme with another point of view – Production of texts in specific formats – Taking notes and summarising – Oral presentations by the students	
References/Readings **Other sources**	– Arrojo, Rosemary. A tradução passada a limpo e a visibilidade do tradutor , Trabalhos em Linguística Aplicada: v. 19 (1992). – Landers, Clifford. Literary Translation: A Practical Guide, Cromwell Press Ltd. England. Part I. Fundamentals, 2001. – Landers, Clifford. Literary Translation: A Practical Guide, Cromwell Press Ltd. England. Part II. Techniques, 2001. – Lefevere, André. Translating Literature: Practice and Theory in a Comparative Literature Context, New	

	York: The Modern Language Association of America, 1992 (160 p.). – Venuti, Lawrence. The Translator's Invisibility: A History of Translation. London and New York: Routledge, 2007. – Campos, Haroldo. "Da tradução como criação e como crítica". In: Metalinguagem & Outras Metas. São Paulo: Perspectiva, 2006. – Castro, Olga; ERGUN, Emek (orgs.). Feminist translation studies: Local and transnational perspectives. London: Routledge, 2017. – Cesar, Ana Cristina. Crítica e tradução. São Paulo: Companhia das Letras, 2016. – Faleiros, Álvaro. Traduzir o poema. São Paulo: Ateliê Editorial, 2012. – Galindo, Caetano W.; Costa, Walter Carlos. *Paulo Henriques Britto: Entrevista*. Curitiba: Medusa, 2019. 168 p. – Meschonnic, Henri. Poética do traduzir. Trad. Jerusa Pires Ferreira e Suely Fenerich. São Paulo: Perspectiva, 2010. – Paes, José Paulo. Tradução: a ponte necessária – aspectos e problemas na arte de traduzir. São Paulo: Editora Ática, 1990. – Paz, Octavio. Tradução: Literatura e literalidade. Belo Horizonte: FALE/UFMG, 2009.	
Learning Outcomes	At the end of this Course the students will be able to: Compare original literary texts in Portuguese and their translated versions assessing their qualities and areas to improve; familiarize themselves with basic translation theories and practice, the most usual problems that appear in literary translation, as well as techniques and strategies; learn to adequately use dictionaries and other materials, as well as make use of various sources that will contribute to their future translation work.	

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Course Code: DSOC-PRO-07
Title of the Course: AFRICAN LITERATURE IN PORTUGUESE
(Literatura Africana em Língua Portuguesa)
Number of Credits: 4
Effective from AY: 2022-23

Prerequisites for the course:	Student must register for the M.A. Portuguese program with a B.A in Portuguese or a Bachelor degree in any discipline having cleared the ranking test.	
Objectives:	– reading, understanding and discussing literary texts produced by African writers in different contexts such as novels, short tales. – understanding and comparing different internal and external cultural aspects of the CPLP (Comunidade dos Países de Língua Portuguesa)	
Content:	1. Introduction to the Cultures of the PALOPs; 2. Language and Literature in Africa: issues and contexts; 3. African Literature in Portuguese: identity and models; 4. Emerging African Literatures in Portuguese: formation and evolution in Angola, Mozambique, Cabo Verde, Guiné-Bissau and São Tomé e Príncipe; 5. Prose 6. Poetry and Drama	6 hours 6 hours 8 hours 12 hours 14 hours 14 hours
Pedagogy:	– Lectures – Research and reading of essays on different issues concerning African Literature in Portuguese. – Presentation of material by the teacher. – Reading of selected literary texts (functional, recreational, analytical e critical). – Audio-visual comprehension exercises. – Oral and written questions and commentaries (Taking into account the following stages: planning, drafting and revision). – Preparation for research activities. – Reading of poems and texts in prose: Reading of novels and poems: 1.Terra Morta, Castro Soromenho; 2. A Vida Verdadeira de Domingos Xavier, Luandino Vieira; 3. Regresso Adiado, Manuel Rui; 4. Jaime Bunda e a Morte do Americano, Pepetela; 5. Nós Matámos o Cão Tinhoso, Luís Bernardo Honwana; 6. A Varanda do Frangipani, Mia Couto; 7. O Testamento do Sr. Nepumoceno da Silva Araújo, Germano de Almeida; 8. Antologia Temática da Poesia Africana, Mário de Andrade.	
References/Readings	– Ferreira, Manuel, *Literaturas Africanas de Expressão Portuguesa* (2 Vols.), ICALP, Lisboa,1977	

Other sources	– Laranjeira, Pires, *Literaturas Africanas de Expressão Portuguesa*, Universidade Aberta, Lisboa,1995 – Laranjeira, Pires, *Ensaios Afro Literários*, Novo Imbondeiro, Lisboa, Coimbra, 2001 – Salinas Portugal, Francisco, *Entre Próspero e Caliban*, Edicions Laiovento, Galiza, 1999. – Ki-Zerbo, *História de Africa*, D. Quixote, Lisboa, 1990 – Laranjeira, Pires, *A Negritude Africana de Língua Portuguesa*, Porto, 1995 – Laranjeira, Pires, *Estudos sobre Literaturas das Nações Africanas de Língua Portuguesa*, Lisboa,1980 – Mata, Inocência*, Literatura Angolana: Silêncios e Falas de Uma Voz Inquieta*, Lisboa, 2001 – Trigo, Salvato, *Ensaios de Literatura Comparada Afro-Luso-Brasileira*, Vega, Lisboa, 1985 – *Dicionário de Literaturas Africanas de Língua Portuguesa*, Caminho, Lisboa, 1998	
Learning Outcomes	At the end of this course students will have gained knowledge of: concepts, varieties and diversification of social and cultural aspects among Portuguese Speaking Countries; the most characteristic aspects of the cultures of the African Portuguese Speaking Countries; literary works produced in Angola, Moçambique, Cabo Verde, Guiné-Bissau and São Tomé e Príncipe.	

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D 3.25 Minutes of the Board of Studies in Data Science meeting held on 26.07.2022.

Annexure I

Integrated B.Sc. (Data science), M.Sc. (Computer Science/Data Science/ Decision Science/Economics): Programme Structure

Semester I	**Credits**	**Semester II**	**Credits**
IMC 101: Management Concepts and Organisational Behaviour	4	Business Analytics	2
IMC 102: Environmental Studies	4	Microeconomics	4
IMC 103: Probability and Statistics - I	4	Linear Algebra	4
IMC 104: Programming in Python	6	Algorithms and Data Structures	6
IMC 105: Soft Skills - I	2	Probability and Statistics - II	4
IMC 106: Perspective Building Course - I	2	Soft Skills - II	2
	22		22
Semester III	**Credits**	**Semester IV**	**Credits**
Marketing Analysis	4	Machine Learning	6
Deductive and Inferential Mathematics	4	Data Modelling and Visualization	4
Macroeconomics	4	Linear Programming & Optimization	4
Database Management Systems	6	Econometrics I	4
Soft Skills - III	2	Soft Skills - IV	2
Perspective Building Course - II	2	Perspective Building Course - III	2
	22		22
Semester V	**Credits**	**Semester VI ***	**Credits**
Computer Organization & Operating Systems	6	Domain	12
Programming in C	6	Electives	14
Data Science Toolkit	4		

Strategic Management	4		
Econometrics II	4		
Perspective Building course - IV	2		
	26		26
Semester VII	**Credits**	**Semester VIII**	**Credits**
Discipline	24	Discipline	24
Semester IX *	**Credits**	**Semester X**	**Credits**
Discipline	16	Project/Dissertation/Optionals	16
Total Credits (5 years) = *220*			

* semester includes an audited internship .

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Programme: B.Sc., MSc (Computer Science/ Data Science/ Decision Science/ Economics) Course Code:IMC 101

Title of the Course: Management Concepts and Organisational Behaviour

Number of Credits: 4 Total Contact Hours: 48

Effective from AY: 2020-21

Prerequisites for the course:	Same as programme pre-requisites	
Objective:	At the end of the course, the student should have the ability to understand managerial processes and have the competence to deal with people at work-place	
Content:	Management Science: basic concepts and its role in decision making: Planning, organizing, staffing, leading and controlling. Organization Structure and Design: Role in Individual and Interpersonal behavior at work-place Introduction to Determinants of Individual Behaviour: Perception, Personality, Attitudes, , learning, Self-Concepts ; Theories/ Models for understanding these determinants Fundamentals of Interpersonal Behaviour: Group Dynamics, Tools for Interpersonal Analysis, Fundamentals of Leadership and Motivation and their application, Theories/ Models/ Styles Organizational Change and Development; Models of Change; Organizational Climate and Culture; Conflict, and Negotiations. Power and Politics in Organization.	8 hours 4 hours 15 hours 15 hours 6 hours
Pedagogy:	Lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study/ Case Studies etc. or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.	

Learning Outcomes The participant will be able to understand people's behavior at work-place, and take managerial decisions

References/ Readings	1. Weihrich, Heinz and Harold Koontz; 'Essentials of Management: An International Perspective'; McGraw–Hill, Inc.; 10th edition, 2015 2. Robbins, Stephen and Mary Coulter; 'Fundamentals of Management'; Prentice Hall of India Pvt. Ltd.; New Delhi; 9th edition, 2018 3. Luthans, Fred; 'Organizational Behavior'; McGraw– Hill, Inc, 12th edition, 2017 4. Robbins, Stephen P; 'Essentials of Organizational Behavior'; Pearson Education India, 18th edition, 2018.	

Programme: B.Sc., MSc (Computer Science/ Data Science/ Decision Science/ Economics) Course Code:IMC 102

Title of the Course: Environmental Studies (as approved for other programmes) **Number of Credits: 4**

Effective from AY: 2020-21

Programme: B.Sc., MSc (Computer Science/ Data Science/ Decision Science/ Economics) Course Code:IMC 103

Title of the Course: Probability and Statistics - I

Number of Credits: 4 Total Contact Hours: 48 Effective from AY: 2020-21

Prerequisites for the course:	Same as programme pre-requisites	
Objectives:	This course aims to introduce the basic concepts of probability theory	
Content:	**Module** **1:** Experiments and sample spaces, events, algebra of events, probability axioms, conditional probability, independence of events, mutually exclusive events. Bayes theorem. **2:** One dimensional random variable: discrete and continuous random variable, characteristics of distributions, cumulative distribution function, functions of one random variable. **3:** Two dimensional random variable: marginal and conditional distributions, conditional expectation independence. **4**: Covariance and correlation. Understanding linkages, visualizing **5**. Discrete distributions: Bernoulli, Binomial, Poisson	12 hours 12 hours 12 hours 5 hours 7 hours

Pedagogy:	Lectures/ tutorials/assignments/self-study	
References/Readings	1. William W. Hines and Douglas C. Montgomery, Probability and Statistics in Engineering and Management Science, Wiley India Pvt. Ltd., 2003 2. T.Veerarajan, Probability, Statistics and Random Processes, Tata McGraw Hill Pub. Co. Ltd., 2009	
Learning Outcomes	Upon successful completion of this course, students will have a good understanding of elementary probability	

Programme: B.Sc., MSc (Computer Science/ Data Science/ Decision Science/ Economics)
Course Code:IMC 104
Title of the Course: Programming in Python
Number of Credits: 6 (4 L + 2 P) Total Contact Hours: 48L+48P Effective from AY: 2020-21

Prerequisites for the course	Same as programme pre-requisites	
Objectives:	The aim of the course is to provide an exposure to solve common computing problems through programming using Python language. The course is designed with a lab component to give the student hands-on experience of the basic concepts of programming.	

Content:	Introduction to computer systems and data representation: Functional units of a Computer, Characteristics of a Computer, Data representation and Storage,Evolution of Programming Languages, Compilation and Interpretation, Structured and Procedural Programming languages	3 hours
	The Problem Solving Process: – Requirement Analysis, Algorithmic Construction, Identifying Test Cases, Desk Checking, Implementation, Testing and maintenance issues, Data verification and validation.	4 hours
	Python Programming Environment: Python overview, Structure of Python program, character Set, variable declarations and data types, Program Statements, Types of Instructions, Expression Evaluation rules, Type Conversions. Managing I/O operations	4 hours
	Selection and Iterative Constructs :Writing conditions, IF-ELSE constructs Conditional operators, SWITCH ,WHILE and FOR loops, Use of BREAK and CONTINUE statements. Nested Loops	9 hours
	Advance Data types: Lists, Tuples, Set, Dictionaries, Strings, Unicode, formatting strings, docString. Searching and sorting algorithms without using library functions.	6 hours
	Modular Programming: Importance of User Defined Functions, Hierarchy charts, fan-in/out, cohesion and coupling and loosely coupled modules. Fan-in – Fan-out concepts.	5 hours

	User Defined Functions: Local and Global Variables, Scoping Rules, Parameters & arguments. Function with variable arguments. Modules, packages, scope. Recursion & Recursive Functions. Recursive v/s Iterative Functions.	7 hours
	Custom Data Types and File Management: Object of a Class and basic concept of classes & OOP, Files, Exceptions in file handling.	4 hours
	Introduction to Packages: Python packages for plotting, mathematical computation & linear regression.	6 hours
Pedagogy:		

	Lectures/Practical/ tutorials/assignments/self-study.	
References/Readings	1. Taneja Sheetal, Kumar Naveen , —Python Programming - A modular approach, Pearson 2017 2. Guttag John V., —Introduction to Computation and Programming using Python, MIT Press, 2nd Edition 2016. 3. Maureen Sprankle, Jim Hubbard — Problem Solving and Programming Concepts, Pearson, 9th Edition 2012	
Learning Outcomes	Upon successful completion of the course, a student will be able to: ● Analyze a given problem and develop a Python program to solve it. ● Identify test cases for a given problem. ● Understand, test, trace programs written in Python language. ● Working with python Standard Libraries	

Suggested Lab Assignments:

Introduction to UNIX environment- Introduction to Fedora/Ubuntu, Basic directory and file handling commands, Editor (vi editor), man pages, installation of Python and Jupyter notebook.

Programs using decision control, branch and loop control structure

1. Program to find the largest of three numbers
2. Program to print the reverse of a given number.
3. Program to check whether a given number is Armstrong or not
4. Program to print the prime numbers from 2 to n, where n is an input given by the user.
5. Program to print the patterns.

Programs using List, Set, Tuple, Dictionary & Strings

6. Program to find the largest and smallest number in a list of integers (without using library function).

7. Program to sort a given integer list in ascending order(without using library function). 8. Program to print the sum and average of the elements of the list(without using library function).

9. Program to find the duplicate elements in the list(without using library function). 10. Program to reverse a given string and check whether it is palindrome (without using library function).

11. Program to read a string and count the number of vowels in it.
12. Program to concatenate two strings without using library functions
13. Program to arrange the list of names in alphabetical order.
14. Program to find the union, interaction and difference between two sets. 15.

Program to take a sentence as an input from the user and compute the frequency of each letter. Make use of dictionary type to maintain the count.

Programs using functions & Recursion.

16. Write functions for addition, subtraction and multiplication of two matrices. Each function has two matrices as parameters and returns the result.
17. Program to print the Fibonacci series using recursion.
18. Program to find the GCD of two numbers using recursion.
19. Program to solve Tower of Hanoi

Programs user-defined data types & file handling

20. Program to store the item number, name, rate and quantity of 'n' items in a custom data type, where n is given as input by the user. Display the total value inventory items. 21. Program to store employee details in a Custom data type. The data should include employee ID, name, salary, and date of joining. The date of joining should be stored in a structure. The program should perform the following operations based on a menu selection
    a) Display the details of the employees who have more than 5 years of experience with the company.
    b) Increase the salaries according to the pay scale rules
22. Program to create a custom data type of Student with fields Roll No, Name, course, and Total_Marks. Read the data from the user and store them in a file. Write a function to display the Roll No, name of the student who has secured the highest marks. 23. Program to count the number of characters in a file.
24. Program to search for a particular word in a file.
25. Program to handle various file exceptions.
26. Program to implement linear regression method.
27. Program to plot graphs.

Programme: B.Sc., MSc (Computer Science/ Data Science/ Decision Science/ Economics) Course Code:IMC 105
Title of the Course: Soft Skills: Oral Communication

Number of Credits: 2 Total Contact Hours: 24 Effective from AY: 2020-21

Prerequisites for the course:	Same as programme pre-requisites	
Objective:	To introduce the essentials of effective communication in different contexts	

Content:	Difference between formal and informal communication; Communication process, types, Effectiveness in communication – the Roles of Sender, Receiver and the medium; Role of culture in communication; cross cultural communication; Non Verbal Communication – aspects and importance. Oral Communication: Skills required for effective interpersonal and group communication, Effective Public speaking. Noise in communication and its prevention. Barriers and Gateways in Communication;	12 hours 12 hours
Pedagogy:	Lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study/ Case Studies etc. or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.	
Learning Outcomes	The participant will be able to facilitate interpersonal Communication, participate in group discussions, and to write effectively.	

References/ Readings

1. Business and Professional Communication by Kelly M. Quintanilla and Shawn T. Wahl, 2018, Sage Publications 2. Effective Business Communication by Anjanee Sethi ,Bhavna Adhikari, 2009; Tata MacGraw Hill Education, India. 3. How to be a Great Communicator in Person, On Paper, and on Podiumby Nido Qubein, 2008; Viva Books, India

Programme: B.Sc., MSc (Computer Science/ Data Science/ Decision Science/ Economics)

Course Code:IMC 106
Title of the Course: Perspective Building: Film Appreciation

Number of Credits: 2 Total Contact Hours: 24 Effective from AY: 2020-21

Prerequisites for the course	Same as programme pre-requisites	
Objective:	To help the participants appreciate cinema (national and international) as having its own distinct language and philosophy, the way it stimulates people, and helps in making sense of the world.	

Content:	**Approaches to Films** Document, Documentary and Narratives; Thought Orientation in Films; Text, Context and Non-Text **Film and Other Art Forms** Photography and Representation; Symbolism and Metaphors; Music, Dance and Drama; Presenting Reality and Fiction **Films and our Minds** Films and Emotions; Imagination; Identifying the Audience (Spectatorship); Communication and Persuasion **Films and Morality** Lessons from Films; Authorship and Copyright; Film Criticism; Evils and Issues – Pornography, Free Will, Laws and Artistic License	7 hours 8 hours 8 hours 7 hours
Pedagogy:	Lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study/ Case Studies etc. or a combination of some of these. Sessions shall be interactive in nature to enable peer group learning.	

Learning Outcomes	After completion of the course, students will develop the ability to 1. Appreciate films as works of art 2. Recognize the impact of films on society 3. Critique films	
References/ Readings	1. Jim Piper (2014) The Film Appreciation Book, 1st Edition; Allworth Publishers, USA 2. Satyajit Ray (2006) Speaking of Films, International Edition Penguin, India 3. Gregory Currie (1995) Image and Mind, Film, Philosophy and Cognitive Science; Cambridge University Press.	

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D 3.26 Minutes of the Board of Studies in Hindi meeting held on 10.05.2022 and 25.07.2022.

Annexure I

SEMESTER-WISE FLOW CHART OF M.A HINDI FROM A.Y. 2022-23 ONWORDS

COURES	CODE	SEMESTER I	SEMESTER II	SEMESTER III	SEMESTER IV	TOTAL CREDIT
Discipline Specific Core Course	**HNDSCC**	1) HNDSCC 301 Linguistics 2) HNDSCC 302 Medieval Poetry: Practical Criticism 3) HNDSCC 303 Indian Poetics 4) HNDSCC 304 Hindi Story & Novel	1) HNDSCC 305 Hindi Language: Script and Grammar 2) HNDSCC 306 Western Poetics 3) HNDSCC 307 Critics and Criticism 4) HNDSCC 308 Drama and Theatre			**32**
Discipline Specific Optional Course	**HNDSOC**	1) HNDSOC 301 History of Hindi Literature (Aadikal, Bhaktikal, Ritikal) 2) HNDSOC 302 Modern Hindi Poetry : Practical Criticism 3) HNDSOC 303 Another form of Modern Prose 4) HNDSOC 304 Study of Special Author: Amritlal Nagar 5) HNDSOC 305 Hindi Memoir Literature (2 credit) 6) HNDSOC 306 Hindi Autobiography Literature (2 credits) 7) HNDSOC 307 Study Tour in Hindi Region (2 credits) 8) HNDSOC 308 Language and Literature: Social and Cultural Survey (2 credit)				**08**

Research Specific Optional Course	**HNRSOC**			1) HNRSOC 301 Research Methodology 2) HNRSOC 302 Academic Writing 3) HNRSOC 303 Comparative Literature 4) HNRSOC 304 Literature : Thought and Philosophy 5) HNRSOC 305 Contemporary Hindi Poetry: Practical Criticism 6) HNRSOC 306 Hindi Prose: Various Discourses		**12**
Optional Generic Course	**HNOGC**			1) HNOGC 301 History of Modern Hindi Poetry 2) HNOGC 302 History of Hindi Prose 3) HNOGC 303 Indian Literature 4) HNOGC 304 Media and Journalism 5) HNOGC 305 Creative Writing 6) HNOGC 306 Functional Hindi 7) HNOGC 307 Folk Literature 8) HNOGC 308 Translation 9) HNOGC 309 Post Modern Discourse		**12**
Discipline Specific Dissertation	**HNDSD**				Dissertation	**16**

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SEMESTER	CODE	COURSE	Annexure II NO. OF CREDITS
		Discipline Specific Core Course	
Semester I	HNDSCC 301	Linguistics/भाषाविज्ञान	**04**
	HNDSCC 302	Medieval Poetry: Practical Criticism/ मध्यकालीन काव्य: व्यावहारिक समीक्षा	**04**
	HNDSCC 303	Indian Poetics/भारतीय काव्यशास्त्र	**04**
	HNDSCC 304	Hindi Story & Novel/हिंदी कथा साहित्य	**04**
Semester II	HNDSCC 305	Hindi Language: Script and Grammar/ हिंदी भाषा: लिपि एवं व्याकरण	**04**
	HNDSCC 306	Western Poetics/ पाश्चात्य काव्यशास्त्र	**04**
	HNDSCC 307	Critics and Criticism/ आलोचक और आलोचना	**04**
	HNDSCC 308	Drama and Theatre/ नाटक एवं रंगमंच	**04**
Discipline Specific Optional Course			
Semester I, II & III	HNDSOC 301	History of Hindi Literature (Aadikal, Bhaktikal, Ritikal)/ हिंदी साहित्य का इतिहास: आदिकाल, भक्तिकाल एवं रीतिकाल	**04**
	HNDSOC 302	Modern Hindi Poetry: Practical Criticism/ आधुनिक हिंदी काव्य: व्यावहारिक समीक्षा	**04**
	HNDSOC 303	Another form of Modern Prose/आधुनिक गद्य की प्रकीर्ण विधाएँ	**04**
	HNDSOC 304	Study of Special Author: Amritlal Nagar/ रचनाकार का विशेष अध्ययन: अमृतलाल नागर	**04**
	HNDSOC 305	Hindi Memoir Literature/हिंदी संस्मरण साहित्य	**02**
	HNDSOC 306	Hindi Autobiography Literature/हिंदी आत्मकथा साहित्य	**02**
	HNDSOC 307	Study Tour in Hindi Region/ हिंदी क्षेत्रों में अध्ययन-यात्रा	**02**
	HNDSOC 308	Language and Literature: Social and Cultural Survey/भाषा और साहित्य: सामाजिक एवं सांस्कृतिक सर्वेक्षण	**02**
Research Specific Optional Course			
SEMESTER III & IV	HNRSOC 301	Research Methodology/शोध प्रविधि	**04**
	HNRSOC 302	Academic Writing/ अकादमिक लेखन	**04**
	HNRSOC 303	Comparative Literature/ तुलनात्मक साहित्य	**04**
	HNRSOC 304	Literature: Thought and Philosophy/ साहित्य: विचार एवं दर्शन	**04**
	HNRSOC 305	Contemporary Hindi Poetry: Practical Criticism/ समकालीन हिंदी कविता: व्यावहारिक समीक्षा	**04**
	HNRSOC 306	Hindi Prose: Various Discourses/ हिंदी गद्य: विविध विमर्श	**04**
		Optional Generic Course	
SEMESTER III	HNOGC 301	History of Modern Hindi Poetry/ आधुनिक हिंदी काव्य का इतिहास	**04**
	HNOGC 302	History of Hindi Prose/हिंदी गद्य का इतिहास	**04**

	HNOGC 303	Indian Literature/भारतीय साहित्य	**04**
	HNOGC 304	Media and Journalism/जनसंचार एवं पत्रकारिता	**04**
	HNOGC 305	Creative Writing/रचनात्मक लेखन	**04**
	HNOGC 306	Functional Hindi/प्रयोजनमूलक हिंदी	**04**
	HNOGC 307	Folk Literature/लोक-साहित्य	**04**
	HNOGC 308	Translation/अनुवाद	**04**
	HNOGC 309	Post Modern Discourse/उत्तर आधुनिक विमर्श	**04**
		Discipline Specific Dissertation	
Semester IV	HNDSD 301	**Dissertation/लघु शोध प्रबंध**	**16**

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Annexure III

गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSCC 301

Title of the course (पाठ्यक्रम का शीर्षक): Linguistics (भाषाविज्ञान)

No. of Credits (क्रेडिट): 04 (60 hours)

Effective from academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	हिंदी भाषा तथा इतिहास की संक्षिप्त जानकारी होना आवश्यक है।	**Hours (घंटे)**
Objectives (उद्देश्य)	• प्रस्तुत पाठ्यक्रम के माध्यम से विद्यार्थियों को भाषा और भाषाविज्ञान के विविध पहलुओं की जानकारी देना है। • भाषा, भाषा का विकास, भाषा की आवश्यकता, ध्वनियों का वर्गीकरण आदि से परिचित कराना। • रूपविज्ञान, अर्थविज्ञान से परिचित कराना। • कोशविज्ञान और कोशों की परंपरा से परिचित कराना।	
Contents (विषय वस्तु)	**1. भाषा और भाषाविज्ञान** • भाषा : परिभाषा, अभिलक्षण और विशेषताएँ • भाषा-उत्पत्ति के सिद्धांत • भाषा और बोली : स्वरूप और अंतर • भाषाओं का वर्गीकरण	10
	2. ध्वनिविज्ञान • वाग्यंत्र : अर्थ और परिचय • स्वर-व्यंजन – वर्गीकरण • स्वनिम : परिभाषा, भेद, संस्वन और वितरण • ध्वनि परिवर्तन : कारण एवं दिशाएँ	12
	3. रूपविज्ञान (पदविज्ञान) • रूपविज्ञान : स्वरूप-विवेचन • रूपिम : परिभाषा एवं भेद • रूपिमिक प्रक्रियाएँ : व्युत्पादन और रूपसाधन • रूपिमों का वितरण • शब्द वर्ग और व्याकरणिक कोटियाँ • रूप परिवर्तन : कारण और दिशाएँ	12
	4. वाक्यविज्ञान • वाक्य और वाक्यविज्ञान : अवधारणा एवं स्वरूप • अभिहितान्वयवाद और अन्विताभिधानवाद • वाक्य के प्रकार	10

	5. अर्थविज्ञान ● अर्थ और अर्थविज्ञान : परिभाषा एवं स्वरूप ● शब्द और अर्थ का संबंध ● अर्थ बोध के साधन और बाधक तत्त्व ● अर्थ निर्णय के साधन ● अर्थ परिवर्तन के कारण एवं दिशाएँ	10
	6. कोशविज्ञान ● शब्दकोश की परंपरा ● कोश निर्माण की प्रक्रिया ● शब्दकोशों के मुख्य प्रकार	6
Pedagogy (अध्यापन विधि)	व्याख्यान, चर्चा, प्रस्तुतीकरण, भाषा प्रयोगशाला, कार्यशाला	
References (संदर्भ ग्रंथ सूची)	1) ख़ान, प्रो॰ इशरत. भाषाविज्ञान – प्रमुख आयाम. अमन प्रकाशन, कानपुर, 1995. 2) झा 'श्याम', डॉ॰ सीताराम. भाषा विज्ञान तथा हिंदी भाषा का वैज्ञानिक विश्लेषण. बिहार हिंदी ग्रंथ अकादमी, पटना, 2015. 3) तिवारी, डॉ॰ भोलानाथ. भाषाविज्ञान. किताब महल, इलाहाबाद, 2014. 4) द्विवेदी, कपिलदेव. भाषाविज्ञान एवं भाषाशास्त्र. विश्वविद्यालय प्रकाशन, वाराणसी, 2019. 5) मिश्र, प्रो॰ नरेश. भाषाविज्ञान और हिंदी भाषा. संजय प्रकाशन, 2009. 6) वर्म्मा, रामचंद्र, कपूर, बदरीनाथ. कोश कला. लोकभारती प्रकाशन, इलाहाबाद, 2007. 7) शर्मा 'ऋषि', उमाशंकर. भाषाविज्ञान की रूपरेखा. चौखंभा क्लासिका, वाराणसी, 2022. 8) शर्मा, देवेंद्रनाथ, शर्मा, दीप्ति. भाषाविज्ञान की भूमिका. राधाकृष्ण प्रकाशन, 2015. 9) शर्मा, रामकिशोर. आधुनिक भाषाविज्ञान के सिद्धांत. लोकभारती प्रकाशन, इलाहाबाद, 2016. 10) शर्मा, रामविलास. ऐतिहासिक भाषाविज्ञान और हिंदी भाषा. राजकमल प्रकाशन, नई दिल्ली, 2017. 11) सक्सेना, बाबूराम. सामान्य भाषाविज्ञान. हिंदी साहित्य सम्मेलन, प्रयाग, 2010. 12) सिंह, कृपाशंकर, सहाय, चतुर्भुज. आधुनिक भाषाविज्ञान. वाणी प्रकाशन, 2008.	
Learning Outcomes (अधिगम परिणाम)	● विद्यार्थी भाषा की उत्पत्ति, अवधारणा और विशेषताओं से अवगत होंगे। ● भाषा, भाषा का विकास, भाषा की आवश्यकता, ध्वनियों का वर्गीकरण आदि से परिचित होंगे। ● रूपविज्ञान, अर्थविज्ञान से परिचित होंगे। ● कोशविज्ञान और कोशों की परंपरा से परिचित होंगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा एवं साहित्य महाशाला

हिंदी अध्ययन शाखा

Programme (कार्यक्रम): M.A. (Hindi) स्नातकोत्तर हिंदी

Course (पाठ्यक्रम): HNDSCC 302

Title of the Course (पाठ्यक्रम का शीर्षक): Medieval Poetry : Practical Criticism (मध्यकालीन काव्य : व्यावहारिक समीक्षा)

No. of Credits (क्रेडिट): 04 (60 Hours)

Effective from Academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	मध्यकालीन कवियों की संक्षिप्त जानकारी अपेक्षित है।	**HOURS (घंटे)**
Objectives (उद्देश्य)	• वर्तमान संदर्भ में भक्तिकालीन काव्य की महत्ता से परिचित कराना। • भक्तिकाल के कवियों से परिचित कराना। • भक्तिकालीन काव्य की भावात्मक एवं वैचारिक चेतना से अवगत कराना। • भक्तिकाल की प्रासंगिकता पर प्रकाश डालना।	
Contents (विषयवस्तु)	मलिक मुहम्मद जायसी, कबीरदास, गोस्वामी तुलसीदास, मीराँबाई, बिहारी एवं घनानंद के काव्य की व्यावहारिक समीक्षा के मानदंड। चयनित कवि एवं कवयित्री : कविताएँ 1. मलिक मुहम्मद जायसी निर्धारित पाठ्यपुस्तक : जायसी ग्रंथावली, संपादक - आ॰ रामचंद्र शुक्ल: नखशिख - खंड।	12
	2. कबीरदास निर्धारित पाठ्यपुस्तक : कबीर - सं॰ आचार्य हज़ारी प्रसाद द्विवेदी पदसंख्या : 1, 2, 5, 12, 20, 39, 41, 77, 92, 109, 118, 130, 134, 137, 141, 162, 224, 247।	10
	3. गोस्वामी तुलसीदास निर्धारित पाठ्यपुस्तक : रामचरितमानस - गोस्वामी तुलसीदास रामचरितमानस : उत्तरकांड (पद संख्या 01 से 30 तक)	10
	4. मीराँबाई - निर्धारित पाठ्यपुस्तक : मीराँबाई की पदावली – सं॰ परशुराम चतुर्वेदी : पद - i. मैं तो साँवरे के रंग राची। ii. सखी मेरी नींद नसानी हो। iii. तनक हरि चितवौ जो मोरी ओर। iv. हरि मेरे जीवन प्राण आधार। v. बादल देख दरी हो श्याम। vi. सुण लीजो बिनती मोरी। vii. ज्यासंग मेरा न्याहा लगाया। viii. हरि तुम कायकू प्रीत लगाई। ix. तुम बिन मेरो कौन खबर ले। x. हरि गुन गावत नाचूँगी।	10
	5. बिहारी - निर्धारित पाठ्यपुस्तक : बिहारी रत्नाकर : श्री जगन्नाथदास 'रत्नाकर'- दोहे संख्या : 4, 7, 10, 91, 93, 95, 96, 155, 157, 158, 163, 300, 322, 364, 499	

	6. घनानंद – निर्धारित पाठ्यपुस्तक - घनानंद कवित्त (सं॰) विश्वनाथ प्रसाद मिश्र : कवित्त संख्या – 2, 12, 15, 24, 40, 78, 87, 112, 140, 278	10 08
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद, संवाद, संगोष्ठी प्रस्तुतीकरण, वृत्तचित्र	
Reference/Readings (संदर्भ ग्रंथ)	1) अग्रवाल, पुरुषोत्तम. कबीरः साखी और सबद, नेशनल बुक ट्रस्ट, नई दिल्ली, 2016. 2) अग्रवाल, वासुदेव शरण. पद्मावत, लोकभारती प्रकाशन , इलाहाबाद, 2000. 3) गुप्त, माताप्रसाद. तुलसी ग्रंथावली - भाग 1, 2, हिंदुस्तानी एकेडमी प्रयाग, 1950. 4) गुप्त, माताप्रसाद. तुलसीदास, हिंदी परिषद प्रकाशन इलाहाबाद, 1957. 5) तिवारी, गोपीनाथ (सं॰) - तुलसीदास विभिन्न दृष्टियों का परिप्रेक्ष्य, विश्वविद्यालय प्रकाशन, वाराणसी, 1973. 6) डॉ॰ तिवारी, रामचंद्र. कबीर - मीमांसा, लोकभारती प्रकाशन , इलाहाबाद, 1995. 7) आ॰ द्विवेदी, हज़ारी प्रसाद. कबीर, राजकमल प्रकाशन , नई दिल्ली, 1995. 8) आ॰ शुक्ल, रामचंद्र. त्रिवेणी, नागरीप्रचारिणी सभा, वाराणसी, 1983. 9) शुक्ल, ललित. पद्मावत संदर्भ कोश, स्टैंडर्ड पब्लिशर्स इंडिया, नई दिल्ली, 1999. 10) साही, विजयदेव नारायण. जायसी, हिंदुस्तानी एकेडमी इलाहाबाद, 1993. 11) डॉ॰ सिंह, वासुदेव. कबीर, साहित्य, साधना और पंथ , संजय बुक सेंटर, वाराणसी, 1993. 12) डॉ॰ सिंह, वासुदेव. मध्यकालीन काव्यसाधना, संजय बुक सेंटर, वाराणसी, 1981.	
Learning Outcomes (अधिगम परिणाम)	• मध्यकालीन काव्य की महत्ता से परिचित होंगे। • भक्तिकाल के कवियों से परिचित होंगे। • भक्तिकालीन काव्य की भावात्मक एवं वैचारिक चेतना से अवगत होंगे। • भक्तिकाल की प्रासंगिकता को समझ पाएँगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSCC 303

Title of the course (पाठ्यक्रम का शीर्षक): Indian Poetics (भारतीय काव्यशास्त्र)

No. of credits (क्रेडिट): 04 (60 hours)

Effective from academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	भारतीय काव्यशास्त्र की सामान्य जानकारी होना आवश्यक है।	**Hours (घंटे)**

Objectives (उद्देश्य)	• काव्य की अवधारणा से परिचित कराना। • काव्य के विविध रूपों से परिचित कराना। • प्रस्तुत पाठ्यक्रम के माध्यम से विद्यार्थियों को भारतीय काव्यशास्त्र के विविध सिद्धांतों से परिचित कराना। • भारतीय काव्यशास्त्र के आचार्यों के विविध मतों से परिचित कराना।	
Contents (विषय वस्तु)	**काव्य की अवधारणा** • काव्य का स्वरूप • काव्य के लक्षण • काव्य के तत्त्व • काव्य के हेतु • काव्य के प्रयोजन • काव्य के विविध रूप	12
	भारतीय काव्यशास्त्र के सिद्धांत - **रस सिद्धांत :** अवधारणा एवं स्वरूप • रस के भेद, साधारणीकरण • विभिन्न आचार्यों के मत • रस निष्पत्ति सिद्धांत के परवर्ती आचार्य भट्टलोल्लट - उत्पत्तिवाद शंकुक - अनुमितिवाद भट्टनायक - भुक्तिवाद अभिनव गुप्त - अभिव्यक्तिवाद	12
	अलंकार सिद्धांत : स्वरूप एवं विवेचन • अलंकार : परंपरा एवं भेद	8
	रीति सिद्धांत : स्वरूप, परंपरा एवं भेद • रीति के आधारभूत तत्त्व - काव्य गुण, काव्य दोष, अलंकार	8
	ध्वनि सिद्धांत : स्वरूप एवं परंपरा • शब्द शक्तियाँ • ध्वनि के भेद	8
	वक्रोक्ति सिद्धांत : स्वरूप एवं परंपरा • वक्रोक्ति के भेद	6
	औचित्य सिद्धांत : स्वरूप एवं परंपरा औचित्य के भेद	6
Pedagogy (अध्यापन विधि)	व्याख्यान, सामूहिक चर्चा, संगोष्ठी, प्रस्तुतीकरण	
References (संदर्भ ग्रंथ सूची)	1) उपाध्याय, बलदेव. भारतीय साहित्यशास्त्र. वाराणसी. 2) गुप्त, गणपतिचंद्र. साहित्यिक निबंध. लोकभारती प्रकाशन, इलाहाबाद, 2015. 3) गुलाबराय, बाबू. सिद्धांत और अध्ययन. आत्माराम ऐंड संस, दिल्ली, 2010.	

	4) चौधरी, सत्यदेव. भारतीय काव्यशास्त्र. अलंकार प्रकाशन, नई दिल्ली. 5) त्रिपाठी, राधावल्लभ. भारतीय काव्यशास्त्र की आचार्य परंपरा. विश्वविद्यालय प्रकाशन, वाराणसी. 6) त्रिपाठी, राममूर्ति. भारतीय काव्य विमर्श. वाणी प्रकाशन, नई दिल्ली. 7) डॉ॰ नगेंद्र. भारतीय काव्यशास्त्र की परंपरा. नेशनल पब्लिशिंग हाउस, दिल्ली. 8) बाली, डॉ॰ तारक नाथ. भारतीय काव्यशास्त्र. वाणी प्रकाशन, 2017. 9) मिश्र, भगीरथ. काव्यशास्त्र. विश्वविद्यालय प्रकाशन, वाराणसी, 2016. 10) शुक्ल, रामबहोरी. काव्य प्रदीप. हिंदी भवन, इलाहाबाद, 2012. 11) सिंह, योगेंद्र प्रताप. भारतीय काव्यशास्त्र. लोकभारती प्रकाशन, इलाहाबाद.	
Learning Outcomes (अधिगम परिणाम)	• काव्य की अवधारणा से परिचित होंगे। • काव्य के विविध रूपों से परिचित होंगे। • प्रस्तुत पाठ्यक्रम के माध्यम से विद्यार्थियों को भारतीय काव्यशास्त्र के विविध सिद्धांतों से परिचित होंगे। • भारतीय काव्यशास्त्र के आचार्यों के विविध मतों से परिचित होंगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Programme (कार्यक्रम): M.A. HINDI (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSCC 304

Title of the Course (पाठ्यक्रम का शीर्षक): Hindi Story & Novel (हिंदी कथा साहित्य)

No. of Credits (क्रेडिट): 04 (60 Hours)

Effective from Academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	कथा की मौखिक एवं लिखित परंपरा का ज्ञान अपेक्षित है।	**Hours (घंटे)**
Objectives (उद्देश्य	• हिंदी कथा साहित्य के उद्भव, विकास एवं परिवेश से परिचित कराना। • हिंदी कथा साहित्य पढ़ने में रुचि विकसित कराना। • विद्यार्थियों की विश्लेषण-क्षमता विकसित कराना। • विद्यार्थियों की रचनाशीलता को बढ़ावा देना।	
Contents (विषयवस्तु)	1. हिंदी कथा साहित्य: उद्भव और विकास	**10**
	2. निर्धारित रचनाएँ कहानियाँ: • माधवराव सप्रे - एक टोकरी-भर मिट्टी • जयशंकर प्रसाद - पुरस्कार • अज्ञेय - मुस्लिम-मुस्लिम भाई-भाई • मन्नू भंडारी- त्रिशंकु • गीतांजलि श्री - बेलपत्र	**20**

	• हरपाल सिंह 'अरुष'- और वह साधु बन गया उपन्यास: • प्रेमचंद - गोदान • धर्मवीर भारती - गुनाहों का देवता • रणेंद्र - ग़ायब होता देश	**30**
Pedagogy (अध्यापन विधि)	व्याख्यान, सामूहिक चर्चा, स्वाध्याय, संगोष्ठी, दृश्य-श्रव्य प्रस्तुतीकरण।	
Prescribed Text (निर्धारित पाठ्य सामग्री)	1) प्रेमचंद. गोदान. लोकभारती प्रकाशन, इलाहाबाद, 2020. 2) भारती, धर्मवीर. गुनाहों का देवता. भारतीय ज्ञानपीठ, नई दिल्ली, 2014. 3) रणेंद्र. ग़ायब होता देश. पेंगविन बूक्स इंडिया, 2014.	
References (संदर्भ ग्रंथ सूची)	1) झाल्टे, डॉ॰ दंगल. उपन्यास समीक्षा के नए प्रतिमान. वाणी प्रकाशन, नई दिल्ली, 1987. 2) त्रिपाठी, विश्वनाथ. कहानी के साथ-साथ. वाणी प्रकाशन, दिल्ली, 2016. 3) बांदिवडेकर, चंद्रकांत. आधुनिक हिंदी उपन्यास : सृजन और आलोचना. नेशनल पब्लिकेशन हाउस, नई दिल्ली, 1985. 4) मधुरेश. हिंदी कहानी का विकास. सुमित प्रकाशन, इलाहाबाद, 2018. 5) राय, डॉ॰ गोपाल. हिंदी कहानी का इतिहास भाग-1 (1900 से 1950). राजकमल प्रकाशन, दिल्ली, 2014. 6) राय, डॉ॰ गोपाल. हिंदी कहानी का इतिहास भाग-2 (1951 से 1975). राजकमल प्रकाशन, दिल्ली, 2014. 7) राय, डॉ॰ गोपाल. हिंदी कहानी का इतिहास भाग-3 (1976 से 2010). राजकमल प्रकाशन, दिल्ली, 2014. 8) राय, डॉ॰ गोपाल. हिंदी कथा साहित्य. ग्रंथ निकेतन, पटना, 1965. 9) श्रीवास्तव, गरिमा (सं॰). उपन्यास का समाजशास्त्र. संजय प्रकाशन, नई दिल्ली, 2006. 10) सिंह, नामवर. आधुनिक हिंदी साहित्य की प्रवृत्तियाँ. लोकभारती प्रकाशन, इलाहाबाद, 2008. 11) सिंह, पुष्पपाल. समकालीन कहानियाँ: नया परिप्रेक्ष्य. सामयिक प्रकाशन, दिल्ली, 2011.	
Learning Outcomes (अधिगम परिणाम)	• हिंदी कथा साहित्य के उद्भव, विकास एवं परिवेश से परिचित होंगे। • हिंदी कथा साहित्य पढ़ने में रुचि विकसित होगी। • हिंदी कथा साहित्य की समीक्षा कर पाएँगे। • विद्यार्थियों की रचनाशीलता को बढ़ावा मिलेगा।	

गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSCC 305

Title of the course (पाठ्यक्रम का शीर्षक): Hindi Language, Script and Grammar (हिंदी भाषा, लिपि एवं व्याकरण)

No. of credits (क्रेडिट): 04 (60 hours)

Effective from academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	हिंदी भाषा तथा व्याकरण की सामान्य जानकारी होना आवश्यक है।	**Hours (घंटे)**
Objectives (उद्देश्य)	• प्रस्तुत पाठ्यक्रम के माध्यम से विद्यार्थियों को हिंदी भाषा के इतिहास की जानकारी देना है। • हिंदी भाषा समुदाय से परिचित कराना। • व्याकरण के विविध पक्षों से परिचित कराना। • देवनागरी लिपि की विशेषताओं से परिचित कराना।	
Contents (विषय वस्तु)	**1. हिंदी भाषा का विकास : ऐतिहासिक पृष्ठभूमि** • विश्व की भाषाओं में हिंदी तथा भारोपीय परिवार। • प्राचीन भारतीय आर्यभाषाएँ : वैदिक एवं लौकिक संस्कृत। • मध्यकालीन भारतीय आर्यभाषाएँ : पालि, प्राकृत और अपभ्रंश। • आधुनिक भारतीय आर्यभाषाएँ।	15
	2. हिंदी भाषा समुदाय • हिंदी शब्द का अर्थ और प्रयोग। • हिंदी की बोलियाँ : राजस्थानी, बिहारी, पहाड़ी, पूर्वी और पश्चिमी हिंदी। • हिंदी की विभाषाएँ : हिंदवी, दक्खिनी हिंदी, रेख़्ता, उर्दू, हिंदुस्तानी।	10
	3. व्याकरण • हिंदी शब्द रचना : संधि, समास, उपसर्ग, प्रत्यय। • **व्याकरणिक प्रकार्य के आधार पर हिंदी शब्द वर्ग** **1) विकारी शब्द** : संज्ञा, सर्वनाम, विशेषण, क्रिया **2) अविकारी शब्द :** क्रिया विशेषण, संबंधसूचक, समुच्चयबोधक, विस्मयादिबोधक, निपात।	15
	• **व्याकरणिक कोटियाँ :** लिंग, वचन, कारक, काल • शब्दों का वर्गीकरण। • विराम चिह्न।	10
	4. देवनागरी लिपि का उद्भव और विकास • लिपि : परिभाषा एवं प्रकार। • देवनागरी लिपि का इतिहास। • देवनागरी लिपि की वैज्ञानिकता, विशेषताएँ एवं सीमाएँ।	10
Pedagogy (अध्यापन विधि)	व्याख्यान, चर्चा, संगोष्ठी, प्रस्तुतीकरण, कार्यशाला	

References (संदर्भ ग्रंथ सूची)	1) ओझा, रा॰ ब॰ पं॰ गौरीशंकर हीराचंद. भारतीय प्राचीन लिपिमाला. राजस्थानी ग्रंथाघर, जोधपुर, 2016. 2) गुरु, पं॰ कामताप्रसाद. हिंदी व्याकरण. प्रकाशन संस्थान, नई दिल्ली, 2015. 3) तिवारी, उदयनारायण. हिंदी भाषा का उद्गम और विकास. लोकभारती प्रकाशन, इलाहाबाद, 2019. 4) तिवारी, डॉ॰ भोलानाथ. हिंदी भाषा का इतिहास. वाणी प्रकाशन, 2014. 5) देवनागरी लिपि तथा हिंदी वर्तनी का मानकीकरण, केंद्रीय हिंदी निदेशालय, 2016, 2019. 6) पांडेय, डॉ॰ पृथ्वीनाथ. शुद्ध हिंदी कैसे बोलें, कैसे लिखें. सामयिक पेपरबैक्स, नई दिल्ली, 2019. 7) बाहरी, डॉ॰ हरदेव. हिंदी उद्भव, विकास और रूप. किताब महल, नई दिल्ली, 2021. 8) महरोत्रा, रमेशचंद्र. मानक हिंदी का व्यवहारपरक व्याकरण. राधाकृष्ण प्रकाशन, नई दिल्ली, 2016. 9) महिया, किशनाराम, शर्मा, विमलेश. हिंदी व्याकरणमाला. ज्ञानवितान प्रकाशन, अजमेर, 2020. 10) वर्म्मा, रामचंद्र. अच्छी हिंदी. लोकभारती प्रकाशन, इलाहाबाद, 2015. 11) सहाय, शिवपूजन, सं॰ मंगलमूर्ति. व्याकरण दर्पण. अनामिका पब्लिशर्स, नई दिल्ली, 2013. 12) सिंह, डॉ॰ ब्रज किशोर. हिंदी व्याकरण विमर्श. साहनी पब्लिकेशंस, दिल्ली, 2019.	
Learning Outcomes (अधिगम परिणाम)	• विद्यार्थी हिंदी भाषा के इतिहास की जानकारी पाएँगे। • हिंदी भाषा समुदाय से परिचित होंगे। • व्याकरण के विविध पक्षों से परिचित होंगे। • देवनागरी लिपि की विशेषताओं परिचित होंगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSCC 306

Title of the course (पाठ्यक्रम का शीर्षक): Western Poetics (पाश्चात्य काव्यशास्त्र)

No. of Credits (क्रेडिट): 04 (60 hours)

Effective from academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	• काव्यशास्त्र का सामान्य परिचयात्मक ज्ञान होना अपेक्षित है। • पाश्चात्य विचारकों के चिंतन की संक्षिप्त जानकारी होना अपेक्षित है।	**Hours (घंटे)**
Objective (उद्देश्य)	• पाश्चात्य काव्यचिंतन की परंपरा से अवगत कराना। • पाश्चात्य काव्यशास्त्र के विभिन्न सिद्धांतो का अध्ययन कराना।	

	• 21वीं सदी के पाश्चात्य काव्यचिंतन से परिचित कराना। • काव्य-सिद्धांतों के ज्ञान के आधार पर साहित्यिक कृतियों के अध्ययन एवं आस्वादन के लिए आलोचनात्मक दृष्टि प्राप्त कराना।	
Contents (विषयवस्तु)	**1. पाश्चात्य काव्यचिंतन का उद्भव एवं विकास** (प्राचीन यूनानी काव्यचिंतन से 21वीं सदी तक का क्रमिक विकास)	**12**
	2. प्रमुख पाश्चात्य चिंतकों के सिद्धांत 1) **प्लेटो:** काव्यप्रेरणा, अनुकरण, प्रत्ययवाद। 2) **अरस्तू:** अनुकरण, त्रासदी, विरेचन। 3) **लोंजाइनस:** उदात्तता। 4) **कॉलरिज, वर्ड्सवर्थ:** स्वच्छंदतावाद। 5) **मैथ्यू आर्नल्ड:** कला और नैतिकता, आलोचना सिद्धांत। 6) **क्रोचे:** अभिव्यंजनावाद। 7) **आई॰ ए॰ रिचर्ड्स:** मूल्य सिद्धांत, संप्रेषण सिद्धांत, अर्थ मीमांसा। 8) **टी॰ एस॰ इलियट:** निर्वैयक्तिकता, वस्तुनिष्ठ सादृष्य, संवेदनशीलता का असाहचर्य।	**6** **6** **6** **6** **6** **6** **6** **6**
Pedagogy (अध्यापन विधि)	व्याख्यान, सामूहिक चर्चा, स्वाध्याय, संगोष्ठी, दृश्य-श्रव्य प्रस्तुतीकरण।	
References (संदर्भ ग्रंथ सूची)	1) गुप्त, गणपतिचंद्र. भारतीय एवं पाश्चात्य काव्य सिद्धांत. लोकभारती प्रकाशन, इलाहाबाद, 2009 2) जैन, निर्मला. पाश्चात्य साहित्य चिंतन. राधाकृष्ण प्रकाशन, दिल्ली, 1990 3) जैन, निर्मला, बाँठिया .कुसुम पाश्चात्य साहित्य चिंतन. राजकमल प्रकाशन, दिल्ली, 2009 4) बाली, तारकनाथ. पाश्चात्य काव्यशास्त्र. वाणी प्रकाशन, दिल्ली, 2010 5) मिश्र, डॉ॰ सभापति. भारतीय काव्यशास्त्र एवं पाश्चात्य साहित्य-चिंतन. जयभारती प्रकाशन, इलाहाबाद, 2007 6) मिश्र, डॉ॰ भगीरथ. पाश्चात्य काव्यशास्त्र इतिहास सिद्धांत और वाद. विश्वविद्यालय प्रकाशन, वाराणासी, 2016 7) मिश्र, सत्यदेव. पाश्चात्य काव्यशास्त्र : अधुनातन संदर्भ. लोकभारती प्रकाशन, प्रयागराज, 2021 8) शर्मा, कृष्णलाल. यूनानी रोमी काव्यशास्त्र में उत्तर आभिजात्य चिंतनधारा. वाणी प्रकाशन, नई दिल्ली, 2015 9) शर्मा, देवेंद्रनाथ. पाश्चात्य काव्यशास्त्र. नेशनल पब्लिशिंग हाउस, नई दिल्ली, 2016 10) सिंह, विजय बहादुर. पाश्चात्य काव्यशास्त्र. अपरा प्रकाशन, नई दिल्ली, 2016 11) Barry, Peter. Beginning Theory: An Introduction to Literary and Cultural Theory. Manchester University Press, 2002 12) Bennett, Andrew, wand Nicholas Royale. An Introduction to Literature, Criticism and Theory. Pearson Education Limited, 2009 13) Habib, M.A.R. Literary Criticism from Plato to the Present: An Introduction. Wiley-Blackwell, United Kingdom, 2011 14) Tilak, Dr. Raghukul. History and Principles of Literary Criticism. Rama Brothers, 2002	
Learning Outcome (अधिगम परिणाम)	• पाश्चात्य काव्यचिंतन की परंपरा से अवगत होंगे।	

	• पाश्चात्य काव्यशास्त्र के विभिन्न सिद्धांतो से परिचित होंगे। • 21वीं सदी के पाश्चात्य काव्यचिंतन से परिचित होंगे। • काव्य-सिद्धांतों के ज्ञान के आधार पर साहित्यिक कृतियों के अध्ययन एवं आस्वादन के लिए आलोचनात्मक दृष्टि प्रदान होगी।	

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शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSCC 307

Title of the course (पाठ्यक्रम का शीर्षक): आलोचक और आलोचना (Critics & Criticism)

No. of Credits (क्रेडिट): 04 (60 Hours)

Effective from academic year (शैक्षणिक वर्ष से लागू): 2022-2023

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	आलोचना का व्यावहारिक रूप में प्रयोग और साहित्य के इतिहास का ज्ञान अपेक्षित।	**(Hours) घंटे**
Objectives (उद्देश्य)	• विद्यार्थियों को आलोचना की अवधारणा, इतिहास, स्वरूप, भेद आदि से परिचित कराना। • विद्यार्थियों को हिंदी आलोचना के विकास से परिचित कराना। • विद्यार्थियों को शुक्लयुगीन आलोचना से लेकर मार्क्सवादी और अस्मितावादी आलोचना-दृष्टि से परिचित कराना। • विद्यार्थियों को विभिन्न आलोचकों के योगदान से परिचित कराना।	
Contents (विषय वस्तु)	1. आलोचना: अवधारणा, स्वरूप एवं भेद • आलोचना, समालोचना और समीक्षा में अंतर • आलोचक के गुण • आलोचक के दायित्व	**8**
	2. हिंदी आलोचना का विकास • भारतेंदुयुगीन आलोचना और नवजागरण • महावीरप्रसाद द्विवेदी और पुनर्जागरण • आचार्य रामचंद्र शुक्ल की आलोचना दृष्टि • छायावादी कवियों की आलोचना दृष्टि	**12**
	3. शुक्लोत्तर आलोचना • हज़ारीप्रसाद द्विवेदी: मानवतावादी एवं सांस्कृतिक आलोचना • नंददुलारे वाजपेयी और स्वच्छंदतावादी आलोचना	**8**
	4. मार्क्सवादी आलोचना • मार्क्सवादी आलोचना का परिचय • शिवदान सिंह चौहान	**12**

	5. आलोचक: विशेष अध्ययन • आचार्य रामचंद्र शुक्ल • रामविलास शर्मा • गजानन माधव 'मुक्तिबोध' • नामवर सिंह • निर्मला जैन • डॉ॰ धर्मवीर	**20**
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद-संवाद, संगोष्ठी, सामूहिक चर्चा, प्रस्तुतीकरण।	
References (संदर्भ ग्रंथ सूची)	1) अवस्थी, रेखा. प्रगतिवाद और समानांतर साहित्य. राजकमल प्रकाशन, दिल्ली, 2012. 2) चौहान, शिवदान सिंह. आलोचना के मान. संपादन: विष्णुचंद्र शर्मा, स्वराज प्रकाशन, दिल्ली, 1958. 3) जैन, निर्मला. नई समीक्षा के प्रतिमान. किताबघर प्रकाशन, दिल्ली, 2015. 4) जैन, निर्मला. हिंदी आलोचना का दूसरा पाठ. राजकमल प्रकाशन, दिल्ली, 2014 5) जैन, नेमिचंद (सं॰). मुक्तिबोध रचनावली भाग-4. राजकमल प्रकाशन, दिल्ली, 2007. 6) जैन, नेमिचंद (सं॰). मुक्तिबोध रचनावली भाग-5. राजकमल प्रकाशन, दिल्ली, 2007. 7) डॉ. धर्मवीर. कबीर के आलोचक. वाणी प्रकाशन, दिल्ली, 2004 8) डॉ. रामबक्ष. समकालीन हिंदी आलोचक और आलोचना. हरियाणा साहित्य अकादमी, चंडीगढ़, 1991 9) तिवारी, रामचंद्र. हिंदी आलोचना शिखरों का साक्षात्कार. लोकभारती प्रकाशन, इलाहाबाद, 2016. 10) त्रिपाठी, विश्वनाथ. हिंदी आलोचना. राजकमल प्रकाशन, दिल्ली, 2003. 11) दास, डॉ॰ श्यामसुंदर. साहित्यालोचन. भारतीय ज्ञानपीठ, दिल्ली, 2007. 12) द्विवेदी, हज़ारीप्रसाद. साहित्य सहचर. लोकभारती प्रकाशन, इलाहाबाद, 2013. 13) नवल, नंदकिशोर. हिंदी आलोचना का विकाास, राजकमल प्रकाशन, दिल्ली, 2011. 14) प्रसाद, कमला. आलोचक और आलोचना. आधार प्रकाशन, पंचकुला, हरियाणा, 2002. 15) मधुरेश. हिंदी आलोचना का विकास. सुमित प्रकाशन, इलाहाबाद, 2012 16) शर्मा, रामविलास. भारतेंदु हरिश्चंद्र और हिंदी नवजागरण. राजकमल प्रकाशन, दिल्ली, 2014. 17) शर्मा, रामविलास. महावीरप्रसाद द्विवेदी और हिंदी नवजागरण. राजकमल प्रकाशन, दिल्ली, 2010. 18) सिंह, डॉ॰ बच्चन. हिंदी आलोचना के बीज शब्द. राजकमल प्रकाशन, दिल्ली, 2015.	

Learning Outcomes (अधिगम परिणाम)	• विद्यार्थी हिंदी आलोचना की विकास यात्रा से परिचित होंगे। • विद्यार्थी आलोचक के गुण, सीमाओं आदि से परिचित होंगे। • विद्यार्थी शुक्लयुगीन आलोचना से लेकर अस्मितावादी आलोचना की विशेषताओं से परिचित होंगे। • विद्यार्थी आलोचकों के आलोचनात्मक योगदान से परिचित होंगे।	

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शणै गोंयबाब भाषा एवं साहित्य महाशाला

हिंदी अध्ययन शाखा

Programme (कार्यक्रम) : M.A (Hindi) स्नातकोत्तर हिंदी

Course (पाठ्यक्रम) : HNDSCC 308

Title of the Course (पाठ्यक्रम का शीर्षक) : Drama & Theatre (नाटक एवं रंगमंच)

No. of Credits (क्रेडिट) : 04 (60 Hours)

Effective from Academic year (शैक्षणिक वर्ष से लागू) : 2022-2023

Prerequisites for the Course (पाठ्यक्रम के लिए पूर्वापेक्षित)	नाटक एवं रंगमंच से परिचित होना अपेक्षित है।	**Hours (घंटे)**
Objectives (उद्देश्य)	• नाटक के विकासक्रम का अध्ययन कराना। • रंगमंच के विकासक्रम का अध्ययन कराना। • भारतेंदु एवं अन्य नाटककारों के समकालीन परिवेश से अवगत कराना। • हिंदी नाटकों के कला एवं भाषिक पक्ष का अध्ययन कराना।	
Contents (विषयवस्तु)	**1. नाटक एवं रंगमंच :** स्वरूप एवं परंपरा का विकास। • संस्कृत नाट्य परंपरा। • मध्ययुगीन लोकनाट्य परंपरा। • स्वतंत्रतापूर्व हिंदी नाटक एवं रंगमंच। • स्वातंत्र्योत्तर हिंदी नाटक एवं रंगमंच।	**15**
	2. निर्धारित नाटक • भारतेंदु हरिश्चंद्र : अंधेर नगरी	**6**
	• जयशंकर प्रसाद : चंद्रगुप्त	**8**
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	• असग़र वजाहत : जिस लाहौर नइ देख्या ओ जम्याइ नइ	**8**
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद, संवाद, संगोष्ठी प्रस्तुतीकरण	
Prescribed Text (निर्धारित पाठ्य सामग्री)	1) प्रसाद, जयशंकर. चंद्रगुप्त. वाणी प्रकाशन, नई दिल्ली, 2011. 2) राकेश, मोहन. आधे-अधूरे. राधाकृष्ण प्रकाशन, नई दिल्ली, 1990. 3) वजाहत, असग़र. जिस लाहौर नइ देख्या ओ जम्याइ नइ. वाणी प्रकाशन, दरियागंज, नई दिल्ली, 2010. 4) शेष, शंकर. एक और द्रोणाचार्य. अभिनव प्रकाशन, मुंबई, 1978.	

	5) साहनी, भीष्म. माधवी, राजकमल प्रकाशन, दरियागंज, नई दिल्ली, 2017. 6) हरिश्चंद्र, भारतेंदु. अंधेर नगरी. विश्वविद्यालय प्रकाशन, वाराणसी, उत्तर प्रदेश, 2009.	
References (संदर्भ ग्रंथ सूची)	1) ओझा, डॉ॰ दशरथ. हिंदी नाटक : उद्भव और विकास, राजपाल प्रकाशन, दिल्ली, 2017. 2) ओझा, डॉ॰ मांधाता, सरदाना, डॉ॰ शशि. नाटक: नाट्य-चिंतन और रंग प्रयोग, कलामंदिर दिल्ली, 2003. 3) कुमार, सिद्धनाथ. नाट्यालोचन के सिद्धांत, वाणी, नई दिल्ली 2004. 4) गौतम, विकल. हिंदी नाटक : रंग, शिल्प, दर्शन, वाणी प्रकाशन, नई दिल्ली, 2013. 5) चंदेर, डॉ॰ नाट्यचिंतन: नए संदर्भ, साहित्य रत्नाकर, कानपुर, 1987. 6) चातक, गोविंद. आधुनिक हिंदी नाटक का अग्रदूत मोहन राकेश, जगतपुरी, प्रकाशन, राधाकृष्ण प्रकाशन प्रा॰ लि॰ नई दिल्ली, 2003. 7) चातक, गोविंद. हिंदी नाटक इतिहास के सोपान, तक्षशिला, नई दिल्ली, 2002. 8) जैन, नेमिचंद्र. मोहन राकेश के संपूर्ण नाटक (संपादन). कश्मीरी गेट, राजपाल ऐंड सन्स, प्रकाशन दिल्ली, 1976. 9) जैन, नेमिचंद्र. रंग परंपरा भारतीय नाट्य में निरंतरता और बदलाव, वाणी प्रकाशन, नई दिल्ली, 1996. 10) डॉ॰ अज्ञात. भारतीय रंगमंच का विवेचनात्मक इतिहास, साहित्य रत्नालय, कानपुर, 1997. 11) तनेजा, जयदेव. आधुनिक भारतीय रंगलोक, भारतीय ज्ञानपीठ, नई दिल्ली, 2006. 12) तनेजा, जयदेव. समसामयिक हिंदी नाटको में चरित्र सृष्टि, सामयिक प्रकाशन, दिल्ली, 1971. 13) त्रिपाठी, डॉ॰ वशिष्ठ नारायण. भारतीय लोकनाट्य, वाणी प्रकाशन, दिल्ली, 2001. 14) परमार, श्याम. लोकधर्मी नाट्य परंपरा, हिंदी प्रचारक पुस्तकालय, वाराणसी, उत्तर प्रदेश, 1956. 15) प्रसाद, डॉ॰ प्रसून. मोहन राकेश के नाटक : एक मूल्यांकन, आधार प्रा॰ लि॰ हरियाणा, 2008. 16) प्रेमलता. आधुनिक हिंदी नाटक और भाषा की सृजनशीलता, लोकभारती प्रकाशन, इलाहाबाद, 1993. 17) रस्तोगी, गिरीश. मोहन राकेश और उनके नाटक, लोकभारती प्रकाशन, इलाहाबाद, 1975. 18) रस्तोगी, डॉ॰ गिरीश. समकालीन हिंदी नाटक की संघर्ष चेतना, साहित्य अकादेमी, हरियाणा, 1990. 19) राकेश. अनीता, सतरें और सतरें, राधाकृष्ण, प्रा॰ लि॰ दिल्ली, 2002. 20) रानी, डॉ॰ गुरदीप. मिथक सिद्धांत और स्वरूप, बुकमार्ट पब्लिशर्स, दिल्ली, 2009. 21) राय, डॉ॰ नरनारायण. रंगशिल्पी मोहन राकेश, कादंबरी प्रकाशन, नई दिल्ली, 1991. 22) सिंह, डॉ॰ राजेश्वरप्रसाद. मोहन राकेश का नाट्यशिल्प: प्रेरणा एवं स्रोत, अमित प्रकाशन, ग़ाज़ियाबाद, 1992.	

Learning Outcomes (अधिगम परिणाम)	• नाटक के विकास से परिचित होंगे। • रंगमंच के विकास से परिचित होंगे। • नाटककारों के समकालीन परिवेश से अवगत होंगे। • हिंदी नाटकों के कला एवं भाषिक पक्ष से अवगत होंगे।	

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गोवा विश्वविद्यालय
शणै गोंयबाब भाषा और साहित्य महाशाला
हिंदी अध्ययन शाखा

Programme (कार्यक्रम): M.A HINDI (स्नातकोत्तर हिंदी)
Course (पाठ्यक्रम): HNDSOC 301
Title of the Course (पाठ्यक्रम का शीर्षक): History of Hindi Literature: Aadikal, Bhaktikal & Ritikal (हिंदी साहित्य का इतिहास: आदिकाल, भक्तिकाल एवं रीतिकाल)
No. of Credits (क्रेडिट): 04 (60 Hours)
Effective from Academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	हिंदी साहित्येतिहास का संक्षिप्त परिचय होना अपेक्षित है।	**Hours (घंटे)**
Objectives (उद्देश्य)	• इतिहास एवं साहित्येतिहास से संबंधित दृष्टिकोणों से अवगत कराना। • हिंदी साहित्येतिहास लेखन के स्रोतों एवं परंपरा का परिचय देना। • आदिकालीन, भक्तिकालीन, रीतिकालीन परिवेश एवं साहित्यिक प्रवृत्तियों से परिचित करना। • हिंदी साहित्येतिहास लेखन और परंपरा के महत्त्व को समझाना।	
Contents (विषयवस्तु)	**1. हिंदी साहित्येतिहास की भूमिका:** • इतिहास-दर्शन की रूपरेखा • साहित्येतिहास: परंपरागत दृष्टिकोण एवं नए सिद्धांत • हिंदी साहित्येतिहास लेखन के स्रोत • हिंदी साहित्येतिहास लेखन की परंपरा • काल विभाजन एवं नामकरण	**16**
	2. आदिकाल: • अपभ्रंश और हिंदी साहित्य • सिद्ध, नाथ और जैन साहित्य • रासो काव्य की परंपरा और उसकी साहित्यिकता • लोक-साहित्य	**16**
	3. भक्तिकाल: • भक्ति आंदोलन एवं सांस्कृतिक चेतना • निर्गुण काव्यधारा (संत काव्य एवं सूफ़ी काव्य)	**18**

	• सगुण काव्यधारा (कृष्ण एवं राम भक्ति काव्य)	
	4. रीतिकाल: • रीतिकाल: उद्भव और विकास • दरबारी संस्कृति और रीतिकाव्य • रीतिकालीन साहित्य की प्रमुख धाराएँ • रीतिकालीन साहित्य के अन्य पक्ष (वीर, भक्ति एवं नीति काव्य)	**10**
Pedagogy **(अध्यापन विधि)**	व्याख्यान, स्वाध्याय, संगोष्ठी, दृश्य-श्रव्य प्रस्तुतीकरण, अभिलेखागार-भेंट	
References **(संदर्भ ग्रंथ सूची)**	1) गुप्त, गणपतिचंद्र. हिंदी साहित्य का वैज्ञानिक इतिहास. लोकभारती प्रकाशन, इलाहाबाद, 2007. 2) गुप्त, गणपतिचंद्र. हिंदी साहित्येतिहास परंपरागत दृष्टिकोण एवं नए सिद्धांत. अटलांटिक पब्लिशर्स ऐंड डिस्ट्रीब्यूटर्स, नई दिल्ली, 1989. 3) डॉ॰ नगेंद्र, डॉ॰ हरदयाल (सं॰). हिंदी साहित्य का इतिहास. मयूर पेपरबैक्स, नई दिल्ली, 2018. 4) द्विवेदी, हज़ारीप्रसाद. हिंदी साहित्य का आदिकाल. वाणी प्रकाशन, दिल्ली, 2008. 5) पांडेय, मैनेजर. साहित्य और इतिहास दृष्टि. पेपरबैक्स वाणी प्रकाशन, नई दिल्ली, 2021. 6) पांडेय, रामसजन (सं॰). हिंदी साहित्य का इतिहास. संजय प्रकाशन, दिल्ली, 2013. 7) मिश्र, डॉ॰ भगीरथ. हिंदी साहित्य का परिचयात्मक इतिहास. राधाकृष्ण प्रकाशन, नई दिल्ली, 2010. 8) राजे, डॉ॰ सुमन. हिंदी साहित्य का आधा इतिहास. भारतीय ज्ञानपीठ, नई दिल्ली, 2016. 9) वर्मा, रामकुमार. हिंदी साहित्य का आलोचनात्मक इतिहास. लोकभारती प्रकाशन, इलाहाबाद, 2010. 10) शुक्ल, आ॰ रामचंद्र. हिंदी साहित्य का इतिहास. मलिक ऐंड कंपनी, जयपुर, 2016.	
Learning Outcomes (अधिगम परिणाम)	• इतिहास एवं साहित्येतिहास से संबंधित दृष्टिकोणों से अवगत होंगे। • हिंदी साहित्येतिहास लेखन के स्रोतों एवं परंपरा का परिचय होगा। • आदिकाल, भक्तिकाल एवं रीतिकाल के परिवेश एवं साहित्यिक प्रवृत्तियों से परिचित होंगे। • हिंदी साहित्येतिहास लेखन और परंपरा के महत्त्व को समझ सकेंगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Programme (कार्यक्रम): M.A. (Hindi) स्नातकोत्तर हिंदी

Course (पाठ्यक्रम): HNDSOC 302

Title of the course (पाठ्यक्रम का शीर्षक): Modern Hindi Poetry: Practical Criticism (आधुनिक हिंदी काव्य: व्यावहारिक समीक्षा)

No. of Credits (क्रेडिट): 04 (60 Hours)

Effective from Academic Year (शैक्षणिक वर्ष से लागू): 2022-2023

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	• आधुनिक हिंदी काव्य की सामान्य जानकारी होना अपेक्षित है। • आधुनिक हिंदी काव्य की प्रवृत्तियों का ज्ञान होना अपेक्षित है।	**Hours (घंटे)**
Objectives (उद्देश्य)	• आधुनिक हिंदी काव्य की विविध प्रवृत्तियों से परिचित कराना। • आधुनिक हिंदी कवियों की लेखन शैली का अध्ययन कराना। • आधुनिक युग की परिवेशगत जीवनानुभूतियों का स्वरूपांकन कराना। • आधुनिक हिंदी कविता की मूल संवेदना एवं भाषाई चेतना का अध्ययन कराना। • आधुनिक हिंदी कविता का आस्वादन करना एवं व्यावहारिक समीक्षा कराना।	
Contents (विषयवस्तु)	**चयनित कवि एवं कविताएँ :** • **जयशंकर प्रसाद** — कामायनी - आनंद सर्ग — **9** • **सूर्यकांत त्रिपाठी 'निराला'** — जूही की कली, भगवान बुद्ध के प्रति, कुकुरमुत्ता — **8** • **महादेवी वर्मा** — मधुर मधुर मेरे दीपक जल, क्या पूजन क्या अर्चन रे, शलभ मैं शापमय वर हूँ, कीर का प्रिय आज पिंजर खोल दो! — **8** • **सुभद्राकुमारी चौहान** — मानिनि राधे, जलियाँवाले बाग़ में बसंत, मेरी कविता — **8** • **नागार्जुन** — प्रतिबद्ध हूँ, अकाल और उसके बाद, मंत्र, प्रेत का बयान। — **10** • **गजानन माधव 'मुक्तिबोध'** — मुझे क़दम क़दम पर, मैं तुम लोगों से दूर हूँ, ब्रह्मराक्षस, अँधेरे में। — **8** • **सच्चिदानंद हीरानंद वात्स्यायन 'अज्ञेय'** — यह दीप अकेला, नदी के द्वीप, सोन मछली, असाध्य वीणा। — **9**	
Pedagogy (अध्यापन विधि)	व्याख्यान, सामूहिक चर्चा, स्वाध्याय, संगोष्ठी, दृश्य-श्रव्य प्रस्तुतीकरण।	

Prescribed text **निर्धारित पाठ्यसामग्री/** **आधार ग्रंथ**	1) गुप्ता, रूपा (सं॰) .सुभद्राकुमारी चौहान ग्रंथावली. स्वराज प्रकाशन, नई दिल्ली,2015 2) जैन, नेमिचंद्र (सं॰) .मुक्तिबोध समग्र. राजकमल प्रकाशन, नई दिल्ली, 2019 3) नवल, नंदकिशोर (सं॰). निराला रचनावली. राजकमल प्रकाशन, नई दिल्ली, 2009 4) पालीवाल, कृष्णदत्त (सं॰) .अज्ञेय ग्रंथावली. भारतीय ज्ञानपीठ, नई दिल्ली, 2011 5) प्रतिनिधि कविताएँ, राजकमल प्रकाशन, नई दिल्ली, 2017 6) प्रसाद, जयशंकर. कामायनी. राजपाल ऐंड सन्स, नई दिल्ली, 2017 7) वर्मा, महादेवी. यामा. भारती भंडार, इलाहाबाद, 2018	
References **(संदर्भ ग्रंथ सूची)**	1) कुमार, राजेंद्र (सं॰). अँधेरे में का महत्त्व. लोकभारती प्रकाशन इलाहाबाद सं॰ 2008 2) गुप्त, दुर्गा प्रसाद. हिंदी में आधुनिकतावाद. अनंग प्रकाशन दिल्ली सं॰ 1998 3) चतुर्वेदी, रामस्वरूप. आधुनिक कविता यात्रा. लोकभारती प्रकाशन, इलाहाबाद, 2000 4) डॉ॰ नगेंद्र. आधुनिक हिंदी कविता की मुख्य प्रवृत्तियाँ. नेशनल पब्लिशिंग हाउस, नई दिल्ली,1979 5) डॉ॰ प्रेमशंकर (सं॰). हिंदी स्वच्छंदतावादी काव्य. मध्यप्रदेश हिंदी अकादमी 1974 6) डॉ॰ हरदयाल (सं॰). आधुनिक हिंदी कविता. शब्दाकार दिल्ली 1993 7) तिवारी, विश्वनाथ प्रसाद (सं॰). निराला. लोकभारती प्रकाशन इलाहाबाद, 1997 8) तिवारी, विश्वनाथ प्रसाद (सं॰). अज्ञेय. नेशनल पब्लिशिंग हाउस, नई दिल्ली, 1994 9) पांडेय, अरविंद. हिंदी के कवि : रचना और शिल्प. अनुभव प्रकाशन, कानपुर, 1986 10) मदान, इंद्रनाथ (सं॰). कामायनी (मूल्यांकन और मूल्यांकन), 1967 11) वाजपेयी, नंददुलारे. हिंदी साहित्य : बीसवीं शताब्दी. लोकभारती प्रकाशन, इलाहाबाद,1987 12) श्रीवास्तव, परमानंद.निराला की कविताएँ (मूल्यांकन और मूल्यांकन). नीलाभ प्रकाशन, इलाहाबाद, 1992 13) सिंह, नामवर. छायावाद. राजकमल प्रकाशन, नई दिल्ली, 1988 14) सिंह, नामवर. कविता के नए प्रतिमान. राजकमल प्रकाशन, नई दिल्ली, 1990 15) सिंह, नामवर. आधुनिक साहित्य की प्रवृत्तियाँ. लोकभारती प्रकाशन, इलाहाबाद, 1991 16) सैनी, राजकुमार. साहित्य स्रष्टा निराला. वाणी प्रकाशन, नई दिल्ली, 1995	
Learning Outcomes (अधिगम परिणाम)	• आधुनिक हिंदी काव्य की विविध प्रवृत्तियों से परिचित होंगे। • आधुनिक हिंदी कवियों की लेखन शैली से अवगत होंगे। • आधुनिक युग के परिवेशगत जीवनानुभूतियों का ज्ञान प्राप्त करेंगे। • आधुनिक हिंदी कविता की मूल संवेदना एवं भाषाई चेतना का ज्ञान प्राप्त करेंगे। • आधुनिक हिंदी कविता की व्यावहारिक समीक्षा एवं आस्वादन करने में सक्षम होंगे।	

गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSOC 303

Title of the course (पाठ्यक्रम का शीर्षक): Another Form of Modern Prose (आधुनिक गद्य की प्रकीर्ण विधाएँ)

No. of Credits (क्रेडिट): 04 (60 HOURS)

Effective from academic Year (शैक्षणिक वर्ष से लागू): 2022-2023

Prerequisites for the course **(पाठ्यक्रम के लिए पूर्वापेक्षित)**	निबंध, आत्मकथा, संस्मरण, यात्रावृत्त आदि विधाओं की संक्षिप्त जानकारी अपेक्षित है।	**(HOURS)** **घंटे**
Objectives (उद्देश्य)	• विद्यार्थियों को गद्य की इतर विधाओं - निबंध, आत्मकथा, संस्मरण, डायरी आदि की जानकारी देना। • विद्यार्थियों को गद्य विधाओं के इतिहास से परिचित कराना। • विद्यार्थियों को विधाओं के श्रेष्ठ साहित्य से परिचित कराना। • विद्यार्थियों को विधाओं के बीच के अंतस्संबंध से परिचित कराना।	
Contents (विषय वस्तु)	**1. निबंध -** • प्रतापनारायण मिश्र - ट • हरिशंकर परसाई - साहित्य और नंबर दो का कारोबार • रामवृक्ष बेनीपुरी - नींव की ईंट • विद्यानिवास मिश्र - मेरे राम का मुकुट भीग रहा है • सुशील सिद्धार्थ - मालिश महापुराण	**18**
	2. संस्मरण - महादेवी वर्मा : सुभद्राकुमारी चौहान सुधीर विद्यार्थी : मेरा राजहंस	**8**
	3. डायरी - गणेश शंकर विद्यार्थी की जेल डायरी	**10**
	4. यात्रावृत्त - राहुल सांकृत्यायन : किन्नर देश में	**14**
	5. आत्मकथा - प्रभा खेतान : अन्या से अनन्या	**10**
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद-संवाद, संगोष्ठी प्रस्तुतीकरण, वृत्तचित्र।	
Prescribed Text (निर्धारित पाठ्य सामग्री)	1) खेतान, प्रभा. अन्या से अनन्या. राजकमल प्रकाशन, दिल्ली, 2010. 2) सलिल, सुरेश (संपादन). गणेश शंकर विद्यार्थी जेल डायरी. प्रवीण प्रकाशन, दिल्ली, 1981. 3) सांकृत्यायन, राहुल. किन्नर देश में. किताब महल, दिल्ली, 1948. 4) सिद्धार्थ, सुशील, मालिश महापुराण. सामयिक प्रकाशन, दिल्ली, 2014.	
References (संदर्भ ग्रंथ सूची)	1) चतुर्वेदी, रामस्वरूप. गद्य विन्यास और विकास. लोकभारती प्रकाशन, इलाहाबाद, 1996. 2) तिवारी, रामचंद्र. हिंदी का गद्य साहित्य. चौखंभा प्रकाशन, वाराणसी, 1987. 3) प्रकाश, अरुण. गद्य की पहचान. अंतिका प्रकाशन, दिल्ली, 2012. 4) वर्मा, धीरेंद्र. हिंदी साहित्य कोश. ज्ञानमंडल लिमिटेड, वाराणसी, उत्तर प्रदेश, 2015.	
Learning Outcomes (अधिगम परिणाम)	• विद्यार्थी इतर विधाओं से परिचित होंगे। • विद्यार्थी इतर विधाओं के इतिहास और साहित्य से परिचित होंगे। • विद्यार्थी विधाओं के श्रेष्ठ साहित्य से परिचित होंगे।	

	• विद्यार्थी विधाओं के बीच के अंतस्संबंध से परिचित होंगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSOC 304

Title of the course (पाठ्यक्रम का शीर्षक): रचनाकार का विशेष अध्ययन: अमृतलाल नागर (Study of Special Author: Amritlal Nagar)

No. of Credits (क्रेडिट): 04 (60 Hours)

Effective from academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	• साहित्य-समाज की साझी संस्कृति की जानकारी अपेक्षित है।	**(Hours) घंटे**
Objectives (उद्देश्य)	• लखनऊ की साझी संस्कृति की जानकारी देना। • विद्यार्थियों को अमृतलाल नागर के साहित्य के विभिन्न पहलुओं से परिचित कराना। • अमृतलाल नागर की विचारधारा से परिचित कराना। • विद्यार्थियों को अमृतलाल नागर के साहित्यिक परिवेश से परिचित कराना।	
Contents (विषय वस्तु)	1. अमृतलाल नागर • जीवन, परिवेश एवं रचनाएँ • वैचारिक दृष्टि	**5**
	2. निर्धारित पाठ्य सामग्री • कहानियाँ: प्रायश्चित, लखनवी होली, एक दिल हज़ार अफ़साने • उपन्यास: भूख, मानस का हंस	**20**
	3. निबंध: • भारतीय साहित्य में प्रेमचंद का स्थान • अवध और उसकी संस्कृति • भारतीय साहित्य कुछ सवाल	**8**
	4. संस्मरण: • गढ़कोला में पहली निराला जयंती • तीस बरस का साथी रामविलास शर्मा • किसान कवि पढ़ीस • जौनपुर का एक असाधारण साधारण पुरुष	**14**
	5. पैरोडी कविताएँ • किसान • जूही की कली	**02**

	6. फ़िल्म: कल्पना	**02**
	7. नाटक: युगावतार	**04**
	8. आत्मकथा: टुकड़े-टुकड़े दास्तान	**05**
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद-संवाद, संगोष्ठी, परिचर्चा, प्रस्तुतीकरण	
Prescribed Text (निर्धारित पाठ्य सामग्री)	1) नागर, अमृतलाल. एक दिल हज़ार अफ़साने (अमृतलाल नागर की संपूर्ण कहानियाँ). राजपाल ऐंड सन्स, दिल्ली, 2015. 2) नागर, अमृतलाल. हम फ़िदा-ए-लखनऊ. राजपाल ऐंड सन्स, दिल्ली, 2015. 3) नागर, अमृतलाल. भूख. राजपाल ऐंड सन्स, दिल्ली, 2016 . 4) नागर, अमृतलाल. मानस का हंस. राजपाल ऐंड सन्स, दिल्ली, 2014. 5) नागर, अमृतलाल. टुकड़े-टुकड़े दास्तान. राजपाल ऐंड सन्स, दिल्ली, 2017. 6) नागर, अमृतलाल. साहित्य और संस्कृति (साहित्यिक एवं ललित निबंधों का संकलन). राजपाल ऐंड सन्स, दिल्ली, 1987.	
References (संदर्भ ग्रंथ सूची)	1) कौशिक, हेमराज. अमृतलाल नागर के उपन्यास. प्रकाशन संस्थान, दिल्ली, 1985. 2) जैन, ज्ञानचंद. कथाशेष. राजकमल प्रकाशन, नई दिल्ली, 1999. 3) डॉक्टर रामरती. अमृतलाल नागर के उपन्यासों में चित्रित राजनीति. संजय प्रकाशन, दिल्ली, 2008. 4) त्रिपाठी, नागेश. अमृतलाल नागर के उपन्यासों का समाजशास्त्रीय अध्ययन. वैशाली प्रकाशन, गोरखपुर, 1993. 5) नागर, शरद (संकलन एवं संपादन) अमृतलाल नागर. फ़िल्मक्षेत्रे-रंगक्षेत्रे. वाणी प्रकाशन दिल्ली, 2003. 6) यादव, उषा सिंह, राजकिशोर (सं॰). हिंदी बाल साहित्य एवं बाल विमर्श. सामयिक प्रकाशन, दिल्ली, 2014. 7) राय, गोपाल. हिंदी कहानी का इतिहास (1951-1975). राजकमल प्रकाशन, दिल्ली, 2011 8) शर्मा, विष्णुचंद्र (संपादन) पक्षधर यथार्थ के कथाकार. यशपाल, अमृतलाल नागर, रेणु. स्वराज प्रकाशन दिल्ली, 2001.	
Learning Outcomes (अधिगम परिणाम)	• विद्यार्थी साझी संस्कृति से परिचित होंगे। • विद्यार्थी लखनऊ के रहन सहन, खानपान, भाषा आदि से परिचित होंगे। • विद्यार्थी अमृतलाल नागर के साहित्य में अभिव्यक्त परिवेश से परिचित होंगे। • विद्यार्थी अमृतलाल नागर की विचारधारा वहाँ के साहित्यिकों से जानेंगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSOC 305

Title of the course (पाठ्यक्रम का शीर्षक): Hindi Memoir Literature (हिंदी संस्मरण साहित्य)

No. of Credits (क्रेडिट): 02 (30 HOURS)

Effective from academic Year (शैक्षणिक वर्ष से लागू): 2022-2023

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	संस्मरण विधा की संक्षिप्त जानकारी अपेक्षित है।	**(HOURS) घंटे**
Objectives (उद्देश्य)	● विद्यार्थियों को संस्मरण विधा की जानकारी कराना। ● विद्यार्थियों को संस्मरणों के माध्यम से तत्कालीन समाज, राजनीति की समस्याओं से परिचित कराना।	
Contents (विषय वस्तु)	● संस्मरण साहित्य: अर्थ, परिभाषा, स्वरूप एवं विकास	**8**
	● निर्धारित संस्मरण 1) हरकिशन सिंह सुरजीत: संगठित किसान आंदोलन के प्रणेता स्वामी सहजानंद सरस्वती 2) फणीश्वरनाथ रेणु: अपने-अपने त्रिलोचन 3) मंटो: इस्मत चुग़ताई और मैं 4) कांतिकुमार जैन: बैकुंठपुर में बचपन 5) विजयमोहन सिंह: एक दरवेश की दास्तान (भीष्म साहनी) 6) सिद्धार्थ सिंह: नामवर सिंह और नामवर बाबूजी 7) अनीता राकेश: चंद सतरें	**22**
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद-संवाद, संगोष्ठी, परिचर्चा, प्रस्तुतीकरण, वृत्तचित्र।	
References (संदर्भ ग्रंथ सूची)	1) कुमार, सुवास (सं०). फणीश्वरनाथ रेणु संचयिता. मेधा बुक्स, शाहदरा दिल्ली, 2003. 2) डॉ० हरिमोहन. साहित्यिक विधाएँ : पुनर्विचार. वाणी प्रकाशन, दिल्ली 1997. 3) धूमकेतु, जयप्रकाश. राहुल सांकृत्यायन : स्वप्न और संघर्ष (सं०). प्रभाष प्रकाशन, इलाहाबाद, 2008. 4) वर्मा, डॉ० धीरेंद्र. (प्रधान संपादक), वर्मा, ब्रजेश्वर. भारती, धर्मवीर. चतुर्वेदी, रामस्वरूप (संयोजक) हिंदी साहित्य कोश भाग-1 (पारिभाषिक शब्दावली), ज्ञानमंडल लिमिटेड, वाराणसी, 1985. 5) व्यास, ज्योति. आधुनिक हिंदी साहित्य में आत्मकथा और संस्मरण विधा. अमन प्रकाशन कानपुर, उत्तर प्रदेश, 2015. 6) शर्मा, डॉ० मनोरमा. संस्मरण और संस्मरणकार. आराधना ब्रदर्स, कानपुर, उत्तर प्रदेश, 1988.	
Learning Outcomes (अधिगम परिणाम)	● विद्यार्थी संस्मरण विधा से परिचित होंगे। ● विद्यार्थी संस्मरणों के माध्यम से तत्कालीन समाज, राजनीति की समस्याओं से परिचित होंगे।	

गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Program (कार्यक्रम): M.A. Hindi (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSOC 306

Title of the course (पाठ्यक्रम का शीर्षक): Hindi Autobiography Literature (हिंदी आत्मकथा साहित्य)

No. of Credits (क्रेडिट): 02 (30 HOURS)

Effective from academic Year (शैक्षणिक वर्ष से लागू): 2022-2023

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	आत्मकथा विधा की संक्षिप्त जानकारी अपेक्षित है।	**(HOURS) घंटे**
Objectives (उद्देश्य)	• विद्यार्थियों को आत्मकथा विधा की जानकारी कराना। • विद्यार्थियों को विभिन्न आत्मकथाओं के माध्यम से लेखक के सामाजिक, राजनीतिक, सांस्कृतिक परिवेश से परिचित कराना।	
Contents (विषय वस्तु)	• आत्मकथा: • अर्थ, परिभाषा, स्वरूप एवं विकास	**11**
	• निर्धारित आत्मकथाएँ 1) यशपाल: सिंहावलोकन 2) निर्मला जैन: ज़माने में हम 3) तुलसीराम: मुर्दहिया 4) रमणिका गुप्ता: हादसे	**19**
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद-संवाद, संगोष्ठी प्रस्तुतीकरण, वृत्तचित्र।	
Prescribed Text (निर्धारित पाठ्य सामग्री)	1) गुप्ता, रमणिका. आपहुदरी (एक ज़िद्दी लड़की की आत्मकथा), सामयिक प्रकाशन, दिल्ली, 2015. 2) जैन, निर्मला. ज़माने में हम. राजकमल प्रकाशन, दिल्ली, 2012. 3) तुलसीराम, मुर्दहिया. राजकमल प्रकाशन, दिल्ली, 2012. 4) यशपाल. सिंहावलोकन, लोकभारती प्रकाशन, इलाहाबाद, 2007.	
References (संदर्भ ग्रंथ सूची)	1) चतुर्वेदी, पंकज. आत्मकथा की संस्कृति, वाणी प्रकाशन, दिल्ली, 2003. 2) डॉ॰ हरिमोहन. साहित्यिक विधाएँ पुनर्विचार, वाणी प्रकाशन, दिल्ली 1997. 3) वर्मा, डॉ॰ धीरेंद्र. (प्रधान संपादक), वर्मा, ब्रजेश्वर. भारती, धर्मवीर. चतुर्वेदी, रामस्वरूप (संयोजक) हिंदी साहित्य कोश भाग-1 (पारिभाषिक शब्दावली), ज्ञानमंडल लिमिटेड, वाराणसी, 1985. 4) 'विद्यालंकार', डॉ॰ विश्वबंधु शास्त्री. हिंदी का आत्मकथा साहित्य, राधा प्रकाशन दिल्ली, 1984. 5) सिंदल, डॉ॰ आनंद. आत्मकथा: साहित्य, सिद्धांत और समीक्षा, अमन प्रकाशन कानपुर, उत्तर प्रदेश, 2014.	
Learning Outcomes (अधिगम परिणाम)	• विद्यार्थी आत्मकथा विधा से परिचित होंगे। • विद्यार्थी विभिन्न आत्मकथाओं के माध्यम से लेखक के सामाजिक, राजनीतिक, सांस्कृतिक परिवेश से परिचित होंगे।	

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गोवा विश्वविद्यालय

शणै गोंयबाब भाषा और साहित्य महाशाला

हिंदी अध्ययन शाखा

Programme (कार्यक्रम): M.A. HINDI (स्नातकोत्तर हिंदी)

Course (पाठ्यक्रम): HNDSOC 307

Title of the Course (पाठ्यक्रम का शीर्षक): Study Tour in Hindi Region

(हिंदी क्षेत्रों में अध्ययन-यात्रा)

No. of Credits (क्रेडिट): 02 (30 HOURS)

Effective from Academic year (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	अध्ययन-यात्रा में रुचि होना अपेक्षित है।	**Hours (घंटे)**
Objectives (उद्देश्य)	● विद्यार्थियों को अध्ययन-यात्रा के स्वरूप से परिचित कराना। ● क्षेत्र-विशेष के भौगोलिक, सामाजिक, सांस्कृतिक एवं ऐतिहासिक महत्त्व से परिचित कराना। ● छात्रों में दल-निष्ठा, नेतृत्व क्षमता, साहस, आत्मविश्वास, अवलोकन और शोध-प्रवृत्ति को परखना एवं विकसित कराना। ● पुरातात्त्विक संदर्भ और साक्ष्य को एकत्र करना। ● छात्रों में रचनात्मकता को बढ़ावा देना।	
Contents (विषयवस्तु)	● अध्ययन-यात्रा: स्वरूप एवं विशेषताएँ ● पूर्व योजना: टिकट आरक्षण, सामान बाँधना, स्वास्थ्य और सुरक्षा प्रबंधन, जाँच-सूची, ऑनसाइट रेखाचित्रण, फ़ोटोग्राफ़ी, वीडियो आदि का संक्षिप्त परिचय।	**4**
	● निर्धारित रचनाएँ: 1. राहुल सांकृत्यायन: घुमक्कड़ शास्त्र 2. कृष्णा सोबती: बुद्ध का कमंडल लद्दाख ● हिंदी क्षेत्र: दिल्ली, उत्तर प्रदेश, बिहार, राजस्थान, उत्तराखंड, मध्य प्रदेश (इसमें से किसी एक क्षेत्र में अध्ययन-यात्रा कर वहाँ की भौगोलिक संरचना, ऐतिहासिक महत्त्व, परिवेश, लोक-जीवन, बोली-भाषा, खाद्य-संस्कृति, साहित्य, नृत्य, वास्तुकला, समस्याओं आदि का अध्ययन करना अपेक्षित है) ● अध्ययन-यात्रा से संबंधित रिपोर्ट लेखन	**2** **20** **4**
Pedagogy (अध्यापन विधि)	व्याख्यान, सामूहिक चर्चा, स्वाध्याय, संगोष्ठी, दृश्य-श्रव्य प्रस्तुतीकरण।	
Prescribed Text (निर्धारित पाठ्य सामग्री)	1. सांकृत्यायन, राहुल. घुमक्कड़शास्त्र. किताब महल, नई दिल्ली, 2020. 2. सोबती, कृष्णा. बुद्ध का कमंडल लद्दाख़. राजकमल प्रकाशन, नई दिल्ली, 2012.	
References (संदर्भ ग्रंथ सूची)	1. चंद्र, मोती. काशी का इतिहास. विश्वविद्यालय प्रकाशन, वाराणसी, 1985. 2. जोशी, मनोहर श्याम. लखनऊ मेरा लखनऊ. वाणी प्रकाशन, दिल्ली, 2002. 3. रुसवा, मिर्ज़ाहादी. लखनऊ की नगर वधू. शरद प्रकाशन, दिल्ली, 1976.	
Learning Outcomes (अधिगम परिणाम)	● विद्यार्थी अध्ययन-यात्रा के स्वरूप को समझेंगे।	

	• क्षेत्र-विशेष के भौगोलिक, सामाजिक, सांस्कृतिक एवं ऐतिहासिक महत्त्व से परिचित होंगे। • छात्र अपने अंदर दल-निष्ठा, साहस, आत्मविश्वास, अवलोकन, नेतृत्व क्षमता, और शोध-प्रवृत्ति आदि को परखेंगे और उसे विकसित करेंगे। • पुरातात्त्विक संदर्भ और साक्ष्य को एकत्र करेंगे। • छात्रों में रचनात्मकता को बढ़ावा मिलेगा।	

गोवा विश्वविद्यालय
शणै गोंयबाब भाषा एवं साहित्य महाशाला
हिंदी अध्ययन शाखा

Programme (कार्यक्रम): M.A. (Hindi) स्नातकोत्तर हिंदी
Course (पाठ्यक्रम): HNDSOC 308
Title of the Course (पाठ्यक्रम का शीर्षक):
Language and Literature: Social and Cultural Survey (भाषा और साहित्य: सामाजिक एवं सांस्कृतिक सर्वेक्षण)
No. of Credits (क्रेडिट): 02 (30 Hours)
Effective from Academic Year: (शैक्षणिक वर्ष से लागू): 2022-23

Prerequisites for the course (पाठ्यक्रम के लिए पूर्वापेक्षित)	• ग्रामीण क्षेत्रों के प्रति जिज्ञासा अपेक्षित है। • भारतीय समाज की सामान्य जानकारी होना अपेक्षित है।	**HOURS (घंटे)**
Objectives (उद्देश्य)	• गाँवों की सामाजिक समस्याओं को समझाना। • समस्याओं के संभावित समाधानों का अन्वेषण कराना। • लोकसंस्कृति का अध्ययन कराना। • क्षेत्रीय अध्ययन एवं संशोधन के लिए आधारभूमि तैयार कराना।	
Contents (विषयवस्तु)	निम्नलिखित बिंदुओं के आधार पर एक संक्षिप्त रपट प्रस्तुत करनी है। 1. गाँव की जनसंख्या। 2. समग्र शिक्षा अभियान। 3. हिंदी भाषा का ज्ञान। 4. साक्षरता दर। 5. सामाजिक-सांस्कृतिक परिवेश। 6. सामाजिक समस्याएँ। 7. व्यवसाय एवं आर्थिक स्थिति। 8. यातायात सुविधा। 9. नेटवर्क सुविधा। 10. लोकसंस्कृति। 11. पर्यावरण तथा अन्य समस्याएँ। 12. स्वच्छता अभियान की जानकारी। 13. गाँव के लोगों की अपेक्षाएँ।	**30**
Pedagogy (अध्यापन विधि)	व्याख्यान, वाद-विवाद-संवाद, भ्रमण,चर्चा-परिचर्चा, साक्षात्कार।	
References/Reading (संदर्भ ग्रंथ सूची)	1) कपूर, सुदर्शन कुमार. भारत की सांस्कृतिक विरासतः एक परिदृश्य चित्र. एन॰बी॰टी॰, दिल्ली. 2) महाजन, सुचैता. सामाजिक बदलाव के लिए शिक्षा. एन॰बी॰टी॰, दिल्ली.	

Learning Outcomes (अधिगम परिणाम)	• गाँवों की सामाजिक समस्याओं को समझ पाएँगे। • समस्याओं के संभावित समाधानों का अन्वेषण करने में सक्षम होंगे। • लोकसंस्कृति का अध्ययन कर सकेंगे। • अगामी शोध-कार्य के समय क्षेत्रीय अध्ययन करने में सक्षम होंगे।	

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D 3.27 Minutes of the Board of Studies in Geography meeting held on 25.07.2022.

Annexure I

GOA UNIVERSITY

DEPARTMENT OF GEOGRAPHY

MA Syllabus based on Choice Based Credit System as per the NEP 2020

Total Credits 80

List of P. G. papers revised and approved by the BOS in Geography held on 25 July 2022

The course and credit distribution

Courses	Course Code	SEM I	SEM II	SEM III	SEM IV	Total Credits
Discipline Specific Core Courses	DSCC	16	16			32
Discipline Specific Optional Courses	DSOC	4	4			8
Research Specific Optional Courses	RSOC			8	4	12
Optional Generic Course	OGC			12		12
Discipline Specific Dissertation	DSD				16	16
Total Credits	20	20	20	20	20	80

One credit is 15 contact hours

Compulsory courses

Course Number and Name	Lecture hours per week	Credits	Page Number
DSCC-GEO 101: **Theory:** Advance Geomorphology	3	3	3-5
DSCC-GEO 101: **Practical:** Practicals in Geomorphology	2	1	6-7
DSCC-GEO 102: **Theory:** Advance Climatology	3	3	8-9
DSCC-GEO 102: **Practical:** Practicals in Climatology	2	1	10-11
DSCC-GEO 103: **Theory:** Fundamentals of Remote Sensing	3	3	12-13
DSCC-GEO 103: **Practical:** Practicals in Remote Sensing	2	1	14-15
DSCC-GEO 104: **Theory:** Environmental Geography	4	4	16-17
DSCC-GEO 105: **Theory:** Population Geography	3	3	18-19
DSCC-GEO 105: **Practical:** Practicals in Population Geography	2	1	20-21
DSCC-GEO 106: **Theory:** Economic Geography	3	3	22-23
DSCC-GEO 106: **Practical:** Practicals in Economic Geography	2	1	24-25

DSCC-GEO 107: **Theory:** Fundamentals of Geographic Information System	3	3	26-27
DSCC-GEO 107: **Practical:** Practicals in Geographic Information System	2	1	28-29
DSCC-GEO 108: **Theory:** Geographical Thought and Development of Geography	4	4	30-31

Optional Courses

Course Number and Name	**Lecture hours per week**	**Credits**	
DSOC- GEO 201 Disaster Mitigation and Management	4	4	32-34
DSOC- GEO 202 Advance Oceanography and Soil Geography	4	4	35-37
DSOC- GEO 203 Socio-Cultural and Urban Geography	4	4	38-40
DSOC- GEO 204 Political Geography	4	4	41-42
DSOC- GEO 205 Geography of Trade and Transport	4	4	43-44

SYLLABUS OF THE M. A. GEOGRAPHY PROGRAMME
COMPULSORY COURSES

Programme: M. A. (Geography)

Course Code: DSCC-GEO 101 **Title of the Course**: Advance Geomorphology

Number of Credits: 3

Effective from AY: 2022-2023

Prerequisites for the course:	Basic knowledge of Physical Geography	
Objectives:	The main focus of this course is to 1. Understand the processes that shape the landforms around us 2. To apply geomorphological concepts to problems of slope instability and try to identify the factors responsible for landslide occurrences in various environments	15 Hours
Content:	Nature and scope of Geomorphology, Fundamental concepts—Geological structures	

	and landforms, uniformitarianism, multi-cyclic and polygenetic evolution of landscapes, concept of threshold Earth movements - epeirogenic, orogenic and cymatogenic earth movements. Forces of crustal instability, isostasy, plate tectonics, seismicity, vulcanicity, orogenic structures with reference to the evolution of the Himalaya.	15 Hours
	General degradational processes: processes of rock weathering and their effects on landforms, Slope development and slope facets; Concept of slope form, slope processes, and evolution; Models of slope evolution; Geomorphological processes upon slopes. Evolution of landforms by the process – Fluvial, Glacial & Periglacial, Aeolian Karst and Coastal	15 Hours
	Applied geomorphology — application of geomorphic mapping terrain evaluation. Digital Elevation Model (DEM) and Triangulated Irregular Network (TIN) unit, land capability and land suitability classification, hydro-geomorphology, urban geomorphology, environmental geomorphology, geomorphic hazards.	
Pedagogy:	Lectures, Group, discussions, tutorials, student Seminars, Presentations, Field visits, Case Studies, Problem Solving Sessions.	
References/Readings:	1) Bloom A.L. 1978: Geomorphology: A Systematic Analysis of Late Cenozoic Landforms Prentice – Hall of India, New Delhi. 2) Brunsden D. 1985: Geomorphology in the Service of Man: The Future of Geography, Methnen, U.K. 3) Chorley, R. J. 1969: Introduction to Fluvial Processes, Methuen, London. 4) Chorley, R. J., Schumm, S. A. and Sugden, D. E. 1984: Geomorphology, Methuen, London. 5) Cooke, R.U. and Warren, 1973: Geomorphology in Deserts, Batsford, London 6) Dayal, P. 1996: Textbook of Geomorphology, Shukla Book Depot, Patna.	

	7) Goudie Anrew et.al. 1981: Geomorphological Techniques, George Allen &Unwin, London. 8) Hallam, A. 1973: A Revolution in Earth Science: From Continental Drift to Plate Tectonics, Oxford University Press, London. 9) Homes A. 1965: Principles of Physical Geology, 3rd Edition, ELBSS Edn. 10) Kale, V. and Gupta, A. 2001: Introduction to Geomorphology, Orient Longman, Kolkata. 11) McCullagh, P. 1978: Modern Concepts in Geomorphology, Oxford University Press, Oxford. UK. 12) Morisowa, M. 1968: Streams, their Dynamics and Morphology, McGraw Hill, New York. 13) Strahler A.N. 1968: The Earth Sciences, Harper & Row Intl. Edn, New York 14) Thornberry W. D. 1969: Principles of Geomorphology 2nd Edition, Wiley Intl. Edn. & Wiley, 1984. 15) Verstappen H. 1983: Applied Geomorphology, Geomorphological Surveys for Environmental Development, Elsevier, Amsterdam	
Learning outcomes:	On completion of the course, students will be able to: **1. Identify** the process of landform formation. **2. Understand** general de-gradational processes. **3. Apply** geomorphic knowledge for sustainable environment **4. Analyze** geomorphological knowledge to solve problems	

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Programme: M. A. (Geography)

Course Code: DSCC-GEO 101 **Title of the Course**: Practical in Geomorphology

Number of Credits: 1

Effective from AY: 2022-2023

Prerequisites for the course:	Basic Skills of Map Reading	
Objectives:	The main focus of this course is to understand geomorphic mapping in the field-process and material mappings with the help of toposheets.	
Content:	Preparation of contour and drainage map from toposheet, Morphometric analysis. Slope (isotan and isosin) and aspect maps & Hypsometric curve and integral. Geomorphic mapping in the field-process and materials mapping. Size analysis of the sediment samples collected in the field (by sieving).	15 Hours
	Plotting of the weights in different sieves on probability graph. Calculation of mean, median sorting index, skewness & kurtosis. Determination of silt and clay based on settling velocity. Measurement of channel cross-sections in the field, Geomorphic map of channel bed, Study of erosional and depositional features on the field	15 Hours
Pedagogy:	Demonstrations and Problem Solving Sessions.	
References/Readings:	1. Doorenbos, J. (1977) and Pruitt W. O. Crop water requirement, FAO Irrigation and Drainage. 2. Frere and Popov (1979)- Agro-Meteorological Crop monitoring and forecasting, FAO plant production Paper No. 17. 3. Lawrence, G. R. P.: Cartographic Methods, Methuen & Co. London. 4. Monkhouse, F. J. R and: Maps and Diagrams, Wilkinson, H. R. Methuen and Co., London. 5. Singh, R. L. & Singh, Rana P. B. (1999): Element of Practical Geography, Kalyani Pub. New Delhi.	
Learning outcomes:	At the end of this course, students will learn to: 1. Prepare maps using toposheets 2. Carry out soil analysis of drainage and morphometry.	

Programme: M. A. (Geography)

Course Code: DSCC-GEO 102 **Title of the Course**: Advanced Climatology

Number of Credits: 3

Effective from AY: 2022-2023

Prerequisites for the course:	Basic knowledge of Weather and Climate	

Objectives:	The main focus of this course is to study the unique characteristics of atmosphere in controlling the global climate, origin, types of climates, causes and processes influencing the climatic variations, and the impact of climate on humans or vice-versa.	
Content:	Nature and scope of climatology and its relationship with meteorology. Composition, mass and structure of the atmosphere. **Temperature:** Insolation, difference between Heat and Temperature, Horizontal and Vertical distributions of insolation, heat balance of the earth, green-house effect, and Inversion of temperature **Pressure:** Factors affecting air pressure, Pressure changes with altitude, distribution of surface pressure, Pressure measurement and Units	15 Hours
	Stable and Unstable Atmosphere, Factors affecting atmospheric stability, Normal, environmental, dry and wet adiabatic lapse rate, Absolute stability, Absolute instability, Conditional instability, Weather associated with stability and instability **Atmospheric moisture:** Humidity, Humidity measurement, Changes of state of water, evaporation, Factors affecting Evaporation , condensation, Factors affecting Condensation, Precipitation: formation, types, acid rain, world pattern of precipitation,	15 Hours
	Wind movement, Global Circulation Model, Tri-cellular theory, and Eddy theory. Classical and Modern Theory of Monsoon Air masses and their modifications, Global, Seasonal & Local winds, Jet stream	15 Hours
Pedagogy:	Lectures, Group, discussions, tutorials, student Seminars, Presentations, Field visits, Case Studies, Problem Solving Sessions.	
References/Readings:	1. Critchfield, H. J. (Rep.2010): General Climatology. Prentice Hall, New Delhi. 2. Lal, D. S. (Edition 2003): Climatology. Sharda Pustak Bhawan, 11, University Road, Allahabad, 211002, U. P.	

	3. Lutgen, Frederick K., Buck, Edward Tar: "The Atmosphere: An Introduction to Meteorology", Prentice Hall, Englewood Cliffs, New Jersey, 0762,1998. 4. Singh, Savindra (Rep.2011): Climatology, Prayag Pub. Allahabad, U. P. India. 5. Trewartha, G. T.: Introduction to Weather and Climate, Mc-Graw- Hill Book Co., New York.	
Learning outcomes:	On completion of the course, students will be able to: 1. **Develop** in depth basic knowledge of Climatology 2. **Understand** various concepts, theories and models. 3. **Apply** the knowledge of Climatology in understanding real life situations. 4. **Analyze** the various theories of Monsoon and understand characteristics of Monsoon	

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Programme: M. A. (Geography)

Course Code: DSCC-GEO 102

Title of the Course: Practicals in Climatology

Number of Credits: 1

Effective from AY: 2022-2023

Prerequisites for the course:	Elementary knowledge of Climatology	
Objectives:	The main focus of this course is to study the climatic data and analyse upper air data, water and rainfall.	
Content:	**Temperature Analysis:** Processing of observed data to derive maximum, minimum and daily range of temperature. Analysis of upper air data – Tephigram (Temperature-Height diagram) Calculation of relative humidity, dew point and vapor pressure from dry and wet bulb temperature data.	15 Hours
	Rainfall Analysis: Classification of Koppen and Thornthwaite's Climate, Calculation of seasonal rainfall and annual variability of rainfall, Construction of crop-coefficient curve for any one crop.	15 Hours

	Calculation of water surplus and water deficit amounts during crop growing season. Computation of Water Requirement Satisfaction index. Discomfort index by Thom's (1959) method. Identification and categorization of heat and cold waves	
Pedagogy:	Demonstrations and Problem Solving Sessions	
References/Readings:	1. Doorenbos, J. (1977) and Pruitt W. O. - Crop water requirement, FAO Irrigation and Drainage. 2. Frere and Popov (1979)- Agro-Meteorological Crop Monitoring and Forecasting, FAO Plant Production Paper, No. 17. 3. John F. Mather (1974) - Climatology Fundamentals and Application, Oxford University Press, London. 4. Mather J. R. (1974)- Climatology, Fundamentals and Applications, Mc Graw Hill Book Co, New York. 5. Singh, R. L. & Rana P. B. (1999): Element of Practical Geography, Kalyani Pub. New Delhi. 6. Trewartha, G. T. (1980): An Introduction to Climatology, Mc-Graw-Hill Book Co. New York.	
Learning outcomes:	Students will be able to **Analyse** Temperature and Rainfall Data. **Calculate** water surplus and water deficit during crop growing season	

Programme: M. A. (Geography)

Course Code: DSCC-GEO 103

Title of the Course: Fundamentals of Remote Sensing

Number of Credits: 3

Effective from AY: 2022-2023

Prerequisites for the course:	NIL	
Objectives:	The course is designed to fulfil following objectives: 1. To provide exposure to students in gaining knowledge on concepts and principles of Remote Sensing and Aerial Photography 2. Interpretation of Satellite Image	
Content:	Introduction, History, development of Remote Sensing, Electro-magnetic Radiation (EMR) Concept, Electro-magnetic spectrum and its components, EMR Interactions with Earth's	

	Atmosphere and Surface features, Spectral Reflectance Curve, Advantages & Disadvantages of Remote Sensing. Remote Sensing Platforms, Satellite orbit: Geostationary satellite and polar orbiting satellite, Types of Sensors, Operating Principles of across & along track scanners	15 Hours
	Concept of Resolution, Swath and Image Pixel, Types of Resolution, Spectral information in satellite image, Spectral Signature Curve Concept of False Color Composite (FCC) and True Color Composite, Satellite Data Products of Indian Remote Sensing, National Aeronautics and Space Administration and European Space Agency, Digital Height Products, Elements of Image Interpretation: Tone, Color, Texture, Pattern, Shape, Size and associated features	15 Hours
	Introduction to Aerial Photography, Geometry of the vertical aerial photograph, Classification of aerial photography, Scale of Aerial Photograph, Aerial survey planning. Introduction to Photogrammetry, Photo Scale; Planimetric measurements on aerial photographs: Area, Distance, Relative height; Radial displacement due to relief and its controlling factors, Concept of 3D vision, Digital and traditional Photogrammetry, Concept of Anaglyph & Stereo imaging; Photogrammetric instruments: Pocket Stereoscope, Mirror Stereoscope, Parallax Bar, Stereo Plotter	15 Hours
Pedagogy:	Lectures, Group, discussions, tutorials, student Seminars, Presentations, Field visits, Case Studies, Problem Solving Sessions. Tools handling	
References/Readings:	1. Barrett, E. C. and Curtis, L. .F.: Fundamentals of Remote Sensing and Air Photo Interpretation, Mcmillan, New York, 1992. 2. Compbell, J.: Introduction to Remote Sensing, Guilford, New York, 1989.	

	3. Curran, Paul J : Principles of Remote Sensing, Longman, London, 1985. 4. Luder, D: Aerial Photography Interpretation : Principles and Application, McGraw Hill, New York, 1959. 5. Pratt, W. K. Digital Image Processing. Wiley, New York,1978. 6. Thomas, M. Lillesand and Ralph, W. Kefer, Remote Sensing and Image Interpretation, John Wiley & Sons, New York, 1994.	
Learning outcomes:	On completion of the course, students will be able to: 1 **Acquire** in depth knowledge of the basic concepts of Remote Sensing 2 **Understand** the importance of Remote Sensing and its applications. 3 **Distinguish** between Remote Sensing and Photogrammetry. 4 **Apply** the knowledge of Remote Sensing and in day-to-day life.	

Programme: M. A. (Geography)

Course Code: DSCC-GEO 103 **Title of the Course**: Practicals in Remote Sensing

Number of Credits: 1

Effective from AY: 2022-2023

Prerequisites for the course:	Computer Skills	
Objectives:	The course is designed to fulfil the following objectives 1. To acquire skills in storing, managing digital data for planning and development. 2. Preparing Land Use maps and detecting change 3. Interpretation of satellite images	
Content:	**Data Representation:** Understanding & Visualizing Satellite Data, Layer Stacking, Layer Mosaic, Band combinations & Color Composites, Identification of features using Color Composite.	

	Spectral Signatures: Representation of pixel data in the form of spectral signature curve, Identification of features using spectral differences **Data Sources:** Downloading free satellite data: Landsat, ASTER, SRTM, Sentinal	15 Hours
	Image Interpretation: Interpretation of satellite image: Landsat TM, Resourcesat, Sentinal, Landsat Thermal Band. **Image Classification & Change Detection:** Generating land use map using satellite image classification techniques, Accuracy Assessment, Area calculations, Change Detection in land use pattern. **Aerial Stereoscopy:** Arrangement of stereo pairs, identification and interpretation of features.	15 Hours
Pedagogy:	Demonstrations, Problem Solving, Interactive Sessions, Hands on Computer based exercises	
References/Readings:	1. American Society of Photogrammetry: Manual of Remote Sensing. ASP Falls Church, V.A. 1983. 2. Barrett, E. C. and L. F. Curtis: Fundamentals of Remote Sensing and Air Photo Interpretation, Mc. Millan, New York, 1992. 3. Compbell, J.: Introduction to Remote Sensing, Guilford, New York, 1989. 4. Curran, Paul J : Principles of Remote Sensing, Longman, London, 1985. 5. Hord, R. M.: Digital Image Processing of Remotely Sensed Data, Academic, New York, 1989. 6. Luder, D.: Aerial Photography Interpretation: Principles and Application, McGraw Hill, New York, 1959. 7. Pratt, W. K. Digital Image Processing. Wiley, New York, 1978. 8. Thomas, M. Lillesand and Ralph W. Kefer, Remote Sensing and Image Interpretation, John Wiley & Sons, New York, 1994.	
Learning outcomes:	Acquire skills in handling instruments, tools, techniques and modelling while using Remote Sensing Technology.	

Course Code: DSCC-GEO 104 **Title of the Course**: Environmental Geography

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Basic Understand of Environment	
Objectives:	The main focus of the course is to Possesses core knowledge of Environmental Geography and analyse the impact of Global Warming and Climate Change.	
Content:	**Introduction to Environmental Geography :** Concept of Environment, major elements of the environment, functioning of environmental systems, the role of biotic and abiotic elements, approaches and methods in Environmental Geography.	15 Hours
	Ecosystem and Biodiversity: Terrestrial ecosystems: Forest, Grassland, Desert and Agriculture. Biodiversity: Genetic, species, community and ecosystem diversity; biodiversity uses, threats to biodiversity, biodiversity conservation.	15 Hours
	Environmental Degradation: Nature and types of degradation-Natural and Anthropogenic degradation, causes and effects of environmental degradation/problems with special reference to the Indian scenario. **Global Warming and Its Impacts:** Climate Change and Global Warming - Ozone layer depletion, Green House Gases, Impacts of Climate Change and Global warming and measures.	15 Hours
	Environmental Management: Environmental planning and policies, Environmental Impact Assessment (EIA). Sustainable development, management of environmental quality.	15 Hours
Pedagogy:	Lectures, Group, discussions, tutorials, student Seminars, Presentations, Field visits, Case Studies, Problem Solving Sessions.	
References/Readings:	1. Bertalanffy, L. General Systems Theory, George Bragiller, New York, 1958.	

	2. Bodkin, E.: Environmental Studies, Charles E. Merril Pub. Co., Columbus, Ohio, 1982. 3. Manners, I. R. and Mikesell, M. W.(eds.), Perspectives on Environment, Commission on College Geography, Publ. No. 13, Washington, D.C., 1974. 4. Noel, Castree, David, Demeritt, Liverman, Diana & Rhodes, Bruce. A Companion to Environmental Geography- A John Wiley & Sons, Ltd., Publication, 2009. 5. Odum, E. P. : Fundamentals of Ecology, W. B. Saunders, Philadelphia, 1971. 6. Singh, S.: Environmental Geography, Prayag Publications, Allahabad, 1991. 7. Smith, R. L.: Man and His Environment: An Ecosystem Approach, Harper & Row, London, 1992. 8. Strahler, A. N., Geography of Man's Environment, John Wiley & Sons Inc. New York, 1984.	
Learning outcomes:	On completion of the course, students will be able to: 1 **Understand** the functioning of environmental systems. 2 **Evaluate** the cause-and-effects of environmental degradation. 3 **Apply** knowledge to understand Global Warming and Climate Change. 4 **Undertake** research on man-nature interaction.	

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Programme: M. A. (Geography)

Course Code: **DSCC-GEO 105** **Title of the Course**: Population Geography

Number of Credits: 3

Effective from AY: 2022-2023

Prerequisites for the course:	Basic knowledge of demographic parameters, which are acquired in undergraduate course.	
Objectives:	The main focus of this course is to introduce students to the theories of population geography and demography. The course will enable students to examine the patterns and trends associated with migration. Students will also associate the relation between population and resources, along with contemporary examples.	
Content:	**Population as a Geographic Subject:** Scope, development and recent trends of population geography and its interdisciplinary nature, Population geography and demography. **Human Population over Time and Space, Determinants of population growth:** World population growth and distribution, overview of population growth. Determinants of Fertility and Mortality, Demographic Transition theory and its relevance. Case Study of India and one of its States.	15 hours
	Dynamics of Migration: trends and patterns: Importance of Migration, types of migration, cause – effect of migration, Indian migration abroad, recent trends and consequences. Migration theories – Lee, Ravenstein and Zelinsky.	15 hours
	Population and Resources: Population versus resources - Under population, overpopulation and optimum population, Malthusian theory of population and analysis of Global Crises. Population-Development and environment. **Population Issues - Global and India** China: Population control Policy and consequences, racism, population dynamics of western world, India Billion Plus and Consequences, India's Population policy, declining gender ratio, women equity and empowerment in India. Changing age structure and Ageing Population, Human development Index.	15 hours
Pedagogy:	Lectures, group discussions, field visits, student presentations, case studies	

References/Readings:	1. BOSE, ASHISH ET AL.: POPULATION IN INDIA'S DEVELOPMENT (1947-2000): VIKAS PUBLISHING HOUSE, NEW DELHI, 1974. 2. Bose, Ashish: India's Billion Plus People- 2001 Census Highlights, Methodology and Media Coverage, B. R. Publishing Corporation, New Delhi. 2001. 3. Census of India, India: A State Profile, 2001 and 2011. 4. Chandna, R. C. Geography of Population: Concept, Determinants and Patterns, Kalyani Publishers, New York, 2000 (Reprint 2012). 5. Clarke, John I.: Population Geography, Pergamon Press, Oxford, 1973. 6. Daugherty, Helen Gin, Kenneth C. W., Kammeryir, An Introduction to Population Geography (Second Edition), The Guilford Press, New York, London, 1998. 7. Garnier, B. J. Geography of Population, Longman, London, 1970 (Reprint 2018). 8. Mitra, Asok: India's Population Aspects of Quality and Control, Vol. I & II. Abhinav Publication, New Delhi, 1978. 9. Mamoria, C. B.: India's Population Problem: Kitab Mahal, New Delhi, 1981. 10. Premi, M. K. India's Population: Heading Towards a Billion, B. R. Publishing Corporation, New Delhi, 1991. 11. Srinivasan, K.: Basic Demographic Techniques and Applications, Sage Pub., New Delhi, 1998.	
Learning outcomes:	At the end of this course, students will: 3. Gain knowledge of concepts associated with population geography. 4. Understand the phenomenon of migration and its effect on resources of a region. 5. Correlate population and resource issues.	

Programme: M. A. (Geography)

Course Code: **DSCC-GEO 105** **Title of the Course**: Practicals in Population Geography

Number of Credits: 1

Effective from AY: 2022-2023

Prerequisites for the course:	Theoretic knowledge about demographic parameters and basics of computation.	
Objectives:	The main focus of this course is to calculate population data and represent in graphical form.	
Content:	**Methods of Population data collection** Basic sources of population data, collection and processing of demographic data: Census, sample survey and registration. Processes involved. **Methods of Calculation of population data** Fertility, Mortality, Population growth and projections (semi average method, least square method, Exponential population growth), construction of life Tables, population density and concentration index. Dependency ratio, calculation of human development Index.	15 hours
	Methods of representation of population data Pie chart, Age and sex pyramid and types, Trilinear chart, Flow diagram, Choropleth, Proportional circles, divided proportional circles, level of urbanization. **Model testing:** Demographic Transition model, rank size rule, nearest neighbourhood index. Settlement Geography – Rural-urban composition and ratio, Gini's concentration, Primacy Index and rank size rule.	15 hours
Pedagogy:	Demonstrations, problem-solving sessions	
References/Readings:	1. BOSE, ASHISH ET AL.: POPULATION IN INDIA'S DEVELOPMENT (1947-2000): VIKAS PUBLISHING HOUSE, NEW DELHI, 1974. 2. Census of India, India: A State Profile, 2001 and 2011. 3. Chandna, R. C. Geography of Population: Concept, Determinants and Patterns, Kalyani Publishers, New York, 2000 (Reprint 2012). 4. Clarke, John I.: Population Geography, Pergamon Press, Oxford, 1973. 5. Garnier, B. J. Geography of Population, Longman, London, 1970 (Reprint 2018). 6. Mitra, Asok: India's Population Aspects of Quality and Control, Vol. I & II. Abhinav Publication, New Delhi, 1978. 7. Premi, M. K. India's Population: Heading Towards a Billion, B. R. Publishing Corporation, New Delhi, 1991.	

	8. Srinivasan, K.: Basic Demographic Techniques and Applications, Sage Publications, New Delhi, 1998.	
Learning outcomes:	At the end of this course, students will be able to: 1. Process raw data into demographic data. 2. Master the skills of graphic representation of data.	

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Programme: M. A. (Geography)

Course Code: **DSCC-GEO 106** **Title of the Course**: Economic Geography

Number of Credits: 3

Effective from AY: 2022-2023

Prerequisites for the course:	No prerequisites for this course.	
Objectives:	The main focus is to understand the ways in which economic activities are organized spatially and to evaluate the theories of industrial locations. Students will also gain knowledge of economic geography through an understanding of accessibility and connectivity, and analyse the regional disparity using local examples.	
Content:	**Introduction to Economic Activities** Scope, content and recent trends in Economic Geography, relation of Economic Geography with other social sciences, Approaches in Economic Geography, Factors of location of economic activities (Physical, social, economic and cultural) Classification of economies; sectors of economy (primary, secondary and tertiary). **Agricultural regions** Concept and techniques of delimitation of agricultural regions, crop combination and diversification-Von Thunen's model and its modifications.	15 hours
	Industries: Classification of industries: Resource based and footloose industries, Theories of industrial location-Weber, Losch and Isard; Case studies of selected industries: Iron and Steel, Aluminum, Chemical, Oil refining and Petrochemical, Engineering, Textile.	15 hours
	Transportation: Modes of transportation and transport cost; accessibility and connectivity:	15 hours

	international, inter and intraregional; comparative cost advantages. Typology of markets, market network in rural societies, market system in urban economy, role of market in the development of trade and commerce. **Economic development of India:** Regional disparities, Impact of green revolution on Indian economy, Globalization and Indian economy and its impact on environment.	
Pedagogy:	Lectures, group discussions, paper reviews, student presentations, case studies.	
References/Readings:	1. Berry, J. L. (1967): Geography of Market Centres and Retail Distribution. Prentice Hall. New York. 2. Chatterjee, S. P. (1984): Economic Geography of Asia. Allied Book Agency, Calcutta. 3. Chorley, R. J. and Haggett, P. (1969): Network Analysis in Geography: Arnold, London. 4. Dreze, J. and Sen, A. (1996). India-Economic Development and Social Opportunity. Oxford University Press, New Delhi. 5. Eckarsley, R. (1995). Markets, the State and the Environment. McMillan. London. 6. Garnier, B. J. and Deblize (1979). A Geography of Marketing. Longman. London.	
Learning outcomes:	At the end of this course, students will be able to: 1. Understand concepts and techniques associated with economic geography. 2. Acquire knowledge pertaining to industries and their location, along with their association to markets.	

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Programme: M. A. (Geography)

Course Code: **DSCC-GEO 106** **Title of the Course**: Practicals in Economic Geography

Number of Credits: 1

Effective from AY: 2022-2023

Prerequisites for the course:	Theoretic knowledge about economic geography and basics of computation.	
Objectives:	The main focus of this course is to analyse and interpret data associated with agriculture, transportation and trade.	
Content:	**Crop Concentration:** Bhatia's method, Jasbir	15 hours

	Crop Diversification: Singh's modified method, Gibbs Martins Index **Crop Combination:** Bhatia's method, Maximum Positive Deviation method of Rafiullah (1956), Athawale's method of crop combination (1966) **Agricultural efficiency:** Aiyar's method, Sapre and Deshpande, Calories per head, Standard Nutritional Units per hectare	
	Lorenz Curve: Gini coefficient **Transport Network:** Theoretical measures of transport network and Graphical Representation: Non-ratio measures cyclomatic number diameter, Ratio measures: Eta, Theta, Iota, Pi, Measurement of route, Measures of Individual elements of transport: Associated number, Degree of connectivity network, Dispersion or Accessibility Index **Models of Spatial Interaction**: Gravity model, Potential Population Surfaces, Breaking Point Theory –Trade area delimitation. Law of retail trade gravitation.	15 hours
Pedagogy:	Demonstrations, problem-solving sessions.	
References/Readings:	1. Chorley, R. J. and Hagget, P. (1971). Models in Geography. Methuen and Co. London. 2. Hussain, M. (1996). Systematic Agricultural Geography. Rawat Publication. Jaipur. 3. Lloyd and Dickens (1972). Location in Space Theoretical Approach to Economic Geography. Harper and Raw Publication. London. 4. Singh, Jasbir (1987). Agricultural Geography. Tata McGraw Publication. New Delhi. 5. Yeats, M. H. (1978). An Introduction to Quantitative Analysis in Human Geography, New York.	
Learning outcomes:	At the end of this course, students will be able to: 1. Learn various methods of crop combinations. 2. Master the skills of processing trade and transport data. 3. Compute indices and models of spatial interaction.	

Programme: M. A. (Geography)

Course Code: **DSCC-GEO 107**

Title of the Course: Fundamentals of Geographic Information System

Number of Credits: 3

Effective from AY: 2022-2023

Prerequisites for the course:	Basic knowledge of remote sensing and computer skills are essential.	
Objectives:	Students will acquire knowledge different components & functions of GIS. Students will be able to examine and identify online open-source software. They will also study GIS data models and ese GIS software to create various types of maps	
Content:	**Introduction to GIS:** Definition, Components & Functions of GIS, Advantage over traditional map making, Interdisciplinary approach of GIS **Geospatial Data:** Geographical Data Models and Structures, Advantages and disadvantages of using raster and vector formats, Sources of Geographical data	15 hours
	Types of GIS & GIS software: GIS Types: Desktop GIS, Web GIS, Mobile GIS Software: Proprietary GIS (ESRI ArcGIS, Map Info, and Global Mapper) and Open-source GIS (Quantum GIS, Grass and Saga GIS) **Data visualization & Integration:** Representation of Geospatial data, Layout formats, Colour Combination & Standardizations, Visualizing data on: GIS portal and Google Earth, Integrating GIS and Google Earth.	15 hours
	Applications of GIS: Case studies on the use of GIS in following fields: Watershed management, Land cover dynamics, socio-cultural settings, Transportation, mining, Land Surface Temperature, Environmental Impact Assessment, Land capability & suitability study **Global Positioning System (GPS):** Introduction to GPS: GPS Segments, Satellite Constellations, Working Principles, GPS Errors, GPS receivers: Handheld GPS, DGPS. GPS Accuracy and applications	15 hours
Pedagogy:	Lectures, group discussions, tutorials.	

References/Readings:	1. Burrough, P.A. Principles of Geographic Information Systems for Land Resource Assessment Oxford University Press, New York, 1986. 2. Fraser Taylor, D.R. Geographic information Systems Pergamon Press, Oxford, 1991. 3. Maquire, D.J.M.F. Goodchild and D.W. Rhind (eds.) Geographic Information Systems: Principles and Application. Taylor & Francis, Washington. 1991. 4. Mark, S. Monmonier. Computer-assisted Cartography. Prentice-Hall, Englewood Cliff, New Jersey, 1982. 5. Peuquet, D. J. and D. F. Marble, Introductory Reading in Geographic Information Systems. Taylor & Francis, Washington, 1990. 6. Star, J and J. Estes, Geographic Information Systems: An Introduction, Prentice Hall, Englewood Cliff, New Jersey, 1994.	
Learning outcomes:	At the end of this course, students will be able to: 1. Understand the methods to integrate geographical concepts with practical examples for problem-solving of critical global and local issues.	

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Programme: M. A. (Geography)

Course Code: **DSCC-GEO 107**

Title of the Course: Practicals in Geographic Information System

Number of Credits: 1

Effective from AY: 2022-2023

Prerequisites for the course:	Basic knowledge of remote sensing and computer skills are essential.	
Objectives:	Students will acquire knowledge of different components & functions of GIS. Students will be able to examine and identify online open-source software. They will also study GIS data models and use GIS software to create various types of maps.	
Content:	**Geospatial Data Access:** Accessing existing data into GIS, Creating multiple copies, re-projecting vector and raster files, Map Projections and Datum, Symbology, Geo-referencing, Digitization.	15 hours

	Digitization: Creating vector layers in GIS, Basic and Advanced editing, Topology building **Attribution:** Creating and modifying attribute tables, attaching attribute information to vector layers, using field calculators	
	Data Retrieval: Querying, Attribute Queries and Spatial Queries, Saving query outputs **Vector operations**: Merge, Dissolve, Intersect, union, Clip, Erase and spatial join **GPS Survey**: Handling GPS receiver, taking waypoints, Importing GPS points in GIS software	15 hours
Pedagogy:	Demonstrations, equipment handling, interactive sessions, hands-on computer-based exercises.	
References/Readings:	1. Burrough, P.A. Principles of Geographic Information Systems for Land Resource Assessment Oxford University Press, New York, 1986. 2. Fraser Taylor, D.R. Geographic information Systems Pergamon Press, Oxford, 1991. 3. Maquire, D.J.M.F. Goodchild and D.W. Rhind (eds.) Geographic Information Systems: Principles and Application. Taylor & Francis, Washington. 1991. 4. Mark, S. Monmonier. Computer-assisted Cartography. Prentice-Hall, Englewood Cliff, New Jersey, 1982. 5. Peuquet, D. J. and D. F. Marble, Introductory Reading in Geographic Information Systems. Taylor & Francis, Washington, 1990. 6. Star, J and J. Estes, Geographic Information Systems: An Introduction, Prentice Hall, Englewood Cliff, New Jersey, 1994.	
Learning outcomes:	At the end of this course, students will be able to: 1. Use technology to integrate geographical concepts with practical examples for problem-solving of critical global and local issues. 2. Acquire hands-on training in various GIS softwares and GPS survey methods.	

Programme: M. A. (Geography)

Course Code: **DSCC-GEO 108**

Title of the Course: Geographical Thought and Development of Geography

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	No prerequisites for this course.	
Objectives:	Students will acquire knowledge on the contributions made by geographers during different periods and understand various approaches to studying geography. Students will also be able to assess the dualism and dichotomies in Geography. Students will also analyse the initiatives taken by the Research Organizations in India.	
Content:	**Development of Geography: Ancient Period** Geography as a science of synthesis, Greek, Roman and Indian Schools of Thoughts, Contribution of Herodotus, Eratosthenes, Strabo, Ptolemy. **Development of Geography: Medieval Period** Scientific explanations: routes to scientific explanations Arab School of thought, Dark age, Age of Discovery, Contribution of Marco Polo, Columbus, Vasco-Da-Gama and Captain Cook.	15 hours
	Development of Geography: Modern Period Foundations of modern geography, German, French, British and American schools of thought, Contributions of Kant, Humboldt, Ritter, W. M. Davis, Charles Darwin. **Dualism in Geography:** Descriptive & analytical, Systematic & regional geography; physical & human geography, the myth and reality about dualisms, Environmental Determinism, Possibilism, Neo-determinism, Positivism, behavioralism, postmodernism.	15 hours
	Development of Geography in 21st Century Conceptual and methodological developments and changing paradigms, Scientific methods, Quantitative revolution. **Applied Geography:** Quantification and application of statistical techniques in Geography, Computer applications in Land use, regional, Rural & urban Planning, Management	15 hours

	of resources and Assessment. GPS Accuracy and applications	
	Development of Geography in India: The early Development of Geography in India, Developmental Initiatives during Colonial Period and Post-Independence, Contributions of Indian Geographers, Current Initiatives in Geography. **Geographic Institutions of Eminence in India:** Academic and Research Institutions, Professional Bodies of Geographers and their Initiatives.	15 hours
Pedagogy:	Lectures, group discussions, case studies, field visits.	
References/Readings:	1.Coffey, W. J. (1981): Geography: Towards a General Spatial Systems Approach, Methuen, London. 2. Cooke, R. U. and Doornkamp, J. C. (1974): Geomorphology in Environmental Management, Clarendon Press, Oxford. 3. Dikshit, R. D. (1997): Geographical Thought: A Contextual History of Ideas, Pub. By A. K. Ghosh, Prentice Hall of India Pvt. M 97, New Delhi. 4. Frazire, J. W. (1982): Applied Geography, Prentice Hall, Englewood Cliffs. 5. Hartshorne, R. (1959): Perspectives of Nature of Geography, Rand MacNally and Co., London. 6. Hussain, M. (1995): Evolution of Geographical Thought, Rawat Pub., Jaipur, India. 7. Singh, I. (2006): Diverse Aspect of Geographical Thought, ALFA Publications, New Delhi. 8. Cole and king 9. David Harvey 10. Trewartha	
Learning outcomes:	At the end of this course, students will be able to: 1. Appreciate the development of geography as an amalgamation of multiple sub-disciplines of science and humanities. 2. Understand the future course of the subject through initiatives of academic and research institutions.	

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OPTIONAL COURSES

Programme: M. A. (Geography)

Course Code: DSOC-GEO 201

Title of the Course: Disaster Mitigation & Management

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	NIL	
Objectives:	The main focus of the course is to understand different hazards and understand and apply risk reduction strategies.	
Content:	**Introduction to hazards & disasters:** Definition, Types of hazards & disasters, Definition, Hazard, Risk & Vulnerability assessment. **Disaster Zonation of the world:** Disaster Zonation of the world in terms of Natural Disasters like Earthquakes, Tropical Cyclones, Tsunamis, Avalanches, Mass movements and Landslides, Floods by severity scales, Disasters in India.	15 Hours
	Climatic, Geological & Geomorphic Disasters: Earthquakes and Tsunamis- Cause and effects and areas affected by earthquakes and tsunamis. Land instability - Causes and effects and areas affected by landslides, subsidence, erosion, deposition.	15 Hours
	Human-induced, Physical Hazards, Biological and Chemical: Hazards Types of human-induced hazards: physical, chemical, biological and pollution. Factors of man-made hazards. Physical Hazards - Cause and effects of Landslides, Soil erosion, forest fires, desertification etc. Impact of large river projects such as the Sardar Sarovar, the Tehri Dam, the impacts of excessive irrigation, and effects of thermal and hydel power stations. Chemical Hazards - Nuclear Hazards, release of toxic elements in the air, soil and water; oil spills. Biological Hazards- Effects of Population growth – its impact on biodiversity, effects of over	15 Hours

	exploitation of resources, ecological disturbances – such as soil development, hydrological cycle, pollution.	
	Disaster Management and Measures: Structural and Nonstructural Measures, Disaster prevention, mitigation, preparedness, response, recovery and rehabilitation. **Strategies of risk reduction:** Strategies of risk reduction, disaster preparedness, support system, organizations, awareness programs. Disaster Policy and Planning in India, Disaster vulnerabilities in the Himalayas: Earthquakes, Flooding and Landslides (to be based on Sikkim examples and Data)	15 Hours
Pedagogy:	Lectures, Group, discussions, tutorials, student Seminars, Presentations, Field visits, Case Studies, Problem Solving Sessions.	
References/Readings:	1. Blaikie, P., Cannon, T., Davis, I., et al. 1994: At Risk: Natural Hazards, People's Vulnerability and Disasters, Routledge, London. 2. Hart, M. G. (1986): Geomorphology, Pure and Applied, George Allen and Unwin, London. 3. Morrisawa, M. (Ed.) (1994): Geomorphology and Natural Hazards, Elsevier, Amsterdam. 4. National Center for Disaster Management (NIDM), Disaster Atlas, South-East Asia, New Delhi. 5. Paraswamam, S. and Unikrishnan, P. V. (2000): India Disaster Report, Oxford University Press, New Delhi. 6. Quarantelli, E. L. (ed.): What is a Disaster? Perspective on the Question, Routledge, London. 7. Singh, Savindra (2000): Environmental Geography, Parag Pustak Bhavan, Allahabad. 8. Turk, J. (1985): Introduction to Environmental Studies, Saunders, College Publication, Japan.	

	9. Valdiya K. S. (1987): Environmental Geology, Tata McGraw Hill, New Delhi.	
Learning outcomes:	On completion of the course, students will be able to: 1 **Know** the importance of disasters and mitigation measures. 2 **Understand** the cause and effect relationship of the disasters. 3 **Apply** the knowledge in real life situations. 4 **Undertake** research in the field of disaster assessment and mitigation	

Programme: M. A. (Geography)

Course Code: DSOC-GEO 202 **Title of the Course**: Advanced Oceanography and Soil Geography

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	Basic knowledge of Physical Geography	
Objectives:	The main focus of the course is to understand Ocean System, its functioning and influence on the earth. The course also introduces different aspects of Soil Science.	
Content:	**Introduction:** Foundation of Modern Oceanography, Contribution of Oceanographers in the subject, Post-war Oceanography, Modern Trends **Origin of the Ocean Basins and Ocean Floor:** Continental Drift, Seafloor Spreading, Plate Tectonics, World Oceans and their formations, Continental Margin, Oceanic Ridges and Rises, Abyssal Plains, Oceanic Trenches, Marine Sediments, Coral Reefs and Atolls.	15 Hours
	Properties of Sea Water: Factors affecting the temperature of sea water and distribution, Factors affecting density, Origin and composition of sea salt and residence time. Sea Water Analysis in Laboratory. **Tides and Tidal Currents:** Tides and their types, tide generating forces, Tidal effects in coastal	15 Hours

	areas, Tidal Bores, Tidal Currents and their Channels, Equilibrium Theory of Tides, Dynamic Theory of Tides. **Ocean Currents:** Ocean Currents and their types, Factors responsible for ocean currents, Ocean currents in Pacific, Atlantic and the Indian Ocean.	
	Introduction to Soil Formation: Importance of soil, Relationship between Hydrology and Soils, Agriculture and Soils, Types of soils, World soil distribution. Factors of soil formation (climate, topography, vegetation), Parent material and soil, Soil Horizons, Mineral Component of Soils, Soil Organic Matter.	15 Hours
	Soil Properties & Quality: Soil Texture, Soil Structure, Soil Color, Bulk Density, Porosity, Permeability, Soil Moisture and Temperature, Processes in Profile Development, Acidity and Alkalinity, Soil pH, Nutrient Cycling. Soil Analysis in Laboratory, Salinization, Acidification, Soil fertility decline, Soil contamination, Deforestation, Overgrazing, Incorrect methods of farming, methods of soil conservation and reclamation Maintenance of Soil Productivity, Fertilizers and Pesticides, Problem Soils, Soil Quality and Sustainable Land Management.	15 Hours
Pedagogy:	Lectures, Group, discussions, tutorials, student Seminars, Presentations, Field visits, Case Studies, Problem Solving Sessions.	
References/Readings:	1. Basu, S. K. (2003) (ed): Handbook of Oceanography, Global Vision, Delhi. 2. Birkeland, P. W. (1999): Soil and Geomorphology, Oxford University Press Inc., New York. 3. Brady, N. C. (1984): The Nature and Properties of Soils. Macmillan Publishing Company, New York and Collier Macmillan Publishers, London. 4. Bunting, B. T. (1969): Geography of Soil, Hutchinson University Library, London.	

	5. Cruickshank, J. G. (1972): Soil Geography, David and Charles (publishers) Limited, Newton Abbot. 6. Davis, Richard A. (1972): Oceanography, Addition Wesley Publishing Co. 7. Fenwick, I. M. and Knapp B. J. (1982): Soils - Process and Response, Unwin Brothers Ltd., The Greshman Press, Surrey. 8. Garrison. Tom (1999): Oceanography, Brooks/Cole Wadsworth, New York. 9. Garrison, Tom (2004): Essentials of Oceanography. Thompson, Australia. 10. Grant, Gross M. (1982): Oceanography, Prentice Hall, Inc., New Jersey. 11. King Cuchlain A. M. (1962): Oceanography for Geographers (ED) Edward Arnold, 12. Pitty, A. F. (1978): Geography and Soil Properties, Methuen and Company Ltd., London. 13. Sharma & Vatal (1962): Oceanography for Geographers. Chaitanya Publishing House, Allahabad. 14. Thomas, J. B. and Brunsden, D. (1977): Geomorphology and Time, Methuen and Company Ltd. 15. Thurman, Harold V. (1985): Introductory Oceanography. Bell & Howell Co. London 16. Weisberg, J. and Howard P. (1974): Introductory Oceanography. McGraw Hill, Kogakusha, Tokyo. 17. White, R. E. (1987): Introduction to the Principles and Practice of Soil Science, Blackwell Scientific Publications, London.	
Learning outcomes:	At the end of this course, the students will be able to:	

	1 **Understand** the significance of Oceans and their impacts on. 2 **Understand** the various concepts in the field. 3 **Acquire** the skills to apply the knowledge to real life situations. 4 **Analyze** the properties of Ocean Water and Soil.	

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Programme: M. A. (Geography)

Course Code: DSOC-GEO 203

Title of the Course: Socio-Cultural and Urban Geography

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	NIL	
Objectives:	The main focus of the course is to introduce different philosophical approaches and concepts in Socio-Cultural Geography and Urban Geography.	
Content:	**Introduction to Philosophical Bases and Concepts:** Definitions, Conceptual and Methodological approaches, Trends and Development. Positivism, Humanism, Idealism, Phenomenalism, Existentialism, Structuralism and Radicalism, **Space and Society:** Origin and diffusion of Culture, Individual's space, Intimate, Personal, Social and Public Space, Interaction and social relations.	15 Hours
	Social Groups: Primary and Secondary Groups, Social Structure, Models of Assimilation and Segregation, Industrialization, Migration, Urbanization, Modernization, Globalization and Sanskritization. **Social – Cultural Regions:** Cultural Diversities, Role of Race, Religion, Caste, Ethnicity, Tribe and Language and Dialect, Level of Education, Economic Activity, Class, Power, Transformation and Change, Cultural regions of the World and India	15 Hours

	Urbanization: Meaning of Urban settlement and their types, and urbanization. Criteria used to distinguish urban settlements; Behavioral, structural and demographic concepts of urbanization. Brief review of spatial-temporal variations in urbanization in the world, Urbanization curve, Contemporary factors of urbanization. **Urban Morphology & Urban Classification:** Park and Burgess Model, Homer Hoyt Model, Harris and Ullman Model, and demarcation of CBD and their applications in Indian context. Various approaches to classification, Urban function, and functional classification of towns and cities by C.D. Harris and H. J. Nelson.	15 Hours
	Rural-Urban Fringe & City and its Region: Concepts of the city region and various synonymous terms used. Criteria used to demarcate the city region, Rurban, Nature of urban influence. **Contemporary Urban issues & Urban policy and planning:** Value of Land and growth of cities - vertical and horizontal, Urban sprawl, Scarcity of housing and growth of Slums, Problems of civic amenities, Urban transport problems, Policies of Urban development, Need for city planning, Elements of the city plan, Master plan of towns, new towns, Environmental pollution, Sustainable Development Goals.	15 Hours
Pedagogy:	Lectures, Group, discussions, tutorials, student Seminars, Presentations, Field visits, Case Studies, Problem Solving Sessions.	
References/Readings:	1. Aijazuddin, Ahmad (1999). Social Geography, Rawat Publications, New Delhi. 2. Brian, R. K. (1996). Landscape of Settlement: Prehistory to the Present. Routledge. London. 3. Bulsara, J. F. (1970). Patterns of Social Life in Metropolitan Areas, Popular Prakashan, Bombay. 4. Carter, H. J. (1972). The Study of Urban Geography. Edward Arnold. London.	

	5. Census of India (1974). Economic and Socio-Cultural Dimensions of Rationalization, Census Centenary, Monograph No. 7, Govt. of India, New Delhi. 6. Coates, B. E. et al. (1977). Geography and Inequality, Oxford University Press, London. 7. Dubey, S. C. (1991). Indian Society, National Book Trust, New Delhi. 8. Hall, P. (1992). Urban and Regional Planning. Routledge. London. 9. Jordon, X. and Lester, G. (1995). The Human Mosaic, Harper and Row, New York. 10. Kundu, A. (1992). Urban Development and Urban Research in India: Khanna Publication. 11. Orang, Mike (1998). Cultural Geography. Routledge Publication, London. 12. Singh. K. and Steinberg. F. (1998). Urban India in Crisis: New Age Interns. New Delhi.	
Learning outcomes:	At the end of this course, the students will be able to: 1 **Understand** the philosophical base of Socio-Cultural and Urban Geography. 2 **Assess** the significance of Social and Cultural Regions of the World and India. 3 **Acquire** the knowledge of spatio-temporal variations in urbanization in the world. 4 **Evaluate** Urban theories and processes in Indian context.	

Programme: M. A. (Geography)

Course Code: **DSOC-GEO 204** **Title of the Course**: Political Geography

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	No prerequisites for this course.	
Objectives:	The main objective of this course is to make students to understand the geo-political significance of India in the Indian Ocean and in the changing world order. The course will analyse the internal disputes of Indian states and apply knowledge of political geography in understanding the space, state and nation. Lastly, the students will evaluate geostrategic views on current global issues.	
Content:	**Introduction to political Geography:** Definition, Geography & Politics, History & Development of Political Geography. **Approaches of Political Geography:** Whittlesey's landscape approach, Functional approach, Centrifugal & centripetal forces, analysis of external functions, Unified Field Theory.	15 hours
	Concept Nation & State Frontiers & Boundaries: Territoriality, State & Nation, State formation. Nation building / Nationalism, Definition of frontiers & boundaries, Distinction between frontiers & boundaries, Genetic, functional & morphological classification of boundaries, Global geostrategic view.	15 hours
	Resource Development & Power Geopolitics: Resources & National strategy, Resource management & power of Nation. Significance of Indian ocean, SAARC, G-4, G-7, G-20, BRICS, Geopolitical and strategic significance of India.	15 hours
	Political Geography of India: Changing internal political map of India and emergence of new states, Unity in diversity, politics of interstate: water, language, and border disputes, Problems of border states of India.	15 hours
Pedagogy:	Lectures, group discussions, case studies, paper reviews.	
References/Readings:	1. Alexander, L. M. (1963): World Political Patterns, Ram McNally, Chicago. 2. Adhikari, Sudeepta (2012): Political Geography, Rawat Publication, Jaipur, India. 3. Dikshit, R. D. (1996): Political Geography: A Contemporary Perspective, Tata McGraw Hill, New Delhi.	

	4. Dikshit, R. D. (1999): Political Geography: A Century of Progress, Sage, New Delhi. 5. De Blij, H. J. and Glasson, M. (1968): Systematic Political Geography, John Wiley, New York. 6. Pounds, N. J. G. (1972): Political Geography, McGraw Hills, New York. 7. Taylor, R. J. (1989) Political Geography, Longman, UK.	
Learning outcomes:	At the end of this course, students will be able to: 1. Appreciate the geo-political implications of India with other nations, as well as the internal situation.	

Programme: M. A. (Geography)

Course Code: **DSOC-GEO 205** **Title of the Course**: Geography of Trade and Transport

Number of Credits: 4

Effective from AY: 2022-2023

Prerequisites for the course:	No prerequisites for this course.	
Objectives:	This course will help students to understand relationship between geography, trade and transport and examine the models and theories of trade and transport. Students will also assess alternative transport system in mega cities of India, and finally analyse recent trends in India's Foreign Trade.	
Content:	**Transportation and Geography:** Transportation and geography, Transportation and space, Transportation and Geography of Trade and Transport, Geography of transportation networks. **Significance of different modes:** Significance of transportation in world and regional economies, Transportation modes, Factors associated with their growth, Characteristics and relative significance of different modes of transport.	15 hours
	Transport network and methods: Methods in transport geography, Models of network changes, Graph theoretic measures, Traffic flow, Gravity models. Transport network and economic development.	15 hours

	Urban transport: Transportation and the urban form, Transport energy and environment. Alternative transport system in mega cities of India, Transport planning and policy.	
	History and development of international trade: History and development of international trade. Trade areas and economic blocks, Various treaties of trade at international level, Geographical factors influencing, international trade. Problems and prospects of international trade in globalization. **Trade Theories:** Theory of comparative advantage-Neo-classical theory, Modern theory.	15 hours
	International Trade: World Trade Patterns, Major Trade Block: OPEC, ASEAN Economic Community (AEC), European Union (EU), WTO, Asia Pacific Economic Cooperation (APEC), Indian Ocean Rim Association (IORA). India's Foreign Trade: Trends, Composition, Direction and Changing Pattern. Challenges and prospects of foreign trade of India, Impact of trade liberalization on the geographical distribution of industries.	15 hours
Pedagogy:	Lectures, group discussions, case studies, paper reviews.	
References/Readings:	1. Bhandari, S. (1992): Transport and Regional Development, Concept Publication, New Delhi. 2. Chorley, R. J. and Haggett, P. (1968): Network Analysis, Edward Arnold, London. 3. Pande, N. P. (1991): Transport Geography, Concept Publication, New Delhi. 4. Sealy, K. R. (1968): Geography of Air Transportation. Hutchinson University Press, London. 5. Singh, K. N. (1990): Transport Network in Rural Development, Institute of Rural Economic Development, Varanasi. 6. Taffe, E. J. and Gauthier H. L. (1973): Geography of Transportation, Prentice-Hall	

	7. Tolley, R. S. and Turton B. J. 91989): Transport system, Policy and Planning Longman Group, Singapore 8. Vaidya, B. C. (eds.) (1998): Reading in Transport Geography: A Regional Perspective, Devika Publications, New Delhi. 9. White, H. P. and Senior, M. L. (1989): Transport Geography, Longman Group, Hong Kong.	
Learning outcomes:	At the end of this course, students will be able to: 1. Correlate trade and transport in spatial context. 2. Apply trade theories to international trade scene.	

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D 3.28 Minutes of the Board of Studies in Botany meeting held on 27.07.2022.

Annexure I

School of Biological Sciences and Biotechnology
M.Sc. Botany Programme (Code: 1453)
(Choice Based Credit System - 80 Credits)

Course Structure

Course Code	Course Title	Credits
(CORE COURSES)		
Semester I		
BOCC-101	Algae, Bryophyta, Pteridophyta and Gymnosperms	3
BOCC-102	Lab in Algae, Bryophyta, Pteridophyta and Gymnosperms	1
BOCC-103	Systematics of Angiosperms	3
BOCC-104	Lab in Systematics of Angiosperms	1
BOCC-105	Internal Morphology and Developmental Biology of Angiosperms.	3
BOCC-106	Lab in Internal Morphology and Developmental Biology of Angiosperms	1
BOCC-107	Plant Physiology	3
BOCC-108	Lab in Plant Physiology	1
BODC-101	Plant Biotechnology	3
BODC-102	Lab in Plant Biotechnology	1
	Semester II	
BOCC-201	Microbiology and Plant Pathology	3
BOCC-202	Lab in Microbiology and Plant Pathology	1
BOCC-203	Cytogenetics and Plant Breeding	3
BOCC-204	Lab in Cytogenetics and Plant Breeding	1
BOCC-205	Plant Molecular Biology	3
BOCC-206	Plant Genetic Engineering	3
BOCC-207	Lab in Plant Molecular Biology and Genetic Engineering	2
BODC-201	Modern Concepts in Plant Ecology	3
BODC-202	Lab in Modern Concepts in Plant Ecology	1
Semester III		
Discipline Specific Generic Courses		
BOGC-301	Introduction to Omics	3
BOGC-302	Plant animal Interaction	4
BOGC-303	Ecotourism	2
BOGC-304	Lab in Ecotourism	2
BOGC-305	Mushroom biotechnology	1
Research Specific Optional Courses		
BORC-301	Research Methodology, Techniques and Instrumentation	4
BORC-302	Applied Phycology: Utilization and Management	3
BORC-303	Lab in Applied Phycology: Utilization and Management	1
Optional Courses		
BOOC-301	Bioinformatics	2
BOOC-302	Lab in Bioinformatics	1

BOOC-303	Mycorrhizal Biotechnology	2
BOOC-304	Lab in Mycorrhizal Biotechnology	1
BOOC-305	Seed Science and Technology	2
BOOC-306	Lab in Seed Science and technology	1
BOOC-307	Post-harvest Technology for Fruit Crops	2
BOOC-308	Plant Biochemistry	3
BOOC-309	Lab in Plant Biochemistry	1
BOOC-310	Oenology (Wine Science and Technology)	1
BOOC-311	Lab in Oenology (Wine Science and Technology)	1
BOOC-312	Marine Phytoplanktons	1
BOOC-313	Ethnobotany	2
BOOC-314	Introduction to Paleoflora	1
BOOC-315	Lab in Mushroom biotechnology	1
Semester IV		
BORC-401	Plant Histochemistry	3
BORC-402	Lab in Plant Histochemistry	1
BOSD	**Dissertation**	16

SWAYAM COURSES **Recommended by BoS for the Post Graduate level**		
Course Code	**Title of the Course**	**Credit Equivalent**
cec20-ge29	Academic writing	4
cec20-bt23	Biostatistics and Mathematical Biology	3
noc20-bt41	Nanotechnology in Agriculture	2
noc20-ag05	Organic Farming for Sustainable Agricultural Production	2
noc20-bt29	Biomedical Nanotechnology	1
cec20-ag14	Functional Food and Nutraceuticals	4
noc20-bt38	Wildlife Ecology	3
noc20-bt31	Experimental Biotechnology	3
cec20-bt24	Biomass Characterization	4

SEMESTER I

Discipline Specific Core Courses

Programme: M. Sc (Botany)
Course Code: BOCC-101
Title of the Course: Algae, Bryophyta, Pteridophyta and Gymnosperms.
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied B. Sc. Botany.	

Objective(s):	To study general characteristics, classification, trends in classification, phylogeny and inter-relationships of Algae, Bryophyta, Pteridophyta and Gymnosperms.	
Content:	1. **Algae:** General introduction to algae including Cyanobacteria: Classification of Algae; Recent trends in the classification of Algae; General account of morphology, anatomy, reproduction, life histories, classification, phylogeny and inter-relationship, ecological and economic importance of the following groups: Chlorophyta, Charophyta, Chrysophyta, Cryptophyta, Pyrrhophyta, Phaeophyta and Rhodophyta. 2. **Bryophyta:** Introduction to Bryophyta: General characteristics, classification; Distribution, morphological, anatomical, reproductive studies and comparative account of sporophytes and gametophytes and interrelationships of the following groups: **Hepaticae:** Sphaerocarpales, Calobryales,Takkakiales, Marchantiales, Jungermanniales, **Anthoceotae**: Anthocerotales; **Musci:** Sphagnales, Andaeales, Polytrichales, Buxbaumiales Funariales including their fossil relatives. 3. **Pteridophyta:** General characters and classification of Pteridophytes; Comparative account of Psilophyta. Lycophyta, Eqisetophyta and Flicophyta; Aposory and Apogamy, Heterospory, Soral Evolution, Fossil Pteridophytes. 4. **Gymnosperms:** General characters and Classification of Gymnosperms; Comparative account of Morphology, anatomy, phylogeny and interrelationships of Pro- Gymnospermopsida, Gymnospermopsida, Gnetopsida and Fossil Gymnosperms.	**11 hours** **10 hours** **12 hours** **12 hours**
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study	
References/ Readings:	**Afroz Alam** (2015). Text Book of Bryophyta I. K. International Publishing House Private Ltd., New-Delhi. **Agashe, S.N.** (1995). Paleobotany, Oxford and IBH Publ. Co. Pvt. Ltd, New Delhi. **Arnold, A.C.** (2005). An Introduction to Paleobotany, Agrobios (India), Jodhpur. **Bhatnagar S. P. and Moitra A.** (1996). Gymnosperms. New Age International, New Delhi. **Biswas C. and Johri B.M.** (1997). Gymnosperms. Narosa Publishers, New Delhi. **Bold H.C. and Wynne M.J.** (1985). Introduction to the algae; Structure and reproduction. Prentice Hall, Englewood cliffs, New Jersey. **Cavers, F.** (1976). The inter relationships of the bryophyte. S.R. Technic, **Ashok Rajpath**, Patna. **Chapman V.J. and Chapman D.J.** (1975). The algae, 2nd Edition, Mac. Millan Publ. Inc. New York. **Chopra, R. N., and Kumar P. K.** (1988). Biology of Bryophytes. John Wiley and Sons, New York, NY. **Desikachary, T.V.** (1959). Cyanophyta ICAR, New Delhi	

Hoek, C. van den, Mann, D.G. and Jahns, H.M. (1995). Algae: An Introduction to Phycology, Cambridge University Press, UK.

Johri, **R.M., Lata, S. and Tyagi, K.** (2012). A Textbook of Bryophyta. Dominant Publishers &. Distributors Pvt., Ltd., New Delhi.

Kashyap, Shiv Ram (1929). Liverworts of The Western Himalayas and The Punjab Plain Part 1 Chronica Botanica, New Delhi.

Kashyap, Shiv Ram, (1932). Liverworts of the western Himalayas and the Punjab plain (illustrated): Part 2. The Chronica Botanica New Delhi.

Kramer, K.U. and Green, P.S. eds., (2013). Pteridophytes and Gymnosperms (Vol. 1). Springer Science & Business Media. Springer Berlin Heidelberg

Parihar, N.S. (1976). Biology and morphology of the Pteidophytes. Central Book Depot.

Parihar, N.S. (1980). Bryophytes: An introduction to Embryophyta Vol I Bryophyta. Central Book Depot.

Prem Puri (1981). Bryophytes: Morphology, Growth and Differentiation, Atmaram and Sons, New Delhi.

Prescott G. W. (1969). The algae: A review. Nelson, London.

Rashid, A. (1999). An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd., New Delhi.

Ramanujan, C.K.G. (1970). Indian Gymnosperms in time and space. Today & Tomorrow's Printers & Publishers.

Round, F.E. (1981). The Ecology of Algae, Cambridge University Press, Cambridge.

Sharma, O.P. (1990). Textbook of Pteridophyta. Macmillan India Ltd., Delhi.

Singh, V. P. (2006). Gymnosperms (Naked seed plants): Structure and Development, Sarup and Sons, New Delhi.

Sporne, K.R. (1965), Morphology of Gymnosperms Hutchinson University Library.

Sporne, K.R. (1986). The morphology of Pteridophytes. Hutchinson University Press, London,

Smith, G. M. (1995). The fresh water Algae of the United States, Mc-Graw Hill, New York.

Srinivasan, K. S. (1969). Phycologia India. Vol I & Vol II B.S.I., Calcutta.

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	Udar, R. (1976). Bryology in India: Chronica Botanica, New Delhi. **Udar, R.** (1970). Introduction Bryophyta Shashidhar Malaviya Prakashan, Lucknow. **Vashishta B.R.** (2015). Algae. S. Chand & Co., New Delhi. **Waston E.V.** (1971). Structure and life of Bryophytes. Hutchinson University Library, London.	
Learning Outcomes:	1. Students will have clear idea of the characteristics of the important plant groups taught in this paper. 2. Concepts in the evolution of plants will be clear to students.	

Programme: M. Sc (Botany)

Course Code: BOCC-102

Title of the Course: Lab in Algae, Bryophyta, Pteridophyta and Gymnosperms.

Number of Credits: 1 (30 hours)

Effective from AY: 2022-23

Prerequisites for the course:	Should have studied B. Sc. Botany.	
Objective(s):	To introduce and expose the students to skills required in field and lab based on theory.	
Content:	1. Study of vegetative and reproductive features of important algal groups including Cyanobacteria with available representatives; Chlorophyta, Charophyta, Euglenophyta, Pyrrhophyta, Phaeophyta and Rhodophyta 2. Study of vegetative and reproductive features of important bryophyte groups with the available representatives- Hepaticae, Anthocerotae and Musci 3. Study of vegetative and reproductive features of important Pteridophytes with the available representatives: Psilotales, Lycopodiales, Selaginellales, Isoeteales, Equisetales, Ophioglossales, Marrattiales, Osmundales, Filicales, Marsileales and Salviniales. 4. Study of vegetative and reproductive features of important Gymnospermopsida and Gnetopsida with the available representatives.	**8 hours** **8 hours** **8 hours** **6 hours**
Pedagogy:	Conducting Practicals mostly with freshly collected and herbarium specimens, field visits, demonstrations, small projects, etc.	
References/ Readings:	**Bellinger, E. G., & Sigee, D. C.** (2015). Freshwater algae: identification, enumeration and use as bioindicators. John Wiley & Sons, UK. **Biswas C. and Johri B. M.** (1997). Gymnosperms. Narosa Publishers, New Delhi. **Bold H.C. and Wynne M. J.** (1985). Introduction to the algae; Structure and reproduction. Prentice Hall, Englewood cliffs, New Jersey. **Desikachary, T.V.** (1959). Cyanophyta ICAR, New Delhi.	

	Parihar, N.S. (1976). Biology and morphology of the Pteidophytes Central Book Depot. **Parihar, N.S.** (1980). Bryophytes: An introduction to Embryophyta Vol I Bryophyta central Book Depot. **Prem Puri** (1981). Bryophytes: Morphology, Growth and Differentiation, Atmaram and Sons, New Delhi. **Prescott G.W**. (1969). The algae: A review. Nelson, London. **Rashid, A.** (1999). An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi. **Ramanujan, C.K.G.** (1970). Indian Gymnosperms in time and space. Today & Tomorrow's Printers & Publishers. **Sporne, K.R.** (1986). The morphology of Pteridophytes. Hutchinson University Press. London **Smith, G.M.** (1995). The fresh water Algae of the United States, Mc-Graw Hill, New York. **Srinivasan, K. S**. (1969). Phycologia India. Vol I & Vol II B.S.I. Calcutta. **Vashishta B.R.** (1988). Algae. S. Chand & Co., New Delhi. **Waston E.V**. (1971). Structure and life of Bryophytes 3rd Hutchinson University Library London.	
Learning Outcomes:	1. Able to understand technical description of plants and construct and use keys for identification, morphological, anatomical and reproductive characteristics of the respective plant groups. 2. Able to understand the concepts of the plant evolution. 3. Overall, they will have better understanding in area of plant diversity and will be able to carry out research work in this field.	

Programme: M. Sc (Botany)
Course Code: BOCC-103
Title of the Course: Systematics of Angiosperms.
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied Plant Taxonomy at undergraduate level. They should be good in basics of classification and nomenclature of angiosperms.	
Objective(s):	Taxonomy is fundamental to the rest of the studies in biology and at the same time it takes inputs from other branches. The ultimate aim of taxonomy is to understand the evolution at work. Angiosperms being the dominant as well as most evolved plant group, the sources of characters for taxonomy are also varied. It is also being practiced at various levels, from morphology to phylogenomics. This course aims to give comprehensive understanding in angiosperm taxonomy as well as its practice and applications.	

Content:	1. **Plant taxonomy**: Scope and importance; taxonomy as a synthetic discipline; principles and goals; applications - IUCN Red List, Conservation priorities;	**4 hours**
	2. **Floras, Revisions and Monographs:** Floras, Revisions and Monographs as basis of taxonomy; components, design and methods of floristics and revisionary/ monographic studies; role of herbaria, botanic gardens and literature in taxonomic studies; important literature resources.	**6 Hours**
	3. **Nomenclature:** Purpose, Principles, and overall knowledge of International Code of Nomenclature for algae, fungi, and plants (ICN) and Articles pertaining to typification, publication, priority, author citation and their application.	**7 hours**
	4. **Numerical methods in taxonomy:** Phenetics, Principal Component Analysis, Discriminant Analyses.	**4 hours**
	5. **Cladistics:** Introduction – advantages and problems; classical taxonomy as base for molecular systematics; systematics and phylogenetics classifications – use and utility. The choice of molecules in systematics – Nucleic acids, proteins and amino acids. Molecular evolution – neutral theory, molecular clock. Cladistics (Phylogeny) – concepts, parsimony, cladograms and trees; characters: apomorphic and plesiomorphic characters, homologous vs analogous; character states, binary and multistate characters, characters transformations; morphometric vs molecular characters. Trees - monophly, polyphyly and paraphyly; rooted and unrooted. Sequences – finding homologous sequences and alignment; local vs global alignment; pairwise and multiple sequence alignment. Tree construction – algorithmic (UPGMA and Neighbour Joining) and tree-searching (Parsimony, Maximum Likelihood and Bayesian). Phylogenomics as the modern trend in plant taxonomy.	**8 hours**
	6. **Phytogeography:** Basic terminologies and their understanding; Endemism- types and causes; vicariance; phytogeography and applications; phytogeographic regions of India and the world.	**5 hours**
	7. **Phylogeny and Classification of Angiosperms:** Fossil angiosperms and their ecology. Recent systems of classification; APG IV system of classification of angiosperms; characteristics and phylogeny of Basal angiosperms (Amborellales, Nymphaeales and Austrobaileyales); Order Ceratophyllales, Eudicots (order Ranunculales); Core eudicots [(Superrrosids (Rosids, Fabids, Malvids) and Superasterids (Asterids, Lamiids and Campanulids)].	**11 hours**
Pedagogy:	Lectures/ Tutorials/Assignments/Self-Study	
References/ Readings:	**APG IV** (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV, Botanical Journal of the Linnean Society, Volume 181, Issue 1, 1 May 2016, Pages 1–20, https://doi.org/10.1111/boj.12385	

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Besse, P. (2014). Guidelines for the choice of sequences for molecular plant taxonomy. In Molecular Plant Taxonomy (pp. 39-51). Humana Press, Totowa, NJ.

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Ian J. Kitching, Peter L. Forey, Christopher J. Humphries and David M. Williams, (1998). Cladistics: The Theory and Practice of Parsimony analysis (2nd Ed.). The Oxford University Press.

Jain, S.K. and R.R. Rao. (1977). A handbook of Field and Herbarium methods. Today and Tomorrow Printers and Publishers, New Delhi.

Joesph Felsenstein, (2003). Inferring Phylogenies. Sinauer Associates, Inc. (Now Oxford University Press).

Jones, S.B. and A.E. Luchsinger. (1987). Plant Systematics (2nd Ed.) McGraw Hill Book Company. New York.

Michael J. Moore, Pamela S. Soltis, Charles D. Bell, J. Gordon Burleigh and Douglas E. Soltis, (2010). Phylogenetic analysis of 83 plastid genes further resolves the early diversification of eudicots. (www.pnas.org/cgi/doi/10.1073/pnas.0907801107)

Michael George Simpson, (2010). Plant systematic (2nd Edition). Academic Press.

Nei, M. and S. Kumar, (2000). Molecular Evolution and Phylogenetics. Oxford University Press Inc.

Page, N. (2017). Photographic guide to endemic woody plants of western ghats. Trail Blazer Printers and Publishers

Peter Skelton and Andrew Smith, (2002). Cladistics: A Practical Primer on CD-ROM with accompanying booklet by Neale Monks. Cambridge University Press.

Quicke, D.L.J. (1993). Principles and Techniques of Contemporary Taxonomy. Blackie Academic & Professional (An imprint of Chapman & Hall.).

Robert W. Scotland and Toby Pennington, (2000). Homology and systematics: coding characters for phylogenetic analysis. Systematics Association.

Salemi, M. and A.-M. Vandamme, (2003). The Phylogenetic Handbook. A Practical Approach to DNA and Protein Phylogeny. Cambridge University Press.

Singh, G. (2010). Plant systematics: an integrated approach (Third Edition). CRC Press.

Singh, G. 2019. (4th ed.). Plant Systematics: Theory and Practice. Oxford & IBH Publishing Company Pvt. Limited.

	Sivarajan, V.V. (1991). (2nd ed.). Introduction to the Principles of Plant Taxonomy (Ed. N S K Robson). Oxford & IBH publishing Co. Pvt. Ltd. **Soltis, D., Soltis P., Endress, P., Chase M.W., Manchester S., Judd W., Majure L., and Mavrodiev, E.** (2017). Phylogeny and Evolution of Angiosperms (Revised and Updated edition). University of Chicago Press: 1427 E. 60th Street Chicago, IL 60637 USA. **Stevens, P. F.** (2001 onwards). Angiosperm Phylogeny Website. Version 14, July 2017 [and more or less continuously updated since]. http://www.mobot.org/MOBOT/research/APweb/ **Stuessy, Tod F.,** (2009). Plant taxonomy: the systematic evaluation of comparative data (2nd ed.). New York: Columbia University Press. **Takhtajan, A**. (Ed.). (2009). Flowering plants. Dordrecht: Springer Netherlands. **Walter S. Judd, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, Michael J. Donoghue,** (2015). Plant Systematics: A Phylogenetic Approach, Fourth Edition.Sinauer Associates, Inc., Publishers, Sunderland, USA (Now Oxford University Press).	
Learning Outcomes:	1. Able to relate plant taxonomy to various other branches including conservation. 2. Should be in a position to understand and use Floras, Revisions and Monographs. 3. Should be able to apply nomenclatural rules. 4. Able to understand and interpret the phylogenetic trees. 5. Know the latest phylogenetic classification of angiosperms, relationships among major clades and their evolution.	

Programme: M. Sc (Botany)
Course Code: BOCC-104
Title of the Course: Lab in Systematics of Angiosperms
Number of Credits: 1 (30 hours)
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied or have the practical knowledge of Plant morphological terms.	
Objective(s):	To learn plant taxonomy through dissection of flowers, use of Floras and field study and develop skills to handle plant identification and floristic work independently and at the same time able to handle molecular data for interpreting phylogeny.	

Content:	1. Writing of technical descriptions and demonstration of preparation of herbarium.	**4 hours**
	2. Construction of keys.	**2 hours**
	3. Identification of local species using Floras, keys and campus field trips.	**8 hours**
	4. Identification of 28 families using diagnostic characters; diagnostic characters to be illustrated.	**14 hours**
	5. Construction of phylogenetic tree based on gene sequences available at NCBI database (each student may be given different gene sequences/taxa).	**4 hours**
	6. A mini field project to study flora from Goa University campus based on Practical 3 and submission of report.	
	Only 30 hours for any of the above practicals will be conducted depending on availability of plant material, equipments, etc.	
Pedagogy:	Through actual dissection of floral parts/ Field trip /Practice	
References/ Readings:	**Barry G. Hall.** (2007). Phylogenetic Trees Made Easy: A How-To Manual, Third Edition. Sinauer Associates, Inc., Publishers, Sunderland, USA. **Jain, S.K. and R.R. Rao.** (1977). A handbook of Field and Herbarium methods. Today and Tomorrow Printers and Publishers, New Delhi. **Judd, W. S., Campbell, C. S., Kellogg, E. A., Stevens, P. F., & Donoghue, M. J.** (2007). Plant systematics: A phylogenetic approach. Third Edition. Sinauer Associates, Inc., Publishers, Sunderland, USA. **Lawrence, G.H.M.** (1951). Taxonomy of Vascular. Plants. Oxford & IBH Publishing Co. **Singh, G.** (2009). Plant systematics: an integrated approach. Science Pub Inc. **Utteridge, T. and G. Bramley.** (2014). Tropical Plant Families Identification Handbook. Kew Publishing.	
Learning Outcomes:	1. Able to write technical description of plants and construct and use keys for identification. 2. Able to identify common plant families based on the morphological features. 3. Able to recognize common plants. 4. Able to construct phylogenetic tree based on molecular sequences.	

Programme: M. Sc (Botany)
Course Code: BOCC-105
Title of the Course: Internal Morphology and Developmental Biology of Angiosperms.
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied B.Sc. Botany. It is assumed that students have a basic knowledge of anatomy and developmental biology of higher plants.	
Objective(s):	The paper provides deeper understanding of various anatomical structures and their functions, several embryological processes including pollen pistil interaction, applied aspects of embryology, various palynological methods to understand pollen biology and pollen biotechnology of flowering plants.	
Content:	**Internal Morphology** 1. Meristems: Shoot and root apical and intercalary meristems; their ultra-structure and histochemistry; cytological and molecular analysis of the shoot apical meristem; autonomy of the meristem and vascular tissue differentiation in the shoot apex. 2. Vascular cambium vs cork cambium, factors controlling their activity; lenticels; abscission; wound healing. 3. Ontogeny, phylogeny, evolution, ultra-structure and function of primary and secondary xylem; wood anatomy; bio-deterioration of wood and its prevention. 4. Ontogeny, phylogeny, evolution, ultra-structure and function of primary and secondary phloem. 5. Structural variability in leaves including leaf structures of C_3 and C_4 sub-types, CAM plants; leaf histogenesis; leaf meristems; evolution of leaf forms, heteroblasty. Origin, development and ultra-structure of trichomes and stomata. 6. Nodal anatomy: Nodal types, phylogenetic and evolutionary considerations. 7. Anatomy of monocotyledonous and dicotyledonous seeds and fruits - their ontogeny structure and functions. **Embryology** 1. **Microsporogenesis and formation of the male gametophyte:** Anther differentiation, pollen development and maturation, gene expression during pollen development, male sterility and pollen abortion, male gametogenesis. 2. **Megasporogenesis and formation of embryo sac:** Ovule differentiation and development, megasporogenesis, organization of embryo sac, types of embryo sac, gene function during megagametogenesis. 3. **Pollen pistil interaction and fertilization:** Pollen-stigma interaction and pollen tube guidance, pollen recognition by stigma, self-incompatibility, structural, biochemical and molecular aspects of gametophytic and sporophytic self-incompatibility. Double fertilization, *in vitro* fertilization. 4. **Endosperm and embryogenesis:** Endosperm, embryo, nutrition and growth of embryo. Gene action during embryogenesis, storage compounds in endosperm and embryo,	**4 hours** **2 hours** **4 hours** **2 hours** **5 hours** **2 hours** **4 hours** **2 hours** **2 hours** **4 hours** **4 hours**

	storage protein gene expression in transgenic systems; apomixis and polyembryony; applied aspects of embryology. **Palynology** 1. **Pollen Biology:** Pollen morphological characters, Pollen wall features, pollen development and evolution of pollen types, palynology and taxonomy. 2. **Aeropalynology:** Methods of aerospora survey and analysis; pollen allergy and pollen calendars. 3. **Mellittopalynology:** Honey bee and pollen loads; role of apiaries in crop production. 4. **Palaeopalynology:** Study of fossil pollens and spores and their significance in paleobotany and coal and oil explorations. 5. Pollen biotechnology for crop production and improvement.	**3 hours** **2 hours** **2 hours** **2 hours** **1 hour**
Pedagogy:	Lectures/ Tutorials/Assignments/Seminars/Self-Study	
References/ Readings:	**Batygina T.B.** (2009). Embryology of Flowering Plants Terminology and Concepts, Volume 3, Reproductive Systems, Science Publishers, USA. **Bhatnagar, S.P., P.K. Dantu and S.S Bhojwani**. (2018). The Embryology of Angiosperms, 6th Edition, Vikas Publishers House, New Delhi. **Bhojwani S. S. and Bhatnagar S. P.** (1992). The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd., New Delhi. **Esau K.** (1985). Plant anatomy, 2nd Edition, Wiley Eastern Limited, New Delhi. **Fahn. A.** (1990). Plant Anatomy, 4th Edition, Pergamon press, New York, Oxford. **Hesse M. and Ehrendorfer F.** (1990). Morphology, Development and Systematic Relevance of Pollen and Spores, Springer-Verlag, New York. **Johri B.M.** (1984). Comparative Embryology of Angiosperms, Ind. Nat. Sci. Acad., New Delhi. **Kashinath Bhattacharya, M. R. Majumdar and S. G. Bhattacharya.** (2006). A text Book of Palynology, New Central Book Agency (P) Ltd., Kolkata, India. **Lyndon R.F. (**1990). Plant Development, the Cellular Basis. Cambridge University Press, UK. **Maheshwari P.** (1985). An Introduction to Embryology of Angiosperms, Tata McGraw Hill, New Delhi. **Metcalf C. R. and Chalk L.** (1950). Anatomy of Dicots Vol. I & II, London Press, Oxford. **Nair P.K.K.** (1985). Essentials of Palynology, Asha Publishing House, New York. **Raghavan V.** (2000). Developmental Biology of Flowering Plants, Springer-Verlag, New York.	

	Richard Crang, Robert Wise, and Sheila Lyons-Sobaski. (2018). Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants, Springer. **Romberger J. A., Hejnowicz Z. and Hill J. F.** (1993). Plant Structure: Function and Development, Springer-Verlag. **Shivanna, K. R. and Rangaswamy N. S.** (1992). Pollen Biology- A Laboratory Manual, Narosa Publishing House, New Delhi. **Shivanna, K. R. and Sawhney V. K.** (1997). Pollen Biotechnology for Crop Production and Improvement, Cambridge University press. U.K.	
Learning Outcomes:	1. Being able to apply the knowledge of anatomy, structure and functions to all flowering plants. 2. Being able to apply the embryological processes and applied aspects of embryology in various situations. 3. Being able to apply the knowledge of pollen biology and biotechnology and methods and techniques learnt to various situations and applications.	

Programme: M. Sc (Botany)
Course Code: BOCC-106
Title of the Course: Lab in Internal Morphology and Developmental Biology of Angiosperms
Number of Credits: 1 (30 hours)
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied B.Sc. Botany. It is assumed that students have a basic knowledge of anatomy and developmental biology of higher plants.	
Objective:	To learn plant anatomy, embryology and palynology through sectioning and staining of various vegetative and reproductive parts of plants. Development of skills such as isolation of embryo and endosperm from early stages of seed development. Also, to study various ornamentation patterns in pollen grains from flowers and honey samples.	
Content:	1. Comparative anatomy of monocotyledon and dicotyledon root, stem and leaf. 2. Anatomical basis of identification C_3& C_4 sub types in grasses. 3. Phytoliths of grasses and their potential use in identification. 4. Anatomy of lenticels and periderm in plants. 5. Anatomy of monocotyledonous and dicotyledonous seeds. 6. Study of different types of stomata and trichomes. 7. Maceration of wood to study xylem components. 8. Study of microsporangium and microsporogenesis. 9. Study of megasporangium and embryo sac development. 10. Study of types of endosperm and its modifications. 11. Study of development of embryo in dicot and monocot. 12. Study of different ornamentation patterns in pollen grains by acetolysis method.	**2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **4 hours** **2 hours** **2 hours** **2 hours** **2 hours** **4 hours**

	13. Analysis of honey samples to identify uni-floral or multi-floral honey. 14. Study the different components of phloem. ***Only 30 hours for any of the above practicals will be conducted depending on availability of plant material, chemicals, equipments, etc.***	**4 hours** **2 hours**
Pedagogy:	Hands on Practical.	
References/ Readings:	**Batygina T. B.** (2009). Embryology of Flowering Plants Terminology and Concepts, Volume 3, Reproductive Systems, Science Publishers, USA. **Bhattacharya K., M. R. Majumdar and S. G. Bhattacharya.** (2006). A text Book of Palynology, New Central Book Agency (P) Ltd., Kolkata, India. **Bhatnagar, S.P., P.K. Dantu and S.S Bhojwani**. (2018). The Embryology of Angiosperms, 6th Edition, Vikas Publishers House, New Delhi. **Bhojwani S. S. and Bhatnagar S. P.** (1992). The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd., New Delhi. **Esau K.** (1985). Plant anatomy, 2nd Edition, Wiley Eastern Limited, New Delhi. **Fahn. A.** (1990). Plant Anatomy, 4th Edition, Pergamon press, New York, Oxford. **Hesse M. and Ehrendorfer F.** (1990). Morphology, Development and Systematic Relevance of Pollen and Spores, Springer-Verlag, New York. **Johri B.M.** (1984). Comparative Embryology of Angiosperms, Ind. Nat. Sci. Acad., New Delhi. **Lyndon R. F.** (1990). Plant Development, the Cellular Basis. Cambridge University Press, UK. **Maheshwari P.** (1985). An Introduction to Embryology of Angiosperms, Tata McGraw Hill, New Delhi. **Metcalf C. R. and Chalk L.** (1950). Anatomy of Dicots Vol. I & II, London Press, Oxford. **Nair P.K.K.** (1985). Essentials of Palynology, Asha Publishing House, New York. **Raghavan V.** (2000). Developmental Biology of Flowering Plants, Springer-Verlag, New York. **Romberger J. A., Hejnowicz Z. and Hill J.F.** (1993). Plant Structure: Function and Development, Springer-Verlag. **Crang R., Wise R., and Lyons-Sobaski S.** (2018). Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants, Springer. **Shivanna, K. R. and Rangaswamy N. S.** (1992). Pollen Biology - A Laboratory Manual, Narosa Publishing House, New Delhi.	

	Shivanna, K. R. and Sawhney V. K. (1997). Pollen Biotechnology for Crop Production and Improvement, Cambridge University press. U.K.	
Learning Outcomes:	1. Being able to apply the knowledge of anatomy, structure and functions to all flowering plants. 2. Being able to apply the embryological techniques and methods to various plant species and situations. 3. Being able to apply the knowledge of pollen biology and methods and techniques to various plant species. 4. Environmental bio-monitoring of pollen allergens.	

Programme: M. Sc Botany
Course Code: BOCC-107
Title of the Course: Plant Physiology
No. of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Knowledge of the subject at UG level.	
Objective(s):	This course teaches processes of plant water relationship, mineral nutrition and assimilation (nitrogen, sulphur and other inorganic nutrients), photosynthesis with emphasis on mechanism of abiotic stresses at physiological and molecular level with reference to crop productivity. The Course also teaches Plant growth and development due to light and phytohormones with emphasizes on cellular and molecular mechanism of signal transduction and physiological response.	
Content:	1. The physico-chemical organisation of the plant cell and cell organelles; structure and composition of plasma membrane fluid mosaic lipo-protein model, membrane, Water relation of plants, unique physico chemical properties of water; bulk movement of water and substances across the membrane, aquaporins, stomatal regulation of transpiration, anti transpirants. 2. Inorganic nutrition, macro and micro nutrients, deficiency symptoms, hydroponic studies; mineral absorption and translocation and assimilation; Nernst equation and Donnan's equilibrium. 3. **Nitrogen metabolism:** Nitrogen nutrition, organic nitrogen, nitrogen fixation in legumes, nitrate and ammonia assimilation: Sulfur metabolism and amino acid synthesis. Inter relationship between photosynthesis, respiration and nitrogen metabolism. 4. **Photosynthesis:** Importance of photosynthesis, Photosynthesis and environment. Light reaction: Radiant energy, photosynthetic apparatus, pigments and their biosynthesis; light harvesting complex; characteristics of two photosystems, photosynthetic electron transport, water oxidation and its molecular mechanism, photophosphorylation, pseudocyclic electron transport (Mehler reaction), Artificial photosynthesis. Climate change & food and fuel security.	**4 hours** **2 hours** **3 hours** **5 hours**

	5. **Dark reaction:** Carbon dioxide fixation in C3, C4 and CAM plants regulation of PCR cycle; photorespiration and its regulation, environmental factors affecting photosynthesis.	**3 hours**
	6. Aerobic and anaerobic respiration; cyanide independent respiration; cytochrome system; carbohydrate and lipid metabolism; high energy compounds and factors affecting respiration. Chemo osmotic hypothesis.	**7 hours**
	7. **Reactive oxygen species:** ROS generation, its oxidative effect on biomoleculaes (protein, lipids and DNA) and enzymatic and non-enzymatic protective processes.	**3 hours**
	8. **Enzymes:** Structure and classification; mechanism of action; Michaelis-Menten equation; Lineweaver-Burk plot; enzyme regulation; allosteric enzymes, isozymes, co-enzymes and vitamins.	**2 hours**
	9. **Growth and development:** Phytochromes and light control, regulatory mechanism; role of phytochrome in phototropism; physiology of flowering and fruiting.	**2 hours**
	10. **Phytohormones:** Auxin; cytokinin; Gibberellins; ethylene; ABA. polyamines; brassinosteroids, jasmonate, their synthesis, distribution; and physiological effects. Molecular mechanism of action.	**5 hours**
	11. **Stress Physiology:** Abiotic stresses (drought, salt and metal), morphological and cellular adaptation; molecular mechanism of stress tolerance and protection.	**4 hours**
	12. Seed dormancy and germination, senescence, circadian rhythms in plants (with emphasis on exogenous factors and molecular mechanism).	**3 hours**
Pedagogy:	Lecture through PPT/E-learning/Assignments/Seminars/LSM Moodle.	
References/ Readings:	**Anderson *et al.*** (1996) Molecular Genetics of Photosynthesis, IRL Press, New Delhi. Hipkins, M.F and Baker N.R. Photosynthesis: Energy transduction a practical approach, IRL Press. **Blankenship R.E.** (2008) Molecular Mechanism of photosynthesis Blackwell Science, Oxford. **Bopp M.** (1985) Plant Growth substances. Springer, Berlin. **Buchanan B.B., Gruissen W. and Jones R.L.** (2nd Ed) (2015) Biochemistry and Molecular Biology of Plants, ASPP. **Coombs J., Hall D.O., Long, S.P. and Scurlock J.M.O**. (1985) Techniques in bioproductivity and Photosynthesis. Pergamon, Oxford. **Davies D.** (1980) The Biochemistry of Plants Academic Press. **Dennis D.T., Turnip D.H., Lefebvre, D.D. and Layzell D.B.** (1997) Plant Metabolism. Longman, Singapore. **Douce R.** (2002) Mitochondria in higher plants: Structure, function and Biogenesis. Academic Press. **Douce R and Day D.A.** (1985) Higher plant cell respiration. Springer, Berlin. **Davies P.J.** (1987) Plant Hormone and their role in plant growth development. Kluwer, Dordrecht, Netherland.	

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Edwards G.E. and Walker D. (1992) C3-C4 mechanisms and cellular and environmental regulation of photosy nthesis. Univ. California Press.

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Karban R. and Baldwin I.T. (2007) Induced response to herbivory. Uni. Chicago press. Galston A. Life processes of Plants. Sci. Am. Library, New York.

Kendrick R.E. and Frankland B. (1976) Phytochrome and Plant Growth. Edward-Arnold, London.

Lauchli A. and Bieleski (1983) Inorganic plant Nutrition. Springer Brady N.C. The nature and properties of soils. Macmillan.

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Mussel H. and Staples R.C. (1979) Stress physiology in crop plants. Wiley New York.

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	Nobel Park S. (2009) Physicochemical and environmental Plant Physiology. Elsevier Science Publishing Co Inc. **Pollock C.J., Farrar J.F. and Gordon, A.J.** (1992) Carbon partitioning within and between organisms. BIOS Scientific, Oxford. **Salisbury, F.B. and Ross, C.W. (**1991) Plant physiology. (4th Ed), Wadsworth Publishing Company, Beverly. **Senger H.** (2012) Blue light effects in biological systems. Springer, Berlin. **Smith H.** (1980) Phytochrome and photomorphogenesis: An introduction to the photocontrol of plant development. McGraw Hill London. **Taiz, L., Zeiger, E., Moller I.M., and Murphy, A.** (2018) Plant Physiology and development. (6th Ed). Sinaeur Associates, Oxford University Press. **Thomson Tesar M.B.** (2015) Physiological basis of crop growth and development, Panima. **Wills R.** (2016) Post-harvest: An introduction to the physiology and handling of fruit. Nobel P.S. Physiological and environmental Plant Physiology. Allied Press. **Wray J. L. and Kinghorn J.R.** (1992) Molecular and genetic aspects of nitrate assimilation. Oxford Science, Oxford.	
Learning Outcomes:	Students will be able to demonstrate a depth of knowledge of physiological processes together with a better understanding of interaction and regulation of growth, metabolism and development and influence of environment on plant and further will be able to communicate scientific ideas in both written and oral forms to diverse audiences.	

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Programme: M. Sc Botany
Course Code: BOCC-108
Title of the Course: Lab in Plant Physiology
No. of Credits: 1 (30 hours)
Effective from AY: 2022-23

Prerequisites for the course:	Knowledge of the subject at UG level to be able to prepare various types of solutions, set pH, and handle basic laboratory tools and techniques.	
Objective(s):	This course is designed primarily to relate the learning of concepts in classroom to demonstrate experimental foundation of underline concepts/principles mainly on aspects of biological molecules, photosynthesis, respiration, transport, growth, growth substances and the stress physiological aspects of crop yield.	
Content:	1. Verification of law of diffusion and osmosis 2. Determination of water potential and osmotic potential and RWC in plant tissue. 3. Analysis of plant tissue for: Water, organic and inorganic content; Determination of a few macronutrients by Flame photometer, and micronutrient by AAS. 4. Quantitative estimation of protein.	**2 hours** **2 hours** **4 hours** **2 hours**

	5. Determination of ascorbic acid content of tissue. 6. Separation of protein by PAGE. 7. Pigments extraction, separation, identification and quantification. 8. Photo-oxidation of plant pigments. 9. Determination of oxidative damage in tissue using TBARS method 10. Enzyme activity with respect to temperature or pH or substrate concentration. 11. Isolation of intact organelles: chloroplasts and mitochondria. 12. Assay of photosynthetic electron transport activity from isolated chloroplast using oxygraph. 13. Assay of respiratory electron transport activity from isolated mitochondria using oxygraph. 14. Non-invasive measurements of photosynthesis (chlorophyll fluorometer). 15. Assay of nitrate/nitrite reductase activity in leaves/algae. 16. Estimation of Proline under stress and normal conditions. ***Only 30 hours for any of the above practicals will be conducted depending on availability of material, chemicals, equipments, etc.***	**2 hours** **4 hours** **2 hours** **2 hours** **2 hours** **4 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours**
Pedagogy:	Wet laboratory exercises	
References/ Readings:	1. **Mu, P., & Plummer D.T.** (2001). An introduction to practical Biochemistry. Tata McGraw Hill publishing company Limited. New Delhi. 2. **Harborne J.B.** (1984). Phytochemical Methods. Chapmann and Hall. London.	
Learning Outcomes:	1. The understanding of the rationale behind the practical procedures and ability to interpret the observations will enhance the student's ability to modify/design their own procedures if necessary as they advance to higher levels. 2. They will develop ability to apply the knowledge of plants symptoms/observation to their underline physiological causes.	

Discipline Specific Optional Courses

Programme: M. Sc (Botany)
Course Code: BODC-101
Title of the Course: Plant Biotechnology
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Basic knowledge of Biotechnology.	
Objective(s):	To impart recent knowledge in the field of Plant Biotechnology beneficial to economy and industry.	
Content:	1. **Plant Tissue Culture:** Totipotency; A brief history of plant tissue culture; Laboratory Organisation; Constituents of media,	**6 hours**

	Preparation of media, Selection of a suitable medium. Applications of Plant Tissue cultures.	
	2. **Cell Cultures:** Isolation of single cells, Bergmann's Plating Technique, Suspension cultures, types of suspension cultures, Synchronization of suspension cultures, Measurement of growth of cultures, Measurement of viability of cultured cells.	**4 hours**
	3. **Secondary Metabolites in Plant Culture**: Applications of secondary metabolites, Production of secondary metabolites, Selection of cell lines for high yield of secondary metabolites, Mass cultivation of plant cells, medium composition and effect of nutrients, Elicitor-induced production of secondary metabolites.	**5 hours**
	4. **Micropropagation:** Techniques of micropropagation, Multiplication by axillary buds, apical shoots and adventitious shoots, Factors affecting micropropagation, Applications and disadvantages of micropropagation.	**3 hours**
	5. **Somaclonal Variation:** History, Basis of somaclonal variations, Isolation of somaclonal variants, Factors affecting production of somaclonal variants, Applications and limitations of somaclonal variation.	**4 hours**
	6. **Germplasm Conservation and Cryopreservation:** Modes of conservation, Cryopreservation: Techniques of cryopreservation, cryobank, Pollen bank; Prospects in agricultural and forest biotechnology.	**4 hours**
	7. **Production of Haploid Plants:** *In vitro* and *in vivo* approaches, Androgenesis: Anther culture, Pollen culture, Development of androgenic haploids, Factors affecting androgenesis; Gynogenesis; Bulbosum method; Diploidization of haploid plants; Pollen as a tool in crop improvement, Pollen storage, Effect of radiation on pollen; Applications and limitations of haploids.	**8 hours**
	8. **Protoplast Culture and Somatic Hybridization:** Isolation of protoplasts: Mechanical and Enzymatic methods; Purification of protoplasts; Viability and plating density of protoplast; Culture of protoplasts; Regeneration of protoplasts; Sub protoplasts; Somatic hybridization: Fusion of protoplasts, Selection of hybrid cells, identification of hybrid (cells) plants, Chromosome number in somatic hybrids; Cytoplasmic hybrids or Cybrids; Genetic modification of protoplasts; Application and limitations of somatic hybridization.	**8 hours**
	9. **Introduction to gene transfer methods and transgenic plants:** Details of this topic is taught in **BOC-208** (Plant Genetic Engineering)	**1 hour**
	10. **Application of Biotechnology in Agriculture, Forestry and human welfare:** Marker assisted selection (MAS); Production of Biopesticides; Environmental and Enzyme biotechnology.	**2 hours**
Pedagogy:	Lectures/Assignments/Tutorials/Self study.	

References/ Readings:	**Aguilar Cristobel Noe** (2008). Food Science and Food Biotechnology in Developing countries.Asiatech Publishers Inc. **Bhavneet Kaur, *et al.*** (2008). Current Topics in Biotechnology. M.D. Publications, New Delhi. **Bhojwani, S. S. and Razdan, M. K.** (1997). Plant Tissue Culture: Theory and Practice. Springer Publishers Netherlands. **Dubey, R. C.** (2009). A text book of Biotechnology. S. Chand & Co. Ltd. New Delhi. **Gautam, H.** (2006). Agricultural & Industrial Applications of Bio-technology. Rajat Publication. **Harikumar, V.S.** (2006). Advances in Agricultural Biotechnology. Regency Publishers. **Kumar, H.D.** (2005). Agricultural Biotechnology. Daya Publishing House. **Park, S.** (2021). Plant Tissue Culture: Techniques and Experiments. Academic Press. **Prasad** (2008). Biotechnology in Sustainable Biodiversity and Food Security. India Book House Limited. **Rajmohan Joshi** (2006). Agricultural Biotechnology. Gyan Books. **Vibha Dhawan** (2008). Biotechnology for Food and Nutritional Security. Teri Press.	
Learning Outcomes:	Able to work in Plant tissue culture laboratory, in Pharmaceutical and ayurvedic drug industries, research laboratories and plant germplasm banks.	

Programme: M. Sc (Botany)

Course Code: BODC-102

Title of the Course: Lab in Plant Biotechnology.

Number of Credits: 1 (30 hours)

Effective from AY: 2022-23

Prerequisites for the course:	Practical knowledge of Plant Biotechnology.	
Objective(s):	To train the students in practical aspects of plant biotechnology with special emphasis on somatic embryogenesis and organogenesis.	
Content:	1. Familiarizing with various physical and chemical sterilization techniques. 2. Preparation Murashige and Skoog (MS) Media. 3. Preparation of explants and inoculation. 4. Leaf and node culture. 5. Stem culture. 6. *In vitro* embryo culture of *Pisum sativum*. 7. Seed culture. 8. Anther culture using Datura flower. 9. Preparation of cell suspension cultures.	**2 hours** **4 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **4 hours**

	10. Study of cell viability methods. **2 hours** 11. Isolation of protoplast from plant leaves by enzymatic method. **4 hours** 12. Isolation of protoplast from plant leaf by mechanical method. **4 hours** 13. Study of protoplast viability. **2 hours** 14. Root organ culture (ROC) technique. **4 hours** 15. Preparation of synthetic seeds (alginate beads). **2 hours** ***Only 30 hours for any of the above practicals will be conducted depending on availability of material, chemicals, equipments, etc.***	
Pedagogy:	Laboratory Practicals.	
References/ Readings:	**Aguilar Cristobel Noe** (2008). Food Science and Food Biotechnology in Developing countries.Asiatech Publishers Inc. **Bhavneet Kaur, *et al.*** (2008). Current Topics in Biotechnology. M.D. Publications, New Delhi. **Bhojwani, S.S. and Razdan, M.K.** (1997). Plant Tissue Culture: Theory and Practice. Springer Publishers Netherlands. **Dubey, R.C.** (2009). A text book of Biotechnology. S. Chand & Co. Ltd. New Delhi. **Gautam, H.** (2006). Agricultural & Industrial Applications of Bio-technology. Rajat Publication. **Harikumar, V.S.** (2006). Advances in Agricultural Biotechnology. Regency Publishers. **Kumar, H.D.** (2005). Agricultural Biotechnology. Daya Publishing House. **Rajmohan Joshi** (2006). Agricultural Biotechnology. Gyan Books. **Park, S.** (2021). Plant Tissue Culture: Techniques and Experiments. Academic Press. **Prasad** (2008). Biotechnology in Sustainable Biodiversity and Food Security. India Book House Limited. **Vibha Dhawan** (2008). Biotechnology for Food and Nutritional Security. Teri Press.	
Learning Outcomes:	Able to work in Plant tissue culture laboratory, in Pharmaceutical and ayurvedic drug industries, research laboratories and plant germplasm banks.	

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SEMESTER II

Discipline Specific Core Courses

Programme: M. Sc (Botany)

Course Code: BOCC-201
Title of the Course: Microbiology and Plant Pathology
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Basic knowledge of microbiology-bacteria, viruses, fungi and plant pathogens at UG level.	
Objective(s):	The aim of the course is to understand the interaction of microbes with plants and its relevance for agriculture and humans. In this, diversity of different microbes like bacteria, viruses and fungi will be studied. This paper will also focus on plant diseases with particular emphasis on identification of diseases and disease causative agents and fundamental concepts needed to manage crop diseases. In the plant pathology component, the course will also deal with genetics of host-pathogen interaction The objective is to make students understand beneficial and pathogenic microbes interacting with plants, the importance of their interaction in agriculture and to humans.	
Content:	1. **General Introduction:** Plant microbe interactions: Beneficial and Pathogenic health and diseases and the changing picture due to climate change. 2. **Plant Virology:** Origin of viruses, morphology, chemical composition (Viral nucleic acids, enzymes and proteins) and structure of virus, viral nomenclature; classification, introduction to molecular virology, viral databases and their use for understanding viral phylogeny, viral genomics and proteomics; classification and nomenclature of plant viruses; Genome organization and replication of viruses, isolation and purification of plant viruses, modern techniques to study the viruses; The virus cryptogram; Transmission of Plant Viruses, Viriods, Prions. 3. **Plant Bacterial Interactions and Mycoplasma:** Evolutionary aspects of plant microbe interaction; Species of bacteria associated with plants in health and disease; bacterial endophytes; phylloplane and rhizhosphere microbiology; role of bacteria in biogeochemical cycling; Present picture of phylogeny and systematics of bacteria; techniques used to study plant-microbe interactions; Agriculturally beneficial bacteria; Economic importance in relation to biological N-fixation, phosphate solubilization, siderophore production and production of antibiotics and enzymes, importance of Actinobacteria and actinorrhiza. Present knowledge of biology and role of Mycoplasma and L-forms. 4. **Mycological Dimensions of Plants:** Plants and fungi interaction through the window of evolution; Importance of mycology in Agriculture, History of mycology, Nomenclature, phylogeny and classification and fungal biodiversity, modern fungal systematics, morphology and molecular-based taxonomy; fungal plant ecology and fungal endophytes; general biology, forms, structure and functions of fungi; physiological aspects and nutritional modes of fungi; fungal genetics at classical and molecular level; the fungal holomorph; Reproduction: asexual	**2 hours** **5 hours** **5 hours** **7 hours**

	and sexual reproduction; Structural, functional and ecological specialization of fungal mycelia and spores; fungi in tropical habitats in relation to the plants. 5. **Study of different groups of fungi with suitable native examples:** Slime moulds, Chytridiomycota; Ooomycota; Glomeromycota; Zygomycota; Ascomycota and Basidiomycota. 6. **Economic and biotechnological dimension of fungi:** Study of economic importance of fungi; Endo- and ecto-mycorrhizae; Orchid mycorrhizae; Edible and poisonous mushrooms; Wood decay by fungi; Lichens; Yeasts; Fungal cultures; Fungal bioprospecting; Secondary metabolites; Industrial significance; Fungi in food processing, production of enzymes, alcohols, antibiotics; use of fungi for green chemistry and nanobiotechnological applications. 7. **Tropical Plant Pathology:** Diseases of plants in the tropics and their systematic studies using modern techniques. A brief history of plant pathology in India. Symptomatology in fungal, bacterial, viral and mycoplasma diseases of plants; Obligate and facultative pathogens. Classification of plant diseases; methods in the study of plant diseases; Koch postulates; Principles of infection and spread of disease; Sources of inoculum; Physiology of host-pathogen interaction; Role of enzymes and toxins in pathogenesis; Molecular basis of plant diseases; Susceptibility and resistance; Epidemiology, disease cycle, disease forecasting; Control of crop diseases by cultural, physical, chemical and biological methods; Crop rotation; Plant quarantine; Resistant varieties; Algal diseases. Diseases of cereals, pulses, vegetables, oil-seed crops, fruit plants, and plantation crops; Viruses, mycoplasma, protozoan and nematode diseases; Etiology, epidemiology and management of major diseases of paddy (blast, brown leaf-spot, sheath blight, bacterial leaf blight and tungro Virus), jowar (smut by *Sphacelotheca sorghi* and *S. cruenta*), sugarcane (red rot, smut, grassy shoot disease), groundnut (tikka), cotton (wilt), coconut (leaf blight, wilt, yellowing), banana (leaf spot, bunchytop), mango (powdery mildew, sooty mould). Post-harvest and market pathology; Remote sensing for analyzing plant diseases; Integrated pest management.	**10 hours** **8 hours** **8 hours**
Pedagogy:	Lectures/ Tutorials/Assignments/Seminars/Moodle Based Work/Videos/Self-Study	
References/ Readings:	**Agrios, G.N.** (1997). Plant Pathology. Academic Press, New Delhi. **Ainsworth, G.C., Sparrow, F. K. and Sussman, A. S.** (1973). The Fungi. Academic Press, New York. **Alexopoulose, C.J., Mims, C.W., Blackwell, M.** (2007). Introductory Mycology. John Wiley & Sons, New York. **Atlas, M. and Bartha, R.** (2000). Microbial Ecology, Longmann, New York. **Bessy, E.A.** (2015) Morphology and Taxonomy of Fungi. Scientific publisher-Jodhpur. **Bilgrami, K.S. and Dube, H. C.** (1990). A text book of Modern Plant Pathology. Vikas Publishing House, New Delhi.	

Black, J. G. (1999). Microbiology–Principles and Explorations, Prentice Hall, London.

Brock, T. D. (1996). Biology of microorganisms Prentice Hall, London.

Burnett, J.H. (1968). Fundamentals of Mycology. Edward Arnold Ltd. London.

Butler, E.J. and Jones, S. G. (1949). Plant Pathology. Mc Millan, London.

Casida, L. E. (1997). Industrial microbiology. New Age Publishers, New Delhi.

Chatterjee, P.B. (1997). Plant Protection Techniques. Bharati Bhavan, Patna.

Chattopadhayay, S.B. (1991). Principles and Procedures of Plant Protection. Oxford & IBH, New Delhi.

Chopra, G.L. (1998). A text book of Fungi. S. Nagin & Co. Meerut.

Dube, H.C. (1996). An Introduction to Fungi. Vikas Publishing House, New Delhi.

Dubey, R. C. and Maheswari, D. K. (2010). A Text book of Microbiology, S. Chand & Company, New Delhi.

Elizabeth Moore-Landeeker (1996). Fundamentals of Fungi. Prentice Hall, New Jersey.

Hale, M.E. (1983). Biology of Lichens. Edward Arnold, London.

Harvey L., Arnold B., Zipursky S. L., Matsudaira P., Baltimore D. and Darnell, J. (2008). Molecular Cell Biology 6th ed. W. H. Freeman & Co. New York.

Hudson, H. J. (1986). Fungal Biology. Edward Arnold, London.

Iwasa J. and Marshall W. (2020). 9th edition, Karp's Cell and Molecular biology-concepts and experiments. John Wiley & Sons, New York.

Kirk, P., Cannon, P., Minter, D., Stalpers, J. (2008) Ainsworth and Bisby's Dictionary of the Fungi, CABI Publishing.

Kumar, H. D. and Swati Kumar (1999). Modern concepts of Microbiology, Vikas Publishing House, New Delhi.

Manners, J.G. (1982). Principles of Plant Pathology. Cambridge University Press, London.

Marshall, H. (1999). Diseases of Plants. Anmol Publications Pvt. Ltd. New Delhi.

Mehrothra, R.S. and Aneja, K.R. (1990). An Introduction to Mycology. Wiley Eastern Ltd. New Delhi.

Mehrotra, R. S. (2000). Plant Pathology. Tata McGraw Hill, Publishing Co. Ltd. New Delhi.

Mundkur, B.B. (1982). Text Book of Plant Diseases. Macmillan India Ltd., New Delhi.

Pathak, V.N., Khatri, N.K. and Pathak, M. (1996). Fundamentals of Plant Pathology. Agrobotanical Publishers (India), Bikaner.

Pelezar, M.J., Chan, E.C.S and Kreig, N.R. (2001). Microbiology-concepts and Applications. McGraw Hill, Inc. New York.

	Powar, C.B. and Daginawala, H.F. (1982). General Microbiology Vol.II. Himalaya Publishers, Bombay. **Rangaswamy, G. and Mahadevan, A.** (2002). Diseases of Crop Plants in India. Prentice Hall of India, New Delhi. **Rao, A.S.** (2001). Introduction to Microbiology. Prentice Hall of India, New Delhi. **Sharma, O.P.** (2007). Text book of Fungi. Tata McGraw Hill, Publishing Co. Ltd. New Delhi. **Sharma, P.D.** (2004). The Fungi for University students. Rastogi Publications, Meerut. **Sharma, P.D.** (2005). Plant Pathology. Narosa Publishing House, New Delhi. **Singh, R.S.** (2000). Introduction to the Principles of Plant Pathology. Oxford IBH, New Delhi. **Srivastava, J.P.** (1998). Introduction to Fungi. Central Book Depot, Allahabad. **Sumbali, G.** (2005). The Fungi. Narosa Publishing House, New Delhi. **Thind B. S.** (2019). Pathogenic Bacteria and Plant Diseases, CRC press.	
Learning Outcomes:	3. Be able to identify microbial habitats and plant disease symptoms. 4. Be able to work in a field laboratory for mycological studies. 5. Gain better understanding of tropical microbial biodiversity and their ecological roles. 6. Have better prospects as plant pathologist in various farms. 7. Will be able to understand molecular basis of plant pathogen interaction and disease.	

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Programme: M. Sc (Botany)
Course Code: BOCC-202
Title of the Course: Lab in Microbiology and Plant Pathology
Number of Credits: 1 (30 hours)
Effective from AY: 2022-23

Prerequisites for the course:	Basic knowledge of microbial habitats in a tropical setup and general idea of diseases affecting crops.	
Objective(s):	To impart requisite field and lab skills in plant microbiology and pathology with emphasis on tropical strains and local needs in agriculture and economy dealing with economically important microbes.	
Content:	**Microbiology** 1. Microbial ecology in relation to the plants-Introduction to field techniques to study plant-microbe interactions. 2. Isolation of Phylloplane microflora on microbiological media and visualization of colony characteristics. 3. Isolation of Rhizosphere microflora on microbiological media and visualization of colony characteristics.	**2 hours** **4 hours** **4 hours**

	4. Isolation of endophytes and visualization of colony characteristics.	**4 hours**
	5. Maintenance of pure cultures of phylloplane, Rhizosphere and endophytic microflora using common microbiological media.	**2 hours**
	6. Use of Microscopy in studying microbes in detail - preparation of unstained and stained specimens of eubacteria, actinobacteria. Photomicrography and digital image analysis of representative pure cultures and interpretation of results.	**2 hours**
	7. Preparation of unstained and stained specimens of yeasts, fungi. Examination of gram character of bacteria.	**2 hours**
	8. SEM study of bacteria, fungi, plant viruses using electron dense stains.	**2 hours**
	9. Studying Phylogeny of plant viruses using bioinformatics tools.	**2 hours**
	10. Study of root nodulation, symbiosome, *Rhizobium*, leghemoglobin and Quorum Sensing in bacterial population.	**2 hours**
	11. Methods of isolation and culturing of fungi: colony characters; microscopic observations; morphology of hyphae and spores.	**2 hours**
	12. Study of reproductive structures of different genera of fungi.	**2 hours**
	13. Study of fungal physiology in pure colonies – characterization of fungal colonies.	**2 hours**
	14. Microfluidics in mycology- fabrication and application of microfluidics devices to fungal cultures for real time visualization of fungal metabolic activities.	**2 hours**
	15. Introduction to mycological databases and myco-systematics on Internet.	**2 hours**
	16. Introduction to Mycobioinformatics- tools and techniques (exercise to construct fungal phylogenetic tree to be given).	**2 hours**
	17. Observation of different fungal substrates using sterile moist chamber incubation (e.g. herbivore dung; decomposing leaf-litter).	**2 hours**
	18. Observations on ecological succession of fungi; Terrestrial, marine and freshwater fungi.	**2 hours**
	19. Particle-plating technique for isolation of litter fungi.	**2 hours**
	20. Technique for isolation of fungal endophytes.	**2 hours**
	21. Isolation and serial dilution techniques (e.g. soil, dung and leaf litter).	**2 hours**
	Plant pathology	
	22. Collection of infected specimens in the field and observation of symptoms.	**2 hours**
	23. Hand sections and tease mounts from infected plant specimens.	**2 hours**
	24. Study of viral, bacterial and fungal diseases of crop plants (cereal, vegetable, fruit, and plantations) from surrounding habitats in Goa.	**4 hours**
	25. Submission of 10 dried herbarium specimens of infected plant materials [fungal (4) +bacterial (3) + viral (3)] collected from nearby habitats.	**2 hours**

	26. A mini field project to study crop diseases from field and market specimens. ***All plant pathology practicals will be conducted and any 16 hours from microbiology component will be conducted depending on availability of material, chemicals, equipments, etc.***	**4 hours**
Pedagogy:	Field visits and lab exercises/sample collections/use of electronic, digital and visual keys, herbarium production/videos/moodle guided exercises/mini projects/demonstration.	
References/ Readings:	**Agrios, G.N.** (1997). Plant Pathology. Academic Press, New Delhi. **Bilgrami, K.S. and Dube, H. C.** (1990). A text book of Modern Plant Pathology. Vikas Publishing House, New Delhi. **Butler, E.J. and Jones, S. G.** (1949). Plant Pathology. Mc Millan, London. **Chatterjee, P.B.** (1997). Plant Protection Techniques. Bharati Bhavan, Patna. **Chattopadhayay, S.B.** (1991). Principles and Procedures of Plant Protection. Oxford & IBH, New Delhi. **Sharma, P.D.** (2004). The Fungi for University students. Rastogi Publications, Meerut. **Srivastava, J.P.** (1998). Introduction to Fungi. Central Book Depot, Allahabad. **Sumbali, G.** (2005). The Fungi. Narosa Publishing House, New Delhi.	
Learning Outcomes:	1. Ability to work as a field microbiologist to sample various habitats and asplant pathologist being able to identify disease symptoms. 2. Being able to identify common micro and macrofungi from diverse natural habitats. 3. Being able to prepare herbarium of diseased plants. 4. Being able to isolate and manage microbial cultures. 5. Being able to perform image analysis of cultures. 6. Being able to apply techniques learnt in appropriate projects involving economically important microbes.	

Programme: M. Sc (Botany)
Course Code: BOCC-203
Title of the Course: Cytogenetics and Plant Breeding
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied B. Sc. Botany. It is assumed that students have a basic knowledge of Genetics and Plant Breeding.	
Objective(s):	The paper provides the students with detailed concepts of cytogenetic and Plant breeding.	

Content:	1. **Cell division (Mitosis and Meiosis):** Mitosis, Meiosis, Cytokinesis, Synaptonemal Complex (SC) and its significance in meiosis, Recombination nodules and their role in meiotic recombination, Mitotic poisons; Comparison between meiosis and mitosis.	**5 hours**
	2. **Genetic and Molecular basis of Cell division cycle:** Mitotic cell division; Meiotic cell division; Dynamics of chromosome movements during cell division; Cytokinesis, Astral microtubules and central spindle; Role of degradation of proteins (proteolysis in cell cycle.	**4 hours**
	3. **Chromosome theory of inheritance:** Association of paternal and maternal chromosomes at meiosis, Qualitative difference between chromosomes, Chromosome theory; Sex chromosomes and chromosome theory.	**2 hours**
	4. **The Nucleus and the Chromosome:** Nucleus; Nucleolus; Chromosome structure and organization: number, size and shape of chromosomes, Morphology, Karyotype, Euchromatin and Heterochromatin, Chemical composition, Ultrastructure, Organization within nucleus; Special type of chromosomes: Lampbrush and Salivary Gland Chromosomes, B-chromosomes; Prokaroytic nucleoids: Bacterial and Plasmid genome, Centromere and Telomere like structures in bacteria and plasmids.	**6 hours**
	5. **Extra chromosomal and Organellar Genetics:** Basis of extra chromosomal inheritance; Plastid inheritance; Shape, size of Chloroplast and Mitochondrial genomes, Replication of cpDNA and mtDNA.	**3 hours**
	6. **Plasmids, transposons and Retroelements:** Plasmids; Classification, Replication, transfer and recombination in plasmids, Plasmids as cloning vectors; Insertion sequence or IS elements; Transposons and controlling elements (in prokaryotes and Eukaryotes - copia, FB, P and I in Drosophila; Ty in yeast; AC-DC and Spm in corn; Retroelementsinvolving RNA phase: Retrotransposons in Plants; Mechanism of transposition; Uses of transposons.	**4 hours**
	7. **Molecular mechanisms to mutation and DNA repair**: Types of mutations; Molecular basis of mutations; mutagens, mechanism of DNA repair.	**4 hours**
	8. **Introduction to Plant Breeding:** Objectives and achievements; Pattern of evolution in crop plants; Plant introduction: Purpose of plant introduction, Achievements of plant introduction; Domestication and acclimatization.	**5 hours**
	9. **Heterosis and inbreeding depression:** Inbreeding depression; Effects of inbreeding; Degrees of inbreeding depression; Homozygous and Heterozygous balance; Heterosis in cross- and self-pollinated plants; Genetic basis of heterosis and inbreeding depression; Dominance hypothesis; Over-dominance hypothesis; Physiological basis of heterosis; Commercial applications.	**4 hours**
		4 hours

	10. **Distance hybridization and *in-vitro* techniques in plant breeding:** Distant hybrids and barriers in the production of distant hybrids, Application in crop improvement; Embryo, Meristem, Anther and Pollen culture, achievements. 11. **Genetics and crossing techniques of economically important crop plants:** Wheat, Rice, Maize and Cotton.	**4 hours**
Pedagogy:	Lectures/Assignments/Tutorials/Self study.	
References/ Readings:	**Alberts, B. *et al.*** (2007) Molecular Biology of the Cell. 5th edition, Garland Science, Taylor & Francis. **Allard, R. W.** (1999) Principles of Plant Breeding. 2nd Edition. John Wiley, New York. **Broda, P. W.** (1979) Plasmids. Freeman, Oxford. **Darlington, C. D.** (1965) Cytology, Churchill. London. **De Robertis, E.D.P. and E.M.F. De Robertis** (1987) Cell and Molecular Biology. 8thedition. B. I. Waverly, New Delhi. **Gupta, P. K.** (2000). Cytology, Genetics and Evolution. 6th edition. Rastogi Publications, Meerut. **Lewin, B.** (2008) Genes IX. Oxford Univ. Press, New York. **Lodish, H. *et al.*** (2007) Molecular Cell Biology. 6th edition, W. H. Freeman, New York. **Poehlman, J. M. and D. Borthakur** (1969) Breeding Asian Field Crops. Oxford and IBH Publishing Co. New Delhi. **Sharma, J. R.** (1994) Principles and Practice of Plant Breeding. Tata Mc Graw-Hill Publishing Co. Ltd., New Delhi. **Sinha, U and S. Sinha** (1989) Cytogenetics, Plant Breeding and Evolution. Vikas Publishing House Pvt. Ltd. New Delhi. **Singh, B. D.** (2003) Plant Breeding – Principles and Methods. Kalyani Publishers, New Delhi. **Strickberger, M. W.** (1985). Genetics. 3rdedition. MacMillan Pub. Co., Philadelphia. **Swaminathan, M. S., et al.** (1983) Cytogenetics of crop plants. MacMillan India Pvt. Ltd., New Delhi. **Swanson, C. P. and P. L. Webster** (1989) The Cell. 7thedition Prentice-Hall of India Pvt. Ltd. New Delhi. **Watson, J. D. *et al.*,** (2009) Molecular Biology of the Gene. 6th edition. Benjamin Cummings, New York.	
Learning Outcomes:	1. The candidates can work in Research institutes like ICAR. 2. The candidates can start their own entrepreneurship in Tissue culture and breeding. 3. The candidates can work in Tissue culture laboratories.	

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Programme: M. Sc (Botany)
Course Code: BOCC-204
Title of the Course: Lab in Cytogenetics and Plant Breeding
Number of Credits: 1 (30 hours)
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied B. Sc. Botany with basic knowledge of Genetics and Plant Breeding.	

Objective(s):	To develop hands on training skills in Cytogenetics and Plant Breeding.	
Content:	1. Mitotic studies in suitable material: Squashing of the root tip and selection of metaphase plate. 2. Mitotic studies in suitable material*:* Camera Lucida drawing, Karyotype analysis, ideogram and derivation of karyotypic formula. 3. To study chromosomal aberrations in *Rheo sp.* 4. Meiosis in *Allium cepa.* 5. Induction of polyploidy in rice. 6. Observation of B chromosomes in suitable material –*Zea mays.* 7. Centre of origin of some economically important crop plants. 8. Floral biology of *Oryza sativa*. 9. Floral biology of *Zea mays.* 10. Effect of chemical mutagen (DES/HZ/EMS) on germination, growth and yield characteristics in *Oryza sativa*/*Brassica juncea /Impatiens balsamina.* 11. Crossing techniques in *Oryza sativa.* 12. Crossing techniques in *Zea mays.* 13. *In vitro* embryo culture of pea (*Pisum sativum*) ***Only 30 hours for any of the above practicals will be conducted depending on availability of material, chemicals, equipments, etc.***	**2 hours** **6 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **2 hours** **4 hours** **2 hours** **2 hours** **4 hours**
Pedagogy:	Laboratory practicals.	
References/ Readings:	**Alberts, B. *et al.*** (2007) Molecular Biology of the Cell. 5th edition, Garland Science, Taylor & Francis. **Allard, R.W.** (1999) Principles of Plant Breeding. 2nd edition. John Wiley, New York. **Broda, P.W.** (1979) Plasmids. Freeman. Oxford. **Darlington, C.D.** (1965) Cytology, Churchill. London. **De Robertis, E.D.P. and E.M.F. De Robertis** (1987) Cell and Molecular Biology. 8th edition. B. I. Waverly, New Delhi. **Gupta, P.K.** (2000). Cytology, Genetics and Evolution. 6th Edition. Rastogi Publications, Meerut. **Lodish, H. *et al.*** (2007) Molecular Cell Biology. 6th edition, W. H. Freeman, New York. **Lewin, B.** (2008) Genes IX. Oxford Univ. Press, New York. **Poehlman, J.M. and D. Borthakur** (1969) Breeding Asian Field Crops. Oxford and IBH Publishing Co. New Delhi. **Sharma, J.R.** (1994) Principles and Practice of Plant Breeding. Tata McGraw-Hill Publishing Co. Ltd., New Delhi. **Sinha, U and S. Sinha** (1989) Cytogenetics, Plant Breeding and Evolution. Vikas Publishing House Pvt. Ltd. New Delhi. **Singh, B.D.** (2003) Plant Breeding – Principles and Methods. Kalyani Publishers, New Delhi. **Strickberger, M.W.** (1985). Genetics. 3rd edition. MacMillan Pub. Co., Philadelphia.	

	Swaminathan, M. S., *et al*. (1983) Cytogenetics of crop plants. MacMillan India Pvt. Ltd., New Delhi. **Swanson, C. P. and P. L. Webster** (1989) The Cell. 7th edition Prentice-Hall of India Pvt. Ltd. New Delhi. **Watson, J. D. *et al*.,** (2009) Molecular Biology of the Gene. 6th edition. Benjamin Cummings, New York.	
Learning Outcomes:	Upon completion of this course, the students will be able to take up job assignments in agri-based industries or work as research assistants on research projects.	

Programme: M. Sc (Botany)
Course Code: BOCC-205
Title of the Course: Plant Molecular Biology
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Should have studied B. Sc. Botany. It is assumed that students have a basic knowledge of biochemistry and molecular biology.	
Objective(s):	The paper deals with various molecular biological processes of DNA replication, transcription and translation. Molecular biology of recombination, synthesis and processing of various RNA molecules are discussed. Further the paper provides deeper understanding of regulation of gene expression in various organisms.	
Content:	**1. Introduction to Molecular Genetics and Genomics:** History of DNA molecule & discoveries till date. Physical nature of DNA: DNA is the genetic material, Chemical nature of DNA: Structure of nucleotides, Bonding, double helix and other helices. Factors affecting DNA structure. Organization of DNA. How Genes function at Molecular level - Replication, Transcription & Translation.	**5 hours**
	2. Molecular Biology of DNA Replication: Enzymes involved in replication, DNA replication is semi-conservative, Meselson-Stahl expt., Multiple Origins & bi-directional DNA replication in Eukaryotes, Replication of Virus & Theta replication of Circular DNA molecules, Rolling Circle replication, Plasmid DNA using a Rolling Circle, Unwinding, Stabilization & Stress relief, initiation by a Primosome complex, Chain elongation & Proofreading, discontinuous replication of the lagging strand, Terminator sequencing of DNA.	**8 hours**
	3. Molecular Biology of Recombination: Molecular mechanisms of Recombination, homologous and site-specific recombination, Gene conversion, Mismatch repair, the Holliday model of recombination, DNA damage and repair mechanisms: Single strand break & repair model.	**5 hours**
	4. Transcription: Enzymes in transcription; Basic features of transcription, Initiation, elongation and termination, RNA polymerases, promoters and enhancers; transcription activator	**7 hours**

	and repressor; transcription factors, prokaryotic and eukaryotic transcription.	**6 hours**
	5. Regulation of Gene Expression: Regulation of gene expression in prokaryotes and Eukaryotes. Transcriptional Control I, expression of lac operon, Transcriptional Control II, Attenuation, Antitermination, Methylation, Yeast GAL regulatory pathway, alteration of gene expression by DNA sequence rearrangements in *Salmonella* and*Trypanosoma*.	**7 hours**
	6. RNA Molecules and RNA Processing: Gene structure, Structure & Processing of messenger RNA, transfer RNA, ribosomal RNA, small interfering RNAs & micro RNAs, regulation through RNA processing & decay, alternative splicing, capping, polyadenylation, RNA transport, mRNA stability, co-suppression through RNA turnover, RNA interference (RNAi).	**7 hours**
	7. The Genetic Code and Translation: Molecular relation between Genotype & Phenotype, The Genetic Code, Factors involved in initiation, elongations and termination of translation, aminoacylation of tRNA, amino acyl tRNA synthetase, Post translational processing and modification, Transport of protein across the membrane.	
Pedagogy:	Lectures/ Tutorials/Assignments/Seminars/Self-Study	
References/ Readings:	**Benjamin Lewin.** (2008). GENES IX. Jones and Bartlett Publishers, London, UK. **Tropp. B.E.** (2012). Molecular Biology. Fourth Edition. Jones and Bartlett India Pvt. Ltd, New Delhi. **Brown T. A.** (2007). Genomes. Third Edition. Garland Science Publishing, New York. U.S.A. **Coruzzi G.** (1994). Plant Molecular Biology - Genetic Analysis of Plant Development and Metabolism. Springer-Verlag, New York, London **Freifelder D.** (1990). Molecular Biology. Second Edition. Narosa Publishing House, New Delhi. **Grierson D and S. Covey.** (1984). Plant Molecular Biology. Panima Educational Agency, New Delhi. **Henry R. J.** (2005). Practical Applications of Plant Molecular Biology. Chapman & Hall, London, UK. **Goldstein E.S., Krebbs J.E., Kilpatrick S.T.** (2011) Lewin's GENES X. Oxford University Press. **Old R.W. and Primerose S. B.** (1980) Principles of Gene Manipulation. An Introduction to Genetic Engineering. Blackwell Scientific Publishers. **Primrose, S. B. and R. M. Twyman.** (2009). Principles of Gene Manipulation and Genomics. Seventh Edition. Blackwell Publishing, U.S.A. **Schuler M.A.Z., and Raymond E.Z.** (2005). Methods in Plant Molecular Biology. Academic Press, USA.	

	Shaw, C.H. (1988). Plant Molecular Biology, Practical Approach. IRL Press, Oxford, Washington DC. **Tewari, K.K. and Singhal, G.S.** (1997). Plant Molecular Biology and Biotechnology. Narosa Publishing House, New Delhi. **Watson J.D., Baker T.A., Bell S.P., Gann A., Levine M & Losick R** (2008). Molecular Biology of Gene. Sixth Edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York. U.S.A.	
Learning Outcomes:	1. Being able to apply the knowledge of various molecular biological processes of DNA replication, transcription and translation to various other organisms. 2. Molecular biology of recombination, synthesis and processing of various RNA molecules could be employed in various situations and applications. 3. Being able to apply the regulation of gene expression to various other organisms.	

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Programme: M. Sc Botany
Course Code: BOCC-206
Title of the Course: Plant Genetic Engineering
No. of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Knowledge of the subject at UG level. Knowledge of the subject at UG level. Also, knowledge of Plant tissue culture (regeneration methods).	
Objective(s):	This course is designed to understand basic principles, tools, techniques and recent advances in plant genetic engineering. Students will be exposed to restriction enzymes, vectors (plasmids, phasemids, etc.), joining and construction of genome and cDNA library and its screening for desired gene, transformation, etc. Student will also be exposed to site directed mutation techniques and other modern techniques such as sequencing, PCR, RT-PCR, RNAi etc.to study gene amplification and their expression. This paper also discusses other application of genetic engineering such as genetic marking and Molecular taxonomy.	
Content:	1. Introductory lecture on application of genetic engineering in the field of Plant science with regard to Agriculture, environment and medical field and study of plant taxonomy. 2. **Restriction and modification of DNA:** Basic principle of genetic engineering; restriction enzyme, cutting and joining the DNA; Vectors: plasmids, fine structure of vector gene desirability traits; construction of plasmid, purification of plasmids, various types of plasmids, bacteriophage and cosmid, single and double standard vectors and their growth cycle and regulation; various cloning strategies, Genome library and cDNA library, selection strategies for desired transformants, Genetic system provided by E. Coli and its host. 3. **Agrobacterium-mediated gene transfer:** Biology and molecular basis of Agrobacterium mediated plant	**2 hours** **8 hours** **6 hours**

	transformation and its application. Other direct gene transfer methods. Conventional Plant Breeding vs Genetic Engineering.	**3 hours**
	4. **Site directed mutagenesis:** DNA sequencing, various strategies for carrying out site directed mutagenesis.	**8 hours**
	5. **Structure, function and regulation of genome:** General organization and replication, transcription and translation of, mitochondrial and chloroplast genome; Genetic interactions in nucleus, chloroplast and mitochondria (retrograde signaling/plastid factors); Genetic codes in organelles.	**8 hours**
	6. **Gene silencing, editing, sequencing, amplification expression in plants:** Post transcriptional and transcriptional gene silencing (RNAi, Antisense), Gene editing and its application (CRISPER-CAS9), mutants of gene silencing, RNA virus in plants, virus induced gene silencing, Dideoxy and other methods of sequencing, PCR, RT-PCR and microarrays.	**7 hours**
	7. **Application of plant genetic engineering:** History of genetically engineered crop, Genetic engineering of plants for various desired characters (herbicide resistance, insect resistance, virus and abiotic stress resistance; to improvement of crop yield and quality; rice genome project, other sequenced genomes, Biotech crop (GM crops) and international development (With relation to matter discussed above).	
	8. **Genetic Engineering and public Concerns:** Ethical & Environmental concerns on Genetic Engineering of plants. Genetically Engineered Foods, Safety of Genetically Engineered Foods, Labeling, Future Foods and Regulatory Challenges, 'Pharm' Factories of the Future. Field testing of transgenic plants; Bio-safety issues in Indian contest; Indian rules, regulation and procedures for handling transgenic plants.	**3 hours**
Pedagogy:	Lectures/E-learning/Assignments/Seminar/Moodle/Group discussion	
References/ Readings:	**Armstrong CL, Spencer TM, Stephens MA and Brown SM** (2000). Transgenic maize. In: O'Brien L, Henry RJ (eds.), Transgenic cereals. American Association of Cereal Chemists, St. Paul, Minnesota, USA. **Coruzzi G.** (1994). Plant Molecular Biology-Genetic Analysis of Plant Development and Metabolism. Springer-Verlag, New York, London. **David Freifelder.** (1987). Molecular Biology. Second Edition. Narosa Publishing House, New Delhi. **Grierson D and S. Covey.** 1984. Plant Molecular Biology. Panima Educational Agency, New Delhi. **Grumezescu, A.M., & Holban, A.M.** (Eds.). (2017). Genetically Engineered Foods (Vol. 6). Academic Press. **Isaacson, W.** (2022). The Code Breaker--Young Readers Edition: Jennifer Doudna and the Race to Understand Our Genetic Code. Simon and Schuster. **Lynas, M.** (2018). Seeds of science: why we got it so wrong on GMOs (Vol. 34). Bloomsbury Publishing. **Lewin Benjamin**. (1999). GENES VII. Oxford University Press.	

	Old, R.W., and Primerose S. B. (1980) Principles of Gene Manipulation. An Introduction to Genetic Engineering. Blackwell Scientific Publications. **Pahara J.**, & **Legault J**. (2021) 2nd Edition Zero to Genetic Engineering Hero. Make community. **Patrick Faraday**. (2018) Genetic Engineering, Emerging concepts and Technology, Syrawood Publishing House. **Shaw, C. H.** (1988). Plant Molecular Biology-Practical Approach. IRL Press, Oxford, Washington DC. **Tewari, K. K. and G. S. Singhal.** (1997). Plant Molecular Biology and Biotechnology. Narosa Publishing House, New Delhi. ***Books referred for BOC-207 (Plant Molecular Biology) should also be read.***	
Learning Outcomes:	After completing this course student should be able to understand basic principles of plant genetic engineering in order to develop and validate transgenic plants.	

Programme: M. Sc (Botany)
Course Code: BOCC-207
Title of the Course: Lab in Plant Molecular Biology and Genetic Engineering
Number of Credits: 2 (60 hours)
Effective from AY: 2022-2023

Prerequisites for the course:	Should have studied B. Sc. Botany. It is assumed that students have a basic knowledge of biochemistry, molecular biology and instrumental techniques at UG level.	
Objective(s):	To learn and understand various methods, techniques and hands on experiments with techniques concerning study of plant molecular biology and genetic engineering. This course is designed to introduce students to both the principles and the applications of molecular recombinant DNA technology to plants and microbial organisms. It describes the use of genetically engineered products to solve agriculture and environmental problems for human welfare.	
Content:	1. Preparation of media and other requirements, sterilized glassware etc. 2. Isolation and purification of genomic DNA from plant materials. 3. Isolation and purification of RNA from plants. 4. Culture of plasmid and maintenance of culture. 5. Isolation of plasmid DNA. 6. Quantitative estimation of genomic DNA and RNA using spectrophotometer. 7. Agarose gel electrophoresis of genomic DNA and RNA and detection using gel documentation system. 8. Digestions of DNA by restriction enzymes and size fractionation of fragments. 9. Ligation of digested fragments. 10. Primer designing. 11. cDNA formation using reverse transcriptase. 12. RT-PCR quantitation of selected gene(s) using SYBRG.	**2 hours** **4 hours** **4 hours** **2 hours** **4 hours** **2 hours** **4 hours** **2 hours** **2 hours** **2 hours**

	13. Use of software for quantitation of gene and compare the expression level. **4 hours** 14. Southern Blotting/Northern Blotting/Western Blotting (any one) **8 hours** 15. Creating a transformant using commercial construct. **2 hours** 16. 16 or 18s rRNA analysis. **4 hours** 17. Leaf disc transformation using Agrobacterium, establishment of transgenic plants and GUS staining of GFP viewing. **4 hours** 18. Amplification of genomic DNA using ISSR/ RAPD random primers in PCR and agarose gel electrophoresis and detect the banding patterns under gel documentation system and analysis of bands to understand genetic variation in plants. **4 hours** ***Only 60 hours for any of the above practicals will be conducted depending on availability of material, chemicals, equipments, etc.***	**4 hours**
Pedagogy:	Hands on practicals.	
References/ Readings:	**Brown T. A**. (2007). Genomes. Third Edition. Garland Science Publishing, New York. U.S.A. **Burton E. Tropp.** (2012). Molecular Biology. Fourth Edition. Jones and Bartlett India Pvt. Ltd, New Delhi. **David Freifelder.** (1990). Molecular Biology. Second Edition. Narosa Publishing House, New Delhi. **Dodds J.H.** (1985) Plant Genetic Engineering. Cambridge University Press. **Gloria Coruzzi.** (1994). Plant Molecular Biology - Genetic Analysis of Plant Development and Metabolism. Springer-Verlag, New York, London. **Grierson D & S. Covey.** (1984). Plant Molecular Biology. Panima Educational Agency, New Delhi. **Henry R. J.** (2005). Practical Applications of Plant Molecular Biology. Chapman & Hall, London, UK. **Kurnaz I.A.** (2015) Techniques in Genetic Engineering. CRC Press. **James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine and Richard Losick. (**2008). Molecular Biology of Gene. Sixth M.Sc Syllabus - 2018 Core 29 Edition. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York. U.S.A. **Lewin Benjamin.** (2008). GENES IX. Jones and Bartlett Publishers, London, UK. **Mary A. Schuler and Raymond E. Zielinski**. (2005). Methods in Plant Molecular Biology. Academic Press, USA. **Neal Stewart J.C.** (2008) Plant Biotech and genetics: Principle, techniques and applications. Wikley jones and Sons, Canada **Primrose, S. B. & R. M. Twyman.** (2009). Principles of Gene Manipulation and Genomics. Seventh Edition. Blackwell Publishing, U.S.A. **Shaw, C.H.** (1988). Plant Molecular Biology, Practical Approach. IRL Press, Oxford, Washington DC.	

	Tewari, K.K. & G.S. Singhal. (1997). Plant Molecular Biology and Biotechnology. Narosa Publishing House, New Delhi. **Vennison, D.C.S.** (2009). Laboratory manual for genetic engineering. PHI Learning Pvt. Ltd..	
Learning Outcomes:	After completing this course student should be able to recognize the foundations of modern biotechnology and explain the principles that form the basis for recombinant DNA technology and be able to carry out R & D work or work in quality control laboratory on molecular biology and recombinant DNA technologies such as vector construction, cloning and gene expression etc.	

Discipline Specific Optional Courses

Programme: M. Sc (Botany)
Course Code: BODC-201
Title of the Course: Modern concepts in Plant Ecology.
Number of Credits: 3
Effective from AY: 2022-23

Prerequisites for the course:	Knowledge of basic ecology at undergraduate level.	
Objective(s):	This course is designed to introduce the concepts and principles of plant and environmental ecology, conservation, sustainable development, population characteristics, community dynamics, ecosystem structure &functions and application of these concepts to solve environmental problems. It seeks to equip students with a comprehensive set of subject-specific knowledge and skills pertaining to ecology.	
Content:	1. **Population Ecology**: Life History Diversity; Environmental characteristics and plant life histories; Life history traits and trade off; population variability, distribution and limiting factors; population growth and regulation; survivorship curve types; population dynamics - density dependent and density independent factors, logistic and exponential growth. Frequency, Density, Abundance; diversity indices, Simpson's diversity index, Shannon's Wiener diversity index. 2. **Spatial Ecology:** Metapopulations, Levins metapopulation model; habitat fragmentation and extinction; metapopulation model and conservation biology; metapopulation dynamics; competition and co-existence. Metacommunities in heterogenous environment-perspectives with special reference to neutral perspectives; species co-existence: fluctuation dependent mechanisms--the storage effect, the intermediate disturbance hypothesis (IDH); niche-based and neutral processes in communities. Environmental (ecological) Niche modelling: Fundamentals of Environmental Niche Modelling (ENM)/Species Distribution Modelling (SDM); Application of ENM in ecology and conservation.	**6 Hours** **12 Hours** **7 Hours**

	3. **Ecological interactions:** Native, Introduced, Exotic and invasive species, introduction and causes. Predator-Prey: Predator functional responses; Lotka-Volterra model; Rosenzweig-MacArthur model; predator preference and Optimal Foraging Theory; Non-consumptive effects of predators; consumer-resource models of competition; competition for multiples resources; beneficial interactions in communities; species interactions in ecological networks; keystone species; body size and foraging relationships.	**7 Hours**
	4. **Molecular and Evolutionary Ecology:** Rapid evolution and ecological consequences; community phylogenetics; phylogenetic niche conservation; Molecular Ecology-Genetic diversity in natural populations, population structure, genetics of metapopulations, gene flow and migration rates, identification of immigrants, genetic estimation of effective population size, population bottlenecks; genomics in adaptive radiation; phylogeography-genetic variation in space and time, applied phylogeography; conservation genetics; molecular ecology and Genetically modified organisms (GMOs).	**4 Hours**
	5. **Applied Ecology and conservation biology:** Global environmental change; UNSDG, IPCC, COP-25, Kyoto protocol, Carbon test plants and carbon sequestration; biodiversity-status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches; Principles of conservation and overview of conservation efforts; major approaches to management; Indian case studies on conservation/management strategy; Assessing Impacts and Vulnerabilities; Global Policy on Climate and Adaptation.	**4 Hours**
	6. **Ecological economics (EE), Environmental valuation and auditing (EA):** Basics of EE, Polluter pays principle; Gross national and gross natural products; Natural resources accounting procedure (NRA); Techniques used in NRA; Evaluation of ecosystem services; Fundamentals of bio-economics; Importance of EE in National Planning and Development.	**5 Hours**
	7. **Environmental Impact Assessment (EIA):** History of EIA, EIS, EMP; EIA laws and regulations; projects requiring EIA in India; EIA methodology-Checklist, overlay, modeling, network, matrix, computer assisted, EIA software packages and tools; Biological Impact assessment; preparing EIA reports, public hearing procedures; EIA case studies from India; Study of EIA manuals.	
Pedagogy:	Lectures/ Tutorials/Assignments/ Mini Projects/Use of software tools and online websites/Moodle based Exercises/ Videos/ Demonstrations/ Field visits/Self-study/Expert Lectures/Training workshops.	
References/ Readings:	**Alan, B.** (1993). Applying Ecology. Chapman & Hall **Beebee, T.J.C. and Graham, R.** (2004). An Introduction to Molecular Ecology. Oxford University Press.	

	Begon, M., Townsend, C. R. and Harper, J. L. (2005). Ecology: From individuals to Ecosystems 4th edition, Wiley-Blackwell. **Cain, Michael L., Bowman, William D and Hacker, Sally D** (2008). Ecology. Sinauer Associates, Inc. **Canter L** (1996) Environmental Impact Assessment, 2nd Edition, McGraw Hill Publishing Company. **Freeland, J.R., Heather, K. and Petersen, S.** (2011). Molecular Ecology (Second Edition). John Wiley & Sons, Ltd. **Graham R., Michael, S. and Trevor, B.** (2017). An Introduction to Molecular Ecology (Third Edition). Oxford University Press. **Jain, S. V.** (2021). Applied Ecology and Sustainable Environment. BFC Publications. **Michael, B., Martin, M. and Thompson, D.J.** (2009). Population Ecology- A unified study of Animals and Plants. Blackwell Science. **Mittelbach, G.G.** (2012). Community Ecology. Sinauer Associates, Inc. **Nunes, P. A., Van Den Bergh, J. C., & Nijkamp, P.** (2003). The ecological economics of biodiversity: methods and policy applications. Edward Elgar Publishing Ltd. **Odum, E. P.** (2007) Fundamentals of Ecology, 5th edition, Thomson books. **Prasad, K. V.** (2022) 'Ecosystem Ecology'. In Insect Ecology: Concepts to Management, Springer, Singapore, 2022. **Yadav, P. R., and Mishra, S. R.** (2004) Environmental biology, Discovery publication, New Delhi.	
Learning Outcomes:	1. Able to predict different ecological models and state its applications in ecology and conservation. 2. Should be able to describe ecological interactions; environmental factors governing these ecosystems and explain the factors leading to environmental degradation, their reasons and impacts on the environment. 3. Apply management strategies and methods to conserve diversity at all levels, from genes to landscapes.	

Programme: M. Sc (Botany)

Course Code: BODC-202

Title of the Course: Lab in Modern Concepts in Plant Ecology

Number of Credits: 1 (30 hours)

Effective from AY: 2022-23

Prerequisites for the course:	Basic knowledge of field work, sampling and have knowledge of Plant ecological terms.	
Objective(s):	To impart knowledge about field, lab, and IT-based ecological techniques and to provide them the tools they need to independently examine any environmental problem and, where possible, come up with suitable solutions in a substantial way.	

Content:	1. Study of ecotones and edges in natural ecosystems.	**2 Hours**
	2. Study of local landscapes using maps/satellite images/modelling tools.	**2 Hours**
	3. Study of stratification and physiognomy.	**2 Hours**
	4. Study of vegetation by sampling methods (Transect/Bisect/Trisect/Ring counts/Quadrat method).	**2 Hours**
	5. To assess the trophic status of aquatic habitat through algal count method.	**2 Hours**
	6. Effect of abundance of single species populations on community in aquatic ecosystem.	**4 Hours**
	7. Phytogeographic analysis preferably using BEAST software.	**2 Hours**
	8. Community phylogenetics.	**2 Hours**
	9. Analysis of MODIS products for global vegetation phenology and productivity.	**2 Hours**
	10. Use of MAXENT modeler for predicting species distributions.	**2 Hours**
	11. Quantitative character analysis of plant communities using the random sampling method (Abundance, density, frequency, basal cover, canopy cover, etc.); Simpson's diversity index, Shannon's Wiener diversity index. Quantitative character analysis using the belt transect and line transect methods; and biological spectrum analysis.	**2 Hours**
	12. Study of effect of effluents on growth of plants.	
	13. To study indices of similarity & dissimilarity in a community.	**4 Hours**
	14. Analysis of plant communities through qualitative and remote sensing methods, Statistical tools and softwares.	**2 Hours** **2 Hours**
	15. Performing Rapid EIA using Leopold interaction matrix (different projects).	**2 Hours**
	16. Community composition of plankton community.	
	17. Effect of zooplankton grazing on phytoplankton communities.	**4 Hours**
	18. Pool size v/s Diversity of aquatic plants.	**2 Hours**
	19. Study of density of single species on growth rate.	**2 Hours**
	20. Assessing the gene flow among populations using molecular markers.	**2 Hours** **2 Hours**
	21. Estimation of effective population sizes from data on genetic markers.	**2 Hours**
	22. Survey of key stone species.	
	23. Study of technical reports on Solid waste Management.	**2 Hours**
	24. Performing rapid biological impact analysis.	**2 Hours**
	25. Software for EIA-solid waste management.	**2 Hours**
	26. Field visit – data collection and report preparation.	**2 Hours**
	27. Biodiversity assessment of forest tree community.	**2 Hours**
	28. Assessment of forest disturbance for conservation aspects.	**2 Hours** **2 Hours**

	Only 30 hours for any of the above practicals will be conducted depending on availability of plant material, chemicals, equipments, etc.	
Pedagogy:	Lectures/Tutorials/Assignments/Seminars/Self-study/Videos/Expert Lectures/Group Discussion/Mini Projects/Workshops	
References/ Readings:	**Cavender-Bares, J., Gamon, J.A., & Townsend, P.A.** (2020). Remote sensing of plant biodiversity. Springer Nature. **Curtis, J. T.** (1956). Plant ecology workbook. A laboratory, field and reference manual. Plant ecology workbook. A laboratory, field and reference manual. **Erickson, P. A.** (1994). A practical guide to environmental impact assessment. Academic Press Inc. **McLean, R. C., & Ivimey Cook, W. R.** (1946). Practical field ecology. Practical field ecology. **Pommerening, A., & Grabarnik, P.** (2019). Individual-based methods in forest ecology and management (Vol. 411). Cham: Springer. **Prach, K., & Walker, L. R.** (2020). Comparative plant succession among terrestrial biomes of the World. Cambridge University Press.	
Learning Outcomes:	2. Will be familiar with modern tools and approaches and will be able to apply them properly for research 3. Be aware of the suitable use of field techniques, data gathering, mapping, analysis and interpretation. 4. Able to take up interdisciplinary research and teaching in Ecology. 5. Better scope to work for environmental NGOs.	

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Annexure II

Model Question paper, marking Schemes and
List of the experiments for T. Y. B.Sc. Practical Examinations

Goa University
Taleigao Plateau, Goa
T.Y.B.Sc. Practical Examination in Botany, April, 20
Semester VI

BOC109: Molecular Biology and Genetic Engineering

Time: 9.30 to 1.30 pm **Maximum Marks: 50**

Instructions to the candidates:

1. *All the questions are compulsory.*
2. *Figure to the right indicates full marks.*
3. *Draw diagrams wherever necessary.*
4. *Candidates should show all the preparations to the examiners.*

Q.1. Perform the experiment allotted to you. **10 marks**
Q.2. Write the protocol of the given experiment. **5 marks**
Q.3. Identify the sequence from sequencing gel photograph/ calculate the size of fragment on restriction map given. **6 marks**
Q.4. Spotting: A, B, C. **9 marks**
Q.5.Viva-Voce. **10 marks**
Q.6. Journal. **10 marks**

- **Marking scheme- BOC109: Molecular Biology and Genetic Engineering**

Q.1. Perform the experiment allotted to you. **(10 marks)**
(For extraction of DNA and RNA)

Requirements	(1)
Principle	(2)
Procedure	(3)
Extraction	(3)
Expected Results	(1)

OR

Q.1. Perform the experiment allotted to you. **(10 marks)**
(For estimation of DNA and RNA)

Requirements	(1)
Principle	(2)
Procedure	(3)

Observation/ tabular columns/formula/ graphs & calculations. (3)
Results (1)

OR

Q.2. Protocol of the given experiment **(5 marks)**
Requirements (1)
Procedure (4)

Q3. Identify the sequence from sequencing gel photograph/ calculate the size of fragment on restriction map given. **(6 marks)**
Procedure (3)
Writing the sequence in 5' to 3' direction (3)

Q.4. Spotting: A, B, C **(9 marks)**

A. Identify and state the principle of the Instrument. (1+2)
B. Identify and comment on the photograph. (1+2)
C. Identify and enumerate the steps involved. (1+2)

Q.5.Viva-Voce. **(10 marks)**
Q.6. Journal. **(10 marks)**

- **List of Experiments - BOC109: Molecular Biology and Genetic Engineering**

Q.1. List of experiments (Any one).
a. Extraction of DNA from cauliflower.

b. Estimation of DNA by diphenylamine reagent.

c. Extraction of RNA from plant material. .
d. Estimation of RNA by Orcinol reagent.

Q.2. Protocols of the following:
Gel electrophoresis/Plasmid Culture/ Plasmid DNA extraction.

Q.3. Identify the sequence from sequencing gel photograph/ calculate the size of fragment on restriction map given.
Gel photographs of Maxam& Gilbert/ Sangers / restriction maps to be provided.

Q.4. **Spotting**

A. Photographs of Rolling circle, Theta replication, semi-discontinuous replication, RNA polymerase, eukaryotic RNA polymerase II, Avery et al, Griffith's, Hershey &Chase's Fraenkel & Conrat's experiments, splice some machinery and splicing mechanism of introns. (Any one)
B. Photographs of steps of genetic engineering for production of Bt cotton, Golden rice, FlavrSavr tomato, humulin, *Agrobacterium*-mediated gene transfer, microprojectile bombardment (gene gun). (Any one)
C. Structures of pBR322, Ti plasmid, YAC, λphage through models/ photographs. (Any one)

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D 3.29 Minutes of the Board of studies in Biotechnology meeting held on 20th May 2022.

Annexure I

Proposed M.Sc. Biotechnology Proposed Scheme

M.Sc. Biotechnology 2022-23

Course Code	Courses		
SEMESTER I			
	Course Title	**Credits**	**Course Level**
GBC 181	Microbiology	3	100
GBO 182	Concepts in Biochemistry	2	100
GBC 183	Biophysical Principles & Analytical Techniques	2	100
GBC 184	Immunology	3	100
GBO 185	Biostatistics	2	100
GBC 186	Lab I: Techniques in Microbiology.	3	100
GBC 187	Lab II : Immunology	2	100
GBC188	LAB III: Biochemical and analytical techniques	3	100
	Total	20	
Semester II			
GBC 189	Environmental Biotechnology	3	100
GBC 190	Stem Cell Biology and regenerative medicine	1	
GBC 191	Genetics and Molecular Biology	3	100
GBC 192	Cell and Developmental Biology	3	100
GBO 193	Bioinformatics	2	200
GBO194	Bio entrepreneurship	2	100
GBC 195	Lab IV: Genetics and Molecular Biology	2	
GBC 196	Lab V: Plant and Animal Tissue Culture	2	100
GBO 197	Lab VI: Lab in Bioinformatics	2	100
Semester III			
GBRO 198	Recombinant DNA Technology	3	300
GBRO 199	Bioprocess Technology	3	300
GBOG 200	Waste Management	3	300
GBOG 201	IPR, Biosafety & Bioethics	3	100
GBOG 202	Food Technology	2	200
GBOG 203	Virology	2	200
GBOG 204	Lab in Bioprocess technology	2	300
GBRO 205	Lab VII: Lab in Recombinant DNA Technology	2	300
Semester IV			
GBOG 206	Research-based specialization	1	200
GBOG 207	Scuba Diving	2	200
GBSD 208	Dissertation	16	400

GBOG 209	Field trip	1	200
Optional Generic Course			
	Bio entrepreneurship	2	100
	Genomics & Proteomics	2	200
	Plant and Animal Biotechnology	2	300
	Emerging trends in wastewater treatment	1	200
	Solid waste Management	3	200
	Nanotechnology	2	100
	Lab in Environmental Biotechnology	3	100

Course level 100: No prerequisite for the course.
Course level 200: At least one prerequisite course is required.
Course level 300: More than two prerequisite courses are required

GBC : Marine Biotechnology-specific core course.
GBO : Marine Biotechnology specific-optional course
GBOG: Marine Biotechnology-optional generic course
GBRO: Marine Biotechnology research-specific optional course
GBSD: Marine Biotechnology-specific dissertation

SEMESTER- I

Course Code: GBC-181
Title of the Course: Microbiology
Number of Credits: 3

Objective:	The objective of this course is to provide information about the types of microbes, nutrition, and general characteristics	
Learning Outcomes	After completing this course, students should be able to- 1. explain the principle features of marine ecosystems and the microbial diversity in oceans; 2. describe and discuss marine microbes in terms of physiological capability and their biogeochemical role.	
Contents:	**MODULE I** • A brief history of microbiology: discovery of the microbial world, controversy over spontaneous generation, the role of microorganisms in the causation of disease, development of pure enrichment culture methods. • Modern /contemporary microbiology in the 21st century • An overview of the organization and cell structure of Prokaryotes and Archaea: i) cell wall ii) outer membrane iii) cytoplasmic membrane iv) flagella & specialized movements in microbes v) cell inclusions iv) differences among the groups. **MODULE II** ● Microbial nutrition: i) autotrophic & heterotrophic modes, ii) defining culture media to support growth, iii) Selective and differential culture media. ● Bacterial growth kinetics: i) growth curve, the mathematical expression of growth & measurement of growth ii) synchronous growth iii) factors affecting growth iv) chemostat & turbidostat. ● Microbial taxonomy: i) nomenclature ii) polyphasic identification, traditional & molecular, iii) Bergey's manual. **MODULE III** i) Structure & classification. ● Algae ● Fungi ● Cyanobacteria ● Bacteria	15 hours 15 hours 15 hours

	● Viruses ● Viroids & prions ii) Specialized microorganisms: • Marine microbes •Extremophiles: barophiles, psychrophiles, thermophiles, halophiles, acidophiles • Anaerobes	
References/Readings	1. Tortora, G., Funke B., Case, C., 2018 Microbiology: An Introduction. Pearson. 2. Madigan M., Bender K.M., Buckley D.,Sattley W., Stahl D (2018) Brock Biology of Microorganisms. Pearsons 3. Willey, J., Sherwood, L., Woolverton, C.J., (2016) Prescott's Microbiology. Mcgraw Hill. 4. Harvey, R.A., Cornelisse, C.N., (2012) Lippincott Illustrated Reviews: Microbiology (Lippincott Illustrated Reviews Series) LWW publisher 5. Madigan, M., Martinko & Parker, J (2010). Brock's Biology of microorganisms. Pearson Prentice Hall. 6. G. Reed, Prescott & Dunn , (2004) Industrial Microbiology CBS Publishers . 7. Pelczar M.J., Chan ECS and Krige (2004)Microbiology Tata Macgrw Hill 8. Stanier, R.Y., Ingraham, J.L., (1999) General Microbiology. Palgrave Macmillan 9. Ford T E (1993). Aquatic Microbiology:An ecological approach. Blackwell Scientific Publication. 10. Atlas, R.M. (1989). Microbiology: Fundamentals and Applications. World Cat Publisher 11. G Reed, (1987) Prescott & Dunns Industrial Microbiology. CBS Publishers. 12. Rheinhemer,G, (1980) Aquatic Microbiology Wiley and sons 13. Collins, Granje J., Lyne, P.. M. Falkenheim J., (2004) Microbiology Methods Hodder Arnold Publication.	

Course Code: GBO 182

Title of the course: CONCEPTS IN BIOCHEMISTRY

Number of Credits: 2

Course Objectives	The major objective of this course is to build upon the knowledge of basic biochemical principles with emphasis on different metabolic pathways and their integration. Attention is drawn to the structure-function relationships of biomolecules.
Learning	Gain fundamental knowledge in biochemistry and understand the role of

Outcomes	enzymes in the regulation of metabolic pathways.	
Contents:	**MODULE I** • Biochemistry: the molecular logic of life. • Amino acids, proteins, nucleic acids, carbohydrates, and lipids. • Vitamins and hormones. • Forces that stabilize biomolecules: electrostatic and Vander Waal's interaction, hydrogen bonding. Interactions with solvents, Hydrophobic effect. • Basic Thermodynamics: Laws of thermodynamics. Concepts of ΔG, ΔH, and ΔS. • Chemical kinetics: Concepts of Order and molecularity of a chemical reaction. Derivation of first and second-order rate equation, measurement of rate constants. Concept of activation energy. • Enzymology: Introduction and classification of enzymes. Types of enzymatic reaction mechanisms, Enzyme kinetics, enzyme inhibition, Regulatory enzymes. Isozymes, Zymogen and Ribozyme. Examples of enzymatic reactions. **MODULE II** • Basic concepts and design of metabolism - glycolysis, gluconeogenesis • Pyruvate oxidation, Citric acid cycle • Oxidative phosphorylation; the importance of electron transfer in oxidative phosphorylation; F_1-F_0 ATP Synthase; shuttles across mitochondria; regulation of oxidative phosphorylation, inhibitors of electron transport chain. • Glyoxylate cycle • The pentose phosphate pathway • Fatty acid synthesis, β-oxidation; biosynthesis of membrane lipids and sterols with specific emphasis on cholesterol metabolism and the mevalonate pathway • Amino acid metabolism; nucleotide metabolism • Photosynthesis and photorespiration	15 hours 15 hours

References/ Reading	1. Murray, R.K. et al (2022). Harper's Illustrated Biochemistry McGraw Hill publisher. 2. Abali E. E., Cline S. D., Franklin D. S., Viselli S. M., (2021) Lippincott Illustrated Reviews: Biochemistry Wolters Kluwer publisher 3. Miesfeld R. L., McEvoy M. M., (2020) Biochemistry. Worldwide publisher 4. Stryer L; Berg J., Tymoczko J., Gatto G. (2019). Biochemistry New York, Freeman publisher. 5. Voet, D., Voet, J.G., Charlotte W.P. (2018). Fundamentals of Biochemistry. Life at the molecular level. Wiley publisher. 6. Papachristodoulou D., Snape A., Elliott W. H., and Elliott D. C. (2018). Biochemistry and Molecular Biology. Oxford University publisher. 7. Nelson D.L. (2017) Lehninger Principles of Biochemistry. W.H. Freeman & Co. 8. Voet, D., Voet, J.G., Charlotte W.P (2012). Principles of Biochemistry. Wiley publisher.	

Course Code: GBC 183

Title of the course: BIOPHYSICAL PRINCIPLES & ANALYTICAL TECHNIQUES

Number of the Credits: 2

Course Objectives	The course is designed to provide a broad exposure to basic techniques used in Modern Biology research. The goal is to impart basic conceptual understanding of principles of these techniques and emphasize biochemical utility of the same. Student is expected to have a clear understanding of all analytical techniques such that the barrier to implement the same is abated to a great extent.

Learning Outcomes	Students will learn to combine previously acquired knowledge of physics and chemistry to understand the biochemical processes in the cell.	
Contents:	**MODULE I** Description of Macromolecular Structure, Intermolecular and Intramolecular forces in protein, DNA and other biomolecules. Diffusion, Brownian motion and sedimentation, determination of molecular weight from sedimentation and diffusion. Concept and application of Chemical and Physical equilibria in biological system Nature and Role of Ionic, Covalent and Non-covalent Interaction in molecular confirmation, scaffolding and packaging of protein and DNA Thermodynamics of protein folding: Protein folding kinetics, Misfolding and aggregation. Physical biochemistry of cell: Chemical forces translation and rotation, diffusion, directed movements, biomolecules as machines, work, power and energy, thermal, chemical and mechanical switching of biomolecules, Biochemical and biophysical characterizations of biomolecules: Fluorescence from GFP), UV-VIS absorption and emission spectra resulting from intrinsic Tryptophan and GFP chromophores, Fluorescence quenching and polarization studies, Unfolding and refolding studies using CD. protein diffusion, dynamics by fluorescence correlation spectroscopy. **MODULE II** **Spectroscopy:** Electromagnetic radiations in spectroscopic techniques. Beer-Lambert law, UV/Visible spectroscopy, Fluorescence spectroscopy, Emission, excitation, Quenching, Quantum Yield. Nuclear magnetic resonance Spectroscopy. Electron spin resonance spectroscopy. **Centrifuge:** Basic concepts of centrifugation. Calculation of g value from RPM. Types of rotors used,	15 hours 15 hours

	Differential centrifugation, Density gradient centrifugation. Rate-zonal centrifugation, Isopycnic centrifugation. **Microscopy:** Abbey's law, Resolution, Magnification, Phase-contrast microscopy, Confocal microscopy, High resolution microscopy, **Nanoscopy:** Atomic force Microscopy, Scanning-tunneling Microscopy, Scanning electron microscopy, Transmission electron microscopy and Cryo-electron microscopy **X-ray diffraction**	
References/ Reading	1. Subramaniam, M. A (2021) Biophysics: Principle and techniques, MJP Publishers. 2. Bhavna P., Fulekar, M.H (2019), Bioinstrumentation, Wiley Int. 3. Rodney C., (2017). Biophysics: An IntroductionWiley Int. 4. Anders L. et al. (2016) Textbook of Structural Biology. World Scientific. 5. Salman K., and Diaz, Z., (2016) Principal And Techniques of Bioinstrumentation, Intelliz Publisher 6. Tinoco Jr. I. Sauer K., Wang J.C., Puglisi J. D., Harbison G., Rovnyak D. (2013) Physical Chemistry: Principles and Applications in Biological Sciences Pearson Publishers 7. Atkins, de P. (2011) Physical Chemistry for the Life Sciences. W.H. Freeman. 8. Van Holde K. E., Johnson, C. Ho P. S. (2005) Principles of Physical Biochemistry. Prentice Hall. 9. Schulz GE and Schirmer RH, (1998) Principles of Protein Structure, Springer Verlag. 10. Branden C., and Tooze J., (1998) Introduction to Protein Structure, Garland Science. 11. Stout G.H., and Jensen L.H., (1989) X-ray Structure Determination: A practical guide. John Wiley and Sons Inc., New York.	

Course Code: GBC-184
Title of the Course: Immunology
Number of Credits: 3

Objective:	To provide a basic knowledge and to appreciate the components of the human immune response that work together to protect the host. 2) To understand the concept of immune-based diseases as either a deficiency of components or excess activity as hypersensitivity 3) To gain an insight into the mechanisms that lead to beneficial immune responses, immune disorders, and immune-deficiencies.

Learning Outcomes	The mode of continuous assessment and formulation of tests enables students to handle competitive entrance exams. The basic overview of Immunology strengthens their foundations for a career in Biotechnology.	
Contents:	**MODULE I – Concepts and Basics** • Introduction – History and scope of immunology • Innate immunity:- factors, features, processes • Acquired:- the Specificity, memory, recognition of self from non-self. • Cells of the immune system: Hematopoiesis and differentiation, Lymphoid and Myeloid lineage, lymphocyte trafficking, B lymphocytes, T lymphocytes, macrophages, dendritic cells, natural killer and lymphokine-activated killer cells, eosinophils and mast cells, lymphocyte subpopulations and CD markers. • Organization of lymphoid organs • MALT, GALT, SALT • Phagocytosis: oxygen-dependant/ independent killing intracellularly. • Major histocompatibility complex…Structure of MHC molecules, basic organization of MHC in human , haplotype-restricted killing. • Nature and biology of antigens and superantigens: haptens, adjuvants, carriers, epitopes, T dependant and T independent antigens **MODULE II – Defence Components: Constituents of immune system and response** • Theories of antibody formation and res • olution of antibody structure • Humoral immunity: cells, antibody formation, primary and secondary response. • Immunoglobulins – structure, distribution and function. • Antigen – Antibody interactions: forces, affinity, avidity, valency and kinetics. • The basics of immuno-diagnostics **MODULE III – Defence Strategies and Pitfalls: Effector mechanisms of immune responses** • Complement system: mode of activation, classical, alternate and MBL pathways. Structures of key components.	15 hours 15 hours

	• Cell mediated immune responses: cell activation, cell-cell interaction and cytokines. • Cell-mediated cytoxicity: Mechanism of T cell and NK cell mediated lysis, antibody-dependant cell-mediated cytotoxicity. • Hybridoma technology and monoclonal antibodies. • Hypersensitivity: An introduction to the different types. • Introduction to autoimmune diseases.	15 hours
References/Readings	1. Kannan I (2021) Immunology. MJP Publishers. 2. Hardeep Kaur H., Toteja R., Makhija. S., (2021) Textbook of Immunology Wiley Publisher 3. Punt, J., Stranford, S., Jones, P., Owen, J.A., (2018) Kuby Immunology W.H. Freeman 4. Roitt I.M. Delves P.J. Martin S. J., Burton D R, Roitt I.M. (2017) Essential Immunology Wiley-Blackwell 5. Male D., Brostoff J., Roth D., Roitt I., (2013) Immunology. Elsevier Saunders publication. 6. Luttmann W., Bratke K., Kupper M., and Myrtek D (2009). Immunology. Academic Press.	

Course Code: GBO 185
Title of the course: BIOSTATISTICS

Number of Credits: 2

Course Objec	The objective of this course is to introduce students to statistical methods and to understand underlying principles, as well as practical guidelines of "how to do it" and "how to interpret it" statistical data.	
Learning Outc	Upon completing this course, students should be able to - • understand how to summarize statistical data; • apply appropriate statistical tests based on an understanding of the study question, type of study, and type of data; • Interpret results of statistical tests.	
Contents:	**MODULE I** 1. Scope of Biostatistics 2. Brief description and tabulation of data and its graphical representation, and frequency distributions. 3. Measures of Central Tendency and dispersion: mean, median, mode, range, standard deviation, variance, coefficient of variation, skewness, kurtosis 4. Displaying data: Histograms, stem and leaf plots, box plots 5. Probability analysis: axiomatic definition, axioms of probability: addition theorem, multiplication rule, conditional probability, and applications in biology.	15 ho
	MODULE II 1. Counting and probability, Bernoulli trials, Binomial distribution, and its applications, 2. Poisson distribution 3. Normal distribution, z, t, and chi-square tests, levels of significance 4. Testing of hypotheses: null and alternative hypotheses, Type I and Type II errors 5. Simple linear regression and correlation 6. Analysis of variance	15 ho
References/ Reading	1. Mahajan B.K., (2018), Methods in Biostatistics: for Medical Students and Research Worker. Jaype Brothers, 2. Samuels, JA Witmer (2016) Statistics for the Life Sciences. Prentice Hall	

	3. Kothari, C. R.,(2013) Quantitative Techniques, Vikas Publishing House. 4. Rao K. Surya (2010), Biostatistics for Health and Life Sciences, Himalaya Publishing House. 5. Rastogi, V. B. (2009). Fundamentals of Biostatistics. Ane Books Pvt Ltd. 6. Arora P.N. and Malhan, P.K. (2006), Biostatistics. Himalaya Publishing House.

Course Code:GBC 186
Title of the Course: Lab I: Techniques in Microbiology
Number of Credits: 3

Objective:	This course involves learning techniques to culture microbes in the lab to form the basis for application in microbiological research studies.	
Learning Outcomes	Key hands-on experience of converting and applying theoretical knowledge to laboratory. Application of the varied interactions /reactions to be utilized in research. Students become familiar with microbiology techniques that are used in many scientific disciplines as well as clinical medicine.	
Contents:	1. Sterilization and disinfection. 2. Preparation of solid & liquid media: 3. Isolation and maintenance of organisms: Streaking, slants and stabs cultures, storage of microorganisms. 4. Differential and Selective media 5. Enumeration: serial dilution methods, plating. 6. Isolation of bacteria from seawater /sediments samples 7. Study of morphology and cultural characteristics 8. Biochemical tests for identification of bacteria. a. Sugar utilization test (minimal medium + sugar) b. Sugar fermentation test c. IMViC d. Enzyme detection – Gelatinase, Catalase, Oxidase e. Oxidative-fermentative test 9. Bacteriological tests for potability of water a. MPN, Confirmed and Completed test. b. Membrane filter technique (Demonstration)	30 hours

	11. Staining methods:- Gram staining, Endospore staining, Metachromatic granules, Cell wall staining 12. Motility in bacteria using: Hanging drop method and swarming growth method. 13. Antimicrobial sensitivity tests : Agar cup and Disc Diffusion methods 14. Drug resistance: comparative studies of different drugs/ disinfectants 15. Cultivation of fungi: a.Slide b. chunk c. coverslip techniques d. Wet mounts of fungal cultures	30 hours
References/Readings	1. Giltner W. (2017) Laboratory Manual in General Microbiology Creative Media Partners, LLC 2. Harrigan W. F., McCance M E (2014). Laboratory Methods in Microbiology Academic Press 3. Karwa A.S.. Rai M.K, Singh H.B (2012). Handbook of Techniques in Microbiology: A Laboratory Guide to Microbes Scientific Publishers	

Course Code: GBC 187
Title of the Course: Lab II: Techniques in Immunology
Number of Credits: 2

Objective:	This course involves learning techniques to culture microbes and to identify immune reactions in the lab to form the basis for application in immunodiagnostics.
Learning Outcomes	Key hands-on experience of converting and applying theoretical knowledge to laboratory. Application of the varied interactions /reactions to be utilized in research. Students become familiar with immunologic techniques that are used in clinical medicine as well as immunology research laboratories.

Contents:	• Determination of Antibody titer using Double Immuno-diffusion assay • Assessment of Similarity between antigens using Ouchterlony's Double diffusion Test • Estimation Of Antigen Concentration using Radial Immuno Diffusion • Quantitative Precipitation Assay • DOT ELISA • Latex Agglutination • Immunoelectrophoresis • Rocket Immunoelectrophoresis • Slide / Tube agglutination Tests.	30 hours 30 hrs
References/Readings	1. Talwar G.P Gupta S.K (2017) A Handbook of Practical And Clinical Immunology Vol I CBS Publishers 2. Detrick B., Hamilton R.G., Folds J.D. (2016) Manual of Molecular and Clinical Laboratory Immunology (2016) ASM Press. 3. Detrick B., Hamilton R.G.; Folds J.D. (2016) Manual of Molecular and Clinical Laboratory Immunology ASM Press. 4. Joshi, K.R., Osama, N.O. (2012) Immunology, Agrobios Ltd, India. 5. Hay, F.C &, O.M.R. Westwood. (2008) Practical Immunology Oxford University Press 6. Janeway, C.A., Travers, P., Walport, M. and Shlomchik, M.J. (2001) Immunobiology: The 7. Hay F.C., Westwood. O.M.R., (2008) Practical Immunology (2008) Wiley BlackWell Publishers Immune System in Health and Disease, Garland Publishing, USA.	

Course code: GBC 188
Title of the course: LAB III - BIOCHEMICAL & ANALYTICAL TECHNIQUES
Number of credits: 3

Course Object	The objective of this laboratory course is to introduce students to experimentation in biochemistry. The course is designed to teach the utility of these experimental methods in a problem-oriented manner.	
Learning Outcc	Students should be able to: • Elaborate concepts of biochemistry with easy-to-run experiments. • Familiarize with basic laboratory instruments and understand principles underlying measurements using those instruments for experiments in biochemistry.	
Contents	1. UV-Visible spectroscopic analysis. 2. Estimation of proteins by the Lowry/Bradford's method 3. Estimation of reducing sugars 4. Enzyme assay 5. Ammonium sulfate precipitation and dialysis 6. Specific activity, fold purification, percentage yield of enzyme 7. Protein subunit molecular weight determination by SDS-PAGE 8. Thin-layer chromatography 9. Column chromatographic techniques: ion exchange/Affinity/Gel filtration 10. Biochemical assays using ELISA plate reader. 11. Compound and Fluorescence microscopy demonstration 12. Analysis of a biological specimen by SEM 13. Fluorescence imaging of fixed stained and live cells 14. Demonstration of fluorescence spectroscopy. 15. Density gradient ultracentrifugation	30 hou 30 hrs

References/ Re	1. John G., (2020), Biological Centrifugation CRC Press. 2. Friedrich L., Engels, J. W. (2018) Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology. Wiley-VCH publisher 3. Ulrich K., (2017) Fluorescence microscopy: From Principle to application, Wiley Int. 4. James J.F. (2017), An Introduction to practical laboratory optics, Cambridge University press. 5. Atkins, de Paula. (2015), Physical Chemistry for the Life Sciences (2nd Edition). W. H. Freeman 6. Prakash S. Bisen, (2014), Laboratory Protocols in Applied Life Sciences., Taylor and Francis Publisher 7. Tinoco, Sauer,Wang, and Puglisi. (2013) Physical Chemistry: Principles and Applications in the Biological Sciences. Prentice Hall, Inc. 8. Jayaraman, J. (2011). Laboratory Manual of Biochemistry. New Age International Private Limited 9. Atkins, de Paula. (2011) Physical Chemistry for the Life Sciences (2nd Edition). W.H. Freeman. 10. Wilson, K., Walker, J. (Eds.). (2010). Principles and techniques of biochemistry and molecular biology. Cambridge university press. 11. K. E. van Holde, C. Johnson, P. S. Ho (2005) Principles of Physical Biochemistry, 2nd Edn., Prentice Hall. 12. Mu, P., & Plummer, D. T. (2001). Introduction to practical biochemistry. Tata McGraw-Hill Education. 13. Boyer, R. (2000). Modern experimental biochemistry. Pearson Education India.

SEMESTER II

Title of the Course: Environmental Biotechnology
Course Code: GBC 189
Number of Credits: 03

Objective:	The objective of this course is to impart knowledge on biotechnological applications that can be used to tackle environmental issues emerging due to industrialization and globalization.	
Learning outcomes	At the end of this course, students will be able to apply their knowledge for the application of biotechnological processes for betterment of environment and sustainable development of the society.	
Contents:	**Module 1:**	

	Introduction to environmental biotechnology: Basic concept of environment and its components. Biotechnology for environment; definitions and facts. **Environment pollution:** Sources of pollution and their environmental impact. Hazardous wastes: Definition, sources and characteristics, categorization, generation, collection, transport, treatment and disposal. Municipal solid wastes: Collection, segregation and transport of solid wastes, handling and segregation of wastes at source. **Monitoring environmental pollution:** Air, water and soil sampling, Analyses of samples. Physical, chemical, biological and molecular methods for the measurement of pollution. Robust techniques and innovative new concepts for identifying and screening of toxins and pathogens in the environment (genetic and biochemical kits and reagents, CRISPR–Cas technology, and cellular models). Nucleic acid based techniques for analyses of diversity, structure and dynamics of microbial community in wastewater treatment, Concept of biomarkers. Environmental impact assessment, Biodiversity and its conservation. **Module II** **Waste Water Treatment systems:** primary, secondary and tertiary treatments; Biological Treatment Processes, Biochemistry and Microbiology of Aerobic and Anaerobic Treatment, Bioreactors for waste water treatment, Disinfection and Disposal, Macrophytes in water treatment, treatment using constructed wetlands. **Treatment of Typical Industrial Effluents:** Dairy, Distillery, Sugar, and Antibiotic Industries. **Solid waste management:** Treatment of municipal, biomedical and agricultural solid waste. Biochemical processes and advanced methods: Methane generation by anaerobic digestion, composting, Vermicomposting, Biofertilizers. Treatment of solid waste at wastewater treatment plants: Advanced methods - Anaerobic co-digestion of the sewage sludge with liquid wastes such as septage, Novel composting methods (such as terra preta of the sludge (biomass)). **Module III:** **Resource management and environment conservation:**	15 hours 15 hours

	Basic concept of saving of resources and energy through biotechnology; Prevention of eutrophication using macroalgae; biological control of mosquitos. **Bioresource technology for clean environment:** Integrated waste management: Biomass (wood waste, agricultural waste, municipal solid waste, manufacturing waste, and Sewage sludge) as source of energy and bio-fuels. Microalgae as a source for Biodiesel. Biodegradable plastic. **Environmental Pollution control**: concepts of bioremediation, bioaugmentation, biostimulation, biodegradation, biosorption, Bio-mineralization.	15 hours
References/ Readings	1. Meena, S. M. and Naik, M. M. (Ed.). (2019). Advances in Biological Science Research: a practical app. Elsevier. 2. King, R. B., Sheldon, J. K., and Long, G. M. (2019).Practical Environmental Bioremediation: The Field Guide, Lewis Publishers. CRC Press. 3. Willey, J. M., Sherwood, L. M., Woolverton, C. J. (2017). Prescott,s Microbiology. Mcgraw-Hill Education. 4. Satyanarayana, T. Johri, B. and Anil, T. (Ed.). (2012). Microorganisms in Environmental Management. Springer Publishers. 5. Colin, M. (2011). Marine Microbiology: Ecology and applications. Second edition. Garland science. 6. Scragg, A. (2005). Environmental Biotechnology. Pearson Education Limited, Oxford University Press. 7. Chaterjee, A. K. (2000). Introduction to environmental biotechnology. PHI, India, 8. Rehm, H. J. and Reed, G. (Eds.). (1999). Biotechnology, a comprehensive treatise.	

Title of the Course: Stem Cell Biology and Regenerative medicine
Course Code: GBC190
Number of Credits: 01

Prerequisites	Basic understanding of cell biology - cell types, growth media, cell division, cell growth, cell differentiation.
Objective:	The aim of the course is to bring together cellular, biochemical, anatomical, histological, physiological and evolutionary medical views of stem cells to a coherent picture in an experimental and clinical context.

Contents:	**MODULE I** Definition,stem cell origins and plasticity,classification and source of stem cells; Stem cell differentiation; Stem cells cryopreservation, iPS technology; microRNAs and stem cell regulation, Tumor stem cells, Overview of embryonic and adult stem cells for therapy. Human stem cells research: Ethical considerations; Stem cell based therapies: Pre-clinical regulatory consideration and patient advocacy.	15 hours
References/Readings	1. John Collins, (2017)Stem cells: From basic to advanced principles,. Hayle Medical 2. Robert lanza, (2013) Essential of Stem cell Biology, Elsevier publisher. 3. Robert lanza, (2011), Principle of Tissue Engineering, AP publisher 4. Robert Lanza (2009) Essential stem cell methods, Elsevier. 5. Robert Lanza (2006) Essential of Stem Cell Biology, Academic Press. 6. A.D. Ho. R. Hoffman, (2006) Stem Cell Transplantation Biology Process Therapy, Willy-VCH	
Learning Outcomes	On completion of the course, students should be aware of basics of stem cell function in the body and their usage in the medical context.	

Course Code: GBC 191
Title of the Course: Genetics and Molecular biology
Number of Credits: 3

Objective:	The aim of this course is to obtain and understand the fundamental knowledge of molecular and cellular processes such as RNA transcription, protein synthesis, mutation, epigenetic modification and gene regulation.	
Learning Outcomes	The students should be able to explain and summarize the scientific principles of the molecular biology of DNA, RNA and understand the role played in overall functioning of the cell.	
Contents:	**MODULE I** • Mendelian Genetics and Population genetics • Structure of DNA - A,B, Z and triplex DNA; • Organization of bacterial genome and eukaryotic chromosomes Heterochromatin and Euchromatin • DNA melting and buoyant density; Tm; DNA reassociation kinetics (Cot curve analysis) Repetitive and unique sequences; Satellite DNA; DNase I hypersensitive regions; DNA methylation & epigenetic effects.	15 hours

	• Structure and function of prokaryotic and eukaryotic mRNA, tRNA (including initiator tRNA), rRNA and ribosomes. Processing of eukaryotic hnRNA: 5'-Cap formation; 3'-end processing of RNAs and polyadenylation; loop model of translation; Splicing of mRNA. • Gene transfer in bacteria-Conjugation, transformation and transduction. • DNA mutation and repair, Transposons **MODULE II** • Prokaryotic and eukaryotic transcription -RNA polymerase/s and sigma factors, • Transcription unit, Prokaryotic and eukaryotic promoters, Promoter recognition, Initiation, Elongation and Termination (intrinsic, Rho and Mfd dependent) • Gene regulation: Repressors, activators, positive and negative regulation, Constitutive and Inducible, small molecule regulators, operon concept: *lac, trp*operons, attenuation, anti-termination, stringent control, translational control. • Eukaryotic transcription - RNA polymerase I, II and III mediated, General eukaryotic transcription factors; TATA binding proteins (TBP) and TBP associated factors (TAF); assembly of pre-initiation complex for nuclear enzymes, interaction of transcription factors with the basal transcription machinery and with other regulatory proteins, mediator, TAFs. ; Silencers, insulators, enhancers, mechanism of silencing and activation. **MODULE III** • Translation in prokaryotes and eukaryotes, • Regulatory RNA and RNA interference mechanisms, miRNA, non-coding RNA; • Families of DNA binding transcription factors: Helix-turn-helix, helix-loop-helix, homeodomain; 2C 2H zinc finger, multi cysteine zinc finger, basic DNA binding domains (leucine zipper, helix-loop-helix), nuclear receptors. • Interaction of regulatory transcription factors with DNA: properties and mechanism of activation and repression including Ligand-mediated transcription regulation by nuclear receptors. • DNA replication. • DNA recombination.	15 hours 15 hours

References/Reading	1. Clark DP. Pazdernik, NJ., McGehee, MR. (2019) Molecular Biology (3 rd) Elsevier Inc 2. Klug, W., Cummings, M, Spencer.C . (2019) Concepts of Genetics (12ed). Pearson publishers 3. Goldstein ES. , Stephen T. Kilpatrick J Krebs J. (2017) Lewin's GENES XII . Bartlett Publishers 4. Lodish HF; Berk A ; Kaiser C ; Krieger M ; Bretscher A . (2016). Molecular Cell Biology (8 ed) Freeman MacMillan publisher 5. Russell PJ, iGenetics: A Molecular Approach. (2016) (3 ed) Pearson publisher. 6. Karp G.,Iwasa J., Marshall W., (2016) Karp's Cell and Molecular Biology: Concepts and Experiments, (8 ed) Wiley Publisher 7. Strickberger, M. (2015) Genetics, (3 ed) by Pearson publishers 8. Simmons M J., Snustad P. (2015). Principles of Genetics (7 ed). Wiley Student Edition. 9. Watson JD, Baker TA, Bell SP, Gann A, Levine M & Losick R (2014) Molecular Biology of the Gene, (7 ed), Cold Spring Harbor Laboratory Press, New York 10. Weaver RF (2012) Molecular Biology (5th ed) McGraw Hill Higher Education publisher.

Course Code: MBC 192
Title of the course: CELL AND DEVELOPMENTAL BIOLOGY
Number of Credits; 3

Course Objectives	The cells being "the fundamental building blocks of all organisms", a comprehensive understanding of the cell and cellular function is essential for all biologists. This course will hence provide a conceptual overview of a cellular system and its functioning in animals and plants. The course will also highlight a conceptual overview of how developmental patterns arise. Using examples from different model systems regulatory networks involved are highlighted, aiming to project the molecular basis of developmental patterns.	
Learning Outcomes	Understanding major concepts in cell and Developmental biology with an awareness of experimental approaches and how they are applied in cell biology research.	
Contents:	**MODULE I** Biochemical organization of the cell; diversity of cell size and shape; cell theory, and the emergence of modern Cell Biology. Principles underlying microscopic techniques for the study of cells. Structure and diversity of biological membranes; mechanisms of membrane transport. Self-assembly of lipids, micelle, bio membrane organization - sidedness	

	and function; membrane assembly. • The plant cell wall; extracellular matrix in plants and animals • Cell lysis and subcellular fractionation • Structural organization and functions of cell organelles: nucleus, mitochondria, Golgi bodies, endoplasmic reticulum, lysosomes, Chloroplast, peroxisomes, vacuoles. Cytoskeletons structure and motility function • Cellular communication: General principles of cell communication, cell adhesion and roles of different adhesion molecules, tight junctions, communicating junctions, integrins, neurotransmission, and its regulation.	15 hours
	MODULE II • Protein localization – synthesis of secretory and membrane proteins, import into nucleus, mitochondria, chloroplast, and peroxisomes, receptor-mediated endocytosis. • Proteasomes; structure and function • Cell division and cell cycle: Mitosis and meiosis, their regulation, Cell cycle, and its regulation, Apoptosis, Necrosis, and Autophagy. • Cell signaling • Cell fusion techniques • Molecular chaperones: types, characteristics, and functional significance • Cell transformation and cancer, oncogenes and proto-oncogenes, tumor suppressor genes, metastasis.	15 hours
	MODULE III • Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development. • Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation, and formation of germ layers in marine animals. • Cell aggregation and differentiation in *Dictyostelium*; axes and pattern formation in *Drosophila*, amphibia; organogenesis – vulva formation in *Caenorhabditis elegans*, eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post-embryonic development- larval formation,	15 hours

	metamorphosis; environmental regulation of normal development; sex determination.	
References/ Reading	1. Amon, A., Krieger, M., Lodish, H., Bretscher, A., Kaiser, C. A., Berk, A., Martin, K. C., Ploegh, H. (2016). Molecular Cell Biology. United Kingdom: W. H. Freeman. 2. Pollard, T. D., Earnshaw, W. C., Lippincott-Schwartz, J, Johnson, G. (2016). Cell biology E-book. Elsevier Health Sciences. 3. Karp, G., Iwasa, J., Marshall, W. (2018). Cell Biology Global Edition. United States: Wiley. 4. J.D. Watson, M.,Levine, T. A. Baker, A. Gann, S. P. Bell, R.L. Watson (2014) Molecular Biology of the Gene, Pearson Education. 5. Turner, B. M. (2008). Chromatin and gene regulation: molecular mechanisms in epigenetics. John Wiley & Sons. 6. Kilpatrick, S. T., Krebs, J. E., Goldstein, E. S. (2017). Lewin GENES XII. Japan: Jones; Bartlett Learning. 7. Gilbert, S. F. (2010). Developmental biology. Sinauer Associates, Inc. 8. Subramanian, M. A. (2022). Developmental Biology. India: MJP Publisher. 9. Cooper, G. M., Hausman, R. E. (2013). The Cell: A Molecular Approach. United States: Sinauer Associates. 10. C. Smith & E. Wood (2005) Cell Biology, Chapman Hall . 11. Wolpert, L. (2011). Developmental Biology: A Very Short Introduction. OUP Oxford. 12. Slack, J. M. W. (2009). Essential Developmental Biology. Germany: Wiley. 13. Lodish et al., (2000) Molecular Cell Biology, W.H.Freeman & Company 14. Smith & Wood (2005) Cell Biology, Chapman & Hall London	

Course Code:GBO-282
Title of the Course: Bioinformatics
Number of Credits:2

Objective:	The objectives of this course are to provide students with theory and practical experience of use of common computational tools and databases which facilitate investigation of molecular biology and evolution-related concepts	
Learning Outcomes	Student should be able to: • develop an understanding of basic theory of these computational tools. • gain working knowledge of these computational tools and methods. • appreciate their relevance for investigating specific contemporary biological questions.	
Contents:	**MODULE I**	

	• Introduction, Primary & Secondary database, Sequence file formats, Introduction to structures, Protein Data Bank (PDb), Molecular Modelling Database (MMDb), Structure file formats, Collection of sequences, sequence annotation, sequence description. • Evolutionary basis of sequence alignment, optimal alignment methods, Substitution scores & gap penalties, Statistical significance of alignments, • Database similarity searching, FASTA, BLAST, Low complexity regions, Repetitive elements, Multiple Sequence Alignment: Progressive alignment methods, Motifs and patterns, Clustal, Muscle; Scoring matrices, Distance matrices. • Alignment, tree building and tree evaluation, Comparison and application of Unweighted Pair Group Method with Arithmetic Mean (UPGMA), Neighbour Joining (NJ), Maximum Parsimony (MP), Maximum Likelihood (ML) methods, Bootstrapping, Jackknife; • Software for Phylogenetic analysis. DNA barcoding: Methods tools and databases for barcoding across all species, Applications and limitations of barcoding, Consortium for Barcode of Life (CBOL) recommendations, Barcode of Life Database (BOLD). **MODULE II** • 3-D structure visualization and simulation, Basic concepts in molecular modeling: different types of computer representations of molecules; External coordinates and Internal Coordinates, Molecular Mechanics, Force fields *etc.* Secondary structure elucidation using Peptide bond, phi, psi and chi torsion angles, Ramachandran map, anatomy of proteins – Hierarchical organization of protein structure –like CATH (class, architecture, topology, homology), SCOP (Structural Classification of Proteins), FSSP (families of structurally similar proteins). • Fundamentals of the methods for 3D structure prediction (sequence similarity/identity of target	15 hours

	proteins of known structure, fundamental principles of protein folding *etc.*) Homology/comparative modeling, fold recognition, threading approaches, and ab initio structure prediction methods; CASP (Critical Assessment of protein Structure Prediction); Computational design of promoters, proteins & enzymes. • Chemical databases like NCI/PUBCHEM; Fundamentals of Receptor-ligand interactions; Structure-based drug design: Identification and Analysis of Binding sites and virtual screening; Ligand based drug design: Structure Activity Relationship– QSARs & Pharmacophore; *In silico* predictions of drug activity and ADMET. • Designing of oligo probes; Image processing and normalization; Microarray data variability (measurement ad quantification); Analysis of differentially expressed genes; Experimental designs.	15 hours
References/Readings	1. Perambur S Neelakanta (2020) A Textbook of Bioinformatics: Information-theoretic Perspectives of Bioengineering and Biological Complexes World Scientific Publisher. 2. Baxevanis A. D., Bader,G.D., Wishart D.S. (2020) Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins Wiley Publisher. 3. Arthur L (2019) Introduction to Bioinformatics. Oxford University Press. 4. Jonathan Pevsner (2015) Bioinformatics and Functional Genomics. Wiley Blackwell Publication. 5. Ignacimuthus. S. (2013) Basic Bioinformatics Alpha Science International Ltd 6. Essential Bioinformatics Paperback – 2007 by Jin Xiong Cambridge University Press; First edition. 7. Bioinformatics databases and algorithms (2007) N. Gautham. 8. Xiong J. (2006). Essential Bioinformatics. Cambridge University Press 9. Bioinformatics: A modern approach . (2005) V.R. Srinivas. 10. Bioinformatics:concepts skills and applications (2004).S.C. Rastogi, N. Mendiratta and P. Rastogi. 11. Statistical methods in Bioinformatics: An introduction. (2005). W. Even and G. Grant.	

Title of the Course: Bioentrepreneurship

Course Code: **GBO194**

Number of Credits: 02

Objective:	Research and business belong together and both are needed. In a rapidly developing life science industry, there is an urgent need for people who combine business knowledge with an understanding of science & technology. Bio-entrepreneurship, an interdisciplinary course, revolves around the central theme of how to manage and develop life science companies and projects. The objectives of this course are to teach students about concepts of entrepreneurship including identifying a winning business opportunity, gathering funding and launching a business, growing and nurturing the organization and harvesting the rewards.	
Learning outcomes	Students should be able to gain entrepreneurial skills, understand the various operations involved in venture creation, identify the scope for entrepreneurship in biosciences and utilize the schemes promoted through knowledge centers and various agencies. The knowledge pertaining to management should also help students to be able to build up a strong network within the industry.	
Contents:	**Module I.** Fundamentals of Entrepreneurship. Mission, vision, entrepreneurial qualities. How to innovate, Design Thinking, Design-Driven Innovation, Systems thinking, Open innovation, How to start a start-up? Statutory and legal requirements for starting a company/venture (IPR, GST, Labor law), E business setup, management. Dos & Donts in entrepreneurship. **Business plan:** Making a business proposal/Plan for seeking loans from financial institution and Banks; Approach a bank for a loan; Sources of financial assistance; Funds from bank for capital expenditure and for working. Funding new ventures – bootstrapping, crowd sourcing, Angel investors, VCs, debt financing, and due diligence, Incubation and acceleration, Government incentives for entrepreneurship. Budget planning and cash flow management; Negotiations/Strategy With financiers, bankers etc.; Profit & Loss statement, Balance sheet, Cash flow, Cost-volume-profit & Bread-Even analysis, Capital budgeting. **Module II** **Marketing management:** Assessment of market demand for potential product(s) of interest; Market conditions, segments; Prediction of market changes; Identifying needs of customers including gaps in the	15 hours 15 hours

	market, packaging the product; Market linkages, branding issues; Developing distribution channels; Pricing/Policies/Competition; Promotion/ Advertising; Services Marketing Dispute resolution skills **Human Resource management in startups:** Human Resource Development (HRD) Leadership skills; Managerial skills; Organization structure, pros & cons of different structures; Team building, teamwork; Appraisal; Rewards in small scale set up. External environment/changes; Crisis/ Avoiding/Managing; Broader vision–Global thinking.	
Reference Books	1. Shimasaki, C. D. (2014). Biotechnology Entrepreneurship: Starting, Managing 2. Companies: Creating Value and Competitive Advantage with the Milestone Bridge.Routledge. Jordan, J. F. (2014). Innovation, Commercialization, and Start-Ups in Life Sciences. London: CRC Press. 3. Ramsey David (2011). Entre Leadership: 20 Years of Practical Business Wisdom from the Trenches. New York: Howard Books 4. Byrne John A. (2011). World Changers: 25 Entrepreneurs Who Changed Business as We Knew it. New York: Penguin 5. Desai, V. (2009). The Dynamics of Entrepreneurial Development and Management. New Delhi: Himalaya Pub. House. 6. Adams, D. J., & Sparrow, J. C. (2008). Enterprise for Life Scientists: Developing Innovation and Entrepreneurship in the Biosciences. Bloxham: Scion. 7. Lynn Jacquelyn (2007). The Entrepreneur's Almanac: Fascinating Figures, Fundamentals and Facts at your Fingertips. Canada: Entrepreneur Media Inc.	

Title of the Course: Lab IV Genetics and Molecular Biology
Course Code: GBC 195

Number of Credits: 02

Objective:	The objective of this course is to provide students with experimental knowledge of molecular biology and genetic engineering.	
Learning Outcomes	Students should be able to gain hands-on experience on gene cloning, protein expression and purification. This experience would enable them to begin a career in industry.	
Contents:	1. UV/Chemical mutagenesis and survival curve. 2. Isolation of amino acid auxotroph by replica plating.	30 hours

	3. Phage infection and burst size; types of plaque formation 4. Transduction 5. Genetic Transfer-Conjugation, gene mapping. 6. Genomic DNA isolation 7. DNA quantification and gel electrophoresis 8. RNA isolation 9. RNA denaturing gel electrophoresis. 10. Mitosis. 11. Meiosis	30 hours
References/Readings	1. Sharma R.K., Sangha S.P.S (2020) Basic Techniques in Biochemistry and Molecular Biology Dream Tech Press. 2. Gakhar S.K., Miglani M., Kumar A., (2019) Molecular Biology: A Laboratory Manual. Rupa Publications. 3. Hofmann A. (2018) Wilson and Walkers Principles And Techniques Of Biochemistry And Molecular Biology. Cambridge University Press 4. Green R. , Sambrook J. (2012) Molecular Cloning: A Laboratory Manual (Fourth Edition): Three-volume set 5. Laboratory Manual for GENETIC ENGINEERING 1st Edition (2009) S. JOHN Vennison PHI Learning	

Course Code: GBC-196

Title of the Course: Lab V-Plant and Animal Tissue Culture

Number of Credits: 2

Objective:	A comprehensive understanding of the cell and cellular functions;plant and animal tissue culture.	
Learning Outcomes	To carry out and interpret experiments in Plant and animal tissue culture.	
Contents:	1. Preparation of starting material (Biosafety cabinet, solutions, media, cell sample etc.): Cell stock preparation (glycerol stock), storage, freezing, thaw and subculture, contamination and precautions 2. Animal cell culture: Secondary cell culture HeLa and non-cancerous cell lines HEK293, COS-7 3. Transfection and co-transfection: Calcium-phosphate method and Lipofection 4. Cell fixation and staining: Immunolabeling, mounting, fluorescence imaging	30 hours

	1. Tissue culture medium preparation, contamination and precautions in plant tissue culture 2. Callus induction from different explants such as rice and carrot 3. plantlet regeneration. 4. Somatic embryogenesis 5. Single cell suspension. 6. Protoplast isolation	30 hrs
References/Readings	1. Freshney I.R. and Capes-Davis A., (2021) Freshney's Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley Blackwell Publisher 2. Freshney R.I and Masters. J.R.W. (2000) Animal cell culture (2000) – A Practical Approach Oxford University Press 3. Sherathiya, H., (2013) Practical manual for Plant Tissue Culture: Basic Techniques of Plant Tissue Culture and Molecular Biology. Grin Verlag 4. Smith R. (2012) Plant tissue culture Techniques and experiment. Academic Press.	

Course Code: GBO-197
Title of the Course: Lab VI- Bioinformatics
Number of Credits: 2

Objective:	The aim is to provide practical training in bioinformatics and statistical methods including accessing major public sequence databases.	
Learning Outcomes	On completion of this course, students should be able to: ▪ describe contents and properties of important bioinformatics databases, perform text- and sequence-based searches, analyse and discuss results in the light of molecular biology knowledge; • explain major steps in pairwise and multiple sequence alignment, explain its principles and execute pairwise sequence alignment by dynamic programming; • predict secondary and tertiary structures of protein sequences; • perform and analyse various statistical tools available to analyse the data.	
Contents:	1. Using NCBI and UniProt web resources. 2. Introduction and use of various genome databases. 3. Sequence information resource: Using NCBI, EMBL, Genbank, Entrez, Swissprot/ TrEMBL, UniProt.	

	4. Similarity searches using tools like BLAST and interpretation of results. 5. Multiple sequence alignment using ClustalW. 6. Phylogenetic analysis of protein and nucleotide sequences. 7. Use of gene prediction methods (GRAIL/Genscan,/Glimmer). 8. Use of various primer designing and restriction site prediction tools. 9. Use of different protein structure prediction databases (PDB, SCOP, CATH). 10. Construction and study of protein structures using RASMOL/Deepview/PyMol. 11. Homology modelling of proteins. 12. Whole-genome assembly from NGS raw data sequence and annotation 13. 16S rRNA sequence analysis and use of BioEdit 14. Molecular docking	30 hours 30 hours
References/Readings	1. Baxevanis A. D., Bader,G.D., Wishart D.S. (2020) Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins Wiley Publisher. 2. A.D. Baxevanis and B.F.F. Ouellette (Eds). (2002), Bioinformatics: a Practical Guide to the Analysis of Genes and Proteins, John Wiley and Sons. 3. D.W. Mount, (2001), Bioinformatics: Sequence and Genome Analysis, Cold Spring Harbor Laboratory Press. 4. Jones & Peuzner, (2004); Introduction to Bioinformatics Algorithms; Ane Books, India. 5. Statistical methods in Bioinformatics: An introduction. (2005). W. Even and G. Grant 6. Bioinformatics: A Practical Approach 2007 Shui Qing (Chapman & Hall/CRC Mathematical and Computational Biology)	

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Annexure II

Proposed Scheme For

M.Sc. Marine Biotechnology

(Applicable from 2022-23)

Course Codes	Courses		
SEMESTER I			
	Course Titles	**Credits**	**Course Level**

MBC 181	Marine Microbiology & Ecology	3	100
MBO 182	Concepts in Biochemistry	2	100
MBC 183	Biophysical Principles & Analytical Techniques	2	100
MBC 184	Immunology and Marine pathogenesis	3	100
MBO 185	Biostatistics	2	100
MBC 186	Lab I: Techniques in Microbiology and Marine Biology and Chemistry	3	100
MBC 187	Lab II : Immunology & Marine Pathogenesis	2	100
MBC188	LAB III: Biochemistry and analytical techniques	3	100
	Total	20	
Semester II			
MBC 189	Oceanography and Marine Bioresources	3	100
MBC 190	Aquaculture Technology	3	200
MBC 191	Genetics and Molecular Biology	3	100
MBC 192	Cell and Developmental Biology	3	100
MBO 193	Bioinformatics	2	200
MBC 195	Lab IV: Genetics and Molecular Biology	2	200
MBC 196	Lab V: Plant and Animal Tissue Culture	2	100
MBO 197	Lab VI: Lab in Bioinformatics	2	200
Semester III			
MBRO 198	Recombinant DNA Technology	3	300
MBR0 199	Bioprocess Technology and Marine Bioprocessing	3	300
MBOG 200	Potential of Marine Biotechnology	3	300
MBOG 201	IPR, Biosafety & Bioethics	3	100
MBOG 202	Marine Food Technology	2	200
MBOG 203	Virology	2	200
MBOG 204	Lab in Bioprocess technology and marine bioprocessing	2	300
MBRO 204	Lab VII: Lab in Recombinant DNA Technology	2	300
Semester IV			
MBOG 206	Research-based specialization	1	200
MBOG 207	Scuba Diving	2	200
MBSD 208	Dissertation	16	400
MROG 209	Summer/ Winter Training Assessment	1	200
Optional Generic Course			
	Bio entrepreneurship	2	100
	Stem Cell Biology	1	200
	Genomics & Proteomics	2	200
	Plant and Animal Biotechnology	2	300
	Emerging trends in wastewater treatment	2	200
	Solid waste Management	2	200
	Nanotechnology	2	200

Course level 100: No prerequisite for the course.
Course level 200: At least one prerequisite course is required.
Course level 300: More than two prerequisite courses are required

MBC : Marine Biotechnology-specific core course.
MBO : Marine Biotechnology specific-optional course
MBOG: Marine Biotechnology-optional generic course
MBRO: Marine Biotechnology research-specific optional course
MBSD: Marine Biotechnology-specific dissertation

SEMESTER- I

Course Code: MBC 181

Title of the Course: MARINE MICROBIOLOGY & ECOLOGY

Number of Credits: 3

Course Objectives	The objective of this course is to provide information about the microbes available in the aquatic environment, their role and interaction with the marine environment
Learning Outcomes	• Explain the principle features of marine ecosystems and the microbial diversity in oceans; • Describe and discuss marine microbes in terms of physiological capability and their biogeochemical role.

Contents:	**MODULE I** • Classification of the marine environment. • Marine microbial habitats, Estuarine Ecosystems: Rocky shores, Sand dunes, Salt marshes, Deep Sea, hydrothermal vents, mangroves, and coral reefs. • Diversity of Marine microorganisms: Archaea, Bacteria, Cyanobacteria, Algae, Fungi, Viruses, Viroids, and Prions. • Characteristics of marine microorganisms. • Specialized microorganisms: actinomycetes anaerobes. • Extremophiles: barophiles, thermophiles, psychrophiles, halophiles, polyextremophiles, • An overview of the organization and cell structure of prokaryotes and Archaea: i) cell wall ii) outer membrane iii) cytoplasmic membrane iv) flagella & specialized movements in microbes v) cell inclusions iv) differences among the groups.	15 hours
	MODULE II • Techniques in Marine microbiology: • Sampling: Water, Sediments. • Direct observation and enumeration of microbes: Light and electron microscopy to study morphology and structure of microbes. • Culture-base methods for isolation and identification of microbes. Phenotypic and Genotypic testing, polyphasic methods of identification. Chemotaxonomy, Metagenomics. • Bergey's manual & identification of marine bacteria.	15 hours
	MODULE III • Microbial nutrition: i) autotrophic & heterotrophic modes, ii) defining culture media to support growth, iii) selective and differential culture media. • Bacterial growth kinetics: i) growth curve, the mathematical expression of growth & measurement of growth ii) synchronous growth iii) factors affecting growth iv) Chemostat & Turbidostat. • Flagella and specialized movements in microbes, Quorum sensing, Chemotaxis, Phototaxis, Bioluminescence and indicator species and Biological Rhythms.	15 hours
References/	1. Munn, C.B., (2020) Marine Microbiology: Ecology and Applications. CRC	

Reading	Press 2. Kirchman, D.L, Gasol, J.M., (2018), Microbial ecology of the Oceans. Wiley-Blackwell, New York. 3. Paul, J., (2001) Methods in Microbiology: Marine microbiology, Academic Press. 4. Gram, L., (2009) Microbial Spoilage of Fish and Seafood, Springer 5. Pelczar M.J. Jr., Chan E.C.S. and Kreig N.R. (2001) Microbiology. CBS Publishers. 6. Surajit D., Hirak Ranjan D., (2018) Microbial Diversity in the Genomic Era, Elsevier 7. Horikoshi K., Antranikian G., Bull A. T, Robb F. T. and Stetter, K. O., (2011) Extremophiles handbook, Springer 8. Madigan. M.T., Buckley, D.H., Sattley, W.M., Stahl, D.A.(2021) Brock Biology of Microorganisms, Pearson Publisher.

Course Code: MBO 182

Title of the course: CONCEPTS IN BIOCHEMISTRY

Number of Credits: 2

Course Objectives	The major objective of this course is to build upon the knowledge of basic biochemical principles with emphasis on different metabolic pathways and their integration. Attention is drawn to the structure-function relationships of biomolecules.
Learning Outcomes	Gain fundamental knowledge in biochemistry and understand the role of enzymes in the regulation of metabolic pathways.

Contents:	**MODULE I** • Biochemistry: the molecular logic of life. • Amino acids, proteins, nucleic acids, carbohydrates, and lipids. • Vitamins and hormones. • Forces that stabilize biomolecules: electrostatic and van der Waal's interaction, hydrogen bonding. Interactions with solvents, Hydrophobic effect. • Basic Thermodynamics: Laws of thermodynamics. Concepts of ΔG, ΔH, and ΔS. • Chemical kinetics: Concepts of Order and molecularity of a chemical reaction. Derivation of first and second-order rate equation, measurement of rate constants. Concept of activation energy. • Enzymology: Introduction and classification of enzymes. Types of enzymatic reaction mechanisms, Enzyme kinetics, enzyme inhibition, Regulatory enzymes. Isozymes, Zymogen and Ribozyme. Examples of enzymatic reactions.	15 hours
	MODULE II • Basic concepts and design of metabolism - glycolysis, gluconeogenesis • Pyruvate oxidation, Citric acid cycle • Oxidative phosphorylation; the importance of electron transfer in oxidative phosphorylation; F_1-F_0 ATP Synthase; shuttles across mitochondria; regulation of oxidative phosphorylation, inhibitors of electron transport chain. • Glyoxylate cycle • The pentose phosphate pathway • Fatty acid synthesis, β-oxidation; biosynthesis of membrane lipids and sterols with specific emphasis on cholesterol metabolism and the mevalonate pathway • Amino acid metabolism; nucleotide metabolism • Photosynthesis and photorespiration	15 hours
References/ Reading	1. Murray, R.K. et al (2022). Harper's Illustrated Biochemistry McGraw Hill publisher. 2. Abali E. E., Cline S. D., Franklin D. S., Viselli S. M., (2021) Lippincott Illustrated Reviews: Biochemistry Wolters Kluwer publisher 3. Miesfeld R. L., McEvoy M. M., (2020) Biochemistry. Worldwide publisher 4. Stryer L; Berg J., Tymoczko J., Gatto G. (2019). Biochemistry New York, Freeman publisher. 5. Voet, D., Voet, J.G., Charlotte W.P. (2018). Fundamentals of Biochemistry. Life at the molecular level. Wiley publisher. 6. Papachristodoulou D., Snape A., Elliott W. H., and Elliott D. C. (2018).	

	Biochemistry and Molecular Biology. Oxford University publisher. 7. Nelson D.L. (2017) Lehninger Principles of Biochemistry. W.H. Freeman & Co. 8. Voet, D., Voet, J.G., Charlotte W.P (2012). Principles of Biochemistry. Wiley publisher.

Course Code: MBC 183
Title of the course: BIOPHYSICAL PRINCIPLES & ANALYTICAL TECHNIQUES
Number of the Credits: 2

Course Objectives	The course is designed to provide a broad exposure to basic techniques used in Modern Biology research. The goal is to impart a basic conceptual understanding of the principles of these techniques and emphasize the biochemical utility of The students are expected to have a clear understanding of all analytical techniques such that the barrier to implement the same is abated to a great extent.	
Learning Outcomes	Students will learn to combine previously acquired knowledge of physics and chemistry to understand the biochemical processes in the cell.	
Contents	**MODULE I** • Description of Macromolecular Structure, Intermolecular and Intramolecular forces in protein, DNA and other biomolecules. • Diffusion, Brownian motion and sedimentation, determination of molecular weight from sedimentation and diffusion. • Concept and application of Chemical and Physical equilibria in biological system • Nature and Role of Ionic, Covalent and Non-covalent Interaction in molecular conformationon, scaffolding and packaging of protein and DNA • Thermodynamics of protein folding: Protein folding kinetics, Misfolding and aggregation. • Physical biochemistry of cell: Chemical forces translation and rotation, diffusion, directed movements, biomolecules as machines, work, power and energy, thermal, chemical and mechanical switching of biomolecules, • Biochemical and biophysical characterizations of biomolecules: Fluorescence from GFP), UV-VIS absorption and emission spectra resulting from	15 hours

	intrinsic Tryptophan and GFP chromophores, Fluorescence quenching and polarization studies, Unfolding and refolding studies using CD. protein diffusion, dynamics by fluorescence correlation spectroscopy. **MODULE II** • **Spectroscopy:** Electromagnetic radiations in spectroscopic techniques. Beer-Lambert law, UV/Visible spectroscopy, Fluorescence spectroscopy, Emission, excitation, Quenching, Quantum Yield. Nuclear magnetic resonance Spectroscopy. Electron spin resonance spectroscopy. • **Centrifuge:** Basic concepts of centrifugation. Calculation of g value from RPM. Types of rotors used, Differential centrifugation, Density gradient centrifugation. Rate-zonal centrifugation, Isopycnic centrifugation. • **Microscopy:** Abbey's law, Resolution, Magnification, Phase-contrast microscopy, Confocal microscopy, High resolution microscopy, **Nanoscopy:** Atomic force Microscopy, Scanning-tunneling Microscopy, Scanning electron microscopy, Transmission electron microscopy and Cryo-electron microscopy • **X-ray diffraction**	15 hours
References/ Reading	1. Subramaniam, M. A (2021) Biophysics: Principle and techniques, MJP Publishers. 2. Bhavna P., Fulekar, M.H (2019), Bioinstrumentation, Wiley Int. 3. Rodney C., (2017). Biophysics: An IntroductionWiley Int. 4. Anders L. et al. (2016) Textbook of Structural Biology. World Scientific. 5. Salman K., and Diaz, Z., (2016) Principal And Techniques of Bioinstrumentation, Intelliz Publisher 6. Tinoco Jr. I. Sauer K., Wang J.C., Puglisi J. D., Harbison G., Rovnyak D. (2013) Physical Chemistry: Principles and Applications in Biological Sciences Pearson Publishers 7. Atkins, de P. (2011) Physical Chemistry for the Life Sciences. W.H. Freeman. 8. Van Holde K. E., Johnson, C. Ho P. S. (2005) Principles of Physical Biochemistry. Prentice Hall. 9. Schulz GE and Schirmer RH, (1998) Principles of Protein Structure, Springer Verlag. 10. Branden C., and Tooze J., (1998) Introduction to Protein Structure,	

	Garland Science. 11. Stout G.H., and Jensen L.H., (1989) X-ray Structure Determination: A practical guide. John Wiley and Sons Inc., New York.

Course Code: MBC-184
Title of the Course: Immunology & Marine Pathogenesis
Number of Credits: 3

Course Objectives:	1) To provide a basic knowledge and appreciate the components of the human immune response that work together to protect the host. 2) To understand the concept of immune-based diseases as either a deficiency of components or excess activity as hypersensitivity 3) To gain an insight into the mechanisms that lead to beneficial immune responses, immune disorder and immune deficiencies. 4) To introduce the common fish/shellfish pathogens, understand their growth characteristics and control and preventive measures.	
Learning Outcomes	The mode of continuous assessment and formulation of tests enables students to handle competitive entrance exams. The basic overview of Immunology and Marine Pathogenesis strengthens their foundations for a career in Biotechnology and Marine Biotechnology.	
Content:	**MODULE I – Concepts and Basics** • Introduction – History and scope of immunology • Innate immunity:- factors, features and processes • Acquired:- the Specificity, memory, recognition of self from non-self. • Cells of the immune system: Hematopoiesis and differentiation, Lymphoid and Myeloid lineage, lymphocyte trafficking, B lymphocytes, T lymphocytes, macrophages, dendritic cells, natural killer and lymphokine-activated killer cells, eosinophils and mast cells, lymphocyte subpopulations and CD markers. • Organization of lymphoid organs:-MALT, GALT, SALT • Phagocytosis: oxygen-dependent/ independent killing intracellularly. • Major histocompatibility complex…Structure of MHC molecules, basic organization of MHC in human, haplotype-restricted killing. • Nature and biology of antigens and super antigens: haptens, adjuvants, carriers, epitopes, T-dependant and T-independentt antigens **MODULE II – Defence Components: Constituents of immune system and effector mechanisms of immune responses**	15 hours

	• Humoral immunity: cells, antibody formation, primary and secondary response. • Immunoglobulins – structure, distribution and function. • Antigen – Antibody interactions: forces, affinity, avidity, valency and kinetics. • The basics of Immuno-diagnostics. • Complement system: mode of activation, classical, alternate and MBL pathways. Structures of key components. • Cell mediated immune responses: cell activation, cell-cell interaction and cytokines. • Cell-mediated cytoxicity: Mechanism of T cell and NK cell mediated lysis, antibody-dependant cell-mediated cytoxicity • Hybridoma technology and monoclonal antibodies. • Hypersensitivity: An introduction to the different types. • Introduction to autoimmune diseases. **MODULE III – Marine Pathogens and Disease Control** • Introduction to finfish and shellfish diseases: bacterial, fungal, parasitic, nutritional, environmental and their control. • Prevention of Fish diseases • Human bacterial Pathogens associated with fishes and their products - *Aeromonas* spp., *Clostridium* spp., *Listeria* spp., *Plesiomonas*, *Salmonella* spp., *Staphylococcus aureus*, *Vibrio* spp. and common *Enterobacteriaceae* • Marine Biotoxins as biological hazards associated with fish and fishery products.	15 hours 15 hours
References/ Readings	1. Parthiban F., Felix S. (2018) Microbiology of Fish and Fishery Products, Daya Publishing House. 2. Punt, J., Stranford, S., Jones, P., Owen, J.A.,(2018) Kuby Immunology W.H. Freeman 3. Roitt I.M. Delves P.J. Martin S. J., Burton D R, Roitt I.M. (2017) Essential Immunology Wiley-Blackwell 4. Male D., Brostoff J., Roth D., Roitt I., (2013) Immunology. Elsevier Saunders publication 5. Ward, D.R. and Hackney, C.A., (2012). Microbiology of marine food products. Springer Science 6. Woo, P. T. K., Bruno, D. W (2011). Fish diseases and disorders. Volume 3: viral, bacterial and fungal infections. CABI	

	Publishing. 7. Luttmann W., Bratke K., Kupper M., and Myrtek D (2009). Immunology. Academic Press

Course Code: MBO 185
Title of the course: BIOSTATISTICS

Number of Credits: 2

Course Obj	The objective of this course is to introduce students to statistical methods and to understand principles, as well as practical guidelines of "how to do it" and "how to interpret it" statistical data.	
Learning Ou	Upon completing this course, students should be able to – • understand how to summarize statistical data; • apply appropriate statistical tests based on an understanding of the study question, type of study, and type of data; • Interpret results of statistical tests.	
Conte	**MODULE I** • Scope of Biostatistics • Brief description and tabulation of data and its graphical representation, and frequency distributions. • Measures of Central Tendency and dispersion: mean, median, mode, range, standard deviation, variance, coefficient of variation, skewness, kurtosis • Displaying data: Histograms, stem and leaf plots, box plots • Probability analysis: axiomatic definition, axioms of probability: addition theorem, multiplication rule, conditional probability, and applications in biology.	15 ho
	MODULE II • Counting and probability, Bernoulli trials, Binomial distribution, and its applications, • Poisson distribution • Normal distribution, z, t, and chi-square tests, levels of significance • Testing of hypotheses: null and alternative hypotheses, Type I and Type II errors • Simple linear regression and correlation • Analysis of variance	15 ho
References / Reading	1. Mahajan B.K., (2018), Methods in Biostatistics: for Medical Students and Research Worker. Jaype Brothers, 2. Samuels, JA Witmer (2016) Statistics for the Life Sciences. Prentice Hall 3. Kothari, C. R.,(2013) Quantitative Techniques, Vikas Publishing	

	House. 4. Rao K. Surya (2010), Biostatistics for Health and Life Sciences, Himalaya Publishing House. 5. Rastogi, V. B. (2009). Fundamentals of Biostatistics. Ane Books Pvt Ltd. 6. Arora P.N. and Malhan, P.K. (2006), Biostatistics. Himalaya Publishing House.

Course Code: MBC 187

Title: LAB I -TECHNIQUES IN MICROBIOLOGY, MARINE BIOLOGY AND CHEMISTRY

Number of Credits: 3

Course Obj	To introduce the students to methods to isolate and culture bacteria using different medium, le sampling methods and measure the physical and chemical parameters of the marine aquatic system.	
Learning Ou	Upon completion of the course, the student will be able to • Use appropriate media to isolate bacteria from different ecosystems. • Study and group bacteria on the basis of morphological and biochemical testing. • Understand the various techniques used for marine sampling. • estimate the planktons and elemental composition in sea water	
Conter	• Preparation of solid & liquid media, Differential and Selective media: Isolation of bacteria from seawater /sediments samples, Enumeration: serial dilution methods, plating. • Maintenance of organisms: Streaking, slants and stabs cultures • Study of morphology and cultural characteristics. • Gram staining. • Motility • Antimicrobial sensitivity test and demo of drug resistance. • Cultivation of fungi: Slide, chunk and coverslip techniques. • Samplers: water samplers, dredges, grabs, snappers. • Sampling (Field trips) and identification: • Phytoplankton & Zooplankton • Nekton • Benthos Estimations: • Chlorophyll • Nutrients: nitrates, nitrites, phosphates, silicates • Dissolved oxygen • Salinity, pH & alkalinity.	30 hour 30 hour

References/	1. Sastry, A. (2021). Essentials of Practical Microbiology. India: Jaypee Brothers Medical Publishers Pvt. Limited.Yuncong Li, Kati M., (2019) Water Quality Concepts, Sampling, and Analyses. CRC Press LLC. 2. Sattley, W., Madigan, M., Bender, K., Stahl, D., Buckley, D. (2017). Brock Biology of Microorganism. Pearson Education. 3. Baird R., Eaton A. D., Rice E. W., Bridgewater L. (2017) Standard methods for the examination of water and wastewater. American Public Health Association 4. McCance, M. E., Harrigan, W. F. (2014). Laboratory Methods in Microbiology. Elsevier Science. 5. Leo M.L. Nollet, Leen S. P. Gelder De (2013) Handbook of Water Analysis. CRC Press. 6. Grasshoff K., Kremling K.,Ehrhardt, M., (2009) Methods of Seawater Analysis, Wiley Publisher . 7. Vasanthakumari R., (2009) Practical Microbiology. (2009). India: B.I. Publications Pvt. Limited. 8. Bakus, G. J., Bakus, G. J. (2007). Quantitative Analysis of Marine Biological Communities: Field Biology and Environment. Wiley publisher. 9. Eleftheriou A, and McIntyre A., (2005) Methods for the Study of Marine Benthos.Wiley Publisher. 10. Omori, M., Ikeda, T. (1992). Methods in Marine Zooplankton Ecology. Krieger Publisher

Course Code: MBC 187

Title of the course : LAB VII - IMMUNOLOGY & MARINE PATHOGENESIS

Number of credits: 2

Course Object	This course involves learning techniques to identify reactions in the lab that form the ba application in immunodiagnostics and also to gain an insight into the evaluation mar	
Learning Outcc	Key hands-on experience of converting and applying theoretical knowledge to the laborator become familiar with techniques involved in immunology as well as in the study of marine	
Contents:	1. Determination of antibody titer using the double immunodiffusion 2. Assessment of similarity between antigens using Ouchterlony's double diffusion test 3. Estimation of antigen concentration using radial immunodiffusion 4. Quantitative precipitation assay 5. DOT ELISA 6. Latex agglutination 7. Immunoelectrophoresis 8. Rocket immunoelectrophoresis 9. Sampling of fish and shellfish for disease diagnosis 10. Identification of bacteria- staining techniques and biochemical techniques 11. Observation of cellular components of fish blood and shrimp hemolymph 12. Isolation and characterization of fungi from fish & slide culture of fungi 13. SDS-PAGE analysis of fish proteins 14. Fish/shrimp cell culture. 15. Identification of fish pathogens using various techniques.	30 h 30 h
References/ Re	1. Talwar G.P ., Gupta S.K (2017) A Handbook Of Practical And Clinical Immunology Vol I CBS Publishers. 2. Thanwal. R., (2014) A Handbook of Diseases, Astha Publishers & Distributors. 3. Bullock, G.L.,(2014) Diseases of Fisheries . Narendra Publishing House . 4. Joshi, K.R., Osama, N.O. (2012) Immunology, 5th Edition, Agrobios Ltd, India. 5. Edward J. Noga, (2010). Fish Disease: Diagnosis and treatment, Wiley Blackwell. 6. Janeway, C.A., Travers, P., Walport, M. and Shlomchik, M.J. (2001) Immunobiology: The Immune System in Health and Disease, Garland Publishing, USA. 7. Freshney. I.R., (1998). Culture of Animal Cells. Wiley-Blackwell 8. Inglis, V.,(2013) Bacterial Diseases of Fish , Wiley Publications	

Course code: MBC 188
Title of the course: LAB III - BIOCHEMICAL & ANALYTICAL TECHNIQUES
Number of credits: 3

Course Object	The objective of this laboratory course is to introduce students to experimentation in biochemistry. The course is designed to teach the utility of these experimental methods in a problem-oriented manner.	
Learning Outcc	Students should be able to: • Elaborate concepts of biochemistry with easy-to-run experiments. • Familiarize with basic laboratory instruments and understand principles underlying measurements using those instruments for experiments in biochemistry.	
Contents:	16. UV-Visible spectroscopic analysis. 17. Estimation of proteins by the Lowry/Bradford's method 18. Estimation of reducing sugars 19. Enzyme assay 20. Ammonium sulfate precipitation and dialysis 21. Specific activity, fold purification, percentage yield of enzyme 22. Protein subunit molecular weight determination by SDS-PAGE. 23. Thin-layer chromatography. 24. Column chromatographic techniques: ion exchange/Affinity/Gel filtration 25. Biochemical assays using ELISA plate reader. 26. Compound and Fluorescence microscopy demonstration 27. Analysis of a biological specimen by SEM 28. Fluorescence imaging of fixed stained and live cells 29. Demonstration of fluorescence spectroscopy. 30. Density gradient ultracentrifugation	30 hou 30 hou

References/ Re	1. John G., (2020), Biological Centrifugation CRC Press. 2. Friedrich L., Engels, J. W. (2018) Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology. Wiley-VCH publisher 3. Ulrich K., (2017) Fluorescence microscopy: From Principle to application, Wiley Int. 4. James J.F. (2017), An Introduction to practical laboratory optics, Cambridge University press. 5. Atkins, de Paula. (2015), Physical Chemistry for the Life Sciences (2nd Edition). W. H. Freeman 6. Prakash S. Bisen, (2014), Laboratory Protocols in Applied Life Sciences., Taylor and Francis Publisher 7. Tinoco, Sauer,Wang, and Puglisi. (2013) Physical Chemistry: Principles and Applications in the Biological Sciences. Prentice Hall, Inc. 8. Jayaraman, J. (2011). Laboratory Manual of Biochemistry. New Age International Private Limited 9. Atkins, de Paula. (2011) Physical Chemistry for the Life Sciences (2nd Edition). W.H. Freeman. 10. Wilson, K., Walker, J. (Eds.). (2010). Principles and techniques of biochemistry and molecular biology. Cambridge university press. 11. K. E. van Holde, C. Johnson, P. S. Ho (2005) Principles of Physical Biochemistry, 2nd Edn., Prentice Hall. 12. Mu, P., & Plummer, D. T. (2001). Introduction to practical biochemistry. Tata McGraw-Hill Education. 13. Boyer, R. (2000). Modern experimental biochemistry. Pearson Education India.

SEMESTER II

Title of the Course: Oceanography and Marine Bioresources
Course Code: MBC 189.
Number of Credits: 03

Course Objective:	Introduce students to the marine environment and its physical features; Introduce students to marine life, their habitats and adaptations.	
Learning Outcomes	At the end of this course, students will be able to: 1. Understand the status and trends of major marine resources 2. Understand how oceans influence the climate. 3. Familiarise with marine life and factors influencing primary and secondary production.	
Contents:	**Module 1: (Marine life diversity and processes)** • Classification of the marine environment	

	• Marine bioresources. • Marine microbes (viruses, bacteria, archaea, protists, fungi) • Plankton (phytoplankton and zooplankton) • Marine algae and plants (seaweeds, sea grasses, mangrove plants) • Invertebrates: sponges, cnidarians, polychaetes, crustaceans, marine worms, molluscs, echinoderms, arthropods, Non-craniate (non-vertebrate) chordates, • Vertebrates -Marine fishes (bony, cartilaginous, jawless fishes) - Marine tetrapods (amphibians, reptiles, birds, mammals) • Adaptations of organisms to different habitats • Marine biomass and productivity - primary production, photosynthetic efficiency; secondary production, productivity distribution in ocean environment, Mechanism and factors affecting primary production. • Bio-communication in oceans, Quorum sensing, Microbe-microbe interaction, Microbe-seaweed interaction, Microbe-metazoan interaction, Population connectivity • Species abundance, richness and diversity indices, Biogeography, Recruitment, Growth, Mortality. • Food web dynamics and ecosystem functioning, Microbial loop - Role of microbes in marine food web dynamics, • Biogeochemical processes: Nutrient cycling, carbon cycle, Nitrogen cycle, Sulphur cycle, Iron cycling, Phosphorus cycling and other cycles. • Culture of microalgae and invertebrates.	15 hours
	Module 2: (Physical Oceanography) •Ocean atmosphere interface • Circulation: Coriolis effect, Ekman transport, Langmuir circulation. • Planteray waves: Kelvin and Rossby waves. • Climate variability: Pacific decadal oscillation, North Atlantic oscillation, and Arctic oscillation, thermohaline circulation • El Niño-Southern Oscillation: El Niño & La Niña and its effect on global climate • Ocean currents: Antarctic Circumpolar Current, Deep ocean (density-driven), Western boundary currents (Gulf Stream, Kuroshio Current, Labrador Current, Oyashio Current, Agulhas Current, Brazil Current, East Australia Current); Eastern Boundary currents (California Current, Canary Current, Peru Current, Benguela Current) • Ocean gyres: Major gyres, Tropical gyres, Subtropical gyres, Subpolar gyres • Tides, Tsunamis, Wind waves and its effects	15 hours

	• Plate tectonics, Mid-oceanic ridge spreading and convection **Module 3: (Chemical Oceanography)** • Seawater composition and its properties • Characterization of sediments: constituents, texture and mass properties • Types of Biogeochemical cycles in oceans (trace elements) • Isotope geochemistry • Oceanic anoxic events and dead zones • Biological pump • Ocean acidification and its significance	15 hours
References/ Readings	1. Beer, T. (2017). Environmental Oceanography. CRC Press Heywood V.H. (1995) Global Biodiversity Assessment. UNEP, Cambridge University Press 2. Trujillo A. P., and Thurman H. V., (2017) Essentials of Oceanography. Pearson Publisher 3. Knauss, J. A., & Garfield, N. (2016). Introduction to physical oceanography. Waveland Press. 4. Pickard, G. L., & Emery, W. J. (2016). Descriptive physical oceanography: an introduction. Elsevier. 5. Bertness, M. D., Bruno, J. F., Silliman, B. R., & Stachowicz, J. J. (Eds.). (2014). Marine community ecology and conservation. Sinauer Associates, Incorporated. 6. Chambers, R. C., & Trippel, E. A. (Eds.). (2012). Early life history and recruitment in fish populations (Vol. 21). Springer Science & Business Media 7. Kortzinger, (2004). The Ocean takes a Breath, Science 306(5700):1337 8. Jeffrey S. Levinton, C. D., (2001). Marine Biology: Function, Biodiversity , Ecology . OUP, USA publication 9. Naskar K. and Mandal R., (1999) Ecology and Biodiversity of Indian Mangroves. Daya Publishers 10. Agarwalk et. al., (1996) Biodiversity and Environment. APH Publishing Corporation,	

Course Code: MBC 190:
Title of the course: AQUACULTURE TECHNOLOGY
Number of Credits: 3

Course Objectives	This course is aimed to teach sustainable use of aquatic resources with various approaches in biotechnology.
Learning Outcomes	On completion of this course, students should be able to: • Explain fundamental principles of aquaculture biotechnology;

	• Identify the role of aquaculture biotechnology in society. •	
Content	**MODULE I** Importance of coastal aquaculture; Aqua farms; Design and construction; Criteria for selecting cultivable species; Culture systems and management practices – extensive, semi-intensive and intensive culture practices. Seed production in controlled condition; Types; Design and management of hatchery –induced spawning; Mass production of seeds; feed formulation; Artificial insemination - *in vitro* fertilization; Fish Feed Technology: Types of feed, conventional feed *vs* functional feeds; Principles of feed formulation and manufacturing, diets suitable for application in different aquaculture systems; feed formulation ingredients; Use of natural and synthetic carotenoids; feed additives; Role of additives; Feed processing: Gelatinization, extrusion Technology, pellet dressing with heat liable nutrients; Feed evaluation; Feeding schedule to different aquatic organisms, check tray operation and feed management, Biomass calculation based on feed intake; Post-harvest Biotechnology: Fundamental aspects of freezing, methods of freezing; Delaying of spoilage. Molecular Tools in Conservation of Fisheries Resources: Artificial Hybridization: Heterosis, Control of fish diseases by selection; selective breeding of disease resistant fish. Culture of Live food organisms: Candidate species of phytoplankton & zooplankton as live food organisms of freshwater & marine species; biology & culture requirements of live food organisms: green algae, diatoms, rotifers and brine shrimp. **MODULE II** Male and female of finfish and shellfish; Primary and secondary sex characters; Process of Oogenesis & Spermatogenesis, metabolic changes during gametogenesis; neuroendocrine system in crustacean & molluscs & its role in control of reproduction; mechanism of hormone synthesis, release, transport & action; Pheromones & reproductive behaviour; environmental factors influencing reproduction; Advances in Fish	15 hours 15 hours

	Breeding: Hypophysation, cryopreservation technique, genetic basis of determination of sex; chromosome manipulation: ploidy induction, sex reversal; gynogenesis and androgenesis; Broodstock management; Application of cross breeding in aquaculture; Selective breeding: qualitative and quantitative traits for selection, methods of selection; Inbreeding and heterosis in various economic characters; hormone induced ovulation; Synthetic hormones for induced breeding- GnRH analogue structure and function. **MODULE III** Bio-floc technology; Aquaponics; Zero water exchange aquaculture system; Aqua mimicry; Hydroponics; Raceway system of aquaculture; Bioremediation in Aquaculture systems: Genetically modified organisms in waste water treatment; Bioremediation for soil and water quality improvement; Micro-algae- indoor and mass-culture methods, Biotechnological approaches for the production of important microalgae and other commercial important products.	15 hours
References/ Reading	1. Stickney R.R., Gatlin D., (2022) Aquaculture: An Introductory Text CABI Publishing 2. Krishnaveni, G., and Veeranjaneyulu, K., (2016) RECENT TECHNOLOGIES IN FISH AND FISHERIES Rigi Publications 3. Se-kwon Kim , (2015) Handbook of Marine Biotechnology, Springer 4. Patel, A., and Pathak S.N., (2010) Textbook of Aquaculture. Pacific Book Internationals. 5. Felix,S,(2010) Handbook of Marine and Aquaculture Biotechnology AGROBIOS INDIA. 6. Gautam, N,C, (2007) Aquaculture Biotechnology, Shree Publishers and Distributors 7. Kutty, M.N., and Pillay T.V., (2005) Aquaculture: Principles and Practices (Wiley Blackwell) 8. Stickney, R.R., (2000) Encyclopedia of Aquaculture Wiley InterScience	

Course Code: GBC 191
Title of the Course: Genetics and Molecular biology
Number of Credits: 3

Course Objective:	The aim of this course is to obtain and understand the fundamental knowledge of molecular and cellular processes such as RNA

	transcription, protein synthesis, mutation, epigenetic modification and gene regulation.	
Learning Outcomes	The students should be able to explain and summarize the scientific principles of the molecular biology of DNA,RNA and understand the role played in overall functioning of the cell.	
Contents:	**MODULE I** • Mendelian Genetics and Population genetics • Structure of DNA - A,B, Z and triplex DNA; • Organization of bacterial genome and eukaryotic chromosomes Heterochromatin and Euchromatin • DNA melting and buoyant density; Tm; DNA reassociation kinetics (Cot curve analysis) Repetitive and unique sequences; Satellite DNA; DNase I hypersensitive regions; DNA methylation & epigenetic effects. • Structure and function of prokaryotic and eukaryotic mRNA, tRNA (including initiator tRNA), rRNA and ribosomes. Processing of eukaryotic hnRNA: 5'-Cap formation; 3'-end processing of RNAs and polyadenylation; loop model of translation; Splicing of mRNA. • Gene transfer in bacteria-Conjugation, transformation and transduction. • DNA mutation and repair, Transposons **MODULE II** • Prokaryotic and eukaryotic transcription -RNA polymerase/s and sigma factors, • Transcription unit, Prokaryotic and eukaryotic promoters, Promoter recognition, Initiation, Elongation and Termination (intrinsic, Rho and Mfd dependent) • Gene regulation: Repressors, activators, positive and negative regulation, Constitutive and Inducible, small molecule regulators, operon concept: *lac, trp*operons, attenuation, anti-termination, stringent control, translational control. • Eukaryotic transcription - RNA polymerase I, II and III mediated, General eukaryotic transcription factors; TATA binding proteins (TBP) and TBP associated factors (TAF); assembly of pre-initiation complex for nuclear enzymes, interaction of transcription factors with the basal transcription machinery and with other regulatory proteins, mediator, TAFs. ; Silencers, insulators, enhancers, mechanism of silencing and activation. **MODULE III**	15 hours 15 hours

	• Translation in prokaryotes and eukaryotes, • Regulatory RNA and RNA interference mechanisms, miRNA, non-coding RNA; • Families of DNA binding transcription factors: Helix-turn-helix, helix-loop-helix, homeodomain; 2C 2H zinc finger, multi cysteine zinc finger, basic DNA binding domains (leucine zipper, helix-loop-helix), nuclear receptors. • Interaction of regulatory transcription factors with DNA: properties and mechanism of activation and repression including Ligand-mediated transcription regulation by nuclear receptors. • DNA replication. • DNA recombination.	15 hours
References/Reading	1. Clark DP. Pazdernik, NJ., McGehee, MR. (2019) Molecular Biology (3 rd) Elsevier Inc 2. Klug, W., Cummings, M, Spencer.C . (2019) Concepts of Genetics (12ed). Pearson publishers 3. Goldstein ES. , Stephen T. Kilpatrick J Krebs J. (2017) Lewin's GENES XII . Bartlett Publishers 4. Lodish HF; Berk A ; Kaiser C ; Krieger M ; Bretscher A . (2016). Molecular Cell Biology (8 ed) Freeman MacMillan publisher 5. Russell PJ, iGenetics: A Molecular Approach. (2016) (3 ed) Pearson publisher. 6. Karp G.,Iwasa J., Marshall W., (2016) Karp's Cell and Molecular Biology: Concepts and Experiments, (8 ed) Wiley Publisher 7. Strickberger, M. (2015) Genetics, (3 ed) by Pearson publishers 8. Simmons M J., Snustad P. (2015). Principles of Genetics (7 ed). Wiley Student Edition. 9. Watson JD, Baker TA, Bell SP, Gann A, Levine M & Losick R (2014) Molecular Biology of the Gene, (7 ed), Cold Spring Harbor Laboratory Press, New York 10. Weaver RF (2012) Molecular Biology (5th ed) McGraw Hill Higher Education publisher.	

Course Code: MBC 192
Title of the course: CELL AND DEVELOPMENTAL BIOLOGY
Number of Credits: 3

Course Objectives	The cells being "the fundamental building blocks of all organisms", a comprehensive understanding of the cell and cellular function is essential for all biologists. This course will hence provide a conceptual overview of a cellular system and its functioning in animals and plants. The course will also

	highlight a conceptual overview of how developmental patterns arise. Using examples from different model systems regulatory networks involved are highlighted, aiming to project the molecular basis of developmental patterns.	
Learning Outcomes	Understanding major concepts in cell and Developmental biology with an awareness of experimental approaches and how they are applied in cell biology research.	
Contents:	**MODULE I** • Biochemical organization of the cell; diversity of cell size and shape; cell theory, and the emergence of modern Cell Biology. • Principles underlying microscopic techniques for the study of cells. • Structure and diversity of biological membranes; mechanisms of membrane transport. Self-assembly of lipids, micelle, bio membrane organization - sidedness and function; membrane assembly. • The plant cell wall; extracellular matrix in plants and animals • Cell lysis and subcellular fractionation • Structural organization and functions of cell organelles: nucleus, mitochondria, Golgi bodies, endoplasmic reticulum, lysosomes, Chloroplast, peroxisomes, vacuoles. Cytoskeletons structure and motility function • Cellular communication: General principles of cell communication, cell adhesion and roles of different adhesion molecules, tight junctions, communicating junctions, integrins, neurotransmission, and its regulation. **MODULE II** • Protein localization – synthesis of secretory and membrane proteins, import into nucleus, mitochondria, chloroplast, and peroxisomes, receptor-mediated endocytosis. • Proteasomes; structure and function • Cell division and cell cycle: Mitosis and meiosis, their regulation, Cell cycle, and its regulation, Apoptosis, Necrosis, and Autophagy. • Cell signaling • Cell fusion techniques • Molecular chaperones: types, characteristics, and functional significance • Cell transformation and cancer, oncogenes and proto-	15 hours 15 hours

	oncogenes, tumor suppressor genes, metastasis. **MODULE III** • Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development. • Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation, and formation of germ layers in marine animals. • Cell aggregation and differentiation in *Dictyostelium*; axes and pattern formation in *Drosophila*, amphibia; organogenesis – vulva formation in *Caenorhabditis elegans*, eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post-embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.	15 hours
References/ Reading	1. Amon, A., Krieger, M., Lodish, H., Bretscher, A., Kaiser, C. A., Berk, A., Martin, K. C., Ploegh, H. (2016). Molecular Cell Biology. United Kingdom: W. H. Freeman. 2. Pollard, T. D., Earnshaw, W. C., Lippincott-Schwartz, J, Johnson, G. (2016). Cell biology E-book. Elsevier Health Sciences. 3. Karp, G., Iwasa, J., Marshall, W. (2018). Cell Biology Global Edition. United States: Wiley. 4. J.D. Watson, M.,Levine, T. A. Baker, A. Gann, S. P. Bell, R.L. Watson (2014) Molecular Biology of the Gene, Pearson Education. 5. Turner, B. M. (2008). Chromatin and gene regulation: molecular mechanisms in epigenetics. John Wiley & Sons. 6. Kilpatrick, S. T., Krebs, J. E., Goldstein, E. S. (2017). Lewin GENES XII. Japan: Jones; Bartlett Learning. 7. Gilbert, S. F. (2010). Developmental biology. Sinauer Associates, Inc. 8. Subramanian, M. A. (2022). Developmental Biology. India: MJP Publisher. 9. Cooper, G. M., Hausman, R. E. (2013). The Cell: A Molecular Approach. United States: Sinauer Associates. 10. C. Smith & E. Wood (2005) Cell Biology, Chapman Hall . 11. Wolpert, L. (2011). Developmental Biology: A Very Short Introduction. OUP Oxford. 12. Slack, J. M. W. (2009). Essential Developmental Biology. Germany: Wiley. 13. Lodish et al., (2000) Molecular Cell Biology, W.H.Freeman & Company 14. Smith & Wood (2005) Cell Biology, Chapman & Hall London	

Course Code:GBO-282 **Title of the Course:** Bioinformatics

Number of Credits:2

Objective:	The objectives of this course are to provide students with theory and practical experience of use of common computational tools and databases which facilitate investigation of molecular biology and evolution-related concepts	
Learning Outcomes	Students should be able to: • develop an understanding of basic theory of these computational tools. • gain working knowledge of these computational tools and methods. • appreciate their relevance for investigating specific contemporary biological questions	
Contents:	**MODULE I** • Introduction, Primary & Secondary database, Sequence file formats, Introduction to structures, Protein Data Bank (PDb), Molecular Modelling Database (MMDb), Structure file formats, Collection of sequences, sequence annotation, sequence description. • Evolutionary basis of sequence alignment, optimal alignment methods, Substitution scores & gap penalties, Statistical significance of alignments, • Database similarity searching, FASTA, BLAST, Low complexity regions, Repetitive elements, Multiple Sequence Alignment: Progressive alignment methods, Motifs and patterns, Clustal, Muscle; Scoring matrices, Distance matrices. • Alignment, tree building and tree evaluation, Comparison and application of Unweighted Pair Group Method with Arithmetic Mean (UPGMA), Neighbour Joining (NJ), Maximum Parsimony (MP), Maximum Likelihood (ML) methods, Bootstrapping, Jackknife; • Software for Phylogenetic analysis. DNA barcoding: Methods tools and databases for barcoding across all species, Applications and limitations of barcoding, Consortium for Barcode of Life (CBOL) recommendations, Barcode of Life Database (BOLD). **MODULE II**	15 hours

	• 3-D structure visualization and simulation, Basic concepts in molecular modeling: different types of computer representations of molecules; External coordinates and Internal Coordinates, Molecular Mechanics, Force fields *etc.* Secondary structure elucidation using Peptide bond, phi, psi and chi torsion angles, Ramachandran map, anatomy of proteins – Hierarchical organization of protein structure –like CATH (class, architecture, topology, homology), SCOP (Structural Classification of Proteins), FSSP (families of structurally similar proteins). • Fundamentals of the methods for 3D structure prediction (sequence similarity/identity of target proteins of known structure, fundamental principles of protein folding *etc.*) Homology/comparative modeling, fold recognition, threading approaches, and ab initio structure prediction methods; CASP (Critical Assessment of protein Structure Prediction); Computational design of promoters, proteins & enzymes. • Chemical databases like NCI/PUBCHEM; Fundamentals of Receptor-ligand interactions; Structure-based drug design: Identification and Analysis of Binding sites and virtual screening; Ligand based drug design: Structure Activity Relationship– QSARs & Pharmacophore; *In silico* predictions of drug activity and ADMET. • Designing of oligo probes; Image processing and normalization; Microarray data variability (measurement ad quantification); Analysis of differentially expressed genes; Experimental designs.	15 hours
References/Readings	1. Perambur S Neelakanta (2020) A Textbook of Bioinformatics: Information-theoretic Perspectives of Bioengineering and Biological Complexes World Scientific Publisher. 2. Baxevanis A. D., Bader,G.D., Wishart D.S. (2020) Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins Wiley Publisher. 3. Arthur L (2019) Introduction to Bioinformatics. Oxford University Press.	

	4. Jonathan Pevsner (2015) Bioinformatics and Functional Genomics. Wiley Blackwell Publication. 5. Ignacimuthus. S. (2013) Basic Bioinformatics Alpha Science International Ltd 6. Essential Bioinformatics Paperback – 2007 by Jin Xiong Cambridge University Press; First edition. 7. Bioinformatics databases and algorithms (2007) N. Gautham. 8. Xiong J. (2006). Essential Bioinformatics. Cambridge University Press 9. Bioinformatics: A modern approach . (2005) V.R. Srinivas. 10. Bioinformatics:concepts skills and applications (2004).S.C. Rastogi, N. Mendiratta and P. Rastogi. 11. Statistical methods in Bioinformatics: An introduction. (2005). W. Even and G. Grant.	

Title of the Course: Lab IV Genetics and Molecular Biology
Course Code: MBC 194

Number of Credits: 02

Objective:	The objective of this course is to provide students with experimental knowledge of molecular biology and genetic engineering.	
Learning Outcomes	Students should be able to gain hands-on experience on gene cloning, protein expression and purification. This experience would enable them to begin a career in industry.	
Content:	7. UV/Chemical mutagenesis and survival curve. 8. Isolation of amino acid auxotroph by replica plating. 9. Phage infection and burst size; types of plaque formation 10. Transduction 11. Genetic Transfer-Conjugation, gene mapping. 12. Genomic DNA isolation 13. DNA quantification and gel electrophoresis 14. RNA isolation 15. RNA denaturing gel electrophoresis. 16. Mitosis. 17. Meiosis	30 hrs 30 hrs
References/Readings	1. Sharma R.K., Sangha S.P.S (2020) Basic Techniques in Biochemistry and Molecular Biology Dream Tech Press. 2. Gakhar S.K., Miglani M., Kumar A., (2019) Molecular Biology: A Laboratory Manual. Rupa Publications.	

	3. Hofmann A. (2018) Wilson and Walkers Principles And Techniques Of Biochemistry And Molecular Biology. Cambridge University Press 4. Green R. , Sambrook J. (2012) Molecular Cloning: A Laboratory Manual (Fourth Edition): Three-volume set 5. Laboratory Manual for GENETIC ENGINEERING 1st Edition (2009) S. JOHN Vennison PHI Learning	

Course Code: MBC-195

Title of the Course: Lab V Cell and Tissue Culture

Number of Credits: 2

Objective:	A comprehensive understanding of the cell and cellular functions;plant and animal tissue culture.	
Learning Outcomes	To carry out and interpret experiments in Plant and animal tissue culture .	
Contents:	1. Preparation of starting material (Biosafety cabinet, solutions, media, cell sample etc.): 2. Cell stock preparation (glycerol stock), storage, freezing, thaw and subculture, 3. contamination and precautions 4. Animal cell culture: Secondary cell culture HeLa and non-cancerous cell like 5. HEK293, COS-7 6. Transfection and co-transfection: Calcium-phosphate method and Lipofection 7. Cell fixation and staining: Immunolabeling, mounting, fluorescence imaging	30 hours
	1. Tissue culture medium preparation, contamination and precautions in plant tissue culture 2. Callus induction from different explants such as rice and carrot 3. Plantlet regeneration. 4. Somatic embryogenesis 5. Single cell suspension. 6. Protoplast isolation	30 hrs

References/Readings	1. Freshney I.R. and Capes-Davis A., (2021) Freshney's Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley Blackwell Publisher 2. Freshney R.I and Masters. J.R.W. (2000) Animal cell culture (2000) – A Practical Approach Oxford University Press 3. Sherathiya, H., (2013) Practical manual for Plant Tissue Culture: Basic Techniques of Plant Tissue Culture and Molecular Biology. Grin Verlag 4. Smith R. (2012) Plant tissue culture Techniques and experiment. Academic Press.

Course Code: MBO-196
Title of the Course: Lab VI- Bioinformatics
Number of Credits: 2

Objective:	The aim is to provide practical training in bioinformatics and statistical methods including accessing major public sequence databases.	
Learning Outcomes	On completion of this course, students should be able to: • describe contents and properties of important bioinformatics databases, perform text- and sequence-based searches, analyse and discuss results in the light of molecular biology knowledge; ▪ explain major steps in pairwise and multiple sequence alignment, explain its principles and execute pairwise sequence alignment by dynamic programming; ▪ predict secondary and tertiary structures of protein sequences; • • perform and analyse various statistical tools available to analyse the data.	
Contents:	1. Using NCBI and Uniprot web resources. 2. Introduction and use of various genome databases. 3. Sequence information resource: Using NCBI, EMBL, Genbank, Entrez, Swissprot/ TrEMBL, UniProt. 4. Similarity searches using tools like BLAST and interpretation of results. 5. Multiple sequence alignment using ClustalW. 6. Phylogenetic analysis of protein and nucleotide sequences. 7. Use of gene prediction methods (GRAIL/Genscan,/Glimmer). 8. Use of various primer designing and restriction site prediction tools. 9. Use of different protein structure prediction databases (PDB, SCOP, CATH). 10. Construction and study of protein structures using RASMOL/Deepview/PyMol.	30 hrs

	11. Homology modelling of proteins. 12. Whole-genome assembly from NGS raw data sequence 13. 16sRNA sequence analysis and use of Bioedit 14. Molecular docking	30 hours
References/Readings	1. Baxevanis A. D., Bader,G.D., Wishart D.S. (2020) Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins Wiley Publisher. 2. A.D. Baxevanis and B.F.F. Ouellette (Eds). (2002), *Bioinformatics: a Practical Guide to the Analysis of Genes and Proteins*, John Wiley and Sons. 3. D.W. Mount, (2001), *Bioinformatics: Sequence and Genome Analysis*, Cold Spring Harbor Laboratory Press. 4. Jones & Peuzner, (2004); *Introduction to Bioinformatics Algorithms*; Ane Books, India. 5. Statistical methods in Bioinformatics: An introduction. (2005). W. Even and G. Grant 6. Bioinformatics: A Practical Approach 2007 Shui Qing (Chapman & Hall/CRC Mathematical and Computational Biology)	

(Back to Index) (Back to Agenda)

D 3.30 Minutes of the Board of Studies in Food Technology meeting held on 27.07.2022.

Annexure I

COURSE DETAILS OF M.Sc. (FOOD TECHNOLOGY)

(*with effect from the Academic Year 2022-2023*)

Food scientists and technologists are versatile, interdisciplinary, and collaborative practitioners in a profession at the crossroads of scientific and technological developments. As the food system has drastically changed, from one centred around family food production on individual farms and home food preservation to the modern system of today, most people are not connected to their food nor are they familiar with agricultural production and food manufacturing designed for better food safety and quality. The Post Graduate (Degree) Department of Food Technology, set up in 2017, endeavours to develop professionals skilled at advancing the science of food. The objectives of M.Sc. (Food Technology) are:

- ✓ *Provide students with theoretical knowledge and practical abilities required to work in the food industry, research centres, and food-related national and international organizations*
- ✓ *Contribute to a healthier population by imparting education and understanding of nutritional science*
- ✓ *Develop confident and competent individuals, able to adapt to the changing fabric of society through their professional expertise and personal traits*

The Programme equips students for higher research leading to a Ph.D. Degree or to setting up an enterprise of their own, or for employment in Research Institutes, in teaching, and in Industry.

Prerequisites:

B. Sc. in Food Technology/ Food, Nutrition, and Dietetics/ Microbiology/ Biotechnology/ Chemistry/ Botany/ Life Sciences/ Bio-sciences or Allied Subjects

ANNEXURE I
COURSE STRUCTURE OF M.Sc. (FOOD TECHNOLOGY)

(According to NEP Guidelines; with effect from the Academic Year 2022-2023)

M.Sc. (Food Technology) Part I

SEMESTER I				
CODE	**TITLE OF PAPER**	**THEORY/ PRACTICAL**	**NUMBER OF CREDITS**	**CONTACT HOURS**
FTCC 101	Food Chemistry and Nutritional Biochemistry	Theory	3	45
FTCC 102	Food Microbiology and Preservation	Theory	3	45
FTCC 103	Lab in Food Chemistry and Microbiology	Practical	2	60
FTCC 104	Food Processing and Packaging	Theory	3	45
FTCC 105	Food Quality, Safety Standards, and Laws	Theory	3	45
FTCC 106	Lab in Food Processing and Quality Management	Practical	2	60
&FTOC 101	Industrial Food Waste Management	Theory	2	30
&FTOC 102	Lab in Industrial Food Waste Management	Practical	2	60

&FTOC 103	Food Additives, Adulteration, and Toxicology	Theory	2	30
&FTOC 104	Lab in Food Additives, Adulteration, and Toxicology	Practical	2	60

SEMESTER II				
CODE	**TITLE OF PAPER**	**THEORY/ PRACTICAL**	**NUMBER OF CREDITS**	**CONTACT HOURS**
FTCC 201	Food Biotechnology	Theory	3	45
FTCC 202	Lab in Food Biotechnology	Practical	2	60
FTCC 203	Normal and Clinical Nutrition	Theory	3	45
FTCC 204	Lab in Normal and Clinical Nutrition	Practical	2	60
FTCC 205	Bakery, Confectionery, and Convenience Food Technology	Theory	3	45
FTCC 206	Lab in Bakery, Confectionery, and Convenience Food Technology	Practical	1	30
FTCC 207	Food Engineering	Theory	2	30
&FTOC 201	Spice and Plantation Crop Technology	Theory	2	30
&FTOC 202	Lab in Spice and Plantation Crop Technology	Practical	2	60
&FTOC 203	Nutraceuticals and Health Foods	Theory	2	30
&FTOC 204	Lab in Nutraceuticals and Health Foods	Practical	2	60

- ***FTCC (Discipline Specific Core Course) are compulsory papers offered in Semesters I & II***
- ***A student will have to opt for <u>Discipline Specific Optional Course (FTOC) of 4 credits each</u> in Semester I and Semester II***
- ***& A student will have to opt for the combination of Theory and its related Practical Paper in the FTOC choices provided***

M.Sc. (Food Technology) Part II

SEMESTER III				
CODE	**TITLE OF PAPER**	**THEORY/ PRACTICAL**	**NUMBER OF CREDITS**	**CONTACT HOURS**
&FTGC 101	Cereal, Legume, and Oilseed Processing Technology	Theory	3	45
&FTGC 102	Lab in Cereal, Legume, and Oilseed Processing Technology	Practical	1	30
&FTGC 103	Meat, Poultry, Freshwater, and Marine Food Technology	Theory	3	45
&FTGC 104	Lab in Meat, Poultry, Freshwater, and Marine Food Technology	Practical	1	30
&FTGC 105	Dairy Technology	Theory	3	45

&FTGC 106	Lab in Dairy Technology	Practical	1	30
&FTGC 107	Beverage Technology	Theory	3	45
&FTGC 108	Lab in Beverage Technology	Practical	1	30
&FTGC 109	Pre- and Post-Harvest Technology of Horticulture Produce	Theory	3	45
&FTGC 110	Lab in Pre- and Post-Harvest Technology of Horticulture Produce	Practical	1	30
&FTGC 111	Snack Food Technology	Theory	3	45
&FTGC 112	Lab in Snack Food Technology	Practical	1	30
FTGC 113	Entrepreneurship and Business Management	Theory	2	30
FTGC 114	Food Plant Layout and Design	Theory	2	30
*RSOC 101	Research Methodology	Theory	2	30
*RSOC 102	Academic Writing	Theory	2	30
*RSOC 103	Fundamentals of Statistics	Theory	2	30
RSOC 104	Creative and Social Media Writing	Theory	2	30
RSOC 105	Food Product Development and International Trade	Theory	2	30
RSOC 106	Food Sensory Science and Flavour Technology	Theory	2	30
RSOC 107	Instrumentation and Process Control	Theory	2	30
RSOC 108	Business Communication	Theory	2	30

- ***A student will have to opt for <u>12 credits</u> of Optional Generic Course (OGC) from the options provided (OGC 101 to OGC 114)***
- ***&A student will have to opt for the combination of Theory and its related Practical Paper in the OGC choices***
- ****Research Specific Optional Course (RSOC) - RSOC 101, RSOC 102, and RSOC 103 are mandatory papers***
- ***A student will have to opt for <u>2 credits</u> of RSOC from the remaining options provided (RSOC 104 to RSOC 108)***

SEMESTER IV				
CODE	**TITLE OF PAPER**	**THEORY/ PRACTICAL**	**NUMBER OF CREDITS**	**CONTACT HOURS**
#DSD	Dissertation	Dissertation	16	240
*RSOC 109	Advanced Statistics	Theory	2	30
RSOC 110	Epidemiology and Health Economics	Theory	2	30
RSOC 111	Internship	Practical	2	60

RSOC 112	Study Tour	Practical	2	60

- ***# DSD will be running through Semesters III and IV. The assessment of this course will be done in Semester IV.***
- ****Research Specific Optional Course (RSOC) - RSOC 109 – is a mandatory paper***
- ***A student will have to opt for 2 credits of RSOC from the remaining options provided (RSOC 110 to RSOC 112)***
- ***Field Trips are encouraged to enhance the industrial competency of the students***

ANNEXURE II: SYLLABUS

COURSE CODE FTCC 101
COURSE TITLE FOOD CHEMISTRY AND NUTRITIONAL BIOCHEMISTRY
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should be knowledgeable about chemistry and the different types of food	
COURSE OBJECTIVES	1. To acquaint students with the chemical constituents of food, their interactions during processing, and evaluation of varied characteristics of food 2. To familiarize students with the classification of foods and nutrients, and their metabolism in the human body	
CONTENT		
1	**FOOD AND ITS CONSTITUENTS**	**10 hours**
1.1	Food and Nutrients - *Definition, Classification, and Functions*	
1.2	Role of Water in Food and Human Health – *Interaction with food components and food stability*	
1.3	Pigments, Phytonutrients, Antioxidants, Flavour Components – *Definition, Classification, and Functions*	
1.4	Anti-nutritional Factors in Foods	
1.5	Digestion, Absorption, and Transport of Foods and Nutrients	
2	**CARBOHYDRATES**	**10 hours**
2.1	Definition, Structure, Properties, Functions, Classification, Dietary Sources, Chemical Reactions, Deficiencies and Excess, Recommended Dietary Allowances	
2.2	Reducing and Non-Reducing Sugars; Browning Reactions in Foods – *formation and control*	
2.3	Starch, Resistant Starches and Dietary Fibre – *Definition, Sources, Granule Structure, Properties, Functions, and Native and Modified Starches*	
2.4	Metabolic Pathways - *Glycolysis, Gluconeogenesis, Glycogenesis, Glycogenolysis, Citric Acid Cycle*	
3	**PROTEINS**	

3.1	Definition, Structure, Properties, Functions, Classification, Dietary Sources, Chemical Reactions, Deficiencies and Excess, Recommended Dietary Allowances	**10 hours**
3.2	Metabolic Pathways - *Transamination, Deamination, Decarboxylation, Urea Cycle*	
3.3	Stress and Anti-freeze Proteins; Protein Isolates and Concentrates	
3.4	Denaturation of Proteins	
3.5	Evaluation of Protein Quality	
4	**LIPIDS**	
4.1	Definition, Structure, Properties, Functions, Classification, Dietary Sources, Chemical Reactions, Deficiencies and Excess, Recommended Dietary Allowances	**10 hours**
4.2	Metabolic Pathways - *Fatty Acid Oxidation, Biosynthesis of Fatty Acids*	
4.3	Synthesis and Functions of Cholesterol; Ketogenesis	
4.4	Rancidity and Hydrogenation of Fats	
4.5	Emulsions	
4.6	Synthetic Fats	
5	**VITAMINS AND MINERALS**	
5.1	Classification, Functions, Dietary Sources, Deficiencies and Excess, Recommended Dietary Allowances	**5 hours**
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Agarwal A and Udipi SA. 2014. *Textbook of Human Nutrition*. Jaypee Brothers Medical Publishers (P) Ltd.	
	Bamji MS, Krishnaswamy K, and Brahmam GNV. 2009. *Textbook of Human Nutrition*. Third Edition. Oxford and IBH Publishing Co. Pvt. Ltd.	
	Belitz H.-D, Grosch W, and Schieberle P. 2009. *Food Chemistry*. Fourth Edition. Springer.	
	Civille GV and Carr BT. 2016. *Sensory Evaluation Techniques*. Fifth Edition. CRC Press.	
	Damodaran S and Parkin K. 2017. *Fennema's Food Chemistry*. Fifth Edition. CRC Press.	
	Lawless HT and Heymann H. 2010. *Sensory Evaluation of Food*. Second Edition. Springer	
	Meyer LH. 2004. *Food Chemistry*. CBS Publishers and Distributors	
	Nelson DL and Cox MM. 2017. *Lehninger Principles of Biochemistry*. Seventh Edition. WH Freeman.	
	Potter NN, and Hotchkiss JH. 2007. *Food Science*. 5th Edition. CBS Publishers and Distributors.	
	Rodwell VW, Bender DA, Botham KM, Kennelly PJ, Weil PA. 2015. *Harper's Illustrated Biochemistry*. 30th Edition. McGraw Hill Education.	

COURSE OUTCOMES	1. The student will be able to relate the metabolic pathways of macronutrients to the latter's function in the human body 2. The student will gain an understanding of macro- and micro- nutrient sources and functions in the human body 3. The student will be able to comprehend the influence of food constituents on processing outcomes	

COURSE CODE FTCC 102
COURSE TITLE FOOD MICROBIOLOGY AND PRESERVATION
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should be aware of the different types of microorganisms and their impact on health; they should be knowledgeable about chemistry and different types of food	
COURSE OBJECTIVES	1. To acquaint the students with different groups of microorganisms associated with food, their activities, destruction and detection in food 2. To acquaint students with the industrial techniques used to preserve and process foods, extend their shelf-life and improve their palatability characteristics	
CONTENT		
1	**INTRODUCTION TO FOOD MICROBIOLOGY**	**10 hours**
1.1	Microorganisms in Food	
1.2	Morphological and Ultrastructure of Microbial Cell - *Physiology of microbes (Gram positive and Gram negative bacterial membrane, spore, pili, flagella), Prokaryotic cellular reserve materials, Pathogenic and beneficial microorganisms*	
1.3	Microbial Growth – *Kinetic and growth requirements, Intrinsic and Extrinsic factors influencing microbial growth and survival; Computer modelling of microbial growth*	
1.4	Microbes as Food - *Single cell protein, algae as food, mycoprotein from fungi for use as food and feed, mushroom cultivation*	
2	**PRINCIPLES OF FOOD MICROBIOLOGICAL ANALYSIS**	**10 hours**
2.1	Bacteria, Fungi, Virus, Protozoa, and Algae – *general characteristics, identification, morphological characteristics, importance in food microbiology*	
2.2	Culture Media - *components of media, natural and synthetic media, various media used for bacterial analysis, sterilization of media*	
2.3	General Microbiological Techniques - *bacterial isolation, purification and characterization, enumeration and preservation of bacteria (methods in brief)*	
2.4	Methods of Disinfection, Sanitation and Asepsis	
3	**MICROBES IN FOOD FERMENTATION AND SPOILAGE**	

3.1	Microbial Cultures in Food Fermentation and their Maintenance; Bioreactors – *types and designs*	**10 hours**
3.2	Traditional Fermented Foods of India and Other Asian Countries - *fermented foods based on milk, meat, and vegetables; fermented beverages*	
3.3	Prebiotics, Probiotics, Synbiotics, and Postbiotics	
3.4	Microbial Spoilage of Meat, Eggs, Milk, Seafood and their Products	
3.5	Microbial Spoilage of Vegetables, Fruits, Cereals and their Products	
4	**PRINCIPLES OF FOOD PRESERVATION**	**5 hours**
4.1	Microbial Control by Water and Temperature – *Water Activity, Thermal Death Time, Psychrometric Charts*	
4.2	Microbial Control Using Natural and Synthetic Preservatives - *types, permissible limits, safety aspects*	
5	**METHODS OF FOOD PRESERVATION**	**10 hours**
5.1	Microbial Control by Thermal Processing - *Irradiation, Blanching, Pasteurization, Sterilization, Canning, Extrusion Cooking, Baking, Roasting, Grilling, Dehydration, Concentration, Evaporation, Intermediate Moisture Foods*	
5.2	Microbial Control by Non-Thermal Processing - *Microwave Processing, Modified Atmosphere, Hurdle Technology, Irradiation, Pulsed Electric Field Electroporation, Biopreservation, High-Pressure Food Preservation, Membrane Technology, Cold Plasma Technology*	
5.3	Microbial Control Using Low Temperature - *Refrigeration, Freezing, Lyophilisation, Cryogenic Freezing, Dehydrofreezing, Freeze Concentration, Individual Quick Freezing*	
5.4	Microbes and Enzymes in Food Preservation	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Sivasankar B. 2009. *Food Processing and Preservation*. First Edition. PHI Learning.	
	Banwart GJ.1989. *Basic Food Microbiology*. Second Edition. AVI Publ.	
	Casida LE. 2016. *Industrial Microbiology.* Second Edition. New Age International Publishers.	
	Frazier WC and Westhoff DC. 2008. *Food Microbiology*. Fourth Edition. Tata McGraw-Hill Publishing Company Limited.	
	Garbutt J. 1997. *Essentials of Food Microbiology*. Second Edition. Arnold Heinemann.	
	Jay JM, Loessner MJ, and Golden DA. 2005. *Modern Food Microbiology*. Seventh Edition. Springer.	
	Bhat R, Alias AK, and Paliyath G. 2012. *Progress in Food Preservation.* First Edition. Wiley-Blackwell.	
	Paniker CKJ. 2005. *Ananthanarayan and Paniker's Textbook of Microbiology*. Seventh Edition. Orient Blackswan.	
	Ray B and Bhunia A. 2013. *Fundamental Food Microbiology*. Fifth Edition. CRC Press.	

	Steinkraus KS.1996. *Handbook of Indigenous Fermented Foods*. Marcel Dekker.	
COURSE OUTCOMES	1. The student will be able to apply microbiological aspects in different settings of the food industry 2. The student will be able to utilize various preservative methods of food in industrial settings	

COURSE CODE FTCC 103
COURSE TITLE LAB IN FOOD CHEMISTRY AND MICROBIOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have theoretical knowledge about the nutritional and microbiological components of food	
COURSE OBJECTIVES	1. To enable students to analyse foods for their nutritional content 2. To familiarize students with laboratory procedures required for determining the microbiological safety of foods	
CONTENT		
1	**FOOD CHEMISTRY AND ANALYSIS**	**30 hours**
1.1	Laboratory Safety Rules and Precautions	
1.2	Estimation of Reducing and Non-Reducing Sugars in Honey/Fruit Juices	
1.3	Estimation of Proteins in food using the Biuret Method	
1.4	Saponification, Iodine, and Acid Value of Edible Oils – *fresh and stale foods*	
1.5	Estimation of Lactose in Milk	
1.6	Estimation of Ascorbic Acid in Foods	
1.7	Estimation of Beta-Carotene in Foods	
1.8	Estimation of Calcium, Phosphorous and Iron content of Foods	
1.9	Estimation of Browning Intensity	
1.10	Estimation of Anti-Nutritional Factors in Foods	
2	**FOOD MICROBIOLOGY**	**30 hours**
2.1	Familiarization with Instruments used in Microbiological Lab, their principles and working	
2.2	Gram Staining of Bacteria	
2.3	Determination of Bacterial Viable Count in Food	
2.4	Plate Culture and Microscopic Examination of *Saccharomyces cerevisiae*	
2.5	Isolation of Food (Bread, Fruit) Pathogenic Fungi, Microscopic Examination and Identification	
2.6	Detection and Enumeration of Pathogenic and Indicator Organisms in Food	
2.7	Evaluation of Microbiological Quality of Water and MPN of Coliforms	
2.8	Enumeration of Microbes from Fermented Foods	
2.9	Detection of Physiological Groups in Food: Osmophiles/ Halophiles	
2.10	Evaluation of Microbiological Quality of Water and Commonly Consumed Street Foods	

2.11	Detection of Microbial enzymatic hydrolysis (starch, protein, fats)	
PEDAGOGY	Experiments in the Laboratory	
REFERENCE BOOKS	Garg N, Garg KL, and Mukerji KG. 2010. *Laboratory Manual of Food Microbiology*. I.K. International Publishing House Pvt. Ltd.	
	Sehgal S. 2016. *A Laboratory Manual of Food Analysis*. I.K. International Publishing House Pvt. Ltd.	
COURSE OUTCOMES	1. The student will be able to estimate and draw conclusions regarding nutrients present in foods 2. The student will be able to understand the importance of microbes in food	

COURSE CODE FTCC 104
COURSE TITLE FOOD PROCESSING AND PACKAGING
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should be knowledgeable about chemistry and the different types of food	
COURSE OBJECTIVES	1. To acquaint students with the industrial techniques used to process foods, extend their shelf-life and improve their palatability characteristics 2. To familiarize students with advances in food processing techniques 3. To acquaint students with the principles, methods, and materials used for safe packaging of foods	
CONTENT		
1	**INTRODUCTION TO FOOD PROCESSING**	**10 hours**
1.1	Definition and Difference between Food Processing and Food Preservation; Functions, Benefits and Drawbacks of Food Processing; Effect of Processing on Flavour Components	
1.2	Primary Processing Techniques – *dicing, slicing, mincing, macerating, liquefaction, emulsification*	
1.3	Methods of Cooking – *Dry Heat, Moist Heat, Combination, Microwave*	
1.4	Novel Food Processing Products – *mushrooms, algae, leaf protein concentrates, protein from petroleum yeast, food analogues, edible insects*	
1.5	Performance Parameters for Food Processing – *hygiene, energy efficiency, minimization of waste, labour*	
1.6	Overview of the Types of Food Processing Industries	
2	**PROCESSING EQUIPMENT**	**5 hours**
2.1	Mechanical, Transport, and Storage Equipment – *types, use, and factors affecting selection and purchase*	
2.2	Size Reduction, Homogenization, Mixing, and Foaming Equipment	
2.3	Separation Equipment – *grading and sorting equipment*	
2.4	Thermal Processing and Refrigeration Equipment	
2.5	Evaporation and Dehydration Equipment	
3	**FRUIT AND VEGETABLE PROCESSING**	**5 hours**

3.1	Beverages and Purees - *Role of Enzymes; Processing Techniques; Equipment and Methods; Processed Products*	
3.2	Jams, Jellies, Marmalades, and Crystallized Products – *Ingredients and their role*	
3.3	Pickles, Sauces, and Preserves - *Ingredients and their role*	
4	**INTRODUCTION TO FOOD PACKAGING**	**5 hours**
4.1	Functions and Objectives of Packaging	
4.2	Forms of Packaging – *rigid, semi-rigid, flexible*	
4.3	Packaging Closures and Sealing Systems	
5	**MATERIALS USED FOR FOOD PACKAGING**	**10 hours**
5.1	Paper and Paper-based Packaging Materials – *types, properties, advantages and disadvantages*	
5.2	Metal Packaging Materials - *types, properties, advantages and disadvantages*	
5.3	Glass Packaging Materials - *types, properties, advantages and disadvantages*	
5.4	Plastics and Composites - *types, properties, advantages and disadvantages*	
5.5	Edible and Biodegradable Food Packaging Materials - *types, properties, advantages and disadvantages*	
5.6	Selection and Design of Packaging Material for Dehydrated Foods, Frozen Foods, Dairy Products, Fresh Fruits & Vegetables, Meats, and Sea foods	
6	**PACKAGING MATERIAL PROPERTIES**	**10 hours**
6.1	Barrier properties – *permeability, transmission rates, migration, diffusion and solubility*	
6.2	Mechanical Properties – *tensile strength, bursting strength, tearing resistance, puncture resistance, impact strength, tear strength, stiffness, crease or flex resistance*	
6.3	Optical Properties	
6.4	Labels, and Food and Packaging Material Interactions	
6.5	Methods of Testing and Evaluation	
6.6	Aseptic Packaging of Foods - *definition, function and methods*	
6.7	Active and Intelligent Packaging - *definition, function and design*	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Novel Food Processing Technologies by Barbosa-Canovas, Tapia & Cano CRC Press, 2004.	
	Food Processing: Principles and Applications by Ramaswamy H. & Marcotte M. Taylor & Francis.	
	Bhat R, Alias AK, and Paliyath G. 2012. *Progress in Food Preservation.* First Edition. Wiley-Blackwell.	
	Desrosier NW.	
	Fellows PJ. 2016. *Food Processing Technology Principles and Practice*. Fourth Edition. Woodhead Publishing.	
	Ramaswamy HS and Marcotte M. 2005. *Food Processing: Principles and Applications*. Taylor & Francis.	

	Shapton DA and Shapton NF. 1998. *Principles and Practices for the Safe Processing of Foods*. Butterworth-Heinemann.	
	Sivasankar B. 2009. *Food Processing and Preservation*. First Edition. PHI Learning	
	Robertson GL. 2016. *Food Packaging Principles and Practice*. Third Edition. CRC Press.	
	Natarajan S, Govindarajan M, and Kumar B. 2014. *Fundamentals of Packaging Technology*. Second Edition. PHI.	
COURSE OUTCOMES	1. The student will comprehend the processing techniques utilized in food industries 2. The student will gain an understanding of the material used for packaging in the food industry	

COURSE CODE FTCC 105
COURSE TITLE FOOD QUALITY, SAFETY STANDARDS, AND LAWS
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should be aware of the different types of microorganisms and their impact on health	
COURSE OBJECTIVES	1. To familiarize students with the industrial standards concerning safe food production 2. To acquaint students with the existent national and international systems that ensure food quality 3. To familiarize students with national and international laws governing food production, import and export	
CONTENT		
1	**FOOD SAFETY AND QUALITY**	**10 hours**
1.1	Biochemical Changes caused by Microorganisms – *putrefaction, lipolysis, antagonism and synergism in microorganisms*	
1.2	Food Hygiene – *Food-borne Infections & Intoxications, Microbial Toxins, Indicator Organisms*	
1.3	Industrial Plant Sanitation and Hygiene – *Concept of food safety and quality; Quality attributes*	
1.4	Quality Control & Assurance – *Objectives; Functions; TQM, GMP, GHP, GLP, GAP, HACCP; Indian and International Quality Systems and Standards (AGMARK, BIS, FPO, ISO, BRC, Codex Alimentarius, and related standards.); CEDAC; Food Adulteration*	
2	**QUALITY ANALYSIS**	**5 hours**
2.1	Food Sampling Techniques; Rapid Detection Methods of Microorganisms	
2.2	Sensory Evaluation of foods – *Organoleptic Analysis, Methods and Tests of Sensory Evaluation, Organizing Sensory Evaluation Programmes, Computer-Aided Sensory Evaluations*	
2.3	Separation techniques – *Ultrafiltration, Ultracentrifugation, Sedimentation, Solid Phase Extraction, Supercritical Fluid Extraction, Chromatography, Electrophoresis*	

2.4	Analytical Techniques – *Spectroscopy, Microscopy, Immunoassays, Isotopic techniques, Nanotechnology, Thermal and Sub-thermal methods*	
3	**INDIAN FOOD REGULATORY REGIME**	**10 hours**
3.1	Erstwhile Prevention of Food Adulteration Act and Essential Commodities Act	
3.2	FDA - *Structure and Function, Administrative Set-up, Roles and Responsibilities of Staff*	
3.3	FSSAI – *Genesis and Evolution, Structure and Function, Administrative Set-up at the State Level, Roles and Responsibilities of Staff, Initiatives, Systems, and Processes*	
3.4	Licensing and Registration of Food Units – *Central and State Licensing Authorities*	
3.5	Codex India	
4	**INTERNATIONAL FOOD LAWS, ORGANIZATIONS AND AFFILIATIONS**	**10 hours**
4.1	Food and Agricultural Organization (FAO) & World Health Organization (WHO) – *Role and Functions*	
4.2	World Animal Health Organization	
4.3	World Trade Organization (WTO)	
4.4	European Committee for Standardization, European Union on Food Safety, EFSA, Euro-Asian Council for Standardization	
4.5	COPANT and ASEAN	
4.6	ISO – special emphasis on ISO 9001:2000/2008; ISO 22000:2005; ISO 45001; ISO 14001	
4.7	Rapid Alert System	
5	**EXPORT AND IMPORT LAWS AND REGULATIONS**	**10 hours**
5.1	Food Packaging and Labelling Requirements – *nutrition labelling, health claims, nutrition claims, specialized food regulation – Genetically Modified Foods (GMF), dietary supplements*	
5.2	Foreign Trade Policy	
5.3	Export (Quality Control and Inspection) Act, 1963	
5.4	Plant and Animal Quarantine	
5.5	Customs Act and Import Control Regulations	
5.6	National Agencies for Implementation of International Food Laws and Standards	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Adams MR, Moss MO, and McCLure P. 2016. *Food Microbiology*. Fourth Edition. Royal Society of Chemistry.	
	Early R. 2012. *Guide to Quality Management Systems for the Food Industry*. Blackie Academic & Professional	
	Heinz HJ. 1991. *Principles and Practices for the Safe Processing of Foods*. First Edition. Butterworth-Heinemann.	
	Raj D, Sharma R, and Joshi VK. 2011. *Quality Control for Value Addition in Food Processing*. New India Publishing Agency.	

	Bizmanualz. 2008. *ISO 22000 Standard Procedures for Food Safety Management Systems*.	
	Gupta V. 2017. *The Food Safety and Standards Act, 2006.* Ninth Edition. Commercial Law Publishers (India) Pvt. Ltd.	
	Prabhakar K. 2016. *A Practical Guide to Food Laws and Regulations*. Bloomsberry India Professional.	
	Rees N and Watson D. 2000. *International Standards for Food Safety*. Aspen Publication.	
	Singhal KL and Singhal D. 2012. *Implementing ISO 9001:2008 Quality Management System: A Reference Guide*. Second Edition. PHI Learning.	
COURSE OUTCOMES	1. The student will gain an understanding of safety standards to be followed in a food industry 2. The student will comprehend the national and international laws relevant to the food industry	

COURSE CODE FTCC 106
COURSE TITLE LAB IN FOOD PROCESSING AND QUALITY MANAGEMENT **NUMBER OF CREDITS** 2

PRE-REQUISITES	The student should have theoretical knowledge regarding food preparation and quality	
COURSE OBJECTIVES	1. To provide students with the basic practical skills required to prepare foods, and evaluate raw and processed foods 2. To enable students to evaluate food establishments for their consumer acceptability and sanitation attributes	
CONTENT		
1	**FOOD PROCESSING**	**30 hours**
1.1	Stages of Preparation and Observation of Sugar Syrup	
1.2	Preparation of Bakery Products – *Cakes, Cookies, Breads, Pies, Pastries*	
1.3	Extrusion Cooking – *Preparation of Pastas*	
1.4	Dehydration & Evaporation – *Preparation of Condensed Milk & Salted Dry Fish*	
1.5	Fruit & Vegetable Processing; Use of Chemical Additives for Preservation; Thermal Processing of Foods – *Preparation of Jams, Jellies, Squashes, Pickles, Chutneys, Sauces*	
1.6	Emulsions and Emulsifying Agents – *Preparation of Mayonnaise & Vinaigrettes*	
1.7	Fermented Foods – *Preparation of idlis and curds/ yoghurt*	
1.8	Frozen Foods – *Preparation of Ice Cream & Fruit/ Vegetable Pulp*	
2	**QUALITY MANAGEMENT**	**30 hours**
2.1	Evaluation of Quality Attributes of Raw and Processed Foods	
2.2	Evaluation of Sensory Characteristics of Bakery Products	
2.3	Evaluation of Sensory Characteristics of Thermally Processed Foods	
2.4	Detection of Adulterants in Foods	
2.5	Detection of Heavy Metals, Insecticides & Pesticides in Foods	

2.6	Determination of Nutrient Levels in Foods and Comparisons to Standards	
2.7	Determination of Hygiene of a Food Service Organization	
2.8	Preparation of a HACCP chart for a Food Industry	
PEDAGOGY	Experiments in the Laboratory	
REFERENCE BOOKS	Mahindru SN. 2010. *Encyclopaedia of Food Analysis*.	
	Vaclavik VA, Devine MM, and Pimentel MH. 2010. *Dimensions of Food*. Seventh Edition. CRC Press.	
	Weaver CM and Daniel JR. 2003. *The Food Chemistry Laboratory: A Manual for Experimental Foods, Dietetics, and Food Scientists*. Second Edition. CRC Press.	
COURSE OUTCOMES	1. The student will be able to prepare basic foods while relating the same to the principles of food chemistry and processing 2. The student will be able to apply the principles of quality analysis to foods and industry	

COURSE CODE FTOC 101
COURSE TITLE INDUSTRIAL FOOD WASTE MANAGEMENT
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have basic knowledge of biotechnology and microbiology	
COURSE OBJECTIVES	1. To acquaint students with the application of biotechnology in food processing, nutrition, fermentation, and waste utilisation 2. To familiarize students with waste generated from food industries and methods of by-product utilization	
CONTENT		
1	**INDUSTRIAL FOOD WASTE GENERATION**	**12 hours**
1.1	Grains, Legumes and Oilseeds	
1.2	Fruits and Vegetables	
1.3	Sugar Factories and Bakery Industries	
1.4	Breweries and Distilleries	
1.5	Dairy Industry	
1.6	Flesh Food Processing Units - *Meat, Poultry and Seafood*	
2	**FOOD WASTE EFFLUENTS**	**6 hours**
2.1	Characterization of food industry effluents, Environmental Consequences, Existing Disposal Methods	
2.2	Physical and chemical parameters, Oxygen demands and their interrelationships	
2.3	Waste Components and their Toxicity - *Residues (solids), Fats, Oils and grease, Forms of Nitrogen, Sulphur and Phosphorus, anions and cations, surfactants*	
2.4	Integration of New and Renewable Energy Sources for Waste Utilization	
3	**FOOD WASTE TREATMENT METHODS**	

3.1	Treatment methods for liquid waste from food industry - *Design and working of Activated Sludge Process, Bioremediation, Trickling Filter, Microbial Fuel Cells*	**12 hours**
3.2	Waste Water Management – *Quality, Treatment, Recycle, Reuse, BOD, COD, Role of Macrophytes and Microphytes*	
3.3	Treatment by Biological Methods - *SCP, Biogas, Plant-derived Fuels, Landfill Gas, Biomethanation and Biocomposting Technology for Organic Waste*	
3.4	Incineration, Combustion and other methods of solid waste management	
3.5	Advanced wastewater treatment systems - *Physical separations, Micro-strainers, Filters, Ultra filtration and reverse osmosis*	
3.6	Physicochemical separations - *Activated Carbon Adsorption, Ion Exchange Electro-Dialysis and Magnetic Separation; Chemical Oxidation and Treatment - Coagulation and Flocculation; Handling of sludge*	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Oreopoulou V and Russ W. 2007. *Utilization of By-Products and Treatment of Waste in the Food Industry*. Springer.	
	Arvanitoyannis I. 2007. *Waste Management for the Food Industries*. First Edition. Academic Press.	
	Green J.H. Food Processing Waste Management, AVI Publications, Westport	
COURSE OUTCOMES	1. The student will be able to develop processes for utilization of food waste 2. The student will be able to understand the impact of industrial waste on the environment	

COURSE CODE FTOC 102
COURSE TITLE LAB IN INDUSTRIAL FOOD WASTE MANAGEMENT
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have theoretical knowledge of food processing	
COURSE OBJECTIVES	1. To enable experimentation and observation of the outcomes of environmental waste detection techniques 2. To provide students a practical understanding of industrial food waste management processes	
CONTENT		
1	**INDUSTRIAL WASTE WATER ANALYSIS**	**30 hours**
1.1	Determination of Biological Oxygen Demand (BOD) of Wastewater	
1.2	Determination of Chemical Oxygen Demand (COD) of Wastewater	
1.3	Determination of Alkalinity of Wastewater	
1.4	Determination of Dissolved Oxygen from Waste	
1.5	Qualitative and Quantitative Determination of Faecal Contamination of Water	
1.6	Determination of Statistical Process Control (SPC) of different Wastes	

1.7	Determination of TS, TSS and TDS in Water Samples	
1.8	Assessment of Bioremediation/Biodegradation Potential of Isolated Soil or Wastewater Microbes	
2	**INDUSTRIAL FOOD WASTE MANAGEMENT**	**30 hours**
2.1	Production of Cellulose from Crop Residue	
2.2	Extraction of banana pseudostem fibre for Juice Production	
2.3	Manufacture of Oil from Food Waste (fruit and vegetable peels, flesh food waste)	
2.4	Production of Pectin from Food Waste	
2.5	Production of Biogas from Organic Waste	
2.6	Production of Chitin from Food Waste	
2.7	Extraction of Gelatine from Food Waste	
2.8	Microbial Degradation of Waste (preparation of lab-scale compost)	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTOC 101	
COURSE OUTCOMES	1. The student will be able to develop processes for utilization of food waste 2. The student will be able to chemically analyse waste water	

COURSE CODE FTOC 103
COURSE TITLE FOOD ADDITIVES, ADULTERATION, AND TOXICOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have knowledge of types of foods, chemistry, and microbiology	
COURSE OBJECTIVES	1. To acquaint students with the additives relevant to the processed food industry for shelf-life extension, processing support, and sensory appeal 2. To familiarize students with microbial, chemical and natural toxicants and allergens indigenously present and developed during food processing 3. To orient students with the regulations and the monitoring agencies involved in controlling the safer use of additives in foods	
CONTENT		
1	**INTRODUCTION TO FOOD ADDITIVES**	**5 hours**
1.1	Definition, Classification, and Functions of Food Additives	
1.2	Intentional and Unintentional Food Additives – *effects on human health*	
1.3	Safety Tests for Food Additives	
1.4	Laws and Regulations – *JECFA, Codex Alimentarius; Toxicological Evaluation of Food Additives*	
2	**CATEGORIES OF FOOD ADDITIVES**	

2.1	Nutritional Additives – *types, functions and industrial applications*	**10 hours**
2.2	Processing Agents – *anti-caking, bleaching, chelating, clarifying, emulsifying, leavening agents, stabilizers and thickeners, etc.; types, functions, and industrial applications*	
2.3	Preservatives – *definition; natural and chemical preservatives; acidulants and low pH organic acids and esters; sulphur dioxide and its salts; nitrites; antibiotics; surface preservation*	
2.4	Antioxidants – *natural and chemical antioxidants; primary and secondary antioxidants; mechanism of antioxidant function; sequestrants; selection and application of antioxidants in foods; evaluation of antioxidant effectiveness*	
2.5	Anti-Microbial Agents	
2.6	Sensory Agents – *colourants, sweeteners, and flavourings – functions, types, and industrial applications*	
3	**FOOD ADULTERATION**	
3.1	Definition and Types – *poisonous substances, foreign matter, cheap substitutes, spoiled components; impact on human health*	
3.2	Commonly Adulterated Foods and their Methods of Detection	**5 hours**
3.3	Advanced Adulteration Detection Methods - *Toxicological Evaluation of Food Adulterants*	
3.4	Laws and Regulations – *Food Safety and Standards Act 2006*	
4	**TOXICOLOGY**	
4.1	Definition and Classification of Food Toxicants	
4.2	Principles of Toxicology – *processing and accumulation of toxins in the human body; elimination and detoxification mechanisms; toxicokinetics and toxicodynamics*	
4.3	Toxicants derived from Plants, Animals, Marine, Algal, and Microbial Sources	**10 hours**
4.4	Toxicants derived from Food Processing and Packaging	
4.5	Factors affecting Toxicity of Compounds; Introduction to LD_{50}, NOAEL, LOAEL	
4.6	Manifestation of Toxic Effects - *food poisoning and food-borne infections and disease*	
4.7	Methods used in Safety Evaluation	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Branen AL, Davidson PM and Salminen S. 2001. *Food Additives*. Second Edition. Marcel Dekker.	
	Concon JM. 1988. *Food Toxicology - Principles & Concepts*. Marcel Dekker.	
	George AB. 1996. *Encyclopaedia of Food and Color Additives*. *Vol. III.* CRC Press.	
	Hathcock JN. (Ed.). 1982. *Nutritional Toxicology. Vol. I.* Academic Press.	
	Madhavi DL, Deshpande SS and Salunkhe DK. 1996. *Food Antioxidants: Technological, Toxicological and Health Perspective*. Marcel Dekker.	

	Nakai S and Modler HW. 2000. *Food Proteins and Processing Applications*. Wiley VCH.	
	Rechcigl M Jr. 1983. (Ed.). *Handbook of Naturally Occurring Food Toxicants*. CRC Press.	
	Shabbir S. 2007. *Food Borne Diseases.* Humana Press.	
	Stephen AM. (Ed.). 2006. *Food Polysaccharides and Their Applications*. Marcel Dekker.	
	Steven T. 1989. *Food Toxicology: A Perspective on Relative Risks*.	
	Tweedy BG.1991. *Pesticide Residues and Food Safety*. Royal Society of Chemistry.	
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COURSE OUTCOMES	1. The student will gain an understanding of chemical agents added to enhance the quality of processed foods 2. The student will comprehend the effects of adulterants and toxic products in foods	

COURSE CODE FTOC 104
COURSE TITLE LAB IN FOOD ADDITIVES, ADULTERATION, AND TOXICOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have knowledge of types of foods, chemistry, and microbiology	
COURSE OBJECTIVES	1. To familiarize students with isolation of various biopolymers from food resources 2. To acquaint students with the practical aspects of toxin-free foods	
CONTENT		
1	**ANALYSIS OF FOOD ADDITIVES AND ADULTERANTS**	**30 hours**
1.1	Qualitative and Quantitative Analysis of Chemical Preservatives in Food	
1.2	Estimation of Water-soluble and Oil-soluble Colours in Foods	
1.3	Isolation of Native and Modified Proteins from Foods	
1.4	Survey of Additives used in Popular Commercial Food Products	
1.5	Measurement of Used Oil Rancidity Indices	
1.6	Detection of Pesticide Residues in Food	
1.7	Detection of Antibiotic Residues/ Hormones/ Veterinary Drugs, and Heavy Metals in Foods	
1.8	Qualitative Analysis of Adulterants in Food Samples	
2	**TOXICOLOGICAL ANALYSIS**	**30 hours**
2.1	Analysis of Antibiotic Sensitivity Pattern and MIC for Different Food Pathogens	
2.2	Analysis of Microbial and Plant Toxins	
2.3	Determination of LD_{50} Value of Common Toxic Chemicals using Microbes	

2.4	Detection of Chemical Toxicity using Bacterial Indicator Organisms	
2.5	Exploration of the Data in Codex General Standard for Food Additives (GSFA) Online Database	
2.6	Exploration of the resources available in *EFSA OpenFoodTox* and *USFDA NCTR*	
2.7	Mock Risk Assessment and Risk Characterization	
PEDAGOGY	Experiments in the Laboratory	
REFERENCE BOOKS	Botsford, J.L. (2000) A simple, inexpensive, and rapid method to determine toxicity using a bacterial indicator organism. Proceedings of the 2000 Conference on Hazardous Waste Research, 25-35.	
	Chemical hazards database (Openfoodtox) | efsa. (n.d.). Retrieved from https://www.efsa.europa.eu/en/data-report/chemical-hazards-database-openfoodtox	
	GSFA online home page. (n.d.). Retrieved, from https://www.fao.org/gsfaonline/index.html?lang=en	
COURSE OUTCOMES	1. The student will be able to practically analyse the presence of additives in foods 2. The student will be able to practically determine the presence of adulterants in foods 3. The student will gain practical knowledge in determination of compound toxicity and computational toxicology	

COURSE CODE FTCC 201
COURSE TITLE FOOD BIOTECHNOLOGY
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should have basic knowledge of biotechnology and microbiology	
COURSE OBJECTIVES	1. To acquaint students with the application of biotechnology in food processing, nutrition, fermentation, and waste utilisation 2. To familiarize students with waste generated from food industries and methods of by-product utilization	
CONTENT		
1	**FUNDAMENTALS OF BIOTECHNOLOGY**	**10 hours**
1.1	Definition, Scope, and Application of Biotechnology - *application in food industries, pharmaceuticals, agriculture, and waste utilisation*	
1.2	Fundamentals of Molecular Biology: *Chemistry and Biology of DNA; Types of DNA; DNA Mutations and the Role of Mutagenic Agents, Bacterial DNA replication, Bacterial transcription, Bacterial Translation, Regulation of Gene Expression in Prokaryotes*	
1.3	Recombinant DNA Technology: *DNA modifying enzymes, cloning vectors, steps involved in gene cloning*	

1.4	Genetic recombination mechanisms: *transformation, transduction, conjugation, improvement of microbial strains*	
1.5	Micromanipulation, Cell and Tissue Culture	
2	**GENETIC MODIFICATIONS**	
2.1	Genetically Modified Organisms (GMOs) in Industrial Fermentation Processes and Techniques for improvement in Microbial Strains	**5 hours**
2.2	Improvement of Crops by Genetic Engineering - *insect resistant and herbicide tolerant crops*	
2.3	Genetically Modified Plants - *Golden rice, Flavr savr tomato*	
2.4	Application of Transgenic Animals in Food and Agriculture	
2.5	Pros and Cons of Genetically Modified Foods	
3	**BIOPROCESS TECHNOLOGY**	
3.1	Principal Components of Fermentation Technology, Growth Kinetics (*batch, fed-batch, continuous*)	
3.2	Principles of Upstream Processing, Bioprocess Measurement and Control System - *Computer Aided Process Control*	
3.3	Introduction to Downstream Processing	**10 hours**
3.4	Techniques Involved in Product Recovery and Purification – *foam separation, precipitation, filtration, centrifugation, cell disruption, liquid-liquid extraction, chromatography, membrane processes, drying, crystallization, whole broth processing.*	
3.5	Immobilization Biosensors – *types and application in the food industry*	

4	**INDUSTRIAL BIOTECHNOLOGY**	
4.1	Therapeutic Proteins produced by Biotechnological Processes	
4.2	Industrial Production of Enzymes (*Amylases, Proteases, Lipases*) and Chemicals *(Alcohols, Acids and Solvents)*	
4.3	Use of Microorganisms in Mineral Beneficiation and Recovery; Biomass Production using Microorganisms	**10 hours**
4.4	Role of Plants for Production of Nutraceuticals and Bioremediation	
4.5	Manufacture of Beer, Wine, Vinegar, Cheese, and Mould-Modified Foods	
4.6	Food Ingredients: *xanthan gum, fat substitutes, bio-colours, organic acids and sweeteners*	
5	**BIOINFORMATICS & BIOTECHNOLOGY FOR FOOD SECURITY**	
5.1	Bioinformatics – *History, Scope and Importance; Application in Food Technology; Sequence Information Sources (EMBL, GENBANK, Entrez, PDB, SWISSPROT), Pairwise Alignments, Introduction to BLAST, Multiple Sequence Alignment, Phylogenetic Analysis, Sequence Similarity Searches (BLAST, FASTA, Data Submission).*	**10 hours**

5.2	Regulatory and Social aspects of Food Biotechnology - *ethical issues and guidelines concerning Genetically Modified foods*	
5.3	Trade Related Aspects of Biotech Foods, Intellectual Property Rights (IPR) and Biopiracy	
5.4	Biotech Foods for Developing and Developed Countries	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Anal AK. 2017. *Food Processing By-Products and their Utilization (IFST Advances in Food Science).* Wiley Blackwell.	
	Crueger W and Crueger A. 2000. *Biotechnology: A textbook of Industrial Microbiology.* 2nd edition. Panima Publishing Co. New Delhi.	
	Chawla HS. 2002. *Introduction to Plant Biotechnology.* Second Edition. Science Publishers.	
	Doyle A and Griffiths JB. 1998. *Cell and Tissue Culture: Laboratory Procedures in Biotechnology.* John Wiley and Sons, UK.	
	El-Mansi EMT, Bryce CFA, Demain AL, and Allman AR. 2012. *Fermentation Microbiology and Biotechnology*. Third Edition. CRC Press.	
	Joshi VK and Singh RS. 2013. *Food Biotechnology: Principles and Practices*. I.K. International Publishing House Pvt. Ltd.	
	Nelson, D. L., & Cox, M. M. 2017. *Lehninger principles of biochemistry*, W.H. Freeman, 7th edition.	
	Rastogi S.C., Mendiratta N. & Rastogi P. 2009. Bioinformatics: Concepts, Skills and Applications, 2nd edition.	
	Stanbury PF, Whitaker A and Hall SJ. 2006. Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.	
	Watson, J. D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., & Losick, R. M. 2004. *Molecular biology of the gene*, 6th edition.	
COURSE OUTCOMES	1. The student will be able to apply the principles of microbiology and biotechnology in handling wastes produced by the food industry 2. The student will be able to develop processes for utilization of food waste	

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COURSE CODE FTCC 202
COURSE TITLE LAB IN FOOD BIOTECHNOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have theoretical knowledge of food science
COURSE OBJECTIVES	1. To enable students to experiment with and observe the outcomes of biotechnological techniques propagated in food industries 2. To provide students a practical understanding of industrial food waste management processes
CONTENT	

1.	Assessment of Bacterial Growth Kinetics by Batch and Fed-Batch Fermentation	**60 hours**
2.	Production and Estimation of Amylase	
3.	Mushroom Production	
4.	Micropropagation through Tissue Culture	
5.	Strain Improvement through UV Mutation for Lactose Utilization	
6.	Separation of Protoplast using Lytic Enzymes	
7.	Isolation of Bacterial Genomic DNA and Analysis by Agarose Gel Electrophoresis	
8.	Isolation of Plasmid DNA and Analysis by Agarose Gel Electrophoresis	
9.	Pesticide Degradation (DDT) by *Pseudomonas* Sp.	
10.	Exploring Bioinformatic Web Tools and Resources: EMBL, Genbank, Entrez, BLAST	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTCC 201	
COURSE OUTCOMES	1. The student will be able to apply the principles of microbiology and biotechnology in handling wastes produced by the food industry 2. The student will be able to develop processes for utilization of food waste	

COURSE CODE FTCC 203
COURSE TITLE NORMAL AND CLINICAL NUTRITION
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should have knowledge of human physiology	
COURSE OBJECTIVES	1. To acquaint students with the nutritional requirements at various stages of human growth and development. 2. To familiarize students with dietary modifications necessitated by disease and disorder.	
CONTENT		
1	**DIET THERAPY**	**5 hours**
1.1	Definition and Principles; Scope of Dietetics; Responsibilities of a Dietitian	
1.2	Progression of Hospital Diets	
1.3	Enteral and Parenteral Nutrition	
2	**NUTRITION THROUGH THE YEARS**	**10 hours**
2.1	Nutrient Requirements of Infants, Pre-Schoolers, School Children, Adolescents, Adults, and the Elderly – *dietary issues and special formulations*	
2.2	Dietary Recommendations during Pregnancy and Lactation	

2.3	Nutritional Care of the Low Birth Weight and Pre-term Infant & Children with Special Needs	
3	**DIET THERAPY FOR CLINICAL CONDITIONS**	**20 hours**
3.1	Overweight, Obesity, and Underweight	
3.2	Hormonal Disorders (PCOD and Thyroid Disorders)	
3.3	Diabetes (IDDM, NIDDM, and Gestational Diabetes)	
3.4	Cardiovascular Disease (Hypertension and Atherosclerosis)	
3.5	Hepatic Disease (Hepatitis, Cirrhosis, Gall Bladder Disease)	
3.6	Renal Disorders (Glomerulonephritis, Nephrotic Syndrome, Urinary Calculi, ESRD)	
3.7	Gastrointestinal Disorders (Peptic Ulcers, Diarrhoea, Constipation, Irritable Bowel Syndrome, Inflammatory Bowel Disease)	
3.8	Cancer	
3.9	Osteoporosis	
4	**EMERGING NUTRITIONAL NEEDS**	**10 hours**
4.1	Allergies and Intolerances	
4.2	Sports Nutrition	
4.3	Nutrition at High Altitudes	
4.4	Nutrition in Space	
4.5	Ergogenic Aids	
4.6	Nutrigenomics	
4.7	Current Needs	
4.8	Drug-Nutrient Interactions	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Antia FP and Abraham P. 1998. *Clinical Dietetics and Nutrition*. Fourth Edition. OUP India.	
	Joshi SA. 2017. *Nutrition and Dietetics*. Fourth Edition. McGraw Hill.	
	Mahan LK and Escott-Stump S. 2003. *Krause's Food, Nutrition, and Diet Therapy*. Eleventh Edition. Saunders.	
	McIntosh SN. 2013. *William's Basic Nutrition and Diet Therapy*. Fourteenth Edition. Mosby.	
	Robinson CH, Lawler MR, Chenoweth WL, and Garwick AE. 1990. *Normal and Therapeutic Nutrition*. Seventeenth Edition. MacMillan Publishing Company.	
	Srilakshmi B. 2007. *Dietetics*. Seventh Edition. New Age International Publishers.	
COURSE OUTCOMES	1. The student will be able to apply the principles of nutrition and dietetics to the stages of human development	

	2. The student will be able to apply the principles of nutrition and dietetics to diseased as well as normal conditions 3. The student will be able to relate normal physiology and human disease to the designing of therapeutic formulations	

COURSE CODE FTCC 204
COURSE TITLE LAB IN NORMAL AND CLINICAL NUTRITION
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have knowledge about food and human disease	
COURSE OBJECTIVES	1. To make students competent in planning diets for different age groups and physiological conditions 2. To acquaint students with the link between therapeutic diets and food technology	
CONTENT		
1	**DIET PLANNING REQUISITES**	**10 hours**
1.1	Food Exchange List	
1.2	Recommended Dietary Allowances & Estimated Average Requirements	
1.3	Steps in Diet Planning	
2	**DIET PLANS**	**40 hours**
2.1	Pre-Schoolers, School Children with Packed Meals, Adolescents, Pregnant and Lactating Women, Geriatric Adults	
2.2	Individuals with Weight Issues – *Obese and Underweight*	
2.3	Diabetes Mellitus	
2.4	Hypertension and Coronary Heart Disease	
2.5	Gastrointestinal Disturbances – *Lactose and Gluten Intolerance, Constipation, Diarrhoea, Irritable Bowel Syndrome, Peptic Ulcers*	
2.6	Liver Disorders – *Hepatitis and Cirrhosis*	
2.7	Renal Disorders – *Glomerulonephritis and Urinary Calculi*	
2.8	Sports persons	
2.9	Space Travel (Astronauts)	
3	**ROLE OF FOOD TECHNOLOGY IN THERAPEUTIC NUTRITION**	**10 hours**
3.1	Industrial food formulations for the above clinical conditions	
PEDAGOGY	Planning Diets and Experiments in the Laboratory	
REFERENCES	As suggested in DSCC 203	

COURSE OUTCOMES	1. The student will become competent in planning balanced diets for various normal and therapeutic conditions 2. The student will gain an understanding of designing special feeds for normal and therapeutic conditions	

COURSE CODE FTCC 205
COURSE TITLE BAKERY, CONFECTIONERY, AND CONVENIENCE FOOD TECHNOLOGY
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should be aware of types of processed foods	
COURSE OBJECTIVES	1. To acquaint students with the principles of bakery and confectionery technology 2. To familiarize students with processing techniques, quality parameters, and nutritional comparisons of baked products	
CONTENT		
1	**BAKERY TECHNOLOGY**	**15 hours**
1.1	Principles of Baking	
1.2	Raw Material and their Role – *flour, leavening agents, sweeteners, fats, additives, spice*	
1.3	Types of Bakery Products and Technology for their Manufacture – *dough and batters*; *cakes, pies, pastries, bread, biscuits*	
1.4	Icings and Fillings	
1.5	Quality Parameters of Bakery Products - *chemistry of dough and batters; rheological testing and interpretation of data; sensory evaluation*	
1.6	Staling and Nutrient Losses in Bakery Products	
1.7	Sanitation and Hygiene in a Bakery Unit	
1.8	Equipment used in the Bakery Industry	
2	**CONFECTIONERY TECHNOLOGY**	**15 hours**
2.1	Principles of Confectionery Manufacture	
2.2	Raw Material & their Role including Interfering Agents and Inversion of Sugars	
2.3	Types of Confectionery Products and Technology for their Manufacture	
2.4	Quality Parameters of Confectionery Products	
2.5	Nutrient and other Losses in Confectionery Products	
2.6	Sanitation and Hygiene in a Confectionery Unit	
2.7	Equipment used in the Confectionery Industry	
2.8	Manufacture of Indian Confectioneries	
3	**CONVENIENCE FOOD TECHNOLOGY**	**15 hours**
3.1	Sugar – *raw material, types, and manufacture*	
3.2	Chocolate – *raw material, types, and manufacture*	
3.3	Chewing Gum - *raw material, types, and manufacture*	

3.4	Lozenges - *raw material, types, and manufacture*	
3.5	Pan Coating – *hard and soft panning; problems in coating; glazing, polishing, and tableting*	
3.6	Nutritional Value	
3.7	Quality Parameters	

PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Dubey SC. 2002. *Basic Baking*. The Society of Indian Bakers, New Delhi.	
	Francis FJ. 2000. *Wiley Encyclopedia of Food Science & Technology*. John Wiley & Sons.	
	Manley D. 2000. *Technology of Biscuits, Crackers & Cookies*. Second Edition. CRC Press.	
	Pyler EJ. *Bakery Science & Technology*. Third Edition. Vols. I, II. Sosland Publ.	
	Qarooni J. 1996. *Flat Bread Technology*. Chapman & Hall.	
COURSE OUTCOMES	1. The student will gain an understanding of processing techniques utilized in the bakery and confectionery industry 2. The student will comprehend the role of convenience food technology as an important aspect of commercial foods	

COURSE CODE FTCC 206
COURSE TITLE LAB IN BAKERY, CONFECTIONERY, AND CONVENIENCE FOOD TECHNOLOGY
NUMBER OF CREDITS 1

PRE-REQUISITES	The student should be able to handle various types of food material	
COURSE OBJECTIVES	1. To acquaint students with techniques involved in advanced baking and confectionery 2. To familiarize students with quality analysis procedures of baked products	
CONTENT		
1.	Tests for the Rheological Properties of Dough	**30 hours**
2.	Preparation of Advanced Bakery Products – *sourdoughs, pastries, croissants, doughnuts*	
3.	Preparation of Filled and Iced Cakes	
4.	Preparation of Chocolate	
5.	Preparation of Coated Confectionery	
6.	Quality Evaluation of the Bakery Products, Filled and Iced Cakes, Chocolate, and Coated Confectionery	
7.	Determination of Nutritional Value of Bakery and Confectionery Products	

PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTCC 205	
COURSE OUTCOMES	1. The student will be able to prepare advanced bakery products as well as confectionery items 2. The student will be able to qualitatively analyse baked food products	

COURSE CODE FTCC 207
COURSE TITLE FOOD ENGINEERING
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have an understanding of the physical characteristics of food	
COURSE OBJECTIVES	1. To acquaint students with the principles and processes of food engineering 2. To familiarize students with basic operations and calculations of importance in the food industry	
CONTENT		
1	**THERMODYNAMICS AND HEAT TRANSFER**	**7 hours**
1.1	Principles; Thermal Properties of Foods; Mass Transfer	
1.2	Modes of Heat Transfer – *in solids and liquids; radiative heat transfer*	
1.3	Steady and Unsteady State Heat Transfer, Enthalpy Balance in Heat Exchange Equipment	
1.4	Microwave Heating	
1.5	Fourier's Law; Stefan Boltzmann Law	
2	**RHEOLOGY OF FOODS**	**8 hours**
2.1	Properties and Classification of Fluids	
2.2	Newton's Law of Viscosity, Newtonian and Non-Newtonian Fluids	
2.3	Basic Equations of Fluid Flow, Hagen Poiseille Equation	
2.4	Bernoulli's Equation	
2.5	Flow-Measuring Devices and Flow Rate Calculations	
2.6	Handling of Fluids, Pipe Fittings and Valves, Pumps – *Classification, Centrifugal and Positive Displacement Type, Peristaltic*	
3	**REFRIGERATION AND FREEZING**	**8 hours**
3.1	Parts and Functions of a Refrigerator	
3.2	Refrigeration Cycle	
3.3	Refrigerants	
3.4	Concept of Refrigerator Load *(tons, kilowatts, CFM, and related terminology)*	
3.5	Freezing, VCRS, Freezing Time, Freeze Drying	
3.6	Cryogenic Freezing and Individual Quick Freezing	

4	**MECHANICAL OPERATIONS IN FOOD PROCESSING**	**7 hours**
4.1	Size Reduction and Related Laws	
4.2	Energy and Power Requirement and Consumption	
4.3	Screening, Types of Screens, Filtration, Principle of Constant Pressure and Constant Rate Filtration, Settling Classifiers, Floatation, Centrifugal Separation	
PEDAGOGY	Lectures/ Assignments/ Seminars/ Numerical	
REFERENCE BOOKS	Rao DG. 2009. *Fundamentals of Food Engineering*. PHI.	
	Sharma K, Mulvaney SJ, and Rizvi SSH. 2012. *Food Process Engineering: Theory and Laboratory Experiments*. Wiley-India.	
	Singh RP and Heldman DR. 2013. *Introduction to Food Engineering*. Fifth Edition. AP.	
	Badger, W.L., Banchero, J.T., Introduction to Chemical Engineering, MGH	
	Foust, A.S., Wenzel, L.A., et.al. Principles of Unit Operations, 2nd edition, JWS	
	Toledo RT. 2000. *Fundamentals of Food Process Engineering*. Second Edition.	
COURSE OUTCOMES	1. The student will gain an understanding of the influence of food characteristics on unit operations used in the food industry 2. The student will be able to do calculations so as to enable efficient food processing	

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COURSE CODE FTOC 201
COURSE TITLE SPICE AND PLANTATION CROP TECHNOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should be aware of the common spices and the plantation crops in use	
COURSE OBJECTIVES	1. To acquaint students with the types of plantation crops and their processing techniques 2. To familiarize students with the processing of spices and condiments	
CONTENT		
1	**PLANTATION CROPS**	**10 hours**
1.1	Definition and Classification	
1.2	Coffee – *Chemical Constituents, Harvesting, Bean Processing, Types and Varieties, Manufacture, Quality and Grading, Chicory Chemistry and Use*	
1.3	Tea - *Chemical Constituents, Harvesting, Leaf Processing, Types and Varieties, Manufacture, Quality and Grading*	
1.4	Cocoa – *Production, Composition, Grading, Processing, Cocoa Products (cocoa mass, cocoa powder, cocoa butter, cocoa-based beverages, malted beverages, cocoa liquor)*	
1.5	Coconut – *Production, Composition, Grading, Post-Harvest Technology, Processing and Products (coconut milk, desiccated coconut)*	
1.6	Cashew (nut) – *Harvesting, Processing, and Products*	

2	**SPICE TECHNOLOGY**	**10 hours**
2.1	History of Spices	
2.2	Classification and Composition of Spices	
2.3	Fumigation and Irradiation of Spices	
2.4	Pepper, Cardamom, Red and Green Chilli, Cumin, Coriander, Cinnamon, Fenugreek, Nutmeg, Cloves, Turmeric - *Production, Chemistry, Constituents, Use in Food, and Functional Benefits*	
2.5	Post-Harvest Technology – *spice oils, spice powders, oleoresins, flavour components, concentrates*	
2.6	Plant Suspension Cultures	
2.7	Enzymatic Synthesis of Flavour Identicals	
2.8	Adulteration in Spices, Quality Standards and Specifications	
3	**CONDIMENTS, FLAVOURINGS, AND HERBS**	**10 hours**
3.1	History of Condiment Use in Foods	
3.2	Seasonings & Culinary Herbs (*Vinegar, Salt, Celery, Garlic, Ginger, Onion, Mint, Thyme, Basil, Mustard, Cilantro, Dill, Oregano, Parsley, Rosemary, Sage, Fennel, Paprika, Bay Leaf, Vanilla, Monosodium Glutamate*) - *Production, Chemistry, Constituents, Use in Food, and Functional Benefits*	
3.3	Post-Harvest Technology and Quality Standards	
3.4	Packaging of Spices and Condiments	

PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Banerjee B. 2002. *Tea Production and Processing*. Oxford Univ. Press.	
	Minifie BW. 1999. *Chocolate, Cocoa and Confectionery Technology*. Third Edition. Aspen Publ.	
	NIIR. 2004. *Handbook on Spices*. National Institute of Industrial Research Board, Asia Pacific Business Press Inc.	
	Sivetz M and Foote HE. 1963. *Coffee Processing Technology*. AVI Publ.	
COURSE OUTCOMES	1. The student will gain an understanding of processing techniques used for plantation crops 2. The student will comprehend the processing and use of herbs and spices	

COURSE CODE FTOC 202
COURSE TITLE LAB IN SPICE AND PLANTATION CROP TECHNOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should be theoretically aware of the constituents of spices
COURSE OBJECTIVES	1. To acquaint students with quality analysis of spices and plantation crops 2. To make students practically competent in rudimentary spice processing

CONTENT		
1.	Market Survey of Plantation Crops and their Products	**60 hours**
2.	Market Survey of Spices, Condiments, Herbs, and their Products	
3.	Preparation of Spice Powders	
4.	Detection of Adulteration in Spices	
5.	Determination of Capsaicin Content of Chillies	
6.	Estimation of Curcumin in Turmeric	
7.	Preparation of Virgin Coconut Oil	
8.	Processing of Cashew Nut through Steam Roasting	
9.	Processing of Cashew Apple for Beverages	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTOC 201	
COURSE OUTCOMES	1. The student will be able to practically analyse the quality of spices 2. The student will gain a practical understanding of processing plantation crops to derive edible products	

COURSE CODE FTOC 203
COURSE TITLE NUTRACEUTICALS AND HEALTH FOODS
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have knowledge of food chemistry	
COURSE OBJECTIVES	1. To familiarize students with the emerging trend of nutraceuticals with respect to the types, mechanisms of action, and manufacture of selected nutraceuticals 2. To acquaint students with nutraceutical product development, clinical testing and toxicity aspects	
CONTENT		
1	**INTRODUCTION TO NUTRACEUTICALS**	**10 hours**
1.1	Definition and Basis of Claims – *nutraceuticals, health foods, functional foods*	
1.2	Regulatory Issues for Nutraceuticals and Health Foods including CODEX	
1.3	Foods as Nutraceuticals – *cereals, pulses, minor millets, vegetables, fruits, dairy, flesh foods, nuts, mushrooms, edible insects and ferns*	
1.4	Present and Future Prospects of Nutraceuticals – *Nutraceuticals as a bridge between foods and drugs*	
2	**MANUFACTURE OF NUTRACEUTICALS**	

2.1	Flora, Fauna, and Microbes as a Source for the Production of Nutraceuticals	**10 hours**
2.2	Production of Select Nutraceuticals such as Isoflavonoids, Prebiotics and Probiotics, Glucosamine, Phytosterols, Vitamins (carotenoids, tocopherols, folic acid, ascorbic acid), MUFA, PUFA, ω-3 Fatty Acids	
2.3	Formulation of Functional Foods containing Nutraceuticals – *stability and analytical issues, labelling issues*	
2.4	Nutrigenomics – *Golden Rice, Quality Protein Maize (QPM)*	
2.5	Clinical Testing of Nutraceuticals and Health Foods	
3	**CLINICAL ROLE OF NUTRACEUTICALS**	**10 hours**
3.1	Nutraceutical Use in Disease and Disorder (need for and mechanism of action) – *cardiovascular disease, cancer, diabetes, obesity, immunity, bone and joint issues, macular degeneration, gastrointestinal disturbances, hepatic and renal disorders, hormonal problems, behavioural disorders*	
3.2	Nutraceutical Use in Sports	
3.3	Dosage, Contraindications, and Toxicity of Nutraceuticals	
3.4	Interactions between Nutraceuticals and Prescription Drugs	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Brigelius-Flohé, J and Joost HG. 2006. *Nutritional Genomics: Impact on Health and Disease*. Wiley VCH.	
	Cupp J and Tracy TS. 2003. *Dietary Supplements: Toxicology and Clinical Pharmacology*. Humana Press.	
	Gibson GR and William CM. 2000. *Functional Foods - Concept to Product*.	
	Goldberg I. 1994. *Functional Foods: Designer Foods, Pharma Foods*.	
	Losso JN. 2007. *Angi-angiogenic Functional and Medicinal Foods*. CRC Press.	
	Manson P.2001. *Dietary Supplements*. Second Edition. Pharmaceutical Press.	
	Campbell JE and Summers JL. 2004. *Dietary Supplement Labelling Compliance.*	
	Neeser JR and German BJ. 2004. *Bioprocesses and Biotechnology for Nutraceuticals*. Chapman & Hall.	
	Robert EC. 2006. *Handbook of Nutraceuticals and Functional Foods*. Second Edition. Wildman.	
	Shi J. (Ed.). 2006. *Functional Food Ingredients and Nutraceuticals: Processing Technologies.* CRC Press.	
	Webb GP. 2006. *Dietary Supplements and Functional Foods*. Blackwell Publ.	

COURSE OUTCOMES	1. The student will gain an understanding of nutrient and phytonutrient components of foods that have health benefits 2. The student will be able to appreciate the role of biomolecules as nutraceuticals	

COURSE CODE FTOC 204
COURSE TITLE LAB IN NUTRACEUTICALS AND HEALTH FOODS
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have knowledge of food chemistry	
COURSE OBJECTIVES	1. To acquaint students with extraction procedures of nutrients and functional components from foods 2. To develop food labelling knowledge and competency in students	
CONTENT		
1.	Market Survey and Classification of Health Foods and Nutraceuticals	**60 hours**
2.	Extraction and Estimation of Vitamin C from Fruits	
3.	Extraction and Estimation of Folic Acid from Vegetables	
4.	Extraction and Estimation of β-carotene from Carrots	
5.	Extraction and Estimation of Lycopene from Tomatoes	
6.	Extraction and Estimation of Asthaxanthene from Grapes	
7.	Development of Labels for Health Foods	
8.	Estimation of Tannins in Cashew Apple	
9.	Extraction of Prebiotics from Plant Sources (coconut, leafy plants)	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTOC 203	
COURSE OUTCOMES	1. The student will be able to estimate the nutrient content of fruits and vegetables 2. The student will be able to grade foods in terms of their nutritional and phytonutrient quality	

COURSE CODE FTGC 101
COURSE TITLE CEREAL, LEGUME, AND OILSEED PROCESSING TECHNOLOGY
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should be aware of the major agricultural crops of India and their basic market uses
COURSE OBJECTIVES	1. To acquaint students with major agricultural crops of India and their processing techniques 2. To familiarize students with nutritional value differences as a result of crop processing

CONTENT		
1	**CEREALS AND CEREAL PRODUCTS**	
1.1	Structure, Composition, Nutritional Value, and Market Varieties of Cereals and Minor Millets such as Rice, Wheat, Maize, *Jowar*, *Bajra*, *Ragi*, Barley	
1.2	Farming, Consumption and Industrial Utilization Trends of Cereals in India and Internationally	
1.3	Post-Harvest Technology – *storage, transportation, handling, prevention of spoilage and post-harvest losses, fumigation, and related aspects*	
1.4	Processing Methods – *parboiling, germination, fermentation, malting*	**15 hours**
1.5	Milling – *classification and types*	
1.6	Products of Processing – *flours; semolina; breakfast cereals; flaked, puffed, and popped products; infant foods; corn syrup; corn starch; corn oil; extruded products; convenience foods (ready-to-eat and ready-to-cook)*	
1.7	Effect of Processing on Composition and Nutritive Value	
1.8	Fortification and Value Addition of Cereal Products	
1.9	Quality Control and Standards for Cereal-based Products	
1.10	Packaging of Cereals and Cereal Products	
2	**LEGUMES AND PULSES**	
2.1	Structure, Composition, Nutritional Value, Toxic Constituents, and Market Varieties of Pulses including Soybean	
2.2	Farming, Consumption and Industrial Utilization Trends of Pulses in India and Internationally	
2.3	Post-Harvest Technology – *storage, transportation, handling, prevention of spoilage and post-harvest losses, fumigation, and related aspects*	**15 hours**
2.4	Processing Methods – *sprouting, fermentation*	
2.5	Products of Processing – *grits, nuggets, isolates, concentrates*	
2.6	Effect of Processing on Composition and Nutritive Value	
2.7	Fortification and Value Addition of Pulse Products	
2.8	Quality Control and Standards for Pulse-based Products	
2.9	Packaging of Pulses and Pulse Products	
3	**OILSEEDS**	
3.1	Structure, Composition, Nutritional Value, Toxic Constituents, and Market Varieties of Oilseeds	
3.2	Farming, Consumption and Industrial Utilization Trends of Oilseeds in India and internationally	
3.3	Post-Harvest Technology – *storage, transportation, handling, prevention of spoilage and post-harvest losses, fumigation, and related aspects*	**15 hours**
3.4	Processing Methods and Manufacture of Oils and Fats	
3.5	Products of Processing – *grits, nuggets, isolates, concentrates, low-cost protein foods, oils*	
3.6	Effect of Processing on Composition and Nutritive Value	
3.7	Fortification and Value Addition of Oilseed Products	
3.8	Quality Control and Standards for Oilseed-based Products	

3.9	Packaging of Oilseeds	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Chakrabarty MM. 2003. *Chemistry and Technology of Oils and Fats*. Prentice Hall.	
	Dendy DAV and Dobraszczyk BJ. 2001. *Cereal and Cereal Products*. Aspen.	
	Hamilton RJ & Bhati A. 1980. *Fats and Oils - Chemistry and Technology*. App. Sci. Publ.	
	Hoseney RS. 1994. *Principles of Cereal Science and Technology*. Second Edition. AACC.	
	Kay DE. 1979. *Food Legumes*. Tropical Products Institute.	
	Kent NL. 1983. *Technology of Cereals*. Fourth Edition. Pergamon Press.	
	Kulp K and Ponte GJ. 2000. *Handbook of Cereal Science and Technology*. Second Edition. Marcel Dekker.	
	Lorenz KL.1991. *Handbook of Cereal Science and Technology*. Marcel Dekker.	
	Marshall WE and Wadsworth JI. 1994. *Rice Science and Technology*. Marcel Dekker.	
	Mathews RH. 1989. *Legumes Chemistry, Technology and Human Nutrition*. Marcel Dekker.	
	Matz SA. 1969. *Cereal Science*. AVI Publ.	
	Paquot C. 1979. *Standard Methods of Analysis of Oils, Fats and Derivatives*. Pergamon Press.	
	Pomeranz Y. 1987. *Modern Cereal Science & Technology*. VCH Publ.	
	Salunkhe DK.1992. *World Oilseeds: Chemistry, Technology and Utilization*. VNR.	
	Swern D. 1964. *Bailey's Industrial Oil and Fat Products.*InterSci. Publ. 28	
	Watson SA and Ramstad PE.1987. *Corn Chemistry and Technology*.	
COURSE OUTCOMES	1. The student will gain an understanding of processing techniques used for agricultural produce 2. The student will comprehend the effect of processing on nutritional value of agricultural produce	

COURSE CODE FTGC 102

COURSE TITLE LAB IN CEREAL, LEGUME, AND OILSEED PROCESSING TECHNOLOGY

NUMBER OF CREDITS 1

PRE-REQUISITES	The student should have theoretical knowledge regarding components of cereals, pulses, and oilseeds
COURSE OBJECTIVES	1. To familiarize students with elementary analytical methods required to determine the quality of agricultural produce 2. To acquaint students with rudimentary processing of pulses and oilseeds
CONTENT	

1.	Market Survey of Cereals, Legumes, Minor Millets, Oilseeds and their Products	**30 hours**
2.	Physicochemical Tests for Quality of Cereals, Legumes, and Oilseeds	
3.	Determination of Amylose in Rice	
4.	Extraction of Gluten from Cereals	
5.	Development of Simulated Milk and Milk Products from Soy	
6.	Preparation of Extruded Products from Pulses	
7.	Preparation of Peanut Butter	
8.	Determination of Fractional Properties of Cereals and Pulses (bulk density, true density, angle of repose, angle of friction)	
9.	Determination of Anti-Nutritional Factors in Legumes	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTGC 101	
COURSE OUTCOMES	1. The student will be able to practically analyse the quality of agricultural produce 2. The student will be able to design and develop agriculture-based processed products	

COURSE CODE FTGC 103
COURSE TITLE MEAT, POULTRY, FRESHWATER, AND MARINE FOOD TECHNOLOGY
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should be aware of the contribution of flesh foods to human nutrition	
COURSE OBJECTIVES	1. To acquaint students with the types and grades of meat, poultry, and sea foods 2. To familiarize students with processing techniques used for the production of commercial meat, poultry, and sea foods	
CONTENT		
1	**MEAT PROCESSING**	**15 hours**
1.1	Muscle Structure, Meat Composition, Nutritional Value, Slaughtering and Post-Mortem Chemistry, Colours, and Flavours of Livestock – *buffaloes, sheep, goat, pigs, rabbits*	
1.2	Ante-Mortem Handling of Livestock	
1.3	Microbiology and Safety of Livestock	
1.4	Grading of Livestock and Quality of Meat	
1.5	Storage, Preservation, and Sensory Evaluation of Meat and Meat Products	
1.6	Meat and Processed Meat Products – *pickling, canning, drying, curing, smoking, kebabs, mince, salami, sausages, corned, intermediate moisture and dried meat products*	
1.7	Dressing of Meat – *offal handling and inspection*	
1.8	By-product Utilization	
1.9	Packaging of Meat and Meat Products	

2	**POULTRY PROCESSING**	**15 hours**
2.1	Muscle Structure, Composition, Nutritional Value, Meat Processing Operations, Colours and Flavours – *chicken, duck, quail*	
2.2	Ante-Mortem Handling of Poultry Species	
2.3	Microbiology and Safety of Poultry Species	
2.4	Grading of Poultry Species and Eggs	
2.5	Storage, Preservation, and Sensory Evaluation Techniques	
2.6	Poultry Food Products – *mince, salami, sausages, egg powder*	
2.7	By-product Utilization	
2.8	Packaging of Poultry and Poultry Products	
3	**FRESHWATER AND MARINE FOOD PROCESSING**	**15 hours**
3.1	Muscle Structure, Composition, Nutritional Value, Processing Operations, Colours and Flavours – *fleshy fish and shell fish*	
3.2	Post-Mortem Chemistry of Marine Foods	
3.3	Microbiology and Safety of Marine Foods	
3.4	Grading of Marine Foods	
3.5	Storage, Preservation, and Sensory Evaluation Techniques	
3.6	Marine Food Products	
3.7	By-product Utilization	
3.8	Packaging of Marine Food Products	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Forrest JC. 1975. *Principles of Meat Science*. Freeman.	
	Govindan TK. 1985. *Fish Processing Technology*. Oxford & IBH.	
	Hui YH. 2001. *Meat Science and Applications*. Marcel Dekker.	
	Kerry J. et al. 2002. *Meat Processing*. Woodhead Publ. CRC Press.	
	Levie A. 1984. *Meat Hand Book*. Fourth Edition. AVI Publ.	
	Mead M. 2004. *Poultry Meat Processing and Quality*. Woodhead Publ.	
	Mead GC. 1989. *Processing of Poultry*. Elsevier.	
	Pearson AM and Gillett TA. 1996. *Processed Meat*. Third Edition. Chapman & Hall.	
	Stadelman WJ and Cotterill OJ. 2002. *Egg Science and Technology*. Fourth Edition. CBS.	
COURSE OUTCOMES	1. The student will gain an understanding of the composition of flesh foods 2. The student will be theoretically competent with flesh food processing techniques and their effect on nutritional value	

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COURSE CODE FTGC 104

COURSE TITLE LAB IN MEAT, POULTRY, FRESHWATER, AND MARINE FOOD TECHNOLOGY

NUMBER OF CREDITS 1

PRE-REQUISITES	The student should have knowledge about the nutrient value of flesh foods	
COURSE OBJECTIVES	1. To make students practically competent in analysing characteristics of importance in meats, poultry, and sea foods 2. To enable students to formulate and prepare processed meat, poultry, and sea food products	
CONTENT		
1.	Inspection and Grading of Eggs	**30 hours**
2.	Development, Preparation, and Analysis of Meat Products	
3.	Development, Preparation, and Analysis of Poultry Food Products	
4.	Development, Preparation, and Analysis of Freshwater and Marine Food Products	
5.	Preparation and Analysis of Preserved Meat, Poultry, and Marine Food Products	
6.	Estimation of Meat:Bone Ratios	
7.	Shelf-life Studies on Processed Meat Products	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTGC 103	
COURSE OUTCOMES	1. The student will gain an understanding of quality parameters utilized in the flesh food processing industry 2. The student will be able to develop food products related to flesh foods	

COURSE CODE FTGC 105

COURSE TITLE DAIRY TECHNOLOGY

NUMBER OF CREDITS 3

PRE-REQUISITES	The student should have knowledge of chemistry and microbiology	
COURSE OBJECTIVES	1. To acquaint students with the varied types of dairy products 2. To familiarize students with processing techniques specific to the dairy industry	
CONTENT		
1	**MILK**	**15 hours**
1.1	Definition, Sources, Composition, Nutritive Value, and Procurement of Milk	
1.2	Quality Tests, Grading, and Labelling of Milk	

1.3	Storage and Transportation	
1.4	Processing and Packaging	
1.5	Sensory Evaluation of Dairy and Dairy Products: *terminology; score card for milk, butter, cream; defects*	
2	**MILK PRODUCTS**	
	Manufacture, Composition, Quality Standards, Varieties, and Nutritive Value of the following:	
2.1	Types of Milk – *whole milk, low-fat milk, toned milk, double toned milk, fortified milk, flavoured milk, spray dried milk*	**15 hours**
2.2	Processed Milk Products – *cream, butter, dairy whiteners, condensed milk, ice creams*	
2.3	Fermented Milk Products – *cheese, yoghurt, curds, lassi, shrikhand, buttermilk*	
2.4	Other Milk Products – *ghee, khoa, chenna, paneer, rasogulla, shrikhand, barfi, kalakhand, kulfi*	
3	**ADVANCES IN DAIRY TECHNOLOGY**	
3.1	Application of Membrane Technology (*ultrafiltration, monofiltration, microfiltration, reverse osmosis, ion exchange and electrodialysis processes*) in Fluid Milk Processing	**15 hours**
3.2	Irradiation of Milk	
3.3	Application of Stabilizers and Emulsifiers in Dairy Products	
3.4	Application of Enzymes and Developments in Biotechnology for Milk Products	
3.5	Probiotics – *definition and products*	
3.6	Packaging of Dairy Products	
PEDAGOGY	Lectures/ Assignments/ Seminars	

REFERENCE BOOKS	Aneja RP, Mathur BN, Chandan RC and Banerjee AK. 2002. *Technology of Indian Milk Products*. Dairy India Publ.	
	De S.1980. *Outlines of Dairy Technology*. Oxford Univ. Press.	
	Henderson JL. 1971. *Fluid Milk Industry*. AVI Publ.	
	Rathore NS et al. 2008. *Fundamentals of Dairy Technology-Theory & Practices*. Himanshu Publications	
	Spreer E. 1993. *Milk and Dairy Products*. Marcel Dekker.	
	Walstra P. 1999. *Dairy Technology*. Marcel Dekker.	
	Walstra P. (Ed.). 2006. *Dairy Science and Technology*. Second Edition. Taylor & Francis.	
	Web BH, Johnson AH and Lansford JA. 1987. *Fundamentals of Dairy Chemistry*. Third Edition. AVI Publ.	
COURSE OUTCOMES	1. The student will gain an understanding of processing techniques used in the dairy industry 2. The student will be able to develop products from processing of milk	

COURSE CODE FTGC 106
COURSE TITLE LAB IN DAIRY TECHNOLOGY
NUMBER OF CREDITS 1

PRE-REQUISITES	The student should have knowledge of chemistry and microbiology	
COURSE OBJECTIVES	1. To acquaint students with quality control tests specific to the dairy industry 2. To make students competent in practically performing fundamental dairy processing techniques	
CONTENT		
1.	Market Survey of Milk and Milk Products	**30 hours**
2.	Platform Tests in Raw Milk	
3.	Nutrient Analysis of Milk – Fat, Lactose, SNF	
4.	Preparation and Evaluation of Curds	
5.	Preparation and Evaluation of Butter, Ghee, and *Paneer*	
6.	Preparation and Evaluation of Indian Milk Sweets (*rasgulla, shrikhand, gulab jamun*)	
7.	Development of a high-protein, low-fat Dairy Product	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTGC 105	
COURSE OUTCOMES	1. The student will be able to practically assess the quality of milk for nutritional value and safety 2. The student will gain a practical understanding of the preparation of milk products	

COURSE CODE FTGC 107
COURSE TITLE BEVERAGE TECHNOLOGY
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should have knowledge of chemistry and microbiology	
COURSE OBJECTIVES	1. To acquaint students with the particulars of manufacturing industrial beverages 2. To familiarize students with the quality requirements of bottled beverages	
CONTENT		
1	**WATER AS AN INDUSTRIAL BEVERAGE**	**5 hours**
1.1	Status of the Beverage Industry in India and Globally	

1.2	Types of Bottled Water – *Mineral Water, Spring Water, Flavoured Water, Carbonated Water*	
1.3	Packaged Drinking Water – *Manufacturing Process, Raw and Processed Water, Water Treatment*	
1.4	Quality Standards of Bottled and Packaged Water	
2	**CARBONATED AND NON-CARBONATED BEVERAGES**	**20 hours**
2.1	Beverage Ingredients and their Functions – *sweeteners, bulking agents, acidulants, flavourings, preservatives, Oxygen Radical Absorbance Capacity (ORAC) value*	
2.2	Concentrated Beverages – *ingredients, processing techniques, standards, and sensory evaluation*	
2.3	Carbonated Beverages - *ingredients, processing techniques, standards, and sensory evaluation*	
2.4	Fruit- and Vegetable-based Beverages – *ingredients, processing techniques, standards, and sensory evaluation*	
2.5	Synthetic Beverages - *ingredients, processing techniques, standards, and sensory evaluation*	
2.6	Beverages used in the Sports Industry – *types, ingredients, processing techniques, standards, and sensory evaluation*	
2.7	Indigenous Beverages for Domestic and Commercial Use – *sugarcane juice, cashew apple extract, coconut palm sap, kadhas (traditional decoctions)*	
2.8	Tea, Coffee, and Cocoa - *production, processing, types, standards, and sensory evaluation*	
3	**ALCOHOLIC BEVERAGES**	**20 hours**
3.1	Distillation and Distilled Liquors – *whisky, rum, gin, vodka, brandy*	
3.2	Fermentation and Fermented Alcohols – *wine, ciders, sake*	
3.3	Carbonated Alcohols – *beer, champagne*	
3.4	Indigenous Alcohol Production – *urak, feni, toddy*	
3.5	Liqueurs and Aperitifs	
3.6	Sensory Evaluation	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Hui YH et al 2004. *Handbook of Food and Beverage Fermentation Technology*. Marcel Dekker.	
	Priest FG & Stewart GG. 2006. *Handbook of Brewing*. Second Edition. CRC.	
	Richard P Vine. 1981. *Commercial Wine Making - Processing and Controls*. AVI Publ.	
	Varnam AH and Sutherland JP. 1994. *Beverages: Technology, Chemistry and Microbiology*. Chapman & Hall.	
	Woodroof JG and Phillips GF.1974. *Beverages: Carbonated and Non-Carbonated*. AVI Publ.	

COURSE OUTCOMES	1. The student will gain an understanding of processing techniques used in the beverage industry 2. The student will comprehend the role of ingredients in beverage manufacture	

COURSE CODE FTGC 108
COURSE TITLE LAB IN BEVERAGE TECHNOLOGY
NUMBER OF CREDITS 1

PRE-REQUISITES	The student should have knowledge of chemistry and microbiology	
COURSE OBJECTIVES	1. To acquaint students with the production of industrial beverages 2. To familiarize students with the quality control tests of importance in the beverage industry	
CONTENT		
1.	Preparation of Non-Carbonated Beverages	**30 hours**
2.	Preparation and Evaluation of Wine	
3.	Estimation of Sulphur Dioxide in Beverages	
4.	Estimation of Ascorbic Acid Content of Commercial Juices	
5.	Estimation of Phenolic Content in Beverages	
6.	Analysis of Mineral Content of Bottled Water	
7.	Analysis of Nutrient Content in Sports Drinks	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTGC 107	
COURSE OUTCOMES	1. The student will be able to analyse the quality of commercial beverages 2. The student will be able to produce different types of beverages	

COURSE CODE FTGC 109
COURSE TITLE PRE- AND POST-HARVEST TECHNOLOGY OF HORTICULTURE PRODUCE
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should have knowledge of food microbiology and chemistry	
COURSE OBJECTIVES	1. To acquaint students with the principles and methods of preserving fruits and vegetables 2. To familiarize students with the processing techniques of horticultural produce	
CONTENT		
1	**VEGETABLES**	**15 hours**
1.1	Classification, Types, Composition, and Nutritive Value of Vegetables	
1.2	Harvesting Indices	

1.3	Storage of Fresh Produce – *principles, methods, and techniques*	
1.4	Transportation, Packaging, and Marketing of Fresh Produce	
1.5	Spoilage and Quality Control Measures	
1.6	Principles of Genetics and Cytogenetics	
2	**FRUITS**	**15 hours**
2.1	Classification, Types (simple and aggregate), Composition, and Nutritive Value of Fruits	
2.2	Harvesting Indices	
2.3	Storage of Fresh Produce – *principles, methods, and techniques*	
2.4	Transportation, Packaging, and Marketing of Fresh Produce – *storage and ascorbic acid drip*	
2.5	Spoilage and Quality Control Measures	
2.6	Dry land and Ornamental Horticulture	
3	**PROCESSING TECHNOLOGY**	**15 hours**
3.1	Quality Requirements of Raw Material for Processing	
3.2	Primary Processing Techniques – *minimal processing, grading, sorting, cleaning, washing, peeling, slicing, blanching*	
3.3	Processing for Pulps, Purees, and Concentrates	
3.4	Processing for Pickles, Gravies, Powders, Sauces, Soups	
3.5	Processing for Jams, Jellies, Marmalades, Confectioneries	
3.6	Dehydrated & Osmotically Dehydrated Fruits and Vegetables	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Kadar AA.1992. *Post-harvest Technology of Horticultural Crops*. Second Edition. University of California.	
	Lal G, Siddapa GS and Tandon GL.1986. *Preservation of Fruits and Vegetables*. ICAR.	
	Pantastico B. 1975. *Post-Harvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables*. AVI Publ.	
	Salunkhe DK, Bolia HR and Reddy NR. 1991. *Storage, Processing and Nutritional Quality of Fruits and Vegetables. Vol. I. Fruits and Vegetables*. CRC.	
	Thompson AK. 1995. *Post-Harvest Technology of Fruits and Vegetables*. Blackwell Sci.	
	Verma LR. & Joshi VK. 2000. *Post-Harvest Technology of Fruits and Vegetables*. Indus Publ.	
COURSE OUTCOMES	1. The student will gain an understanding of processing techniques used for horticulture produce 2. The student will comprehend the quality characteristics of importance in fresh and processed horticulture produce	

COURSE CODE FTGC 110

COURSE TITLE LAB IN PRE- AND POST-HARVEST TECHNOLOGY OF HORTICULTURE PRODUCE
NUMBER OF CREDITS 1

PRE-REQUISITES	The student should have knowledge of food chemistry	
COURSE OBJECTIVES	1. To practically acquaint students with fundamental fruit and vegetable processing techniques 2. To familiarize students with quality control tests specific to the horticulture industry	
CONTENT		
1.	Preparation of Vegetable Products	**30 hours**
2.	Preparation of Fruit Products	
3.	Preparation of Dehydrated Vegetables	
4.	Preparation of Banana and Potato Wafers	
5.	Preparation of Dried Figs and Raisins	
6.	Vegetable and Fruit Maturity Index Determination and Calculation	
7.	Quality Standard Measurements of Vegetable and Fruit Products	
PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTGC 109	
COURSE OUTCOMES	1. The student will be able to prepare processed vegetable and fruit products 2. The student will gain an understanding of determining quality characteristics and acceptability parameters of horticulture produce	

COURSE CODE FTGC 111
COURSE TITLE SNACK FOOD TECHNOLOGY
NUMBER OF CREDITS 3

PRE-REQUISITES	The student should have knowledge of the types of food	
COURSE OBJECTIVES	1. To acquaint students with the principles involved in the manufacture of commercial snack foods 2. To familiarize students with equipment of importance in the snack food industry	
CONTENT		
1	**GRAIN-BASED SNACKS**	**15 hours**
1.1	Technology for Whole Grains Snacks – *roasted, toasted, puffed, popped, flaked*	
1.2	Technology for Coated Grain Snacks – *salted, spiced, sweetened*	
1.3	Technology for Batter-Based and Dough-Based Products	

1.4	Technology for Formulated Products – *chips, wafers, papads, instant pre-mixes*	
2	**HORTICULTURE PRODUCE-BASED SNACKS**	**15 hours**
2.1	Technology for Fruit-Based Snacks	
2.2	Technology for Vegetable-Based Snacks	
2.3	Technology for Coated Nuts	
3	**EXTRUDED SNACKS**	**15 hours**
3.1	Formulation and Processing Technology (pasta, chips, *chakli*, vermicelli, etc.)	
3.2	Colouring and Flavouring	
3.3	Packaging	
3.4	Machinery and Equipment – *Types, Use and Care*	
3.5	Chemical and Nutritional Changes in Food during Extrusion	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Edmund WL. *Snack Foods Processing*. AVI Publ.	
	Frame ND. 1994. *The Technology of Extrusion Cooking*. Blackie Academic.	
	Gordon BR. 1997. *Snack Food*.AVI Publ	
	Samuel AM. 1976. *Snack Food Technology*. AVI Publ.	
COURSE OUTCOMES	1. The student will gain an understanding of processing techniques used to make snack foods 2. The student will comprehend the use of additives and packaging requirements for snack foods	

COURSE CODE FTGC 112
COURSE TITLE LAB IN SNACK FOOD TECHNOLOGY
NUMBER OF CREDITS 1

PRE-REQUISITES	The student should be aware of the different types of fast foods	
COURSE OBJECTIVES	1. To practically acquaint students with processing techniques utilized for snack foods 2. To familiarize students with evaluation methods for the quality of snack foods	
CONTENT		
1.	Preparation of Snack Foods based on Cereals	**30 hours**
2.	Preparation of Snack Foods based on Pulses	
3.	Preparation of Snack Foods based on Nuts	
4.	Preparation of Snack Foods based on Fruits	
5.	Preparation of Snack Foods based on Vegetables	
6.	Development of Instant Food Pre-Mixes	
7.	Determination of Shelf-Life and Quality Characteristics of Snack Foods	

PEDAGOGY	Experiments in the Laboratory	
REFERENCES	As suggested in FTGC 111	
COURSE OUTCOMES	1. The student will be able to practically prepare snack foods from a variety of raw material 2. The student will be competent in analysing the shelf life and quality of snack foods	

COURSE CODE FTGC 113
COURSE TITLE ENTREPRENEURSHIP AND BUSINESS MANAGEMENT
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have basic understanding of business and marketing	
COURSE OBJECTIVES	1. To familiarize students with business models and their planning and development 2. To acquaint students with the principles and intricacies of managing an enterprise	
CONTENT		
1	**BEING AN ENTREPRENEUR**	**6 hours**
1.1	Definition and Qualities of an Entrepreneur	
1.2	Types of Industry – *cottage and small-scale industry*	
1.3	Market Structure – *macro and micro businesses*	
1.4	Creating a Business Model	
1.5	Brand Creation	
2	**HUMAN RESOURCE MANAGEMENT**	**8 hours**
2.1	Recruitment	
2.2	Training	
2.3	Performance Appraisals	
2.4	Workers' Safety and Welfare	
2.5	Employees' Union	
3	**MARKETING MANAGEMENT**	**8 hours**
3.1	Functions of Marketing	
3.2	Market Intelligence - s*urvey techniques, demand & supply*	
3.3	Market Forecasting – *consumer behaviour and trends*	
3.4	Segmentation, Targeting, and Positioning	
3.5	Marketing Network	
3.6	E-Marketing and E-Procuring	
4	**ADVERTISING AND COMMERCIALIZATION**	**8 hours**
4.1	Objectives of Advertising	
4.2	Advertising Message	
4.3	Budgeting	
4.4	Media Selection	

4.5	Personal Selling and Publicity	
4.6	Sales Promotion	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Chhabra TN and Suria RK. 2001. *Management Process and Perspectives*. KitabMahal.	
	Jhingan ML. 2005. *International Economics*. 5th Ed. Virnda Publ.	
	Kotler P. 2000. *Marketing Management*. Prentice Hall.	
	Reddy SS, Ram PR, Sastry TVN and Bhavani ID. 2004. *Agricultural Economics*. Oxford & IBH.	
COURSE OUTCOMES	1. The student will gain an understanding of intricacies involved in starting a business 2. The student will gain the ability to market, appraise, and advertise a business	

COURSE CODE FTGC 114
COURSE TITLE FOOD PLANT LAYOUT AND DESIGN
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have basic knowledge of the types of equipment used for food production and processing	
COURSE OBJECTIVES	1. To familiarize students with floor plans required by food processing units 2. To acquaint students with the principles of design needed to maintain hygiene and quality in a food processing unit	
CONTENT		
1	**FOOD PLANT DESIGN**	**12 hours**
1.1	Site Location, Plant Plan and Elevation, Feasibility Studies – *importance, method, and analysis*	
1.2	Plant Design Specifics – *flow charts, interconnections, raw material flows, permanent/temporary storage, shop facilities, office spaces, delivery and shipping facilities, access ways*	
1.3	Modernization, Automation, and Capacity Expansion of Existing Facilities	
1.4	Relocating an Existing Plant	
1.5	Principles for Hygienic Plant Design	
1.6	Legal Aspects	
2	**FOOD PLANT LAYOUT**	**12 hours**
2.1	Objectives of a Layout	
2.2	Types and Flow Patterns of Layouts (small-, medium-, and large-scale units)	
2.3	Utility Inclusions in Food Plants (*water, steam, electricity, effluents)*	
2.4	Illumination and Ventilation – *importance and incorporating it in designs*	
2.5	Layout Design Procedure	
2.6	Symbols used in Design and Layout	

2.7	Building Materials – *factors for selection, properties of materials*	
2.8	Plant Flooring – *requirements, maintenance, structural aspects*	
3	**FOOD PROCESS SCHEDULE**	
3.1	Plant Operations – *models and techniques used in operation research (linear programming, dynamic programming, queuing theory, inventory theory, CPM and PERT techniques, Game Theory)*	**6 hours**
3.2	Benefits of Scheduling Operations	
3.3	Planning for Food Process Schedules	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Sharma A.K. and Kumbhar B.K. 2020. *Food Processing Plant Design and Layout*. KitabMahal.	
	Lopez-Gomez A. and Barbosa-Canovas GV. 2005. *Food Plant Design*. CRC Press.	
	Baker CGJ. 1995. *Handbook of Food Factory Design*. Springer.	
COURSE OUTCOMES	1. The student will gain an understanding of methods involved in designing a food industry 2. The student will gain the ability to apply the theories of food plant design to practice for efficient functioning of a food enterprise	

COURSE CODE RSOC 101
COURSE TITLE RESEARCH METHODOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should possess basic understanding of collecting data for experiments	
COURSE OBJECTIVES	1. To acquaint students with the principles and methods of scientific research 2. To familiarize students with scientific methods of data collection and processing	
CONTENT		
1	**UNDERSTANDING RESEARCH**	**10 hours**
1.1	Significance, Purpose, and Types of Research	
1.2	Research Designs – *types and uses*	
1.3	Sampling Methods and Scaling Techniques	
1.4	Research Informatics	
2	**DATA COLLECTION AND PROCESSING**	**10 hours**
2.1	Types and Methods of Data Collection - *primary and secondary data, merits and demerits*	
2.2	Designing and Pre-Testing a Questionnaire	
2.3	Interviews – *types and techniques*	
2.4	Data Processing – *classification, coding, scrutinizing, editing, and coding data*	
2.5	Tabulation and Graphical Presentation of Data	

3	**THE RESEARCH PROCESS**	**10 hours**
3.1	Defining the Problem	
3.2	Research Questions, Objectives, and Hypothesis	
3.3	Planning the Research – *methodology and tools*	
3.4	Ethics and Misconduct in Research	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Kotahri, C.R. (2009): Research Methodology: Methods and Techniques, 2nd Revised Ed. Reprint, New Age International Publishers	
	Singh YK. 2006. Fundamentals of Research Methodology and Statistics. New Age International Publishers.	
	Krishnan V. 2011. Statistics for Beginners. Atlantic Publishers and Distributors (P) Ltd.	
	Jackson SL. 2012. Research Methods and Statistics: A Critical Thinking Approach. Fourth Edition. Wadsworth Cengage Learning.	
COURSE OUTCOMES	1. The student will be able to design a research proposal 2. The student will be able to conduct a scientific study based on the principles of research	

COURSE CODE RSOC 102
COURSE TITLE + ACADEMIC WRITING
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have a basic understanding of the difference between scientific and fictional writing	
COURSE OBJECTIVES	1. To expose students to different forms of academic writing 2. To inculcate scientific writing skills that prevent plagiarism 3. To encourage students to practice writing so as to deliver quality literature review and analysis	
CONTENT		
1	**INTRODUCTION TO SCIENTIFIC WRITING**	**10 hours**
1.1	Importance and Rules of Academic Writing	
1.2	Styles of Research Writing	
1.3	Plagiarism – *definition, tools for the detection of plagiarism, avoiding plagiarism*	
1.4	Journal and Author Metrics – *Impact Factor, CiteScore, SNIP, Google Scholar Metrics, Eigenfactor, H-Index, G-Index, M-Index, UGC-Care Journals, Scopus-Indexed Journals)*	
1.5	Challenges in Research Writing	
2	**LITERATURE REVIEW**	

2.1	Source of Literature and Process of Literature Review	**10 hours**
2.2	Online Literature Databases, Open Educational Resources for Learning and Research, and Literature Management Tools	
2.3	Referencing and Citation – *APA and MLA styles, in-text, bibliography*	
2.4	The Writing Process – *pre-writing, writing, re-writing*	
2.5	Paragraph Structure and Rhetorical Modes	
2.6	Effective use of Quotations, Paraphrase, and Summary; Stylistics (vocabulary and conciseness)	
3	**REPORT AND THESIS WRITING**	**10 hours**
3.1	Inclusions - *cover and title pages, abstract, introduction, table and figure formats, text, objectives, methodology, analysis, summary, conclusion, bibliography*	
3.2	Layouts – *fonts, spacing, visual effects, labelling, visual presentation of data, creating images using Biorender and Canva, and related aspects*	
3.3	Practical – Writing a Scientific Report/ Review Article	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Ajay Semalty, Academic Writing, 2021, ISBN: 9789390211739, BS Publications, Hyderabad, India; https://bspublications.net/book_detail.php?bid=1574	
	Ajay Semalty, Mona Semalty, Art of Writing and Publishing in Pharmaceutical Journals, 2021, ISBN: 9789386819994, Pharma Med Press, Hyderabad, India, https://bspublications.net/	
	Judith Clare Helen Hamilton, Writing Research: Transforming Data into Text, 2003, ISBN 9780443071829, Churchill Livingstone, https://www.elsevier.com/books/writing-research/clare/978-0-443-07182-9	
	Mathukutty M Monippally, Academic Writing: A Guide for Management Students and Researchers, ISBN 9788132104414, Sage Publications, New Delhi, India.	
	Semalty A, Literature Search & Reference Management in Academic Writing, https://pharmastate.academy/courses/literature-search-reference-managements/	
	Semalty A, Genuine Book Writing, https://docstate.academy/courses/genuine-book-writing/	
	Semalty A, Systematic Review & Meta-analysis, https://docstate.academy/courses/systematic-review-meta-analysis/	
	Semalty A., Systematic Review & Meta-analysis (Advanced), https://docstate.academy/courses/systematic-review-and-meta-analysis	
	Semalty A., Qualitative Research And Review Writing, https://docstate.academy/courses/qualitative-analysis-and-review-writing/	
	Report Writing, IGNOU, https://egyankosh.ac.in/handle/123456789/14018	
	Peter, V. John, Writing a Research Paper, IGNOU, https://egyankosh.ac.in/handle/123456789/35677	

	UGC, Guidance Document "Good Academic Research Practices"; Sept. 2020, https://www.ugc.ac.in/e-book/UGC_GARP_2020_Good%20Academic%20Research%20Practices.pdf	
	Gupta, Anju Sahgal, Copyright and Plagiarism, https://egyankosh.ac.in/handle/123456789/72449	
COURSE OUTCOMES	1. The student will be able to demonstrate ability to write for an academic audience 2. The student will be able to avoid plagiarism and employ idiomatic vocabulary for effective writing 3. The student will be able to identify journals of merit for the collection of information and for publishing scientific work	

COURSE CODE RSOC 103
COURSE TITLE FUNDAMENTALS OF STATISTICS
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should be knowledgeable about basic mathematics and computations	
COURSE OBJECTIVES	1. To acquaint students with the principles of data processing and data inference 2. To familiarize students with statistical principles and techniques 3. To hone the analytical skills of students	
CONTENT		
1	**DESCRIPTIVE STATISTICS**	**8 hours**
1.1	Measures of Central Tendency – *Mean, Mode, and Mode for Grouped and Ungrouped Data*	
1.2	Measures of Variability – *Range, Variance, Standard Deviation, and Standard Error*	
1.3	Measures of Relative Positions - *Sigma Scores, Standard Scores, Interquartile Range, Percentiles, Percentile Ranks*	
1.4	Calculations and Interpretation of Statistical Procedures	
2	**DATA DISTRIBUTION AND INFERENCE**	**14 hours**
2.1	Probability – *Randomness, Probability Models, Probability Laws*	
2.2	Permutation, Combinations, and Binomial Distribution - *Mean & Variance of Binomial Distribution, Properties of Binomial Distribution, Conditions under which it is applicable, Fitting of Binomial Distribution*	
2.3	Poisson Distribution - *Mean & Variance of Poisson Distribution, Properties of Poisson Distribution, Conditions under which it is applicable, Fitting of Poisson Distribution*	
2.4	Normal and Gaussian Curve - *Normal Distribution and Standard Normal Distribution, Normal Probability Curve, Properties of Normal Distribution. Examples Based on Area under Normal Curve, Data Transformation*	
2.5	Measures of Distribution Curve - *Skewness, Kurtosis*	

3	**MEASURE OF RELATIONSHIP BETWEEN VARIABLES**	**8 hours**
3.1	Scatterplots and Correlation	
3.2	Regression and Regression Coefficients	
3.3	Linear and Multiple Regression	
3.4	Application of Correlation and Regression in Food Sciences	
3.5	Introduction to Parametric and Non-Parametric Tests	
PEDAGOGY	Lectures/ Assignments/ Problem-Solving	
REFERENCE BOOKS	Krishnan V. 2011. Statistics for Beginners. Atlantic Publishers and Distributors (P) Ltd.	
	Singh YK. 2006. Fundamentals of Research Methodology and Statistics. New Age International Publishers.	
	Jackson SL. 2012. Research Methods and Statistics: A Critical Thinking Approach. Fourth Edition. Wadsworth Cengage Learning.	
COURSE OUTCOMES	1. The student will be able to choose the appropriate statistical test for an intended outcome 2. The student will be able to competently analyse data	

COURSE CODE RSOC 104
COURSE TITLE CREATIVE AND SOCIAL MEDIA WRITING
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should possess knowledge of verbal and written English	
COURSE OBJECTIVES	1. To acquaint students with the nuances of creating social media content 2. To familiarize students with creative writing techniques	
CONTENT		
1	**CONTENT WRITING**	**10 hours**
1.1	Types of Content Writing - *Articles, Blogs, E-Books, Newsletters*	
1.2	Content Distribution Channels - *Text, Voice, Videos, Posts, Infographics*	
1.3	Keyword Research - *Types of Keywords, Competitive Keywords, SEO*	
1.4	Internet Research Tools, Keyword Planners	
1.5	Plagiarism in Content Writing	
2	**SOCIAL MEDIA WRITING**	**10 hours**
2.1	Difference between Print, Speech, and Social Media Marketing	
2.2	Creative Writing in Digital Marketing, Content Writing vs Copywriting	
2.3	Social Media Marketing and Content Creation, Social Media Research Tools - *Twitter/Facebook Analytics, Surveybot, Social Mention*	

2.4	Hashtags and Video Scripting for Social Media Posts	
2.5	Content Feedback and Social Media Metrics: *Keyhole, Buffer*	
3	**PRACTICAL APPLICATION OF CONTENT WRITING**	**10 hours**
3.1	Google Analytics, Semrush, Google Developers Tool, Google My Business	
3.2	Google Trends, Keyword Planner, keyword.io	
3.3	Google Adsense, 3rd Party Tools	
3.4	Vimeo, Facebook, Instagram, Reels	
3.5	Grammarly, Small SEO tools, Aminstitute Headline Analyzer	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Ajayi, J. (2020) The Ultimate Beginner's Guide to Content Writing. Kindle.	
	Halvorson, K. and Rach, M. (2012) Content Strategy for the Web. New Riders.	
	Robinson, J. (2020) Content Writing Step-By-Step. Amazon Digital Services.	
COURSE OUTCOMES	1. The student will be able to write content for products 2. The student will understand analytics for related content 3. The student will be able to use online tools for content optimisation	

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COURSE CODE RSOC 105
COURSE TITLE FOOD PRODUCT DEVELOPMENT AND INTERNATIONAL TRADE
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have basic understanding of the characteristics of food and the importance of marketing	
COURSE OBJECTIVES	1. To acquaint students with techniques of Product Development and International Trade for the food sector 2. To equip students with knowledge of Intellectual Property Rights (IPR), related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge-based economy	
CONTENT		
1	**INNOVATIONS IN FOOD PRODUCT DEVELOPMENT**	**6 hours**
1.1	Definition and Need for Food Product Development	
1.2	Factors affecting Food Product Development – *corporate factors, market factors, technological pressures, government issues and legislations*	
1.3	Classes and Characteristics of New Food Products	
1.4	Line Extensions and Repositioning of Existing Products	

1.5	Reformulations and New Packaging as a means of New Product Development	
1.6	Ethics in Food Product Development	
2	**FOOD PRODUCT DEVELOPMENT PROCESS**	
2.1	Stages/ Phases of New Product Development – *idea generation, screening, feasibility studies, consumer research, financial review, product design and formulation*	
2.2	Process Development – *recipe development and scale-up, consumer trials, market testing*	**6 hours**
2.3	Quality Assessment of New Developed Products – *sensory evaluation, shelf-life testing*	
2.4	Packaging and Labelling Protocols	
2.5	Costing/ Pricing and Economic Evaluation of the Product	
2.6	Product Launch and Product Life Cycle	
3	**SPECIALITY FOOD PRODUCTS**	
3.1	Therapeutic and Medical Foods	
3.2	Infant Foods	
3.3	Geriatric Foods	
3.4	Functional Foods and Nutraceuticals	**6 hours**
3.5	Herbal Foods	
3.6	Sports Drinks	
3.7	Prebiotics and Probiotics	
4	**INTERNATIONAL TRADE**	
4.1	Salient Features of International Marketing	
4.2	International Marketing Environment	
4.3	Export Regulation – *direct, indirect, licensing and joint ventures*	**6 hours**
4.4	Product Promotion and Pricing, Distribution Channels	
4.5	World Trade Organization (WTO) – *role in international trade*	
5	**INTELLECTUAL PROPERTIES (IPs)**	
4.1	Historical Perspective and Need for the Introduction of Intellectual Property Right regime	
4.2	TRIPs and Provisions in TRIPs Agreement	
4.3	Intellectual Property Rights (IPR) - *benefits of securing IPRs*	
4.4	Indian Legislations for the protection of various types of Intellectual Properties	**6 hours**
4.5	Fundamentals of Patents, Copyrights, Geographical Indications, Trade Secrets, Traditional Knowledge, and Trademarks	
4.6	Protection of Plant Varieties and Farmers' Rights Act (PPV & FRA) and National Biodiversity Board	
4.7	Material Transfer Agreements, Research Collaboration Agreements, License Agreements	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Erbisch FH and Maredia K. 1998. *Intellectual Property Rights in Agricultural Biotechnology*. CABI, Wallingford.	
	Ganguli, Prabudha. 2001. I*ntellectual Property Rights: Unleashing Knowledge Economy*. McGraw-Hill, New Delhi.	

	India, Ministry of Agriculture. 2004. *State of Indian Farmer. Vol. 5.* Technology Generation and IPR Issues. Academic Foundation, New Delhi.	
	Intellectual Property Rights: Key to New Wealth Generation.2001. NRDC and Aesthetic Technologies, New Delhi.	
	Rothschild, Max & Newman, Scott (Ed.). 2003. *Intellectual Property Rights in Animal Breeding and Genetics*. CABI, Wallingford.	
	Saha R. (Ed.). 2006. *Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies*. Daya, Delhi.	
	The Indian Acts - Patents Act, 1970 & Amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 & amendments; Layout Design Act, 2000; PPV & FR Act 2001, and Rules 2003; National Biological Diversity Act, 2003.	
COURSE OUTCOMES	1. The student will be able to understand Product Development and International Trade for the food sector 2. The student will gain the ability to understand Intellectual Property Rights and their value in economy	

COURSE CODE RSOC 106
COURSE TITLE FOOD SENSORY SCIENCE AND FLAVOUR TECHNOLOGY
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have a basic understanding of food science and chemistry	
COURSE OBJECTIVES	1. To acquaint students with the attributes of food that guide consumer acceptability 2. To equip students with the knowledge of designing appropriate sensory evaluation tests	
CONTENT		
1	**FOOD AND BEVERAGE QUALITY**	**10 hours**
1.1	Need for Food Quality Control and Factors Influencing Food Quality - *soil, harvesting practices, processing procedures and conditions, packaging, transportation, storage conditions*	
1.2	Quality Attributes – *dominant and hidden attributes in food*	
1.3	Role of Colour in Quality Spectra – *types of colour-measuring instruments*	
1.4	Role of Viscosity in Food Quality – *types of fluids, types of viscometers*	
1.5	Food and Beverage Consistency – *methods used to measure consistency, difference between viscosity and consistency*	
1.6	Food Size and Shape – *methods used to find shape and size of food products, influence on consumer acceptability*	

1.7	Defects in Foods – *genetic, physiological, entomological, structural, mechanical, measurement of defects, preventing and overcoming defects*	
2	**SENSORY EVALUATION OF FOODS AND BEVERAGES**	**10 hours**
2.1	Overview of Sensory Evaluation Tests; Subjective vs. Objective Methods of Analysis	
2.2	Taste – *mechanism of taste perception, chemical dimensions of basic tastes (sweet, salt, sour, bitter and umami), factors affecting taste quality, reaction time, taste modification, absolute and recognition threshold, taste abnormalities, taste measurement*	
2.3	Odour/Aroma – *physiology and mechanism of odour perception, odour classification, chemical specificity of odour, odour measurement, olfactory abnormalities*	
2.4	Colour – *dimensions and attributes of colour, appearance factors, colour perception and abnormalities, measurement of colour*	
2.5	Texture/Mouth feel – *definition and importance of texture, texture perception and receptors involved, texture classification and measurement*	
2.6	Flavour – *definition, role in food quality, measurement of flavour*	
2.7	Trigeminal Sensations	
2.8	Threshold & Instrumental Measurements of Sensory Attributes of Foods & Beverages – *correlation of the latter with sensory perception*	
2.9	Product Development and Optimization based on Sensory Evaluation	
3	**FLAVOUR TECHNOLOGY**	**10 hours**
3.1	Problems in Flavour Research – *classification of food flavours, chemical compounds responsible for flavour*	
3.2	Flavour and Taste Perception - *flavour compounds, volatile flavour compounds, chemesthesis and chemesthetic responses, tactile response, aroma compounds, flavour profile, bio-flavour and reconstituted flavour*	
3.3	Flavour Concepts - *Onion-Beverage-Maillard reaction-Thio-stench, flavour legislation, flavour release, principles to predict the performance of polymeric flavour delivery systems, delivery of flavours from food matrices*	
3.4	Packaging and Flavour Compounds	
3.5	Use of Biotechnology to develop Flavours	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Krammer and Twigg. 1966. *Fundamentals of Quality Control for Food Industry*, Avi Publishing Company.	
	Herschdoerfer. 2012. *Quality Control in Food Industry*. Elsevier.	
	Civillie and Carr. 2015. *Sensory Evaluation Techniques*. CRC Press.	
	Stone, Bleibaum and Thomas. 2012. *Sensory Evaluation Practices*. Academic Press.	

	Fisher, Carolyn and Thomas R. Scott. "Food Flavours Biology and Chemistry". The Royal Society of Chemistry, 1997.	
	Heath, H.B. and G. Reineccius. "Flavour Chemistry and Technology". CBS Publishers, 1996.	
	Reineccius, Gary. "Flavour Chemistry and Technology". 2nd Edition, Taylor and Francis, 2006.	
	Shahidi, Fereidoon and Chi-Tang Ho. "Flavour Chemistry of Ethnic Foods". Kluwer Academic Plenum, 1999.	
	Ashurst, Philip R. "Food Flavourings". 3rd Edition, Aspen Publications, 1999.	
COURSE OUTCOMES	1. The student will gain a deeper understanding of consumer acceptability of foods based on sensory perception 2. The student will gain the ability to modify sensory attributes of foods to create acceptable food products	

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COURSE CODE RSOC 107
COURSE TITLE INSTRUMENTATION AND PROCESS CONTROL
NUMBER OF CREDITS 2

PRE-REQUISITES	The students should have a basic understanding of math and science	
COURSE OBJECTIVES	1. To enable students to apply basic knowledge of mathematics and science in practice for instrumentation and automation 2. To provide students with a platform to develop basic instruments of use in food technology 3. To assist students in applying the principles of controlled systems as sensed by instruments and feedback for effective control strategies	
CONTENT		
1	**THE CONCEPT OF INSTRUMENTATION**	**10 hours**
1.1	The Purpose & the Types of Instruments – *active, passive, null-type, deflection-type, indicating and signal-output instruments, zero, first and second order instruments*	
1.3	Precision, Repeatability, and Reproducibility of Instruments' Data	
1.4	Measurement Terminology and Calibration of Instruments – *measured variables, measured signals, sensitivity, errors, hysteresis, zero adjustments, and related terms*	
1.5	Thermodynamics and its Applications in Food Technology	
1.6	Basic Concepts of Fluid Mechanics	
2	**INSTRUMENTATION IN FOOD ANALYSIS**	**10 hours**
2.1	Chromatography – *types, principles and use*	
2.2	Spectrophotometry – types, *principles and use*	
2.3	Viscometry – *types, principles and use*	
2.4	Thermogravimetry – *types, principles and use*	

2.5	Cream Separators – *types, principles and use*	
2.6	Plate Freezers – *types, principles and use*	
2.7	Spray Dryers – *types, principles and use*	
3	**INDUSTRIAL PROCESS CONTROL**	**10 hours**
3.1	Functional Elements of an Instrument – *primary sensing element, variable conversion element, variable manipulation element, data transmission element, data storage and data conversion elements, and other related elements*	
3.2	Pasteurizer Control	
3.3	Dehydrator Control	
3.4	Storage Controls	

PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Smith & Vanness, Thermodynamics for Chemical Engineers, MGH Reference books: 1. Richardson, J.F., Peacock, D.G.Coulson & Richardson's Chemical Engineering- Volume 3 ed., First Indian ed. Asian Books Pvt. Ltd. 1998	
	Coughanowr, D. R. and S. E. LeBlanc. (2017).	
	Process Systems Analysis and Control - Third Edition, McGraw Hill, New Delhi.	
	Doebelin, E. O. (1990). Measurement Systems: Application and Design, International Edition, McGraw Hill, Singapore.	
	Ogata, K. (2003). Modern Control Engineering, 5th Edition, Prentice-Hall, New Delhi.	
COURSE OUTCOMES	1. The student will be able to choose instruments for use dependent on the required food processing outcomes 2. The student will gain the ability to practically relate instrument control to product results	

COURSE CODE RSOC 108
COURSE TITLE BUSINESS COMMUNICATION
NUMBER OF CREDITS 2

PRE-REQUISITES	Students should possess basic knowledge of English and grammar	
COURSE OBJECTIVES	1. The student should be able to understand and demonstrate the use of basic and advanced writing techniques that today's technology demands, including anticipating audience reaction 2. Students should be able to write effective and concise letters and memos, and prepare informal and formal reports	
CONTENT		
1	**WRITTEN COMMUNICATION**	**10 hours**
1.1	Challenges in Communication – *the communication process, barriers and gateways to communication*	
1.2	Proof Reading – *importance and techniques*	

1.3	Business Letters – *parts, types, characteristics, and formats*	
1.4	Job Applications – *types, content, and format*	
1.5	Resumes and Covering Letters – *importance, parts, and formats*	
2	**RECRUITMENT AND EMPLOYMENT CORRESPONDENCE**	
2.1	E-mails and Memorandums – *importance, advantages, types, formats*	**10 hours**
2.2	Persuasive and Negative Messages	
2.3	Letters of Acceptance, Resignation, and Promotion	
2.4	Job Descriptions	
2.5	Testimonials and References	
3	**BUSINESS AND SOCIAL ETIQUETTE**	
3.1	Professional Conduct in a Business Setting – *principles, code of ethics*	
3.2	Workplace Hierarchy	**10 hours**
3.3	Making Introductions – *rules of personal and company introductions*	
3.4	Language in the Workplace	
3.5	Appropriate Business Attire	
3.6	Telephone and Table Etiquette	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Essentials of Business Communication, Sixth Edition, Mary Ellen Guffey, South-Western College Publishing.	
	Association for Business Communication	
COURSE OUTCOMES	1. The student will gain an understanding of writing for businesses 2. The student will gain the ability to write for different business needs	

COURSE CODE RSOC 109
COURSE TITLE ADVANCED STATISTICS
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should be knowledgeable about basic sciences and computations	
COURSE OBJECTIVES	1. To acquaint students with the principles and methods of data science 2. To familiarize students with statistical methods for data analysis 3. To acquaint students with statistical applications of MS Excel and SPSS	
CONTENT		
1	**PARAMETRIC TESTS IN DATA SCIENCE**	
1.1	Characteristics and Application of Parametric Tests	**10 hours**
1.2	Introduction to Hypothesis Testing	
1.3	Z-tests and T-tests: *Paired and Unpaired T-test*	

1.4	Pearson Correlation and Discriminant Analysis	
1.5	ANOVA, types of ANOVA: *One-Way, Two-Way, MANOVA*	
1.6	Chi-Square, Types of Chi-Square: *Goodness of Fit, Test of Independence, Test for Homogeneity*	
2	**NON-PARAMETRIC TESTS IN DATA SCIENCE**	**10 hours**
2.1	Characteristics and Application of Non-Parametric Tests	
2.2	Spearman Correlation	
2.3	Introduction to Wilcoxson Signed Rank test, Mann-Whitney and Kruskal-Wallis Test, and Friedman's ANOVA	
2.4	Application of the above Tests in Food and Nutrition-related Research	
3	**STATISTICAL PROCEDURES USING MICROSOFT EXCEL AND SPSS**	**10 hours**
3.1	Introduction to Microsoft Excel: *functions, menus, commands, shortcut keys, applications in statistics*	
3.2	Introduction to SPSS: *functions, menus, commands, shortcut keys, applications in statistics*	
3.3	Input of Data and Data Cleaning/Processing: *Establishing variables, manual and automatic input of data; Data transformation*	
3.4	Descriptive analysis using software: *Mean, Std. Deviation, Frequencies, Charts*	
3.5	Exercises on Linear and Multiple Regression, One-way and Two-way ANOVA, T-test, F-test	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Fundamentals of Applied statistics by Gupta & Kapoor	
	A text book of operations research by S. D. Sharma.	
	Statistical methods by J. Medhi.	
	Fundamentals Mathematical Statistics by Gupta & Kapoor.	
COURSE OUTCOMES	1. The student will be able to process data using MS Excel and SPSS packages 2. The student will be able to utilize higher levels of statistics in data analysis	

COURSE CODE RSOC 110
COURSE TITLE EPIDEMIOLOGY AND HEALTH ECONOMICS
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should be aware of non-communicable and communicable diseases
COURSE OBJECTIVES	1. The student will be able to appreciate the role of epidemiologists in dictating food and nutrient needs of a population

	2. The student will be able to relate the understanding of epidemiology to the food processing industry	
CONTENT		
1	**FUNDAMENTALS OF EPIDEMIOLOGY**	**10 hours**
1.1	Definition, Objectives, Distribution, Determinants, Application, and Tools of Epidemiology and Public Health	
1.2	Historical Aspects and Evolution of Epidemiology	
1.3	Survey Methodology including Sampling and Census	
1.4	Epidemiological Aspects of Diseases of National & International Importance – *diarrhoea, tuberculosis, sexually transmitted diseases, malaria, diabetes, cardiovascular disease, mental health*	
1.5	Demography – *age-gender distribution, measures of fertility, mortality, and morbidity, demographic transition*	
2	**HEALTH MEASUREMENT AND STUDY DESIGN**	**10 hours**
2.1	Epidemiological Measures – *types, reliability, validity, accuracy*	
2.2	Observational Studies – *cross-sectional, descriptive, cohort, case control, before-after, historical perspective, international comparisons*	
2.3	Experimental Studies & Qualitative Research – *mixed designs, ecological studies, familial aggregation studies, and related aspects*	
2.4	Questionnaire Construction	
2.5	Index Construction and Scaling	
2.6	Diagnostic Tests – *types, sensitivity, specificity*	
3	**EPIDEMIOLOGICAL METHODS IN HEALTH MANAGEMENT**	**10 hours**
3.1	National and International Health Programmes – *societal responsibility*	
3.2	Role of Genetic and Environmental Factors in Health Calculation	
3.3	Principles and Economic Models of Health	
3.4	Health Insurance as a prerogative of the Food Industry	
3.5	Health and Economic Development – *pharmaceuticals, nutraceuticals, technological innovation*	
PEDAGOGY	Lectures/ Assignments/ Seminars	
REFERENCE BOOKS	Feldstein, Paul J. 2011. Health Care Economics, 7th Edition. Cengage Learning. On reserve at Hagerty.	
	Henderson, James W. 2014. Health Economics and Policy, 6th Edition. Cengage Learning.	
	Feldstein, Paul J. 2011. Health Policy Issues: An Economic Perspective, 5th Edition. Health Administration Press.	
	Bodenheimer, Thomas, and Kevin Grumbach. 2012. Understanding Health Policy: A Clinical Approach, 6th Edition. McGraw Hill Lange.	

	Morrisey, Michael A. 2013. Health Insurance, 2nd Edition. Health Administration Press.	
	Mankiw, N. Gregory. 2014. Principles of Microeconomics, 7th Edition. Cengage Learning.	
COURSE OUTCOMES	1. The student will gain an understanding of epidemiological science 2. The student will gain the ability to relate epidemiology to the food processing industry	

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COURSE CODE RSOC 111
COURSE TITLE INTERNSHIP
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have knowledge of food science, processing, packaging, and safety	
COURSE OBJECTIVES	1. To provide students an exposure to an industrial set-up 2. To enable the students to observe, first hand, work flow and processes in food industries and associated enterprises	
CONTENT		
1.	Selection of an Industry Relevant to Food and Allied Products	**60 hours**
2.	Working in Department/s within the Selected Industry	
3.	Periodic Analysis of Data and Preparation of Report	
4.	Final Preparation of Internship Report	
PEDAGOGY	Hands-on working experience in the Industry; Internship Report	
REFERENCES	As suggested by the in-charge of internship in the selected industry	
COURSE OUTCOMES	1. The student will be able to appreciate different processing and production technologies in an industrial setting 2. The student will be able to develop skills necessary for working in an industry 3. The student will be able to use analytical and writing skills to present a report	

COURSE CODE RSOC 112
COURSE TITLE STUDY TOUR
NUMBER OF CREDITS 2

PRE-REQUISITES	The student should have knowledge of food science, processing, packaging, and safety
COURSE OBJECTIVES	1. To provide students with a practical understanding of theoretical concepts 2. To enable the students to observe, first hand, work flow and processes in food industries and associated enterprises

CONTENT		
1	**A visit to any ten of the below-mentioned (and/or any other relevant) Food-related Industries**	**25 hours**
1.1	Food and Drug Administration	
1.2	Biotechnology or Pharmaceutical or Nutraceutical Company	
1.3	Fish Processing Unit	
1.4	Non-Alcoholic Beverage Processing Industry	
1.5	Alcoholic Beverage Processing Industry	
1.6	Slaughter House	
1.7	ICAR/ CFTRI	
1.8	Food Packaging Manufacturing Plant	
1.9	Sugarcane Industry	
1.10	Bakery and Confectionery Unit	
1.11	Dairy Industry	
1.12	Oilseed Processing Plant	
1.13	Sewage Treatment Plant	
1.14	Cereal Processing/ Snack Food Industry	
1.15	Food Start-up/ Innovation Hub	
1.16	Hospital, Airline Food Service, and/or Food Catering Establishments (industrial/quantity cooking institutions)	
1.17	Self-Help Groups	
1.18	Mushroom Cultivation Centres	
1.19	Fruit & Vegetable Cultivation/ Processing Units	
1.20	Spice Farms	
1.21	Cashew/ Coconut/ Coffee/Tea/Cocoa Plantations	
2	Out-of-State Visit (3 to 5 days) to Food Processing Units	**25 hours**
3	Report Writing of Industrial & Out-of-State Visits	**10 hours**
PEDAGOGY	Visits and Reports	
COURSE OUTCOMES	1. The student will be able to appreciate different processing and production technologies in various industrial settings 2. The student will be exposed to the diverse nature of food industries 3. The student will be able to competently use analytical and writing skills to draw up a report	

COURSE CODE DSD
COURSE TITLE DISSERTATION
NUMBER OF CREDITS 16

PRE-REQUISITES	The student should have theoretical and practical knowledge of food science, processing, packaging, and analysis
COURSE OBJECTIVES	1. To enable the students to independently explore topics of research importance related to the food industry 2. To empower students to design a research study based on the principles of scientific research

	3. To train students in interpreting, analysing, and reporting collated data related to a topic of study 4. To endow students with skills required for scientific writing and publication	
CONTENT	Review of the State of Research in a Particular Problem Involving Food, and Development of a Hypothesis	**240 hours**
	Planning And Conducting the Experiment	
	Periodic Analysis of Data and Preparation of a Scientific Report	
	Final Preparation of Project Report as Dissertation to be Submitted in Partial Fulfilment of the M.Sc. Programme	
PEDAGOGY	Review of Literature/ Experimental Analysis/ Report Writing/ Presentation/Project carried out individually by each student throughout the academic year	
REFERENCES	As required for the development of review and methodology	
COURSE OUTCOMES	1. The student will be able to plan and execute experiments or undertake literature surveys independently 2. The student will develop the skills required to design experiments for solving problems in food research	

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D 3.31 Minutes of the Board of Studies in Zoology meeting held on 26.07.2022.

Annexure I

(M. Sc. Zoology Syllabus)

Goa University

Goa University, Taleigao Plateau, Goa

403 206 Syllabus of M.Sc. (Zoology)

Programme in SBSB

(To be followed from the Academic year: 2022-23)

Programme Name: M. Sc. Zoology Programme Code: ZO

Programme description:

This program is intended to develop learning about Zoology and significance of fauna ranging from single cell to multicellular systems. Keeping in mind the Programme thrust area “Biodiversity, Comparative Animal Physiology, Wildlife, Toxicology and Fisheries'', the current Post graduation curriculum has been totally restructured. A precise balance between the classical courses and modern biological courses has been made to introduce and emphasize the skill based programmes with an Internship experience. Apart from the classical topics on Animal Sciences namely, Taxonomy and Systematics; Biodiversity; Anatomy of Non- chordates and Chordates, Genetics and Ecology this syllabus also covers topics on various aspects of Life Processes such as Animal Physiology, Developmental Biology and Molecular Biology. The restructured M. Sc. programme also focuses on various application based or skilled based courses such as Advanced Aquaculture Techniques and Ornamental Fish Management, Fish Processing, Butterfly Gardening, Environmental Physiology, Neurophysiology, Stem Cell Biology, Herpetology, Ornithology, Wildlife Biology and Ecotourism. Besides, the courses like Immunology, Cell Biology, Vector Biology and Ecotoxicology programs also represent this restructured syllabus.

This programme through the dissertation will also help the students to understand the basic principles of nature and will also provide scope for hands-on experience to experiment with nature /animals and thereby enable them to develop aptitude for research in various allied fields of animal sciences. This curriculum will also enable them to overcome several day to day problems faced by our society by providing them with some workable solutions.

Prerequisite for M. Sc. Zoology Programme:

The candidate must pass the Bachelors degree examination in Zoology at T. Y. B.Sc. level or its equivalent credits in Zoology.

Programme Structure:

A student should earn a minimum of 80 Credit Courses to receive M.Sc. (Zoology) degree. Out of 80 credits, 40 credits shall be of Programme Core Courses to be earned during Semester I and II and 40 credits are Optional Courses (Including Programme skilled-based optional and general optional / Interdisciplinary / Dissertation) to be earned during Semester III and IV. Active participation in the Field work component as well as short internship program, included in the laboratory courses, is must for every student. There is also liberty to carry out Dissertation work in any sister departments of Goa University / neighbouring Institute (within Goa) / in the Industry (within Goa) but it should be under the supervision of one of the faculty members of Zoology.

Also, all the Core Courses have to be studied by all students in the first year (Semester I & II). Dissertation (16 Credits) is optional in lieu of the equivalent number of credits of courses from the Optional Courses and shall be undertaken in the second year (Semester III).

Timeline for completion of various credits over four Semesters:

Courses	**Codes**	**Sem I**	**Sem II**	**Sem III**	**Sem IV**	**Total**
Discipline Specific Core Courses	DSCC	16	16			32
Discipline Specific Optional Course	DSOC	4	4			08
Research Specific Optional Courses	RSOC			8	4	12
Optional Generic Course	OGC			12		12

Discipline Specific Dissertation	DSD				16	16
		20	20	20	20	80

Semester I			
Code	**Discipline Specific Core Courses**	**Credits**	**Page No.**
ZOCT101	Principles of Animal Systematics	3 credits	08
ZOCT102	Anatomy of Non-Chordates	3 credits	10
ZOCT103	Comparative Physiology of Animals	3 credits	12
ZOCT104	Molecular Biology	3 credits	14
ZOCP101	Laboratory Course-I	3 credits	17
ZOCF101	Field work-I	1 credit	19
	Discipline Specific Optional Course		
ZOOT101	Advances in Genetics (Theory)	3 credits	20
ZOOP101	Advances in Genetics (Practical)	1 credit	22
ZOOT102	Animal Behaviour (Theory)	3 credits	23
ZOOP102	Animal Behaviour (Practical)	1 credit	25
ZOOT103	Ichthyology (Theory)	3 credits	26
ZOOP103	Ichthyology (Practical)	1 credit	28

Semester II			
Code	**Discipline Specific Core Course**	**Credits**	**Page No.**
ZOCT201	Anatomy of Vertebrates	3 credits	30
ZOCT202	Animal Biochemistry	3 credits	32
ZOCT203	Molecular aspects of Developmental Biology	3 credits	34
ZOCT204	Ecology and Biodiversity	3 credits	36
ZOCP201	Laboratory Course-II	3 credits	38

ZOCF201	Field work-II	1 credit	40
	Discipline Specific optional Course		
ZOOT201	Environmental Physiology (Theory)	3 credits	41
ZOOP201	Environmental Physiology (Practical)	1 credit	43
ZOOT202	Animal Cell Biology (Theory)	3 credits	44
ZOOP202	Animal Cell Biology (Practical)	1 credit	46
ZOOT203	Wildlife Conservation & Management (Theory)	3 credits	47
ZOOP203	Wildlife Conservation & Management (Practical)	1 credit	49

Semester III			
Code	**Research Specific optional Courses**	**Credits**	**Page No.**
ZOOT301	Neurophysiology (Theory)	3 credits	50
ZOOP301	Neurophysiology (Practical)	1 credit	52
ZOOT302	Animal Cell Culture (Theory)	1 credit	53
ZOOP302	Animal Cell Culture (Practical)	3 credits	54
ZOOT303	Toxicology (Theory)	3 credits	56
ZOOP303	Toxicology (Practical)	1 credit	58
ZOOT304	Herpetology (Theory)	3 credits	59
ZOOP304	Herpetology (Practical)	1 credit	61
ZOOT305	Ornithology (Theory)	3 credits	63
ZOOP305	Ornithology (Practical)	1 credit	66
ZOOT306	Mammology (Theory)	3 credits	68
ZOOP306	Mammology (Practical)	1 credit	70
ZOOT307	Developments in Aquaculture (Theory)	3 credits	71
ZOOP307	Techniques in Aquaculture (Practical)	1 credit	73
	Optional Generic Course		
ZOOT308	Immunology	3 credits	75
ZOOT309	Biological Applications of Nanoparticles and Nanotoxicology	2 credits	77
ZOOT310	Ecotoxicology	2 credits	78
ZOOT311	Butterfly Gardening	2 credits	80
ZOOT312	Ecotourism (Theory)	2 credits	81
ZOOP312	Ecotourism (Practicals)	1 credit	83

Course Code: ZOCT101 **Course Title: Principles of Animal Systematics**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic working knowledge of classical and animal taxonomy and systematics.	
Objectives:	1. To introduce concepts in animal taxonomy and systematics and their applications. 2. To understand organization and the molecular basis of animal taxonomy.	
Content:	**Module 1** Introduction, stages, importance of taxonomy, advances in taxonomy. Principles, rules and new trends in taxonomy; zoological nomenclature, ICZN regulations, zoological classification, problems faced by taxonomists.	**2 hours** **4 hours**

	Taxonomic collections, identification and description, taxonomical hierarchy (Linnaean hierarchy), concepts of taxon, holotype, paratype, topotype etc.	**4 hours**
	Concept of speciation: biological, phylogenetic and evolutionary.	**2 hours**
	Module 2	
	Morphology based taxonomy, Numerical and Immuno-taxonomy, Paleotaxonomy, Cyto-taxonomy and Chemotaxonomy.	**4 hours**
	Molecular basis of animal taxonomy, genetic polymorphism, electrophoretic variations, amino acid sequencing of proteins, DNA-DNA hybridization.	**4 hours**
	Systematics - definition and role in biology, biological classification, molecular systematics, DNA fingerprinting and molecular markers for detection/evaluation of polymorphism, RFLP, RAPD, etc.	**4 hours**
	Module 3	
	Phylogenetics: introduction; basic terminology, homology and analogy: divergence, convergence, parallelisms and reversals; vicariance.	**3 hours**
	Phylogenetic groups: monophyly, polyphyly, paraphyly.	**1 hour**
	Construction of phylogenetic trees, by using cladistic and phenetic methods. Cladistics and cladogram: Parsimony and finding the shortest trees, rooting trees.	**6 hours**
	Molecular divergence, molecular clock, molecular drive.	**2 hours**
Pedagogy:	Lectures/ tutorials/online teaching mode/self-study and discussions	
Learning Outcome:	1. Understand historical and modern methods of animal classification and systematics. 2. Get acquainted with field techniques for taxonomic study and use of literature and identification keys. 3. Familiarization with molecular basis of animal taxonomy.	

References /Reading:	1. Avise JC (2004), Molecular Markers, Natural History and Evolution, Chapman & Hall, New York. 2. Huston AM (1994), Biological Diversity, Cambridge University Press, Cambridge. 3. Kapoor VC (1983), Theory and Practice of Animal Taxonomy, Oxford & IBH Publishing Co. 4. Kato M (2000), The Biology of Biodiversity, Springer. 5. Mayer E (1971), Elements of Taxonomy, Oxford IBH Publishing company. 6. Simpson GG (2012), Principle of animal taxonomy, Scientific Publishers. 7. Tikader BK (1983), Threatened Animal of India, ZSI publication, Calcutta 8. Wilson EO (1988), Biodiversity, Academic Press, Washington. 9. Wilson EO (1992), The diversity of Life, The College edition W.W. Northem & Co.

Course Code: ZOCT102 **Course Title: Anatomy of Non-Chordates**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on non-chordate anatomy, taxonomy and systematics is a prerequisite for this course.	
Objectives:	1. To develop knowledge about fundamental anatomical principles among non- chordates. 2. To understand the adaptive changes in anatomical structures through the course of evolution.	
Content:	**Module 1** Skeletal system types: Endoskeleton-like (Poriferans), Exoskeleton (Arthropods) and Hydrostatic skeleton (Cnidarians, Molluscs and Echinoderms).	**4 hours**
	Annelid locomotory organs involved in simple propulsion, burrowing, peristaltic waves, sinusoidal and inchworm type of locomotion. Primitive and advanced flight muscles of insects.	**4 hours**
	Diffused, simple ganglionic, cycloneuralian, heteroganglionic types of non-chordate nervous systems. Tetraneury plan of molluscan nervous system, streptoneury, euthyneury and centralization in molluscs.	**6 hours**

	Module 2 Digestive system types: Channel-network systems, Coelenteronic, Saccular and Tubular systems. Radula of Molluscs and various types of mouthparts in Arthropods. Coelomoduct derived, gut derived and other excretory organs of non chordates. Calciferous gland of earthworms. Reproductive system in arthropods with Gonad-Gonoduct-Gonopore (G-G-G) concept with addition of adjunctive organs.	**4 hours** **4 hours** **3 hours**
	Module 3 Respiratory organs and specialized respiratory structures of Annelids, Molluscs and Arthropods. Open and Closed circulatory system concept of Invertebrates. Circulatory system in Annelids, Arthropods and Molluscs. Hearts of Oligochaetes and bivalves.	**5 hours** **6 hours**
Pedagogy:	Lectures/ tutorials/ online teaching mode/self-study.	
Learning Outcome:	1. Understand the basic concepts associated with each system of the body. 2. Identify structures in the body systems which perform the functions according to the habits or habitats of the animals.	
References /Reading:	1. Hymen LH (1951), The invertebrates (all volumes), McGraw Hill, Philadelphia, USA. 2. Barnes RD and Ruppert EE (1994), Invertebrate Zoology, Saunders College Publishing. 3. Barrington EJW (1972), Invertebrate Structure and Function, Thomas Nelson and Sons, USA. 4. Marshall AJ and Williams WD (2004), Textbook of Zoology (vol 1). CBS Publishers & Distributors. 5. Jurd RD (2004), Animal Biology, BIOS Scientific Publishers, USA. 6. Cleveland P, Hickman CP, Roberts LS and Larson A (2001), Integrated Principles of Zoology, McGraw-Hill, NY. 7. Barnes RSK, Calow P, Olive PJW, Golding DW and Spicer JI (2001),	

	The Invertebrates: A Synthesis. Blackwell Science 8. Schmidt-Rhaesa A (2007), The Evolution of Organ Systems, Oxford University Press. 9. Gangully BB, Shina AK and Adhikary S (2011), Biology of Animals vol. 1, New Central Agency, Kolkata.

Course Code: ZOCT103 **Course Title: Comparative Physiology of Animals**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Elementary knowledge on animal anatomy, physiology, taxonomy and systematics.	
Objectives:	1. To provide knowledge of animal body systems to reveal physiological homologies, patterns of physiological adaptation to various environments. 2. To introduce various principles that underlies higher level integrative bodily functions. 3. To provide a comprehensive knowledge of functional physiological pathways common to all animals.	
Content:	**Module 1** Nutrition (Feeding and digestion) in Non-chordates and chordates. Metagenome of mammalian gut, concept of gut-brain axis, rumen fermentation. Movements of gastrointestinal tract, control and reflexes.	**8 hours**
	General view of excretion and osmoregulation in non-chordates and chordates in freshwater, marine water and terrestrial environment. Contributions of Crustacean antennal glands and Molluscan mantle to acid-base regulation. Urine formation in Metanephros kidney, Nephrolithiasis-mechanism of renal stone formation.	**7 hours**
	Module 2 General composition of coelomic fluid and hemolymph of Non- chordates, formation of lymph in humans.	**4 hours**
	Physiological difference between pulmonary and systemic circulation of higher vertebrates and changes during pregnancy. Lung volumes and their physiological	**5 hours**

	interpretations and changes in lung volumes during pregnancy. Ventilation perfusion physiology.	
	Conducting system of heart, regulation of heart beat, cardiac output and blood pressure, comparison of action potentials of Pacemaker cell and cardiomyocyte, effect of exercise on cardiovascular physiology: A human perspective.	**6 hours**
	Module 3 Various types of reproductive modes in non-chordates and chordates.	**5 hours**
	Uterine physiology, implantation, delayed implantation/embryonic diapause and its regulation, estrous cycles and types of anestrous periods. Gestation, prenatal development and placentation in humans.	**10 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study/presentation	
Learning outcome:	1. Understanding of the basic concepts and processes of physiological regulation, from cellular to organ to organismal level. 2. Evaluation of physiological possibilities that animals have developed through natural selection.	
References/ Reading:	1. Barnes RSK, Calow P, Olive PJW, Golding DW and Spicer JI (2001), The Invertebrates: A Synthesis, Third edition, Blackwell Science. 2. Moyces C and Schulte P (2013), Principles of Animal Physiology, Second Edition, Pearson International Edition, USA. 3. Prosser CL (1991), Comparative Animal Physiology, Part A, Environmental and Metabolic Animal Physiology, Fourth Edition, John Wiley & Sons Publication, Oxford. 4. Randall D, Burggren W and French KE (2001), Animal Physiology, Fifth edition, WH Freeman and Co, New York. 5. Schmidt-Nielsen K (2001), Animal Physiology: Adaptation and Environment, Fifth Edition, Cambridge University Press. 6. Withers PC (1992), Comparative Animal Physiology, First Edition, Fort Worth, Saunders College Publication.	

Course Code: ZOCT104 **Course Title: Molecular Biology**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of nuclear and cellular components and functioning of the cell.

Objectives:	1. To develop concepts in molecular biology, enhancing knowledge about the major processes in the cell, throwing light upon the details of the central dogma, as it is a prerequisite for biomedical/ biochemical research. 2. To have a clear understanding of all the dynamic processes of the nucleus which can be further applied in various fields of research.	
Content:	**Module 1** Journey to the discovery of DNA structure (review of research work of Rosalind Franklin, Maurice Wilkins, Linus Pauling, Erwin Chargaff, Watson, and Crick to derive a double helix DNA model).	**2 hours**
	Different types of bonds found in DNA double helix and their associated applications, different types of DNA (B-DNA, A-DNA & Z-DNA).	**2 hours**
	DNA packaging in bacteria (looped and supercoiled structures, enzymes, and protein involved in DNA condensation)	**2 hours**
	Eukaryotic DNA packaging (polynucleotides-DNA helix-nucleosome-chromatosomes-solenoid-chromatin-chromosome, cohesins, and condensins), histone structure.	**3 hours**
	Types of DNA sequences, the structure of telomere and centromere.	**2 hours**
	Types of DNA damage (single base alterations, double base alterations, chain breaks, and cross linking), types of mutagens, DNA repair mechanisms (direct reversal, MMR, BER, NER, HR, MMEJ, NHEJ, SOS)	**4 hours**
	Module 2 Understanding central dogma and flow of information. Replication: Prokaryotic (also rolling circle model and Theta model) and eukaryotic DNA replication in Prokaryotes and Eukaryotes	**4 hours**
	Transcription in prokaryotes (also emphasize promoter clearance and promoter escape), types of RNA Pol proofreading (pyro-phosphorolytic editing and hydrolyting editing), RNA Pol inhibitors / blockers examples.	**3 hours**

	Transcription in Eukaryotes, Eukaryotic promoter sequence, domains of Transcription factors (trans-activating domain and DNA binding domains various types)	**3 hours**
	RNA structures (primary, secondary, and tertiary), RNA types (coding and non-coding), splicing (types and classes), trans splicing, and alternate splicing	**5 hours**
	Module 3 Translation in Prokaryotes and Eukaryotes, codon and associated concepts, protein structure and post-translational modifications (folding, protein splicing, phosphorylation-dephosphorylation, N-glycosylation, methylation, etc.).	**4 hours**
	Inhibitors of protein synthesis, Ramachandran plot for protein structure, the triple helical structure of the collagen protein.	**3 hours**
	Prokaryotic gene regulation (Lac and Trp operons.), sum-up of various levels of gene regulation in Eukaryotes.	**4 hours**
	PCR techniques, CRISPR/Cas 9 techniques, and their applications.	**4 hours**
Pedagogy:	Lectures/tutorials /online teaching mode/ self-study.	
Learning Outcome:	1. Deep understanding of DNA, RNA, and Protein and various processes involved in the flow of information through these molecules. 2. Understanding of the latest techniques associated with molecular biology. 3. Establish a basic understanding of current emerging scientific fields pertaining to molecular biology and be able to critically evaluate the literature related to that field.	
References /Reading:	1. Clark D, Pazdernik N and McGehee M (2018), Molecular Biology. 3rd Edition, Academic Cell. 2. Davis LG, Dibner MD and Battey JF (1986), Basic Methods in Molecular Biology, Elsevier. 3. Gardner EJ, Simmons MJ and Snustad DP (1991), Principles of Genetics, John Wiley & Sons. 4. Karp G, Iwasa J and Marshall W (2019), Karp's Cell and Molecular Biology, 9th Edition, John Wiley. 5. Krebs JE, Goldstein ES, Kilpatrick ST (2018), Lewin's GENES XII, Jones and Bartlett Learning. 6. Krebs JE, Lewin B, Goldstein ES and Kilpatrick ST (2014), Lewin's Genes XI, Jones and Bartlett Publishers. 7. Malacinski GM (2015), Freifelder's Essentials of Molecular Biology, Narosa Book Distributors Private Limited.	

Course Code: ZOCP101 **Course Title: Laboratory Course-I**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic working knowledge of Animal Systematics, Animal Anatomy, Physiology, Molecular Biology.	
Objectives:	1. To obtain Laboratory hands on training in certain areas of systematics, anatomy, physiology and molecular biology.	
Content:	**Animal Taxonomy and Systematics** Systematic analysis with proper morphological keys and construction of Phylogenetic keys of the following: - Malacofauna - Lepidoptera - Avifauna - Ichthyofauna - Araneae	**11 x 2 lab hours**
	Anatomy of Non Chordates **Dissection/Mounting** 1. Exoskeleton and appendages of prawns 2. Nervous system in cockroach / crab (collected from market) /visceral and pedal ganglia in bivalves. 3. Digestive system in prawn (collected from market)/cockroach 4. Comparative study of mouth parts in insects. 5. Reproductive system in cockroach 6. Respiratory system in cockroach 7. Mounting of heart in bivalves	**11x 2 lab hours**
	Animal Physiology 1. Study of human lung volumes and capacities during before and after exercise using respirometer. 2. Determination of metabolic rate using respirometer. 3. Estimation of heart rate, pulse rate and blood pressure changes during exercise using the oscillometric technique. 4. Study of ECG and its evaluation in normal and pathological variations. 5. Evaluation of heart rate, blood pressure using ECG strip. 6. Measurement of muscular fatigue using finger ergograph. 7. Study of nitrogenous waste products of animals from different habitats. 8. Analysis of coelomic fluid of bivalve / crab.	**11 x 2 lab hours** **12 x 2 lab hours**
	Molecular Biology	

	1. Extraction of nucleic acid from chicken liver. 2. Isolation of DNA and RNA from nucleic acids. 3. Qualitative analysis of purified DNA and RNA using UV spectrophotometer / Nanodrop. 4. Separation of nucleic acids on agarose gel and relative quantification. 5. Demonstration/ hands-on training of PCR technique using chicken DNA sample. 6. Demonstration / hands-on training of RT-PCR technique using chicken total RNA sample. 7. Purine/Pyrimidine bases from nucleic acids using paper chromatography. 8. Primer designing of any two housekeeping genes from *Gallus gallus.*	
Pedagogy:	Practicals/ Mini projects/ Group Activities.	
Learning Outcome:	Hands-on training on certain areas based on courses on DSCC ZO1, ZO2, ZO3 & ZO4.	
References /Reading:	As mentioned under the individual course DSCC ZO1, ZO2, ZO3 & ZO4.	

Course Code: DSCF101 **Course Title: Field work -I**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the course:	Basic knowledge of Animal systematics	
Objectives:	To do a field survey	
Contents:	Field work faunistic survey around 1 km radius of his/ her residence during dawn every weekend for at least 2 months (8 weeks) using Transect or Quadrangle method of two different fauna. One/ two day visit to sanctuary in Goa. * In unavoidable circumstances overnight field work will be replaced by extending the time period (from 8 weeks to 10 weeks of weekend faunistic survey). *Evaluation of the field work component will be based on weekly field notes and final compiled field report during SEA.	**15 x 2 lab hours**

Pedagogy:	Practicals, mini projects, group activities, presentations.
Learning outcome:	To know the fauna surrounding one's own house.
References/ Reading:	As mentioned under course DSCCZO1.

Course Code: ZOOT101 **Course Title: Advances in Genetics (Theory)**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic working knowledge of classical genetics.	
Objectives:	This course develops concepts of animal and human Genetics and its use in the diagnosis of genetic disorders.	
Content:	**Module 1** Basic principles of genetics, human genetic make-up, genes as submicroscopic factors controlling human traits, packing of DNA/chromatin into chromosomes, nucleosomes and histones. Review on test cross, back cross, Polytene and Lampbrush chromosomes, human chromosome structure, sex determination in man, sex chromatin, Lyon hypothesis, human karyotype, banding techniques, chromosome identification and nomenclature (ISCN). Principles of inheritance in man (autosomal / sex linked / dominant / recessive / mitochondrial inheritance); human pedigree analysis, human genetic disorders, chromosomal (structural and numerical; autosomal or X linked) and biochemical (congenital diseases / inborn errors of metabolism) with examples, Eugenics, euphenics and euthenics; genetic counseling.	**15 hours**
	Module 2 Prenatal diagnosis of genetic disorders, cytogenetic, biochemical and ultrasonography techniques, amniocentesis, chorionic villus sampling, cordocentesis**,** biochemical markers for prenatal diagnosis, triple test for Down's syndrome. Dermatoglyphics and its application in the diagnosis of human genetic disorders**,** principles of FISH, RFLP & DNA fingerprinting and their uses in human genetics. Genetic models: mouse as a model mammal for genetic studies, other animal models for human diseases.	**15 hours**

	Module 3 Cancer genetics: Introduction and cellular aspects; types of cancers, protooncogenes; oncogenes; viruses and cancer; oncoproteins; tumor suppressor genes; inherited cancer genes (familial cancers); cell cycle dysregulation in cancer, chromosomal instability; roles of p21, p53, ATM, BRCA1/2 in preventing cancer, tests for detection of cancer, treatment of cancer: radiotherapy, chemotherapy, hyperthermia, targeted drug therapy, immunotherapy Mapping genomes: a) Genetic mapping – DNA markers - RFLPs, SSLPs, SNPs b) Physical mapping - Restriction mapping, fluorescence in situ hybridization (FISH), radiation hybrid mapping and sequence tagged site mapping, gene mapping in Drosophila using two point and three point test crosses with an emphasis on interference and coefficient of coincidence.	**15 hours**
Pedagogy	In class /Online lectures, Assignments, Group activities, Presentations	
Learning Outcomes	1. Knowledge of genetic variability in human population 2. Advanced Knowledge of animal and human genetics 3. Knowledge of modern methods for clinical genetic diagnosis 4. Knowledge of the genetic basis of common types of hereditary diseases	
Reading / Reference	1. Turnpenny P, Ellard S. (2020) Emery's Elements of Medical Genetics and Genomics (16th edition), Elsevier 2. Strachan T, Read A. (2018) Human Molecular Genetics (5th edition), Garland Science 3. Kothari ML, Mehta LA and Roychoudhury SS. (2009) Essentials of Human Genetics, Oxford University Press, India 4. Pierce BA. (2020)Genetics: A Conceptual Approach (7th edition). W. H. Freeman and Company 5. Alberts B, Johnson A, Lewis J, Raff M, Roberts K, and Walter P. (2014) Molecular Biology of the Cell (6th edition). Taylor & Francis Group, New York, USA	

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Course Code: ZOOP101 **Course Title: Advances in Genetics (Practicals)**

Number of Credits: 1

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic working knowledge of classical genetics.	
Objectives:	This course develops concepts of Animal and Human Genetics and its use in the diagnosis of genetic disorders.	
Content:	1. Preparation of metaphase plates and karyotyping 2. Dermatoglyphics analysis of human handprint 3. Pedigree analysis of X-linked and autosomal recessive, dominant characteristics 4. G banding of chromosomes 5. Random amplification of polymorphic DNA 6. Linkage mapping by two point and three point cross	**15 x 2 hours**
Pedagogy	Laboratory-based learning	
Learning Outcomes	1. Knowledge of genetic variability in human population 2. Knowledge of human genetics 3. Knowledge of modern methods for clinical genetic diagnosis 4. Knowledge of the genetic basis of common types of hereditary diseases	
Reading / Reference	1. Turnpenny P, Ellard S. (2020) Emery's Elements of Medical Genetics and Genomics (16th edition), Elsevier 2. Strachan T, Read A. (2018) Human Molecular Genetics (5th edition), Garland Science 3. Kothari ML, Mehta LA and Roychoudhury SS. (2009) Essentials of Human Genetics, Oxford University Press, India 4. Pierce BA. (2020)Genetics: A Conceptual Approach (7th edition). W. H. Freeman and Company 5. Alberts B, Johnson A, Lewis J, Raff M, Roberts K, and Walter P. (2014) Molecular Biology of the Cell (6th edition). Taylor & Francis Group, New York, USA	

Course Code: ZOOT102 **Course Title: Animal Behaviour (Theory)**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of animal science and behaviour.

Objectives:	This course develops concepts in the behaviour of animals such as underlying genetic and molecular mechanisms of behaviour as well as its importance in the animal kingdom	
Content:		**15 hours**
	Module 1 Introduction to animal behaviour (ethology): social behaviour: parental care-types, parent offspring conflict, sexual strategies, mating types and courtship, aggression and territory. Communication in animals: auditory, echolocation, infra and ultra sounds, tactile, visual, pheromones-vertebrates and invertebrates, language of honey bees-circle and waggle dance. Feeding strategies: heterotrophs, parasitic, saprophytes, commensalism, mutualism, coprophagy and hematophagy. **Module 2** Learning and imprinting, habituation, conditioning. trial and error, neural mechanism of learning in animals. Socio-biology: Introduction, WO Wilson, Richard Dawkins, WD Hamilton, Units of socio-biology. Hamilton's theory and Altruism, cooperation, reciprocation and Eusociality. Contributions to sociobiology: Jane Goodall and Dian Fossy; Properties, advantages of a social group, social organization in primates. **Module 3** Migration and navigation of animals: Introduction, types and causes of migration in fishes and birds, advantages of migration. Methods of studying migration and navigation. Human ethology: Introduction, ethological concepts and human behavior, concepts of sign stimulus and imprinting, kinship and human social system, human beings and territorial behavior, human aggressive behavior.	
Pedagogy:	Lectures/ tutorials/assignments/self-study/Field study	

Learning Outcome:	1. Understand the genetic and molecular mechanisms underlying behavior. 2. Gain insight on the different types of behaviour used for survival in the animal kingdom
References / Reading	1. Alcock, J. (2013). Animal Behavior: An Evolutionary Approach. United States: OxfordUniversity Press, Incorporated. 2. Mathur, r. (2009, 2010, 2014). Animal behaviour. India: Rastogi publications. 3. Bonner, J. T. (2018). The Evolution of Culture in Animals. United States: Princeton University Press. 4. Ehrman, L., Parsons, P. A. (1976). The genetics of behavior. United States: Sinauer Associates. 5. Halliday, T. (1980). Sexual Strategy. United Kingdom: Oxford University Press.

Course Code: ZOOP102 **Course Title: Animal Behaviour (Practicals)**

Number of Credits: 1

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of animal science and behaviour.	
Objectives:	This course develops concepts in the behaviour of animals such as underlying genetic and molecular mechanisms of behaviour as well as its importance in the animal kingdom.	
Content:	1. Territorial behavior in insects / mammals / birds etc. 2. Foraging behavior in birds / butterfly 3. Parasitism in birds / butterfly / frogs 4. Parental behavior in mammals / birds 5. Human aggressive behaviour	**15 x 2 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study/Field study	
Learning Outcome:	1. Understand the mechanisms underlying behavior. 2. To gain an insight on the different types of behaviors used for survival in the animal kingdom	
References / Reading	1. Alcock, J, Animal Behavior, Sunderland Sinauer Associates 2. Bonner JT, Evolution of Culture in Animals, Princeton Univ Press. New Jersey 3. Ehrman L and Parsons PA, The Genetics of Behavior, Sinauer Associates, Massachusetts. 4. Halliday T, Sexual Strategies, Oxford University Press, Oxford. Lythgoe, JN, The Ecology of Vision, Clarendon press, Oxford McFarland D,	

	Animal Behavior, ELBS Longman Publ. London 5. Animal Behavior by. Reena Mathur, Rastogi Publication, Meerut-New Delhi.

Course Code: ZOOT103 **Course Title: Ichthyology (Theory)**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of fish anatomy, physiology, and endocrinology	
Objectives:	• To understand the various aspects of fish biology concerning its anatomical and physiological systems. • To understand the potentiality of the subject in India, with emphasis in Goa.	
Content:	**Module1** Fish diversity: natural history, evolution, and biogeographical distribution. Fish classification (selected orders) and diversity of freshwater and marine fishes of India concerning the Western coastline. Meristic and morphometric studies; truss morphometry.	**7 hours**
	Swimming modes and buoyancy in fishes. Functional anatomy of fish muscles: body waves, energetics. Physiological aspects of dynamic and static lift.	**4 hours**
	Mechanism of gas exchange in air breathing organs and air bladder. Circulatory system: aquatic and aerial respiration, cardiovascular physiology and osmoregulation.	**4 hours**
	Module 2 Food and feeding biology: natural fish food. Components of balanced food, feed evaluation ratio, feeding mechanism. Types of feeding. Structural modifications to feeding habits. Digestive enzymes and glands. Gut content analysis.	**5 hours**

	Concept of growth: growth curve, biotic and abiotic factors affecting growth, role of minerals, vitamins, and hormones in the regulation of growth, influence of nutrients in growth stimulation. Principles and method of age determination.	**4 hours**
	Reproductive system: sexual maturity, development of gametes in male and female. Fecundity and embryonic development. Fish diseases, immune response to pathogens. Effect of abiotic, biotic, and xenobiotic stresses on the fish immune system.	**6 hours**
	Module 3 Behaviour: feeding, schooling, migration, courtship, and parental care. Adaptations and symbiotic associations. Sensory adaptations and coordination: lateral line system, acoustic system, photoreception, electro-receptors. Bioluminescence, chromatophores, and sense organs in shellfish. Endocrine glands and neuroendocrine coordination. Pelagic and demersal fisheries of Indian coasts. The relevance of the fish and fishery sector in Goa with respect to research, society, and economy.	**10 hours** **5 hours**
Pedagogy:	Lectures/ tutorials/assignments/ small projects/self-study/presentations.	
Learning Outcome:	Knowledge in the broad area of ichthyology (fish biology), with special reference to evolutionary relationships, adaptive morphological attributes, biogeography, ecology, and physiology.	
References /Reading	1. Selvamani B.R and Mahadevan R.K. (2008) Freshwater fish farming (Campus Books International) 2. Pauly, D., P. Tyedmers, R. Froese, and L. Y. Liu. (2001). Fishing down and farming up the food web. Conservation Biology in Practice 2 (4):25 3. Cury, P. and D. Pauly (2000). Patterns and propensities in reproduction and growth of fishes. *Ecological Research* 15: 101-106. 4. Stergiou K.I. (2005). Fish Base: The modern tool of ichthyology, fisheries biology and marine ecology. Proc. 12th Panhellenic Cong. Ichthyology. 12: 92-95. 5. Jennings S., M.J. Kaiser and J.D. Reynolds J.D. (2001). Marine fisheries ecology. Blackwell Science, London, 432 p. 6. Pauly D, Christensen V, Guénette S, Pitcher TJ, Sumaila UR, Walters CJ, Watson R, Zeller D (2002) Towards sustainability in world fisheries. Nature 418:689–695. 7. Jhingran V, (1982) Fish and Fisheries of India 2nd Ed (Hind Publication)	

	8. Kumar S and Thembre M (1996). Anatomy and Physiology of Fishes (Vikas Publishing House) 9. Pillay T. V. S. (1990) Aquaculture – Principles and Practices (Fishing News Books Oxford 10. Bal D, and Rao K. P.(1984) Marine Fisheries of India, Tata McGraw Hill Publishers. 11. Dutta Munshi, J (2006), Fundamentals of Freshwater Biology, Narendra Publishing House, Delhi. 12. Kurian, C and Sebastian VO (2002), Prawn and Prawn Fisheries of India, Hindustan Publishing Corp., Delhi.

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Course Code: ZOOP103 **Course Title: Ichthyology (Practicals)**

Number of Credits: 1

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of Fish biology.	
Objectives:	In-depth knowledge of the practical aspect concerning the detailed study of anatomical features and physiological systems in various fishes.	
Content:	1. Study of Goan fish fauna, sampling of fish and shellfish, quantitative meristic and morphometrics (Using FAO keys) 2. Comparative studies of gills, scales (Determination of age), pharyngeal teeth, and the brain of fishes. 3. Study of feeding habits based on the relative comparison of the gut length of the fishes. 4. Observation of the reproductive system in fish (male and female) and determination of maturity stages in fish. 5. Crude protein analysis of fish muscle by Lowry's method. 6. Histological studies of any two endocrine glands in fish. 7. Study of embryonic developmental stages in fish/crustaceans	**15 x 2 hours**
Pedagogy:	Mini projects/ tutorials/Group discussions/Field visits.	
Learning Outcome:	Students will become familiar with principles of ecology and behavior of fishes. Students will become familiar with fish anatomy. Students are expected to show mastery in the laboratory and field-based activities, with an emphasis on anatomy and identification of fish species, and understanding the socio-economic development through Fisheries.	

References/ Reading	1. Paul.J .B. 2002. Handbook of Fish Biology and Fisheries (Vol.1). Blackwell Publishing. 2. Selvamani B.R and Mahadevan R.K. (2008) Freshwater fish farming (Campus Books International) 3. Pauly, D., P. Tyedmers, R. Froese, and L. Y. Liu. (2001). Fishing down and farming up the food web. Conservation Biology in Practice 2 (4):25 4. The Diversity of Fishes: Biology, Evolution, and Ecology by Gene Helfman, Bruce B. Collette, Douglas E. Facey, and Brian W. Bowen. ISBN: 978-1-4051-2494-2 736 pages, May 2009, Wiley-Blackwell 5. Bond's Biology of Fishes.2008. 3rd edition by Michael Barton (ISBN:0120798751) 6. Cailliet, G., M. Love, A. Ebeling 1986 Fishes, a field and laboratory manual on their structure, identification and natural history. Waveland Press, Ill.

Course Code: ZOCT201 **Course Title: Anatomy of Vertebrates**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on vertebrate anatomy, taxonomy and systematics is a prerequisite for this course.	
Objectives:	1. To develop knowledge about fundamental anatomical principles among vertebrates. 2. To understand the adaptive changes anatomical structureshave undergone in the course of evolution.	
Content:	**Module 1** Detailed comparative analysis of vertebrate brain, spinal cord and sense organs. Basic plan of vertebra construction. Axial and Appendicular skeleton of vertebrates and their modification. Classification of vertebrate musculature. Axial and appendicular musculature of vertebrates.	**5 hours** **5 hours**

	Module 2 Digestive system of vertebrates with special analysis of herbivore, carnivore and omnivore stomach. Excretory system of Tetrapods, Mammalian kidney in detail, specialized excretory structures such as rectal glands (elasmobranchs) and salt glands (reptiles and Birds). Testes and Vasadeferens in anaminiotes and amniotes. Ovary and oviduct of anaminiotes and amniotes. **Module 3** Respiratory structure of fishes, Types of Tetrapod lungs (Alveolar, Faveolar, Parabronchial and Broncho-alveolar). Circulatory systems of Vertebrates, Vertebrate portal systems, Lymphatic system in Tetrapods.	**5 hours** **5 hours** **4 hours** **8 hours** **8 hours**
Pedagogy:	Lectures/ tutorials/ online teaching mode/self-study	
Learning Outcome:	1. Understand the basic concepts associated with each system of the body. 2. Identify structures that are in place in the body systems to perform the functions according to the habits or habitats of the animals.	
References /Reading:	1. Kardong K (2011), Vertebrates: Comparative Anatomy, Function and Evolution, Sixth edition, McGraw-Hill Companies, USA. 2. Kent CG and Carr R (2000), Comparative Anatomy of Vertebrates, Ninth Edition, McGraw-Hill Companies, USA. 3. Liem KF and Franklin W (2001), Functional Anatomy of the Vertebrates: an Evolutionary Perspective, Third Edition, Harcourt College Publishers, California. 4. Moyces C and Schulte P (2013), Principles of Animal Physiology, Second Edition, Pearson International Edition, USA. 5. Prosser CL (1991), Comparative Animal Physiology, Part A, Environmental and Metabolic Animal Physiology, Fourth Edition, John Wiley & Sons Publication, Oxford. 6. Schmidt-Rhaesa A (2007), The Evolution of Organ Systems, First Edition Oxford University Press. 7. Withers PC (1992), Comparative Animal Physiology, First Edition, Fort Worth: Saunders College Publication. 8. Wolff RG (1994), Functional Chordate Anatomy**,** First Edition, Amazon Publication, UK.	

Course Code: ZOCT202 **Course Title: Animal Biochemistry**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Elementary knowledge on structural biochemistry of Protein, Carbohydrate and Lipids.	
Objectives:	1. To understand the biochemical integrity of various metabolic pathways. 2. To understand metabolic pathways, their regulation, and application in diagnostic and maintenance of human well-being state.	
Content:	**Module 1** Water as biological solvent; Ionization of water and buffering in biological systems. Enzyme Kinetics and enzyme inhibition; Catalytic and Regulatory strategies of Enzymes, Allosteric proteins and enzymes and its importance Concept of metabolism; Concept of free energy; Coupled reaction; Review of ATP and ATPase. Role and mechanism of action of NAD+/NADP+, FAD, lipoic acid, thiamine pyrophosphate, tetrahydrofolate, biotin, pyridoxal phosphate, B12 coenzymes and metal ions with specific examples, ascorbic acid, thiamine, pantothenic acid and folic acid.	**15 hours**
	Module 2 Review on Regulation of Glycolysis & Gluconeogenesis, Glycogenolysis & Glycogenesis. TCA cycle; Electron transport system; Oxidative phosphorylation Integration of fatty acid synthesis & β Oxidation of fatty acid; Importance of cholesterol and lipoprotein in health management Synthesis of steroid hormones; Eicosanoids : types, outline of biosynthesis and their physiological importance. Biological Membranes and transport: Lipid bilayer, membrane dynamics, solute transport across membranes.	**15 hours**

	Module 3 Nomenclature and classification of amino acids; Protein and peptide chains; Primary-, Secondary-, Tertiary and Quaternary structures of protein; Separation and Purification of proteins. Protein turn-over and amino acid catabolism; Nitrogen excretory pathways; Oxidation of amino acids; Biosynthesis of amino acids in animal. Biochemistry of Electrophoretic separation techniques; Structures of Membrane receptors (Lipoproteins and glycoproteins); G Protein coupled receptors, receptor tyrosine kinase, adaptor proteins and gated ion channels.	**15 hours**
Pedagogy:	Lectures/ tutorials /online teaching mode/self-study.	
Learning Outcome:	1. Understanding the various metabolic pathways 2. Understanding the regulation of various metabolic pathways. 3. Understanding the integrative metabolism and life processes. 4. Understanding the application of metabolism in maintenance of human well being state.	
References /Reading:	1. Devlin TM (2010), Text book of Biochemistry with Clinical Correlations, Willey, Oxford. 2. Murray RK, Granner D, Mayes P and Rodwell VW (2000), Harper's Illustrated Biochemistry, McGraw-Hill, Companies, USA. 3. Blanco A and Blanco G (2017), Medical Biochemistry, Academic press. 4. Berg J, Tymoczko J and Stryer L (2002), Biochemistry, W H Freeman and Company, New York. 5. Nelson DL and Cox MM (2010), Lehninger's Principles of Biochemistry, Freeman WH and Co, USA. 6. Pelley J (2012), Elsevier's Integrated Biochemistry, Elsevier Publication, Amsterdam, The Netherlands	

Course Code: ZOCT203 **Course Title: Molecular aspects of Developmental Biology**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Elementary knowledge of embryology.	
Objectives:	To understand the overall chronology of the development and the role of various morphogens (protein/mRNA) in specification and determination of various organs and body axis formation.	
Content:	**Module 1** Mammalian Gametogenesis : ultra structure of sperm and egg; Molecular events in mammalian	**7 hours**

	fertilization (capacitation, prevention of polyspermy, genetic fusion , activation of egg metabolism). Cleavage in mammals, difference between somatic mitosis and cleavage, regulation of cleavage. Gastrulation (epiboly and emboly). Development of extra embryonic membrane. **Module 2** Mechanism of cell cellular differentiation; Stages of Commitment (differentiation, specification and determination; cellular communication: paracrine factors and signal transduction cascades (Jak-Stat pathway, smooth and patched protein pathway, wnt signaling pathway, smad pathway) . Developmental dynamics of cell speciation: Specification of body axes in sea urchin-, insect-, fish-, avian- and mammalian embryo. **Module 3** Induction and competence; cascade of induction during the formation of lens;epithelium-mesenchyme interaction during formation of feathers in bird.	**5 hours** **3 hours** **8 hours** **7 hours** **5 hours**
	The central nervous system and the epidermis: Primary and Secondary neurulation; Differentiation of the Neural Tube. Embryonic field; Pattern formation in vertebrate limbs, generation of the proximal – distal, anterior – posterior, dorso - ventral axis of the limb. Regeneration ability of animals; Role of Interstitial cells in Regeneration in Hydra. Molecular mechanism of regeneration of limb in Salamander.	**4 hours** **3 hours** **3 hours**
Pedagogy:	Lectures/tutorials/online teaching mode/self-study.	

Learning Outcome:	1. Understanding the basic concept of animal development 2. Understanding the cyto-differentiation and cellular communication during the process of development. 3. Boosting the concepts and knowledge on regulation of gene expression and their interaction.
References /Reading:	1. Barresi MJF and Gilbert SF (2019), Developmental Biology, 12th edition, Oxford University Press, UK. 2. Carlson BM (2003), Pattern's Foundation of Embryology, Mc Graw Hill Inc., USA. 3. Gilbert SF (2003), Developmental Biology, 5th edition, Sinauer 4.Gilbert SF (2006), Developmental Biology,8th edition,Sinauer Associates Inc., Sunderland, USA. 4. Gilbert SF (2013), Developmental Biology, 10th edition, Sin auer Associates Inc., Sunderland, USA. 5. Moody SA (2015), Principles of Developmental Genetics, Academic Press., New York. 6. Slack JMW (2012), Essential Developmental Biology, Willey Publication, USA 7. Wolpert L, Tickle C and Arias AM (2019), Principles of Development, Oxford University Press.

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Course Code: ZOCT204 **Course Title: Ecology and Biodiversity**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on Taxonomy, Biodiversity, Environment and Ecology.
Objectives:	This course will help the learner to understand the concept and components of ecology and its importance, population, community structures along with interactions. Overall the course develops an in-depth understanding of the whole ecosystem ecology and the various related concepts. Additionally, this course also deals with emerging field of molecular ecology, conservation genetics and the environmental aspects highlighting the changing environment and global effects.

Content:	**Module 1** Introduction: Historical overview of ecology, ecology and evolution, Ecological structure: Levels of organization, species abundance and composition, Biodiversity Ecological interactions: Positive interactions, Negative interactions, Study of behavior and behavioral ecology Ecological energetics: Food chains, Food webs and Trophic levels, Primary production, Nutrient cycles	**15 hours**
	Module 2 Population ecology: population parameters and demographic techniques, Population growth and regulation, Population studies and applications Community ecology: Community nature and parameters, community changes and ecological succession, Community organization Distribution and abundance: Biogeography: analysis of geographic distributions, reasons of existence and co-existence of organisms in niches Management of threatened species: threat to species, In-situ conservation, Ex-situ conservation.	**15 hours**
	Module 3 Human ecology: Introduction and impacts, Human population growth and food requirements, sustainable development Ecology of change: oil spills, plastic and biodiversity, impacts of climate change, Biodiversity Act 2004 (BMC, PBR). Applied ecology: optimum yield problem, biological control, ecotoxicology and pollution management, restoration ecology.	**15 hours**
Pedagogy:	Lectures/tutorials/online teaching mode /self-study.	
Learning Outcome:	1. Essential in depth understanding of the concepts and components of ecology. 2. Students will learn ecosystem structure and function along with the interactions involved at various levels. 3. Vision to understand the ecosystem ecology along with sufficient knowledge of energy flow and exchange. 4. Information about molecular ecology and conservation genetics. 5. Sensitization towards the environment with respect to the global scenario and the related problems, impact, along with methods to tackle the problems.	

References /Reading:	1. Andel JV and Aronson J (2012), Restoration Ecology: The New Frontier, Second edition, Blackwell Publishing Ltd. 2. Baker AJ (2000), Molecular Ecology, In Molecular Methods in Ecology (ed. AJ Baker), Blackwell Publishing. 3. Chapman JL and Reiss MJ (1999), Ecology: Principles and Applications, Cambridge University Press. 4. Conklin AR (2004), Field Sampling: Principles and Practices in Environmental Analysis, CRC Press. 5. Fahey TJ and Knapp AK (2007), Principles and Standards for Measuring Primary Production, Oxford University Press, UK. 6. Grant WE and Swannack TM (2008), Ecological Modeling, Blackwell. 7. Odum EP and Barrett GW (2004), Basic Ecology: Fundamentals of Ecology, Fifth Edition, Oxford and IBH Publishing Co. Pvt. 8. Perrow MR and Davy AJ (2002), Handbook of Ecological Restoration Vol 2 Restoration in Practice, Cambridge University Press. 9. Sutherland WJ (2006), Ecological Census techniques a handbook, Cambridge University Press. 10. Wilkinson DM (2007), Fundamental Processes in Ecology: An Earth system Approach, Oxford University Press, UK. 11. Heatwole, H., Taylor, J. (1987). Ecology of Reptiles. Cocos (Keeling) Islands: Surrey Beatty & Sons. 12. Snakes: Ecology and Behavior. (1993). United Kingdom: McGraw-Hill.

Course Code: ZOCP201 **Course Title: Laboratory Course-II**
Number of Credits: 4
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic working knowledge of Animal Anatomy, Biochemistry, Embryology and Ecology	
Objectives:	1. To provideLaboratory hands on training in various aspects of developmental biology, anatomy, biochemistry and ecology.	
Content:	**Anatomy of Chordates** 1. Preparation of the skeleton using a Chicken. 2. Exposure of axial muscle of fish. 3. Digestive system of fish. 4. Reproductive system of fish. 5. Afferent and Efferent branchial system of fishes. 6. Brain of Chicken *Dead fish collected from the market and chicken from the slaughterhouse	**11 x 2 lab hours**

	Biochemistry 1. Preparation of biological buffers and standard reagents 2. Calibration of pH meter using standard buffers 3. Extraction and Estimation of major biomolecules in different tissues of fish. Total Protein & free amino acids / glycogen & glucose/ triglycerides & cholesterol. 4. Determination of Km and Vmax of Na+ -K + - ATPase/ Acetylcholinesterase. 5. Fractionation of Lipid moieties through TLC (demo). 6. Titration of an acid with conjugated base.	**11 x 2 lab hours**
	Developmental Biology 1. Identification of developmental stages of chick embryo using HH classification. 2. In vitro culture of chick embryo. 3. Effect of proline / retinoic acid in early development of chick embryo (In vivo as well as in vitro). 4. Effect pesticides on the ossification process of chick embryo by dual staining method.	**11 x 2 lab hours**
	Ecology 1. Study of Pond, Grassland, and Forest Ecosystem 2. Habitat Preferences of Stream Invertebrates 3. Abundance and Distribution of Birds/Butterflies/Snakes etc 4. Landscape Ecology 5. Communities: Measuring Diversity 6. Basic concepts of cartography	**12 x 2 lab hours**
Pedagogy:	Practicals/ Mini projects/ Group Activities.	
Learning Outcome:	Hands-on training on certain areas based on courses on DSCCZO7, 208, 209 & 210.	
References /Reading:	As mentioned under individual course DSCCZO7, 208, 209 & 210.	

Course Code: ZOCF201 **Course Title: Field work-II**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of Animal systematics
Objectives:	To do a field survey

Content:	Field Work faunistic survey around 1 km radius of his/ her residence during dawn every weekend for at least 2 months (8 weeks) using Transect or Quadrangle method of two different fauna. Visit to a National Park / Sanctuary, Universities and Research Institutions outside Goa (within 1000 km from Goa) for 5 -6 days including Journey period. *In unavoidable circumstances overnight field work will be replaced by extending the time period (from 8 weeks to 10 weeks of weekend faunistic survey). *Evaluation of the field work component will be based on weekly field notes and final compiled field report as a component of the SEA.	**15 x 2 hours**
Pedagogy:	Practicals, Mini projects, Group activities, presentations	
Learning outcome:	To know the fauna surrounding one's own house.	
References/ Reading:	As mentioned under course DSCCZO1	

Course Code: ZOOT201 **Course Title: Environmental Physiology (Theory)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of Animal Physiology and Biochemistry	
Objectives:	1. To learn the meaning of adaptation. 2. To understand how the various physiological processes adjusted during the fluctuation of the various environmental parameters	
Content:	**Module 1** Nature and levels of adaptation; mechanism of adaptation; cellular metabolism, regulation and homeostasis; concept of stress and strain in animals. Thermal adaptation: biochemical and physiological effects of temperature; Regulation of heat gain and heat loss, Dubois temperature balance; role of nervous system and endocrine system in thermal biology; homeoviscous adaptation of membrane.	**6 hours** **12 hours**

	Module 2 Salinity adaptation: biochemical and physiological effects of salinity; regulation and movements of water and solute; osmoregulatory organs and their excretory products; Role of membranes in osmoregulation. **Module 3** Strategies and mechanism in physiological adaptation with reference to marine life, estuarine life, freshwater life and terrestrial life. Physiological and morphological adaptation of the animals living in extreme environments. Circadian rhythm: biological clock; analysis of circadian rhythmicity; ultradian and infradian rhythm; behavioural and autonomous rhythm; endogenous mechanism of rhythm.	**12 hours** **10 hours** **5 hours**
Pedagogy:	Practicals, Mini projects, Group activities, presentations	
Learning outcome:	1. Understanding the concept of adaptation. 2. Understanding the life processes at various environmental conditions. 3. Understanding the concept of biological rhythm.	
References/ Reading:	1. Russel G Foster and Leon Kretzman, (2017); Circadian rhythm, A very short Introduction, Oxford University Press, UK 2. Roberto Refinetti , (2016) ; Circadian Physiology , CRC Press, USA. 3. Hochachka PW and Somero GN; Biochemical Adaptation, Oxford University Press, UK. 4. Nielsen S, (1997); Animal Physiology: Adaptation and Environment, Cambridge University Press, Cambridge. 5. Wilimer P, Stone G and Johston IA, (2004); Environmental Physiology. of Animals, Wiley Blackwell Publishing Co, USA	

Course Code: ZOOP201 **Course Title: Environmental Physiology (Practicals)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of Animal Physiology and Biochemistry	
Objectives:	Laboratory training based on skilled based courses on Physiology.	
Content:	1. Effect of thermal stress on the excretory rates in bivalves/fish. 2. Effect of salinity stress on the respiratory rates of bivalves/fish. 3. Effect of salinity acclimation in the osmo-regulatory processes of mud crab / fish / bivalves.	**15 x 2 hours**

	4. Effect of thermal stress on the carbohydrate metabolism of bivalve/fish. 5. Effect of salinity stress on the membrane fluidity of gill epithelial cells of mud crab /bivalve/fish.	
Pedagogy	Practicals, Mini projects, Group activities	
Learning outcome	Hands-on training in environmental physiology experiments	
References/ Reading	1. Russel G Foster and Leon Kretzman, (2017); Circadian rhythm, A very short Introduction, Oxford University Press, UK 2. Roberto Refinetti , (2016) ; Circadian Physiology , RC Press, USA. 3. Hochachka PW and Somero GN; Biochemical Adaptation, Oxford University Press, UK. 4. Nielsen S, (1997); Animal Physiology: Adaptation and Environment, Cambridge University Press, Cambridge. 5. Wilimer P, Stone G and Johston IA, (2004); Environmental Physiology. of Animals, Wiley Blackwell Publishing Co, USA	

Course Code: ZOOT202 **Course Title: Animal Cell Biology (Theory)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic understanding of different components and functions of the cell.	
Objectives:	1. To develop advanced concepts of structural and functional properties of cell and their components. 2. To understand dynamic functions associated with cell membrane and organelles.	
Content:	**Module 1** Cell membrane: Plasma membrane dynamics involved in membrane fluidity (paracrystalline state, liquid-disordered state and liquid-ordered state), transbilayer movements, lateral movements, membrane rafts, caveolins, cell-cell interaction, membrane fusions. Importance of freeze-fracture microscopy and fluorophore photobleaching experiments to decipher membrane structure and dynamism. Nuclear transport: passive transport and selective energy dependant transport, karyopherins (importins and exportins), NLS and NES **Module 2**	**7 hours** **4 hours** **4 hours**

	Structural component of Endomembrane system, main vesicular transport pathways (inward transport: Endocytotic pathway and outward transport: Secretory pathway) of endomembrane systems and transport proteins involved.	**4 hours**
	Structural and functional polarization of Golgi apparatus, two models for cis to trans-Golgi progression (Cisternal Maturation Model and Vesicular transport model, three pathways of protein sorting at trans-Golgi network.	**6 hours**
	Lysosomes, signal-mediated diversion to regulated secretion, constitutive secretory pathways. LAMP and LIMP of lysosomes and their significance.	**2 hours**
	Synthesis, structure, and functions of ribosome and its subunits in Prokaryotes and Eukaryotes. Concept of LUCA in relation to ribosomes. (Additional: mention of Mitochondrial Eve and Y-chromosome Adam concept).	**2 hours**
	Comparison of organelle composition of protein secreting and steroid-secreting cells.	**1 hour**
	Module 3	
	Comparison of the constitution of Cytoplasm, Cytosol and Nucleoplasm. Comparison of Cytoskeletal elements of Prokaryotes and Eukaryotes.	**3 hours**
	Programmed and non-programmed cell death and its types, Autophagy, Pyroptosis, Necroptosis, Parthonatos, Ferroptosis, Apoptosis and Necrosis. Extrinsic versus Intrinsic pathway of Apoptosis in Mammals.	**6 hours**
	Cell signaling: General principles, specific responses to cell signaling (survive, grow+divide, differentiate, death) with example each, feedback loops of signaling networks, adaptation to sensitivity to signaling. Overview of receptors, signaling transducers and second messengers.	**6 hours**
Pedagogy	Lectures/ tutorials/Group discussions/PBL/self-study	
Learning outcome	1. Understand the functions of the cell at the molecular level. 2. Gain insight into the most significant functional cellular machinery to expand understanding of biological disturbances.	

References/ Reading	1. Alberts B, Johnson A, Lewis J, et al. (2014) Molecular Biology of the Cell, Taylor & Francis Group, New York, USA. 2. Lodish H, Berk A, Lawrence S, et al., (2008) Molecular Cell Biology, Freeman WH & Co. New York. 3. Watson JD, Beyker, Bell JD, et al., (2004) Molecular Biology of the Gene, Pearson Education, Delhi. 4. Bray BAD, Lewis J, Raff M, Roberts K and Watson JD, Molecular Biology of the Cell, Garland Publishing Co. Ltd. New York. 5. De Robertis EDP and De Robertis EMF, (1979)Cell and Molecular Biology Saunders College, Philadelphia Dowben RM, Cell Biology, Harper and Row Publ. London. 6. Nelson, D. L. and Cox, M. M.(2008) Lehninger Principles of Biochemistry. Seventh Edition (2017). Freeman WH and Co, USA

Course Code: ZOOP202 **Course Title: Animal Cell Biology (Practicals)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic understanding of different components and functions of the cell.	
Objectives:	1. To develop advanced concepts of structural and functional properties of cell and their components. 2. To understand dynamic functions associated with cell membrane and organelles.	
Content:	1. Isolation of lysosomes/ mitochondria from chicken liver using differential centrifugation. 2. Cell isolation and enumeration using trypan blue method. 3. Cell toxicity study using MTT/XTT assay. 4. Study of histology technique using HE staining 5. Study of Cytokinesis-block assay using lymphocytes culture.	**15 x 2 hours**
Pedagogy:	Laboratory-based learning, PBL, Demonstrations, videos	
Learning Outcome:	1. Skill development for isolation of cell organelles. 2. Gain insight into the most significant functional cellular machinery to expand understanding of biological disturbances.	
References /Reading	1. Alberts B, Johnson A, Lewis J, et al. (2014) Molecular Biology of the Cell, Taylor & Francis Group, New York, USA. 2. Lodish H, Berk A, Lawrence S, et al., (2008) Molecular Cell Biology, Freeman WH & Co. New York. 3. Watson JD, Beyker, Bell JD, et al., (2004) Molecular Biology of the Gene, Pearson Education, Delhi. 4. Bray BAD, Lewis J, Raff M, Roberts K and Watson JD, Molecular Biology of the Cell, Garland Publishing Co. Ltd. New York.	

	5. De Robertis EDP and De Robertis EMF, (1979)Cell and Molecular Biology Saunders College, Philadelphia Dowben RM, Cell Biology, Harper and Row Publ. London. 6. Nelson, D. L. and Cox, M. M.(2008) Lehninger Principles of Biochemistry. Seventh Edition (2017). Freeman WH and Co, USA

Course Code: ZOOT203 **Course Title: Wildlife Conservation & Management**
Number of Credits: 3 **(Theory)**
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge in wildlife conservation and management	
Objectives:	1. To provide graduates in Biology a specialization in the field of Wildlife Conservation and Management 2. To generate qualified students who can directly get jobs in the allied fields of Wildlife Conservation and Management; 3. To generate qualified postgraduates who can be part professional/Government organizations working in the field of Wildlife Conservation and Management 4. To generate a team of post graduates who can take up jobs related to Wildlife Conservation in the educational institutions. 5. To generate skilled post graduates who can undertake research in the field of Wildlife biology.	
Content:	**Module 1** Wildlife conservation and management: Introduction to Indian Wildlife, History and Diversity, Biogeographic zones, Value of Wildlife, Important Indian fauna and their distribution, Protected Areas, Endemic species; IUCN red list: Extinct species of India, Endangered, Threatened, Least concern and Critically Endangered. Climate change and its impact on wildlife. Impacts of pesticides on fauna.. **Module 2** Environmental Ethics and Management: Conservation and Management of Wildlife: Conservation and management: In-situ conservation and Ex-situ conservation; Reintroduction, Ecological Restoration. Innovative Methods in Wildlife: Camera Trap, Conservation Drones, Remote Sensing, Radio Telemetry, GIS, GPS Mobile App, Capturing and marking techniques, trapping, darting, tagging and banding, scat analysis, sign surveys. Wildlife Census and Indices: Methods of animal census, counting methods. Animals in Indian Mythology. Major Projects. Ecotourism and Environment Impact Assessment **Module 3**	**7 hours** **8 hours** **4 hours** **6 hours** **5 hours**

	Human Wildlife Conflict: Types of conflict, Prevention or precautions, Human Elephant Conflict, Conflict between human, Tiger and Leopard, Conflict with Sloth Bear. Wildlife Trade and Crime: Wildlife products CITES, TRAFFIC, Wildlife Crime Control Bureau in India, Wildlife Forensics. Law, Ministry and Organizations: Wildlife Protection Act of (1972), National Board of Wildlife, Environment Protection Act (1986), Biological Diversity Act (2002), The First National Wildlife Action Plan (NWAP) (1983), National Wildlife Action Plan (2017-2031), MoEFCC International organizations; UNESCO, IUCN, PETA. National Institutes/Organizations; NTCA, ZSI, BSI, CZA, WII, SACONH, ENVIS. Non-Government Organizations.	**4 hours** **3 hours** **5 hours** **3 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study	
Learning Outcome:	1. Understand the distribution and diversity of Indian wildlife including their conservation status. 2. Gain insight on the different methods and techniques in wildlife conservation 3. Will gain practical knwolegde on wildlife management and conservation 4. Understanding towards implementation of different wildlife projects including various laws, acts and regulations for the conservation of wildlife.	
References/ Reading	1. Abdul Jamil Urfi (2004): Birds beyond Watching, University Press (India) Pvt. Ltd. 2. Dasmann, R.F. (1964) Wildlife biology, John Wiley and Sons, New York. 3. Gary, K., Meffe, Carroll, C.R. and Contributors (1997): Principles of Conservation Biology - 2nd Edition, Sinauer Associates, Inc Sunderland Massachusetts. 4. Giles, R.H. Jr. (Ed 1984): Wildlife management techniques - 3rd edition, The wildlife society, Washington D.C. 5. Grimmet, R., Inskipp, C. & Inskipp, T. (1999): Pocket Guide to the birds of Indian Subcontinent, Oxford University Press, New Delhi. 6. Hosetti, B.B. (2003): Wetlands Conservation and management, Pointer Publishers, Jaipur, India. 7. Kazmerezak Krys and Van Perlo Ber (2000): A field Guide to the birds of India, OM Book Series, New Delhi. 8. Robinson W.L. and Eric G. Bolen (1984): Wildlife Ecology and Management, Millen Publishing Co. New York. 9. Salim Ali (2002): The book of Indian Birds, revised edn. BNHS & Oxford University press, New Delhi. 10. Sharma B.K and Kaur, H. (1986): Environmental Chemistry. Goel Publishing House, Meerut.	

	11. Teague R.D. (Ed.). 1980. A Manual of wildlife conservation, The Wildlife society Washington D.C. 12. Essentials of Conservation Biology, Fourth Edition, by R.B. Primack. 13. Wildlife Conservation and Wildlife Management, by Reena Mathur

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Course Code: ZOOP203 **Course Title: Wildlife Conservation & Management (Practicals)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge in wildlife conservation and management	
Objectives:	1. To provide graduates in Biology a specialization in the field of Wildlife Conservation and Management 2. To generate qualified students who can directly get jobs in the allied fields of Wildlife Conservation and Management; 3. To generate qualified postgraduates who can be part professional/Government organizations working in the field of Wildlife Conservation and Management 4. To generate a team of post graduates who can take up jobs related to Wildlife Conservation in the educational institutions. 5. To generate skilled post graduates who can undertake research in the field of Wildlife biology.	
Content:	**Module 1** 1. Mammal distribution of Goa (i) Primates: Rhesus macaque (ii) Carnivores: Tiger, Panther, Sloth bear (iii) Ungulates: Sambar, Chital, Wild boar. 2.Horn/ Antler identification. 3.Pugmark analysis and Camera trap methods. 4. Animal Scat, pellet, dung, droppings analysis (Indirect evidences) 5.Case study of Man-Animal conflict and Ethnozoology. Visit to Zoo/Wildlife Sanctuary/National Park/Turtle nesting site	**15 x 2 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study	
Learning Outcome:	1. Understand the distribution and diversity of Indian wildlife including their conservation status. 2. Gain insight on the different methods and techniques in wildlife conservation 3. Will gain practical knwolegde on wildlife management and conservation 4. Understanding towards implementation of different wildlife projects including various laws, acts and regulations for the conservation of wildlife.	
References/ Reading	1. Abdul Jamil Urfi (2004): Birds beyond Watching, University Press (India) Pvt. Ltd. 2. Dasmann, R.F. (1964) Wildlife biology, John Wiley and Sons, New York. 3. Gary, K., Meffe, Carroll, C.R. and Contributors (1997): Principles of Conservation Biology - 2nd Edition, Sinauer Associates, Inc Sunderland Massachusetts.	

	4. Giles, R.H. Jr. (Ed 1984): Wildlife management techniques - 3rd edition, The wildlife society, Washington D.C. 5. Grimmet, R., Inskipp, C. & Inskipp, T. (1999): Pocket Guide to the birds of Indian Subcontinent, Oxford University Press, New Delhi. 6. Hosetti, B.B. (2003): Wetlands Conservation and management, Pointer Publishers, Jaipur, India.

Course Code: ZOOT301 **Course Title: Neurophysiology (Theory)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on Non-chordate and Chordate anatomy and Physiology is prerequisite for this course.	
Objectives:	1. To develop knowledge about fundamental Neurophysiological concepts in animal models and in humans. 2. To be aware of electrophysiology techniques involved in recording neurological parameters.	
Content:	**Module 1**	
	Review of classification of neurons and their functions. Blood-brain barrier and its physiological importance, CSF composition, formation, and drainage.	**4 hours**
	Physiological characteristics of neuronal cell membrane components for impulse conduction.	**2 hours**
	Myelin ultrastructure and Nodes of Ranvier, nerve impulse conduction in myelinated and unmyelinated neurons.	**4 hours**
	Electrophysiology of neurons. Comparison of action potentials of giant axon of Squid and mammalian neuron.	**4 hours**
	Voltage and Cell-Patch Clamp Techniques.	**3 hours**
	Module 2	
	Types of synaptic connections (axosomatic, axodendritic, dendro-dendritic, and axo-axonal synapses). Properties of Synapse. The basic concept of Neural integration: Diverging, Converging, and Reverberating circuits.	**2 hours**
	Chemical and electrical synapses and their transmission physiology. Axonal impulse conduction-excitatory and inhibitory synaptic transmission.	**4 hours**

	Neurotransmitters, Neuropeptides, and receptors.	**2 hours**
	Steps involved in the synthesis, transport, and release of neurotransmitters and neuropeptides.	**2 hours**
	Synthesis and release of Acetylcholine, Glutamate, GABA, Dopamine, Norepinephrine, and Epinephrine, Serotonin, Nitric oxide.	**5 hours**
	Module 3	
	Learning and Memory types and its Neural and Cellular basis in Aplysia, Drosophila, Honey bee and Humans.	**4 hours**
	Neurophysiology of Avian song/ call formation.	**2 hours**
	Cognition and its major domains. Mechanoreception, Photoreception, Chemoreception.	**4 hours**
	Neurophysiology of balance and posture.	**3 hours**
	Neurophysiology of sleep.	**2 hours**
Pedagogy:	Lectures/ tutorials/Group discussions/PBL/self-study	
Learning Outcome:	1. Understanding of neurophysiological concepts. 2. Understanding of learning, memory formation and cognition.	
References /Reading	1. Siegel, G. J.; Agranoff, B. W.; Albers, R. W., et al., (2011). Basic Neurochemistry: Molecular, Cellular and Medical Aspects. Academic Press. 2. Hammond, C. (2008). Cellular and Molecular Neurophysiology. Academic Press. 3. Carpenter, R; Reddi, B. (2012). Neurophysiology: A Conceptual Approach,. Hodder and Arnold. UK. 4. Purves, D.; Augustine, G. J.; Fitzpatrick, D.; et al. (2018). Neuroscience. Oxford University Press. 5. Menzel, R.; Benjamin, P. (2013). Invertebrate Learning and Memory, Volume 22. Academic Press. 6. Gazzaniga, M. S. (2009). The Cognitive Neurosciences. A Bradford Book the MIT Press Cambridge , Massachusetts London, England.	

Course Code: ZOOP301 **Course Title: Neurophysiology (Practicals)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on Non-chordate and Chordate anatomy and Physiology is prerequisite for this course.	
Objectives:	1. To develop knowledge about fundamental Neurophysiological concepts in animal models and in humans. 2. To be aware of electrophysiology techniques involved in recording neurological parameters.	
Content:	1. Estimation of Glutamate and GABA from brain tissue (Chicken head) either by Spectrophotometric/ Chromatographic/ Fluorospectrophotometric methods. 2. Primary culture of neurons from the chicken brain. 3. Primary culture of neurons from Chick embryo brain 4. Numerical and pictorial memory analysis using memory drum. 5. Learning and short-term memory formation analysis in human subjects. 6. Pressure phosphene, Balancing analysis using human subject. 7. Visual test analysis for photoreception in human subjects	**15 x 2 hours**
Pedagogy:	Lectures/ tutorials/Group discussions/PBL/self-study	
Learning Outcome:	1. Understanding of Neurophysiological concepts. 2. Understanding of learning, memory formation and cognition.	
References /Reading	7. Siegel, G. J.; Agranoff, B. W.; Albers, R. W., et al., (2011). Basic Neurochemistry: Molecular, Cellular and Medical Aspects. Academic Press. 8. Hammond, C. (2008). Cellular and Molecular Neurophysiology. Academic Press. 9. Carpenter, R; Reddi, B. (2012). Neurophysiology: A Conceptual Approach,. Hodder and Arnold. UK. 10. Purves, D.; Augustine, G. J.; Fitzpatrick, D.; et al. (2018). Neuroscience. Oxford University Press. 11. Menzel, R.; Benjamin, P. (2013). Invertebrate Learning and Memory, Volume 22. Academic Press. 12. Gazzaniga, M. S. (2009). The Cognitive Neurosciences. A Bradford Book the MIT Press Cambridge , Massachusetts London, England.	

Course Code: ZOOT302 **Course Title: Animal Cell Culture (Theory)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on organization of cells, their structure and function in animal body
Objectives:	1. To understand the structure, growth and function of animal cells.

	2. To understand the technology involved in cell and tissue culture establishment, characterization and its maintenance.	
Content:	**Module 1** Basics of animal cell culture, Laboratory layout and sterile handling, Equipments, Chemicals and other requisites for animal cell culture, safety during Animal cell culture. Primary cell culture (Explant and free cell culture), subculture and cell line. Maintenance of cell culture, characterization of cultured cells, Advantages of Animal cell culture, Stem cells (Embryonic and Adult) and their applications.	**7 hours** **8 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study/presentation	
Learning Outcome:	1. Theoretical idea to isolate and culture cells using different techniques 2. Ability to explain sterile techniques for growing culture and identifying contaminants. 3. Ability to describe the culture and *in-vitro* maintenance of the cells	
References /Reading	1. Freshney, R. I. (2015). Culture of animal cells: a manual of basic technique and specialized applications. John Wiley & Sons. 2. Lanza, R., Gearhart, J., Hogan, B., Melton, D., Pedersen, R., Thomas, E. D., & Thomson, J. A. (Eds.). (2005). Essentials of stem cell biology. Elsevier. 3. Masters, J. (Ed.). (2000). Animal cell culture: a practical approach (Vol. 232). OUP Oxford. 4. Boulton, A. A., Baker, G. B., & Walz, W. (Eds.). (1992). Practical cell culture techniques (Vol. 23). Totowa, New Jersey: Humana Press.	

Course Code: ZOOP302 **Course Title: Animal Cell Culture (Practicals)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of Anatomy, Cell Biology, & Laboratory setup	
Objectives:	1. Maintaining aseptic environment for cell culture 2. Hands on training in different cell culture techniques.	
Content:	**Module 1** 1. Sterilization of Animal cell culture/Tissue culture Room 2. Preparation of Laminar Flow hood for cell culture 3. Sterilization techniques: Steam & Hot Air 4. Preparation and sterilization of medias and buffers **Module 2**	**15 x 2 hours**

	1. Isolation and inoculation of gill cells from bivalves by mechanical (trituration) dissociation 2. Isolation of mantle cells from bivalves by explant culture method 3. Isolation of siphon cells from bivalves by enzymatic (Trypsinization) dissociation 4. Isolation and culture of cells from hepatopancreas of prawns/crabs 5. Isolation and primary culture of hepatocytes from fish **Module 3** 1. Primary cultures of fibroblast from chick embryo. 2. Isolation and maintenance of chicken embryonic stem cell from blastoderm. 3. Isolation and culture of chicken cartilage Stem/Progenitor cells. 4. Isolation and inoculation of mesenchymal stem cells from chicken compact bones. 5. Isolation and culture of dermis-derived mesenchymal Stem/Progenitor cells from chick embryo.	**15 x 2 hours** **15 x 2 hours**
Pedagogy:	Practicals/Mini projects/Group activities/presentations.	
Learning Outcome:	Hands on training in Animal cell culture techniques.	
References /Reading	1. Boulton, A. A., Baker, G. B., & Walz, W. (Eds.). (1992). Practical cell culture techniques (Vol. 23). Totowa, New Jersey: Humana Press. 2. Freshney, R. I. (2015). Culture of animal cells: a manual of basic technique and specialized applications. John Wiley & Sons. 3. Lanza, R., Gearhart, J., Hogan, B., Melton, D., Pedersen, R., Thomas, E. D., & Thomson, J. A. (Eds.). (2005). Essentials of stem cell biology. Elsevier. 4. Masters, J. (Ed.). (2000). Animal cell culture: a practical approach (Vol. 232). OUP Oxford. 5. Mitsuhashi, J. (2002). Invertebrate tissue culture methods. Springer science & business media.	

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Course Code: ZOOT303 **Course Title: Toxicology (Theory)**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on Chemistry, Anatomy, Physiology and Ecology.

Objectives:	1. To understand everyday toxic substances and their routes of exposures and its fate in the animal body and in the environment. 2. To understand significance of toxicological studies in forensic science.	
Content:	**Module 1** Introduction to toxicology: Definition and Scope, History of Toxicology, Branches of Toxicology. Classification of Toxicants (based on 1] Source, 2] Use, 3] Target organ 4] Reactivity). Toxicokinetics: Definitions and concepts of Exposure, Dose and response. Metabolism of toxicants (Phase I and Phase II reactions), Absorption, Distribution, Biotransformation and Elimination of Toxicants (Renal Elimination, Hepatic Elimination, Respiratory Elimination), Toxic actions /mechanism (Acute, Sub-chronic & Chronic). Toxicokinetic models (Descriptive and Physiological Models). **Module 2** Environmental Toxicity: Environmental contaminants, Dilution paradigm and Boomerang paradigm, Ways of poisoning food chain, Environmental persistence. Pollution: Air pollution, Noise pollution, water pollution and thermal pollution: types and sources, effects of pollutants on human health. Solid waste pollution: sources and effects of solid waste toxicity on human health. Pesticide and Heavy metal toxicity: effects of pesticides and heavy metals on ecosystem, mechanism of pesticides toxicity, heavy metal toxicity and their effects on human health. Zootoxins, phytotoxins and bacteriotoxins **Module 3** Forensic toxicology: Disciplines of Forensic toxicology (Definition of poisons, Forensic classification of poison, factors affecting the mode of action of poisons, extraction and isolation of poisons from biological samples. Drugs included in routine post-mortem toxicology, Forensic DNA typing system. Applications of forensic toxicology Alkaloid toxicity: definition, classification and isolation of alkaloids from biological samples, general properties of toxic alkaloids. Food poisoning- definition and common sources. Analysis of food products for adulterants by physical, chemical and instrumental techniques.	**15 hours** **15 hours** **15 hours**
Pedagogy:	Lectures/Tutorials/Videos/Assignments/ Group discussions/Self-study.	
Learning Outcome:	1. Understanding application of different routes of exposure for toxicological studies and dose findings. 2. Understanding of the physiological and environmental effects of toxins. 3. Knowledge of various techniques for Toxicity evaluation.	

References/ Reading	1. Timbrell J. Introduction to ToxicologyThird Edition (2002), Taylor and Francis Inc. 2. Klaassen C, John Watkins J. Casarett & Doull's Essentials of Toxicology, Third Edition (2015). McGraw-Hill Education publication. 3. Stine K., Brown TM. Principles of Toxicology. Third Edition (2015). CRC Press. 4. Wallace A H. Principles and Methods of Toxicology. Fifth edition (2007). Informa Healthcare Publication, USA 5. Kwong T, Magnani B, Rosano T,Shaw L. The Clinical Toxicology Laboratory: Contemporary Practice of Poisoning Evaluation, Second Edition (2013). AACC Press. 6. Pandey G, Sahani YP. Toxicological Laboratory Manual. First Edition (2013)International E-Publication, India. 7. Levine B. Principles of Forensic Toxicology. Second Edition (2003)Amer Assn for Clinical Chemistry Press. 8. Hodgson E. A Textbook of Modern Toxicology. Fourth Edition (2010). Willey Publication. 9. Durrant M. Handbook of Clinical Toxicology. First Edition (2019). Hayle Medical Publishers.

Course Code: ZOOP303 **Course Title: Toxicology (Practicals)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on Chemistry, Anatomy, Physiology and Ecology.	
Objectives:	1. To understand everyday toxic substances and their routes of exposures and its fate in the animal body and in the environment. 2. To understand significance of toxicological studies in forensic science.	
Content:	1. Detection of heavy metals in water samples 2. Detection of additives in food items 3. Detection of microplastics in water samples 4. Determination of LD50 from given data using Probit analysis. 5. Effect of heavy metal pollution physiological process in crabs/fishes 6. Estimation of oxidative damage in organisms exposed to pollutants 7. Understanding the classes of drugs and their modes of action	**15 x 2 hours**
Pedagogy:	Lectures/Tutorials/Videos/Assignments/ Group discussions/Self-study.	

Learning Outcome:	1. Understanding application of different routes of exposure for toxicological studies and dose findings. 2. Understanding of the physiological and environmental effects of toxins. 3. Knowledge of various techniques for Toxicity evaluation.
References/ Reading	1. Timbrell J. Introduction to ToxicologyThird Edition (2002), Taylor and Francis Inc. 2. Klaassen C, John Watkins J. Casarett & Doull's Essentials of Toxicology, Third Edition (2015). McGraw-Hill Education publication. 3. Stine K., Brown TM. Principles of Toxicology. Third Edition (2015). CRC Press. 4. Wallace A H. Principles and Methods of Toxicology. Fifth edition (2007). Informa Healthcare Publication, USA 5. Kwong T, Magnani B, Rosano T,Shaw L. The Clinical Toxicology Laboratory: Contemporary Practice of Poisoning Evaluation, Second Edition (2013). AACC Press. 6. Pandey G, Sahani YP. Toxicological Laboratory Manual. First Edition (2013)International E-Publication, India. 7. Levine B. Principles of Forensic Toxicology. Second Edition (2003)Amer Assn for Clinical Chemistry Press. 8. Hodgson E. A Textbook of Modern Toxicology. Fourth Edition (2010). Willey Publication. 9. Durrant M. Handbook of Clinical Toxicology. First Edition (2019). Hayle Medical Publishers.

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Course Code: ZOOT304 **Course Title: Herpetology (Theory)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on herpetofauna its identification at taxonomic level and the systematics	
Objectives:	1. Students will be introduced to the diversity and biology of amphibians and reptiles. 2. The lecture component will have a national, global and diverse focus, covering topics of phylogenetics, the origin and evolution of amphibians and reptiles, the global diversity of taxa, and their biogeography, biology, habitat, ecology and conservation.	
Content:	**Module 1:** Introduction to herpetology: shared characteristics of Amphibians and Reptiles, significance of studying Amphibians and Reptiles, the diversity of Amphibians and Reptiles. Thermal Ecology: Heat Exchange in the environment (Absorption of radiant energy, radiative loss, conduction, convention, evaporative cooling, role of body size and shape in heat exchange), Response to	**15 hours**

	environmental temperatures (Basking, Perching, Breezing, Postural changes, Shade seeking and shuttling, Burrowing, Dial patterns of response to temperature), Costs and benefits of Ectothermy and Endothermy. Water relations in amphibians and reptiles, Aestivation, Hibernation and other Eco physiological adaptations in reptiles and amphibians	
	Module 2: Factors affecting distribution and abundance of amphibians and reptiles, Biogeography of Amphibians and reptiles, Communication in Amphibians and reptiles, Diet and foraging behaviour, Parental care in Amphibians and Reptiles, The Ecology and Behaviour of Amphibian Larvae, the niche (niche theory, interspecific competition, niche overlap and resource partitioning, factors influencing resource partitioning)	**15 hours**
	Module 3: Systematics and diversity of extant Amphibian & Reptiles: life history, skin, reproduction, sensory systems. Taxonomy, morphology, reproduction, life history & fossil Records (Caudata, Anura & Gymnophiona), Taxonomy, Morphology, Reproduction, Life History & Fossil Records (Squamata, Testudines, Crocodilia, Sphenodontia)	**15 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study	
Learning Outcome:	1. Students will learn about the Diversity, Habitat-Ecology, Behavior, Adaptation, Taxonomy of the Amphibian and reptiles. 2. Identification of the local herpetofauna through direct field experience. The course assumes that students are familiar with basic evolutionary theory and general biology.	
References /Reading	1. Porter, K.R. 1972. Herpetology. W. B. Saunders Co., Philadelphia. xi, 524 pages. 8o. 2. Adler, K. (Ed.). 1989. Contributions to the History of Herpetology. K. Adler: Herpetologists of the past; J. S. Applegarth: Index of authors in taxonomic 3. Herpetology; R. Altig: Academic lineages of doctoral degrees in herpetology. Contributions to Herpetology, No. 5, Society for the Study of Amphibians and Reptiles, Oxford, Ohio, 202 pages, 1 plate. 4o. 4. Biology of Reptiles: D.R. Khanna and P.R. Yadav, Discovery Pub, 2004, ix, 414 p, figs, ISBN 5. An Introduction to Reptiles: H.S. Bhamrah and Kavita Juneja, Anmol, 2002, Reprint, vi, 193 p,	

	6. The Reptile Fauna of India: A Source Book by T.S.N. Murthy, B.R. Pub, 2010, xx, 332 p 7. A Pocket Book on Indian Reptiles: Crocodiles, Testudines, Lizards and Snakes, T.S.N. Murthy, Nature Books India, 2009, viii, 88 p 8. The book of Indian Reptiles and Amphibians, By J. C. Daniel, BNHS 9. Snakes of India, The Field Guide, by, R. Whitaker and Ashok Captain. 10. The Fauna of British India, Ceylon and Burma, Reptilia and Amphibia, VOL III – Serpentes, By Malcom A. Smith. 11. The Fauna of British India, Ceylon and Burma, Reptilia and Amphibia, VOL II – Sauria, By Malcom A. Smith. 12. Ecology of Reptiles, Heatwole & Taylor, 1987 13. Snakes Ecology & Behavior, Seigel and Collins

Course Code: ZOOP304 **Course Title: Herpetology (Practicals)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on herpetofauna its identification at taxonomic level and the systematics	
Objectives:	Laboratory training based on skilled based courses on Herpetology.	
Content:	1. The identification of the amphibian families through basic external anatomy 2. The identification of the reptile families through basic external anatomy 3. Identification of reptiles through scale count 4. Learning handling techniques of Amphibians and Reptiles 5. Beta diversity of herpetofauna in the Goa University campus 6. Identification of venomous and non-venomous snakes	**15 x 2 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study	
Learning Outcome:	3. Students will learn about the Diversity, Habitat-Ecology, Behavior, Adaptation, Taxonomy of the Amphibian and reptiles. 4. Identification of the local herpetofauna through direct field experience.	

References /Reading	1. Porter, K.R. 1972. Herpetology. W. B. Saunders Co., Philadelphia. xi, 524 pages. 8o. 2. Adler, K. (Ed.). 1989. Contributions to the History of Herpetology. K. Adler: Herpetologists of the past; J. S. Applegarth: Index of authors in taxonomic 3. Herpetology; R. Altig: Academic lineages of doctoral degrees in herpetology. Contributions to Herpetology, No. 5, Society for the Study of Amphibians and Reptiles, Oxford, Ohio, 202 pages, 1 plate. 4o. 4. Biology of Reptiles: D.R. Khanna and P.R. Yadav, Discovery Pub, 2004, ix, 414 p, figs, ISBN 5. An Introduction to Reptiles: H.S. Bhamrah and Kavita Juneja, Anmol, 2002, Reprint, vi, 193 p, 6. The Reptile Fauna of India: A Source Book by T.S.N. Murthy, B.R. Pub, 2010, xx, 332 p 7. A Pocket Book on Indian Reptiles: Crocodiles, Testudines, Lizards and Snakes, T.S.N. Murthy, Nature Books India, 2009, viii, 88 p 8. The book of Indian Reptiles and Amphibians, By J. C. Daniel, BNHS 9. Snakes of India, The Field Guide, by, R. Whitaker and Ashok Captain. 10. The Fauna of British India, Ceylon and Burma, Reptilia and Amphibia, VOL III – Serpentes, By Malcom A. Smith. 11. The Fauna of British India, Ceylon and Burma, Reptilia and Amphibia, VOL II – Sauria, By Malcom A. Smith. 12. Ecology of Reptiles, Heatwole & Taylor, 1987 13. Snakes Ecology & Behavior, Seigel and Collins

Course Code: ZOOT305 **Course Title: Ornithology (Theory)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on birds and their identification at taxonomic level and the systematics	
Objectives:	This course develops major concepts in ornithology, including avian origin, evolution, systematics, distribution, flight adaptations, physiology, ecology and applied ornithology.	
Content:	**Module 1** Avian origin, evolution, systematics, distribution, flight adaptations and physiology: Evolution- Diversification of modern birds – Adaptive radiation & speciation in birds. Flightless birds and adaptations Topography of bird, types of beaks, types of feet, types of feathers, types of pigments, visual functions of plumage, flight: forms, mechanisms & energetics Avian systematics - avian classification, diversity and distribution of birds of India.	**15 hours**

	Endemism in Indian avifauna – Endemic Bird Areas of India. Flight Adaptations - morphological, anatomical and physiological. Physiology- vocal organ and vocalization, Neurophysiology of song control system, Analysis of bird song using Acoustic spectroscopy, colour physiology of iridescent and non- iridescent feathers and gloss production; Thermoregulatory mechanisms; avian eye and its adaptations Biology of moulting in birds (periodic and forced moulting).	
	Module 2 Avian Ecology: Avian food and foraging - diversity of foods and foraging behaviors, feeding specialization and generalization, resource partitioning, colonial behaviour, cooperation, competition and conflicts. Breeding- nesting territories, communal nesting, bird songs, courtship, mating systems, types of nests, clutch size, parental care, nest parasitism. Migration - types of migration, flyways of migrations, physiological aspects of migration, orientation & navigation in migratory birds, threats to migratory bird populations. Roosting behaviour	**15 hours**
	Module 3 Applied ornithology: Importance of bird population monitoring; census techniques - applications, assumptions & limitations; methods: Line transects, point counts, fixed and variable width and call counts. Bird Banding- Principles of mist-netting; types of marking birds: rings/bands, flags, tags, dyes, and natural markers – Radio-tracking of birds & satellite telemetry. - Conservation of threatened avifauna - Captive breeding & ex-situ conservation of critically endangered birds - Birds as indicators of environmental health – Merits and limitations of birds as ecological indicators, Birds as model systems in applied genetic studies. -Birds as pests in agriculture, pisciculture, apiculture, sericulture, and free-ranging poultry farms – Role of birds in the dispersal of weeds, parasitic, and invasive plants – Birds as vectors of pathogens and parasites – Zoonoses. – Bird strike hazards to aircraft & their management, - Birdwatching as an emerging eco-tourism venture	**15 hours**

	- Biomimicry & birds – Aerodynamic studies, bionic bird, bullet train inspired by Kingfisher. -Recent research in the field of ornithology.	
Pedagogy:	1. Use of conventional, online and ICT Methods. 2. Field visit/project/self-study/Lecture/Tutorials/Assignments	
Learning Outcome:	1. Identification of birds on the field and familiarity of methods for bird studies. 2. Understand various aspects of avian biology such as evolution, taxonomy, anatomy, and physiology. 3. Understand ecology of birds with respect to their feeding, breeding, roosting and migration. 4. Gain insight into applied ornithology and recent research in the field of ornithology.	
References /Reading	1. Ali S (2016): The Book of Indian Birds. Bombay Natural History Society and Oxford University Press, India. 2. Bibby CJ, Burgess ND, Hill A (1992): Bird Census Techniques. Academic Press, UK. 3. Brainard, M. S. and Doupe, A. J. (2000). Auditory feedback in learning and maintenance of vocal behavior. Nature Rev. Neurosci. 1, 31-40. 4. Faborg J and Chaplin SB (1988): Ornithology: an Ecological Approach. Prentice Hall Inc. New Jersey. 6. Gill, F. B. (2007) Ornithology. (3rd ed.) W. H. Freeman and Company, New York, NY. 758 pp 7. Goodfellow P (1977): Birds as Builders. Arco Publishing Co., New York. 8. Lovette I. J. and Fitzpatrick J. W. (2016) Handbook of Bird biology (3rd Ed) Wiley publishers. 9. Inskipp C, Grimmett R and Inskipp T (2011): Birds of the Indian Subcontinent, Princeton University Press. 10. Meyer D.B. (1977) The Avian Eye and its Adaptations. In: Crescitelli F. (eds) The Visual System in Vertebrates. Handbook of Sensory Physiology, vol 7 / 5. Springer, Berlin, Heidelberg. 11. Sturkie, P. D. (1998). Sturkie's Avian Physiology. 5th Edition. Academic Press, San Diego. 12. Ziegler, Harris Philip; Bisch of, Hans-Joachim, eds. (1993). Vision, Brain, and Behavior in Birds: A comparative review. MIT Press	

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Course Code: ZOOP305 **Course Title: Ornithology (Practicals)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on birds and their identification at taxonomic level and the systematics	
Objectives:	This course develops major concepts in ornithology, including avian origin, evolution, systematics, distribution, flight adaptations, physiology, ecology and applied ornithology.	
Content:	1. Identification of birds on the field, based on colour, size, flight, and call. 2. Comparative study of resident and migratory birds with respect to habitats (Plateau, Forest and Wetland). 3. Analysis of ornithological data using statistical software. 4. Study of nesting behaviour of Baya Weaver. 5. Acoustic analysis of bird calls and songs. 6. Structural and functional analysis of avian feathers. 7. Anatomy of bird (poultry chicken): flight muscles, digestive system, respiratory system, urinogenital system, skeletal system, and brain.	**15 x 2 hours**
Pedagogy:	1. Use of conventional, online and ICT Methods. 2. Field visit/project/self-study/Lecture/Tutorials/Assignments	
Learning Outcome:	1. Identification of birds on the field and familiarity of methods for bird studies. 2. Understand various aspects of avian biology such as evolution, taxonomy, anatomy, and physiology. 3. Understand ecology of birds with respect to their feeding, breeding, roosting and migration. 4. Gain insight into applied ornithology and recent research in the field of ornithology.	
References /Reading	1. Ali S (2016): The Book of Indian Birds. Bombay Natural History Society and Oxford University Press, India. 2. Bibby CJ, Burgess ND, Hill A (1992): Bird Census Techniques. Academic Press, UK. 3. Brainard, M. S. and Doupe, A. J. (2000). Auditory feedback in learning and maintenance of vocal behavior. Nature Rev. Neurosci. 1, 31-40. 4. Faborg J and Chaplin SB (1988): Ornithology: an Ecological Approach. Prentice Hall Inc. New Jersey. 6. Gill, F. B. (2007) Ornithology. (3rd ed.) W. H. Freeman and Company, New York, NY. 758 pp 7. Goodfellow P (1977): Birds as Builders. Arco Publishing Co., New York. 8. Lovette I. J. and Fitzpatrick J. W. (2016) Handbook of Bird biology (3rd Ed) Wiley publishers. 9. Inskipp C, Grimmett R and Inskipp T (2011): Birds of the Indian Subcontinent, Princeton University Press.	

	10. Meyer D.B. (1977) The Avian Eye and its Adaptations. In: Crescitelli F. (eds) The Visual System in Vertebrates. Handbook of Sensory Physiology, vol 7 / 5. Springer, Berlin, Heidelberg. 11. Sturkie, P. D. (1998). Sturkie's Avian Physiology. 5th Edition. Academic Press, San Diego. 12. Ziegler, Harris Philip; Bisch of, Hans-Joachim, eds. (1993). Vision, Brain, and Behavior in Birds: A comparative review. MIT Press

Course Code: ZOOT306 **Course Title: Mammology (Theory)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on mammals and their identification at taxonomic level and the systematics	
Objectives:	This course develops major concepts in Mammalogy, including evolution, systematics, biogeography, adaptations, ecology and mammalian conservation.	
Content:	**Module 1** Significance of study on mammals. Mammalian characteristics Evolution, systematics, Molecular technique in mammalian phylogeny Biogeography, morphology, anatomy and physiology of mammals. **Module 2** Foraging behaviour, Activity rhythm, communication Mammalian reproduction: an ecological perspective, mating systems, cooperative breeding, parental care Social organization, territoriality, communities, migration Adaptation: hibernation, torpor, aestivation, locomotion and water regulation of mammals; Adaptations in mammals based on habits and habitat: aquatic, desert, polar, fossorial, cursorial, arboreal, flying and gliding Echolocation in bats, biosonar in cetaceans **Module 3** Field techniques to study mammals, indirect methods of identifying mammals. Mammals as indicators of ecosystem, mammals as indicators of trace elements, mammalian keystone species and its significance in different ecosystem	**15 hours** **15 hours** **15 hours**

	Management of mammals in zoological park, captive breeding of threatened mammals, mammalian conservation ethics	
Pedagogy:	1. Use of conventional, online and ICT Methods. 2. Field visit/project/self-study/Lecture/Tutorials/Assignments	
Learning Outcome:	1. Identification of mammals using direct and indirect method. 2. Understand various aspects of mammology such as evolution, systematics, biogeography, adaptations, and ecology. 3. Gain perception of mammalian conservation.	
References /Reading	1. Clutton-Brock T. (2009). Structure and function in mammalian societies. Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 364(1533), 3229–3242. https://doi.org/10.1098/rstb.2009.0120 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2781877/ 2. George A. Feldhamer, Joseph F. Merritt, Lee C Drickamer, Stephen H. Vessey (2007) Mammalogy - Adaptation, Diversity, Ecology. Johns Hopkins University Press. 3. George A. Feldhamer (2020) Mammalogy - Adaptation, Diversity, Ecology. Johns Hopkins University Press. 4. Vaughan T.A., Ryan J.M., Czaplewski N. J. (2011) Mammology, Jones and Barlett publisher, USA.	

Course Code: ZOOP306 **Course Title: Mammology (Practicals)**

Number of Credits: 1

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on mammals and their identification at taxonomic level and the systematics	
Objectives:	This course develops major concepts in Mammalogy, including evolution, systematics, biogeography, adaptations, ecology and mammalian conservation.	
Content:	1. Study of epidermal derivatives of mammals. 2. Identification of hair of different mammals based on cuticular and medullary patterns. 3. Comparative morphology of dentition. 4. Comparative morphology of skull. 5. Anatomy of rat (preserved specimen). 6. Mapping distribution of primates, carnivores and ungulates in the given area. 7. Field visit to identify mammals using direct/ indirect methods.	**15 x 2 hours**
Pedagogy:	1. Use of conventional, online and ICT Methods.	

	2. Field visit/project/self-study/Lecture/Tutorials/Assignments
Learning Outcome:	1. Identification of mammals using direct and indirect method. 2. Understand various aspects of mammology such as evolution, systematics, biogeography, adaptations, and ecology. 3. Gain perception of mammalian conservation.
References /Reading	1. Clutton-Brock T. (2009). Structure and function in mammalian societies. Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 364(1533), 3229–3242. https://doi.org/10.1098/rstb.2009.0120 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2781877/ 2. George A. Feldhamer, Joseph F. Merritt, Lee C Drickamer, Stephen H. Vessey (2007) Mammalogy - Adaptation, Diversity, Ecology. Johns Hopkins University Press. 3. George A. Feldhamer (2020) Mammalogy - Adaptation, Diversity, Ecology. Johns Hopkins University Press. 4. Vaughan T.A., Ryan J.M., Czaplewski N. J. (2011) Mammology, Jones and Barlett publisher, USA.

Course Code: ZOOT307 **Course Title: Developments in Aquaculture (Theory)**
Number of Credits: 3
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on fish biology and aquaculture	
Objectives:	This course is designed to impart knowledge and technical skills to understand this rapidly changing field of modern Aquaculture. It also aims to empower students to understand the recent trends and challenges of farming society in the field of Aquaculture and get confidence to work on different kinds of aquaculture practices.	
Content:	**Module 1** Review on the fundamentals of Aquaculture: Scope and principles of aquaculture, History of aquaculture, Importance of aquaculture: worldwide, Nationwide, and state-wide. Different sectors of Aquaculture and Types of culture practices: Monoculture, Mono-sex culture, Cage culture, Pen culture, composite culture and other techniques. Hatchery management: types of hatcheries, design, and construction, Pond management, and fertilization; pre-and post-stocking management. Water-quality criteria for Aquaculture.	**15 hours**

	Aquafeed technology: Sources of food, Aquafeed Technology: Balanced diet, Feed formulation, Linear programming, Feed additives, Feed conversion ratio (FCR), Protein retention, Calorie retention. Nutritional requirements at various stages of development of fish & crustaceans. **Module 2** Finfish and Shellfish farming: Freshwater and marine fish seed resources in India. Gears and crafts are used for seed collection and fish collection. Concept of Bundh breeding (Advantages and Disadvantages) Maintenance and criteria for optimum conditions for Hatchery and nursery management (Brood stock collection and transportation, Life cycle, breeding behavior, breeding season, and sexual maturity) of Indian Major Carps, Freshwater prawn, white-leg shrimp, Mud crab, edible oyster, Green mussels. Induced breeding technique in Carps and Salmonids. Advantages of GIFT (Genetically Improved Farmed Tilapia) in Aquaculture. Fish diseases and Integrated health management of the farm. **Module 3** Organic farming techniques: Integrated farming, Biofloc technology. Green aquaculture, Aquaponic system, Bioremediation, Biofiltration, Eco-labelling. Zero water exchange, and Reuse. Aquaculture Industries: Technology of Fish products and By-products, Environmental considerations: Impact of Climate Change on aquaculture, Mitigation, and adaptive strategies.	**15 hours** **15 hours**
Pedagogy:	Lectures/ tutorials/assignments/self-study/Presentation	
Learning Outcome:	Understanding aquaculture sectors, scope its importance and t, and technologies with a broad range of knowledge in development principles of fisheries and aquaculture, capable to apply the modern methods and techniques in planning, design, management of fish farms, understanding competitive ability principles of aquaculture and fisheries, able to flexibility in understanding the e for entrepreneurship and research environment and technological developments and needs.	
References /Reading	1. Robert R. Stickney. (2022). Aquaculture-An introductory text. Alex Lainsburry, CABI South Asia Edition. 2. FAO.2020. The Stare of World Fisheries and Aquaculture (2020). Sustainability in action. http://doi.org/10.4060/ca9229en	

3. Naylor, R.L. Hardy, RW., Buschmann, A.H.,Bush (2021). A 20-year retrospective review of global aquaculture. Nature,591(7851),pp.551-563.
4. Lucas, J.S.(2019).Aquaculture: Farming aquatic animals and plants. John Wiley & Sons.
5. The state of world fisheries and aquaculture (2018)- The sustainable development goals. FAO. License: CC BY-NC-SA 3.0 IGO
6. Ayyappan, S., (2011). Handbook of Fisheries and Aquaculture, ICAR Publications, New Delhi.
7. Pillay,T.V. and Kutty, M.N. (2005). Aquaculture: Principles and practices (2nd Edition). Blackwell Publishing.
8. Dick Mills. (1998). Aquarium fishes, Dorling Kindersly Ltd, London.
9. Jameson, J.D. and Santhanan, R. (1996). Manual of ornamental fishes and farming technologies, Fisheries College and Research Institute, Tuticorin
10. Joshua, K. et al. (1993). Shrimp Hatchery Operation and Management. Marine Products Export Development Authority, Kochi, India
11. Thakur, N.K. et al. (1998) Culture of live food organisms for aqua hatcheries. Training manual. CIFE (ICAR), Mumbai.
12. Jhingran, V.G. Pullin, R.S.V. (1997). A hatchery manual for the Common, Chinese, and Indian Major Carps. Asian Development Bank, International Center for Living Aquatic Resources Management, Philippines.
13. Ramanathan, N. and Francis, T. (1996.) Manual on breeding and larval rearing of cultivable fishes, Fisheries College and Research Institute, Tuticorin.

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Course Code: ZOOP307 **Course Title: Techniques in Aquaculture (Practicals)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on fish biology and aquaculture	
Objectives:	This course is designed to impart knowledge and technical skills to understand this rapidly changing field of modern Aquaculture. It also aims to empower students to understand the recent trends and challenges of farming society in the field of Aquaculture and get confidence to work on different kinds of aquaculture practices.	
Content:	1. Measurement of DO, total hardness, and Salinity of the water bodies 2. Preparation of fish feed in the laboratory. 3. Study of common fish diseases. 4. Demonstration of Induced breeding of Indian major carps	**15 x 2 hours**

	5. Demonstration of raft technique for mussel culture. 6. Culture and maintenance of live fish feed (Artemia, algae) 7. Demonstration of a small-scale aquaponics system. 8. Observations of gonadal maturation in fish. 9. Detection of organoleptic changes in fish. 10. Visit fish farms/ Fish breeding units/ Fish Processing industry.	
Pedagogy:	Mini projects/ tutorials/Group discussions/Field visit	
Learning Outcome:	Students will become familiar with principles of ecology and behavior of fishes Students will become familiar with fish anatomy. Students are expected to show mastery in the laboratory and field-based activities, with an emphasis on anatomy and identification of fish species, and understanding the socio-economic development through Fisheries.	
References/ Reading	1. Paul.J .B. 2002. Handbook of Fish Biology and Fisheries (Vol.1). Blackwell Publishing. 2. Selvamani B.R and Mahadevan R.K. (2008) Freshwater fish farming (Campus Books International) 3. Pauly, D., P. Tyedmers, R. Froese, and L. Y. Liu. (2001). Fishing down and farming up the food web. Conservation Biology in Practice 2 (4):25 4. The Diversity of Fishes: Biology, Evolution, and Ecology by Gene Helfman, Bruce B. Collette, Douglas E. Facey, and Brian W. Bowen. ISBN: 978-1-4051-2494-2 736 pages, May 2009, Wiley-Blackwell, price $129.95 5. Bond's Biology of Fishes.2008. 3rd edition by Michael Barton (ISBN:0120798751) 6. Cailliet, G., M. Love, A. Ebeling 1986 Fishes, a field and laboratory manual on their structure, identification and natural history. Waveland Press, Ill.	

Course Code: ZOOT308 **Course Title: Immunology**

Number of Credits: 3

Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on cell biology
Objectives:	1. To enable the student to understand the principles and mechanisms of immunology 2. To update the student on the scope and importance of clinical immunology and create an awareness about the inherent dangers of microbes

	3. To impart conceptual understanding of functional organization of immune system and its responsiveness in health and disease	
Content:	**Module 1** An overview of immune system, Cells of immune system, Primary and secondary lymphoid organs and their role in immunity. Types of immunity: Concept of innate and acquired- types, functional features. Concept of Antigens, Immunogen, antigenicity and immunogenicity**,** Adjuvants (definition, types and applications). **Module 2** Cellular Immune System**-**Lymphocytes: Development, types, morphology, clones / sub-populations, distribution, B and T cell receptors, B and T cell epitopes, Toll-like receptors; Antigen presenting cells: antigen processing and presentation, MHC molecules and their immunologic significance **Module 3** Antibody structure, types. Generation of antibody diversity. Complement system Components, three major activation pathways, and immune functions including anaphylaxis and inflammation. Cytokines and Interferons, their salient functional features; Interleukins: definition, types (lymphokines and monokines), and functions; Interferons--Origin, types and functions	**3 hours** **4 hours** **5 hours** **3 hours** **6 hours** **4 hours** **5 hours** **5 hours** **6 hours** **4 hours**
Pedagogy:	Lectures/ tutorials/self-study/videos	
Learning Outcome:	1. Development of knowledge on the cellular ontogeny and organ involvement in immunity and how the immune system can fight infections and diseases. 2. Knowledge on development of body immune mechanisms and their applications. 3. Understanding of current immunology news and issues	
References /Reading:	1. Kuby Immunology, 6th edition (2007), T. J. Kindt, R.A. Goldbye, B.A. Osborne, Publisher: W.H. Freeman and Company. 2. Immunobiology: The Immune System in Health and Diseases, 6th Edition (2005), Charles A. Janeway, Publisher: Garland Science. 3. Roitt's Essential Immunology, 11th Edition (2006) Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt, Publisher: Wiley-Blackwell.	

	4. Cellular and Molecular Immunology, 6th Edition (2008) Abul K. Abbas, Andrew H. Lichtman, and Shiv Pillai, Publisher: Elsevier, USA. 5. Prescott, Harley, Klein's Microbiology 7th edition (2009), Joanne M Willey, Christopher J Woolverton, Linda M Sherwood, Publisher: McGraw-Hill.

Course Code: ZOOT309 **Course Title: Biological Applications of Nanoparticles and Nanotoxicology**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of chemistry, physics and biology	
Objectives:	1. To provide knowledge of nanoscience in the field of biology. 2. To understand the nanoparticles interaction with biological systems. 3. To provide wide range of application in the various fields of biology 4. To reveal the toxicity of the widely used nanoparticles.	
Content:	**Module 1** Overview of nanoscience, Nanoparticles. Various types of nanoparticles, chemically and biologically synthesized nanoparticles, Characterization of nanoparticles, Biocompatibility, Importance of nanoparticles in biology: medicine, drug delivery, cancer therapy, tissue regeneration, prosthesis, Recent advances in nanoscience. **Module 2** Nanotoxicology, Sources of nanoparticles, Nanopollution, Routes of exposure in aquatic and terrestrial animals, Human exposure to nanosized materials. Effect of nanoparticles in cells and biological systems. Preventive measures during nanoparticle handling, Toxicity hazards and assessment of risk, Mitigating strategies.	**15 hours** **15 hours**
Pedagogy:	Lectures/ tutorials/self-study/videos	
Learning Outcome:	1. Basic understanding of nanoscience in biology 2. Good understanding of nanoscience, in the form of its applications and also its adverse effects	
References /Reading:	1. Sahu, S. C., & Casciano, D. A. (Eds.). (2014). Handbook of nanotoxicology, nanomedicine and stem cell use in toxicology. John Wiley & Sons. 2. Lindsay, S. (2010). Introduction to nanoscience. Oxford University Press. 3. Houdy, P., Lahmani, M., & Marano, F. (Eds.). (2011). Nanoethics and nanotoxicology. Springer Science & Business Media. 4. Schaefer, H. E. (2010). Nanoscience: the science of the small in physics, engineering, chemistry, biology and medicine. Springer Science & Business Media. 5. Monteiro-Riviere, N. A., & Tran, C. L. (Eds.). (2007). Nanotoxicology: characterization, dosing and health effects. CRC Press.	

	6. Zucolotto, V. (2013). Nanotoxicology: materials, methodologies, and assessments. Springer Science & Business Media.

Course Code: ZOOT310 **Course Title:** **Ecotoxicology**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of Chemistry, Biology, Physiology and Ecology	
Objectives:	Students will gain full understanding of the effects of toxic substances on ecosystems and their living components. Students will also gain knowledge on the various organisms and methods used in ecotoxicological testing as well as mitigation	
Content:	**Module 1** Introduction to Ecotoxicology: Important concepts of ecotoxicology, Routes by which pollutants enter ecosystems; Major classes of pollutants (heavy metals, hydrocarbons, microplastics, etc), their sources and ecotoxicological effects. Effects of toxic substances and biomonitoring Acute and chronic toxicity, dose response, bioaccumulation, biomagnification, bioavailability, biodegradation; Toxicokinetics: Absorption, Distribution, Metabolism, Biotransformation and Elimination of Toxicants, Physiological and biochemical effects of toxic substances: Genotoxic, neurotoxic compounds, endocrine disruptors; Effects at the molecular level, cellular level, organism level (physiological, reproduction, behaviour) Ecotoxicity tests (lab-based and field tests) in air, water and soil, Use of model organisms for ecotoxicology: fish, helminthes, molluscs, mice, Environmental Risk Assessment Environmental bioindicators of ecotoxicity with faunistic studies **Module 2** Microbial Ecotoxicology: Interaction between microorganisms and pollutants; Role of microorganisms in detoxification and degradation of environmental pollutants Metagenomic techniques to study microbial diversity in polluted environment Biotechnology for mitigating environmental toxicity: Ameliorating nutrient toxicity (Nitrates and Phosphates), Handling sludge toxicity, Microbial and Phytoremediation (wetlands), Treatment of domestic wastewater using wetlands – a case study	**8 hours** **12 hours** **5 hours** **5 hours**
Pedagogy:	In class /Online lectures, Assignments, Group activities, Presentations	

Learning Outcome:	On successful completion, students will be able to 1. Understand the toxic effects of pollutants in ecosystems 2. Apply concepts of ecotoxicology using model organisms and for assessing environmental risk 3. Understand mitigation strategies using micro-organisms
References / Reading:	1. Walker CH, Sibly RM, Hopkin SP, Peakall DB. (2012) Principles of Ecotoxicology. 4th Edition. CRC Press, Taylor and Francis. 2. Jorgensen SE. (2010) Ecotoxicology: A derivative of encyclopedia of ecology. Academic Press. 3. Moriarty F. (1999) Ecotoxicology: The study of pollutants in ecosystems. 3rd Edition. Academic Press. 4. Peakall D. (1992) Animal Biomarkers as Pollution Indicators. Chapman and Hall. 5. Hayes WA. (2014) Principles and Methods of Toxicology. CRC Press, Taylor and Francis. 6. Naik MM, Dubey SK. (2017) Marine pollution and Microbial remediation. Springer. 7. Cravo-Laureau C, Cagnon C, Duran R, Lauga B. (2017) Microbial Ecotoxicology. Springer 8. Scragg A. (1999) Environmental Biotechnology. Oxford University press

Course Code: ZOOT311 **Course Title: Butterfly Gardening**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge on Lepidoptera identification	
Objectives:	1. Students will be introduced to the diversity and biology of Lepidopterans 2. The lecture component will have an importance of conserving species of butterflies and moths. Identifying host and nectar plant and to provide skill to develop butterfly gardens for conserving rear/endemic species.	
Content:	**Module 1** Introduction: Unde rstanding a butterfly (life cycle, the body, Butterfly behaviours, courtship, temperature control, roosting, mud puddling, migration, overwintering, long distance flights, dangers to caterpillars and chrysalides, dangers to adults, methods of protection) Importance of butterfly gardening, conservation perspective of butterfly gardening, procedure for rearing caterpillars. Demonstration and identification of available species in a particular niche. **Module 2** Creating a butterfly garden, site selection (Understanding plant terminology, larval food plants, nectar plants (native, non-native,	**15 hours** **15 hours**

	cultivated), preparing mud puddling, flower visitation, nectar, fragrance, flower shape, other attractants, basking, hibernation), butterfly rearing chamber. Feeding caterpillars. Planting plan (Know your area, decision time, choosing plants, preparing beds, soil, water, mulch, using native plants, planting native seeds, native grass lawn, adopt a weed, seed and plant sources, landscape plans)	
Pedagogy:	Lectures/ tutorials/assignments/self-study	
Learning Outcome:	1. Students will learn about the Diversity, Habitat-Ecology, Behavior, Adaptation of butterfly. 2. Identification of the local species of butterfly through direct field experience. 3. The course will enhance the skill of students to develop butterfly gardens.	
References/ Reading	1. Butterfly Gardening, Jane Hurwitz, 2018 2. Butterfly Gardening for Texas, Geyata Ajilvsgi, 2013 3. Butterflies of Western Ghats (India) by Hemant Ogle, 2018 4. Butterflies of Goa, by Parag Rangnekar 5. Butterflies of India, by Isaac Kehimkar, 2016 (Second addition) 6. The boom of Indian Butterflies, by Isaac Kehimkar, 2008 (First addition)	

Course Code: ZOOT312 **Course Title: Ecotourism (Theory)**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Graduation in any discipline from a recognized University	
Objectives:	To understand ecotourism potential, resources and management issues	
Content:	**Module 1: Introduction of Ecotourism and Resources in India (Goa in particular)-** Definition, history, scope, characteristics and principles of ecotourism. Tourist motivation, tourist interaction and intensity of interaction with nature. Ecotourist, eco-sensitivity, ecocentrism, ethics of ecotourism, local participation benefits and conservation. Flora and fauna of Wildlife Sanctuaries, Bird Sanctuaries, National Park, sacred grooves, mangroves, backwater, waterfalls, springs, beaches, hill stations, deserts, butterfly parks, spice plantations. Identification and ecology of aquatic faunal resources (Dolphin, crocodile, corals, mollusc) and terrestrial faunal resources (birds, butterflies, other insects) **Module 2: Ecotourism Management** Marketing of ecotourism, Economic impact, development, governance and policy, programme planning, codes of practice,	**15 hours** **15 hours**

	carrying capacity, resource management, Ecotourism impact assessment and management analysis. Visitor activity and impact management, role of interpretation centre. Safety measures on field and first aid.
Pedagogy:	Use of conventional, online and ICT Methods. Field visit Case study/ ecotourism project proposal/project/self-study Lecture/Tutorials/Assignments
Learning Outcome:	1. To identify ecotourism potential sites, assess ecoresources. 2. Design and execute visitor management plan and promotional material for ecotourism.
References/ Reading	1. Bhatia, A.K. (2014) Tourism development: principles and practices, New Delhi: Sterling Publishers Pvt. Ltd. 2. Cooper,Chris (1994) Tourism Principles and practice. Great Britain Pitman publishing . 3. Fennell David S. (2004) Ecotourism 4th edition Routledge Taylor & Francis group 4. Fennell, David A. (2007) Ecotourism policy and planning. CABI Publishing, Wallingford, Oxon, UK 5. Hill Jennifer, Gale Tim (2009) Ecotourism and Environmental sustainability Principles and practice, Aghgate ebook. 6. Raju, Aluri Jacob Solomon (2007) A Textbook of Ecotourism Ecorestoration and Sustainable Development by New Central Book Agency (P) Ltd, Kolkata. 7. Singh, Ratandeep (2003) Indian Ecotourism: Environmental Rules and Regulations Kaniskha Publishers, New Delhi. 8. Singh Jagbir (2020) Ecotourism. Wiley 9. Trivedi, Priya Ranjan (2006) Encyclopaedia of the Ecotourism (Vol. 5): Future of Ecotourism, Jnanada Prakashan, New Delhi. 10. Wearing Stephen, Neil John (2009) Ecotourism, impacts, potentials and possibilities 2nd edition Elsevier.

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Course Code: ZOOP312 **Course Title: Ecotourism (Practicals)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Graduation in any discipline from a recognized University
Objectives:	To understand ecotourism potential, resources and management issues

Content:	1. How to design: interpretation centre, ecotourism websites, portals and documentaries. 2. Visit to the ecotourism sites. 3. Identification of the flora and fauna (plants, butterflies, birds, malacofauna, etc). 4. Demonstration of preventive and safety measures on the field. 5. Handling of tools and instruments in the field (camera, binocular, spot-scope, GPS, etc)	**15 x 2 hours**
Pedagogy:	Use of conventional, online and ICT Methods. Field visit Case study/ ecotourism project proposal/project/self-study Lecture/Tutorials/Assignments	
Learning Outcome:	1. To identify ecotourism potential sites, assess ecoresources. 2. Design and execute visitor management plan and promotional material for ecotourism.	
References/ Reading	1. Bhatia, A.K. (2014) Tourism development: principles and practices, New Delhi: Sterling Publishers Pvt. Ltd. 2. Cooper,Chris (1994) Tourism Principles and practice. Great Britain Pitman publishing. 3. Fennell David S. (2004) Ecotourism 4th edition Routledge Taylor & Francis group 4. Fennell, David A. (2007) Ecotourism policy and planning. CABI Publishing, Wallingford, Oxon, UK 5. Hill Jennifer, Gale Tim (2009) Ecotourism and Environmental sustainability Principles and practice, Aghgate ebook. 6. Raju, Aluri Jacob Solomon (2007) A Textbook of Ecotourism Ecorestoration and Sustainable Development by New Central Book Agency (P) Ltd, Kolkata. 7. Singh, Ratandeep (2003) Indian Ecotourism: Environmental Rules and Regulations Kaniskha Publishers, New Delhi. 8. Singh Jagbir (2020) Ecotourism. Wiley 9. Trivedi, Priya Ranjan (2006) Encyclopaedia of the Ecotourism (Vol. 5): Future of Ecotourism, Jnanada Prakashan, New Delhi. 10. Wearing Stephen, Neil John (2009) Ecotourism, impacts, potentials and possibilities 2nd edition Elsevier.	

Course Code: ZOOT313 **Course Title: Introduction to Animal Biomimetics**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Graduation in any discipline from a recognized University

Objectives:	To introduce students to Biomimetics To develop a keen interest in observing mechanisms in the nature To evoke their imagination to develop tools through biomimicking	
Content:	**Module 1** Introduction to biomimetics, Mimicking and Inspiration of Nature, Synthetic Life, Artificial Life, Artificial Intelligence. Nature as a Model for Structures and Tools: Constructing Structures from Cells. Biologically Inspired Mechanisms: Digging as the Gopher and the Crab, Inchworm Motors, Pumping Mechanisms, Controlled Adhesion, Biological Clock. Biologically Inspired Structures and Parts: Honeycomb as a Strong, Lightweight Structure, Hand Fan, Fishing Nets and Fins Defense and Attack Mechanisms in Biology: camouflage, body armor, Hooks, Pins, Sting, Syringe, Barb, and the Spear, Decoy Artificial organs Materials and Processes in Biology: Spider Web — Strong Fibers, Honeybee as a Multiple Materials Producer; Swallow as a Clay and Composite Materials Producer, Fluorescence Materials in Fireflies and Road Signs, Impact Sensitive Paint Mimicking Bruised Skin, Mimicking Sea Creatures with Controlled Stiffness Capability, Biology as a Source for Unique Properties and Intelligent Characteristics, Multifunctional Materials, Biomimetic Processes **Module 2:** Bio-Sensors: Miniature Sensors in Biomimetic Robots, MEMS-Based Flow Detector Mimicking Hair Cells with Cilium, Collision Avoidance Using whiskers, Emulating Bats' Acoustic Sensor, Acoustic and Elastic Wave sensors, Fire Monitoring, Sense of Smell and Artificial Nose, Sense of Taste and Artificial Tongue. Robotics Emulating Biology: Artificial Muscles, Aerodynamic and Hydrodynamic Mobility, Social and Other Biological Behaviors. Interfacing Biology and Machines: Telepresence and Teleoperation Biomimetics of Muscle Design Mechanized Cognition: Language, sound, visual. Machine bodies and brains	**15 hours** **15 hours**
Pedagogy:	Use of conventional, online and ICT Methods. Animal behavior observations in the field. Lectures/Tutorials/Assignments / projects/self-study	
Learning Outcome:	Inspired to observe nature with keen interest and think of creating biomimicking tools, beneficial to humans.	
References/ Reading	1. Alexander, R.McN. (2003) Principles of Animal Locomotion, Princeton University Press, Princeton and Oxford, Ch. 2. 2. Breazeal C.L., (2004) Designing Sociable Robots, ISBN 0262524317, MIT Press, Cambridge, Massachusetts, pp. 1–281.	

	3. Primrose Sandy B. (2020) Biomimetics: Nature-Inspired Design and Innovation. Wiley-Blackwell 4. Vincent J.F.V., (2001) ''Stealing ideas from nature,'' Pellegrino S. (Ed.), Chapter 3 in Deployable Structures, Springer-Verlag, Vienna, pp. 51–58. 5. Yoseph Bar-Cohen (2005) BIOMIMETICS: Biologically Inspired Technologies, Edited by, Taylor & Francis Group, New York.

Course Code: ZOOT314 **Course Title: Evolutionary Biology**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic working knowledge of diversity, cell biology, genetics and classical evolutionary biology.	
Objectives:	This course develops major concepts in evolutionary biology, including theories, unicellular/multicellular evolution, evolutionary history and evolutionary time scale. This course also provides a better understanding of population genetics, evolutionary forces and speciation. Additionally, this course throws light on aspects of molecular evolution along with evolutionary models.	
Content:	**Module 1** Emergence of evolutionary thoughts, Creation and evolution, Evolutionary theories and evidences: Contributions of Lamarck, Darwin, Darwin-Wallace postulates, concepts of variation, adaptation, struggle, fitness and natural selection; Spontaneity of mutations; The evolutionary synthesis, limitations of Darwinism, Neo Darwinism. Origin of cells and unicellular evolution: Origin of basic biological molecules, Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane, Experiment of Miller (1953), The first cell, Evolution of prokaryotes, Origin of eukaryotic cells, Evolution of unicellular eukaryotes. Paleontology and Evolutionary History: Overview of evidences - Paleontological, Embryological,Comparative morphological, Anatomical, Genetics and Cytological, Molecular Biological evidences. The Evolutionary time scale: Eras, periods and epoch; Major events in the evolutionary time scale; Origins of unicellular and multi cellular organisms; Major groups of plants and animals; Stages in primate evolution including Homo, Human evolution. **Module 2** Population genetics: Populations, Gene pool, Gene frequency; Hardy- Weinberg Law; Evolutionary forces that affect the allelic	**15 hours** **15 hours**

	frequencies: Mutation, Migration, Selection - Stabilizing selection, Directional selection, disruptive selection, Balancing selection, Frequency dependent selection, Density dependent selection, Group and kin selection, Selection coefficient, Selective value, Selection in natural Populations, Genetic drift, Nonrandom mating. Hybridization and speciation: Concept of species and models of speciation based on distribution sympatric, allopatric, stasipatric, genetic drift, genetic revolution, genetic transilience, Founder-flush theory, phylogenetic gradualism, punctuated equilibrium, hybridization, adaptive radiation, isolating mechanisms. Molecular Evolution: Molecular phylogeny, neutral theory, molecular clock.	
Pedagogy:	Lectures/Tutorials/Videos/Assignments/Group discussion/Self-study.	
Learning Outcome:	1. Understand in detail the various concepts of evolutionary biology such as theories, history and evidences. 2. Study the time scale and understand stages of life formation and evolution. 3. Learn about the intricacies of population genetics in evolution. 4. Understand the various processes related to evolution. 5. Knowledge about molecular evolution, the field that links various aspects in zoology.	
References/ Reading	1. Futuyma DJ. (1998)Evolutionary Biology, 3rd Edition, Sinauer Associates, New York. 2. Ridley M. (2003) Evolution, 3rd edition, Blackwell Publishers, New York. 3. Rose MR and Mueller LD. Evolution and Ecology of the Organism, Prentice Hall, New York. 4. Barton NH, Briggs DEG, Eisen JA, Goldstein AE, Patel NH. (2007) Evolution, Cold Spring Harbor Laboratory Press, New York, USA. 5. Strickberger MW. Evolution (2013) Jones and Bartlett Publisher, Sudbury, USA .	

Course Code: ZOOT315 **Course Title: Vector Biology**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic working knowledge of taxonomy, biodiversity, and arthropodology.
Objectives:	This course will help the learner to understand the whole concept and components of arthropods, in-depth, involved in causing Vector-borne diseases. Additionally, this course also covers the field of modern vector biology, giving exposure to subjects like Proteomics. Moreover, the course also deals with vector control and focus on common mosquito-linked diseases.

Content:	**Module 1** Introduction to vector biology and its importance in public health management. Arthropods as disease vectors, taxonomy, classification, biology, ecology. Arthropod transmitting bacteria and viruses of medical importance; Major vector-borne diseases; Vector-parasite interaction; Host-pathogen interaction; Factor in disease transmission. Special reference to mosquitoes as vectors, Biology, Bio-ecology, Life history of Anopheles, Culex, and Aedes mosquitoes, Mosquito-borne diseases like malaria, filariasis, dengue, Chikungunya, and Japanese encephalitis (Symptoms, prophylaxis, and treatment) **Module 2** General Characters, classification, history, distribution, morphology, biology, life cycle, mode of infection, signs, and symptoms, diagnosis, molecular biology, drug resistance, treatment, preventive measures, and control of - Flies, Bugs, Fleas, Ticks, And Lice. Modern vector biology; Genomics and Proteogenomic of vectors. Chemical and biological and environmental control of vectors; Integrated vector management, vector resistance mechanism.	**2 hours** **4 hours** **4 hours** **5 hours** **8 hours** **7 hours**
Pedagogy:	Lectures/Tutorials/Videos/Assignments/Group discussion/Self-study.	
Learning Outcome:	The learner will understand the concept and components of vectors, their behavior, taxonomy, morphology, life cycle, and entire biology. Understand insects as parasites and the various linked diseases. Sufficient knowledge of modern vector biology and proteogenomic. Know about vector control and integrated vector management. Create and communicate knowledge on the causes and prevention of vector-borne disease in the population, to promote health and health services. Learn about mosquito-linked diseases.	
References/ Reading	1. Mani MS (1982), General Entomology, Oxford and IBH Publishing Co., New Delhi. 2. Rathnaswamy GK (1986), A Handbook of Medical Entomology and Elementary Parasitology, S. Vishwanath Pvt.Ltd., India. 3. Bruce ED, Eldridge F and Edman JD (2000), Medical Entomology, Kluwer Academic Publishers, UK. 4. Kahn HA (1983), Introduction of Epidemiology Methods, Oxford University Press, New York.	

	5. Snodgrass RE (1935), Principles of Insect Morphology, Tata McGraw Hill publishing co. India. 6. Mullen G and Durden L (2002), Medical and Veterinary Entomology, Academic Press, USA. 7. Kettle DS (1984), Medical and Veterinary Entomology, Cabi Press, USA. 8. Service MW (2012), Medical Entomology for students, Cambridge University Press, UK. 9. Service MW (1993), Mosquito Ecology, Field sampling methods, Applied Science Publishing Ltd., London. 10. Marquardt WC (1996), Biology of disease vectors (2nd Edition), Doody Enterprises, Inc. USA.

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Course Code: ZOOT316 **Course Title: Ornamental Fish Management (Theory)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of fish biology and diversity.	
Objectives:	1. To understand the potentiality of ornamental fisheries in India. 2. To introduce the nature and scope of aquarium management and ornamental fish culture 3. To impart knowledge on self-employment opportunities in ornamental fish culture and aquarium management. 4. To impart practical skills to students on aquarium management and ornamental fish culture.	
Content:	**Module 1** Diversity of ornamental fish. Major hotspots of ornamental fish- global and Indian perspective. Ornamental fish trade- global and Indian perspective. Preferred species in trade. Major ornamental fish species of India. Ornamental plants. Different varieties of exotic and indigenous ornamental fishes. Reproductive biology. Sexual dimorphism, mode of reproduction in ornamental fish. Commercial farming technologies Principles of a balanced aquarium. Indigenous ornamental fishes and their culture, propagation, and trade. Coloration and Pigmentation: category; types; formation; dietary, neuronal, hormonal control. Physiology of color changes and its significance. Common aquarium diseases and their control.	**15 hours**

	Feeding and nutrition of ornamental fishes. Nutritional requirements of aquarium fish. Live feed culture. Types of aquarium fish feed. Preparation of aquarium fish food. Packaging, transportation, and marketing of aquarium fishes. Anesthetics used in the trade. Problems in ornamental fish export. Applications of genetics and biotechnology for producing quality strains; Management practices of ornamental fish farms.	
Pedagogy:	Lectures/Tutorials/Videos/Assignments/Group discussion/Self-study.	
Learning Outcome:	• fabricate an aquarium at home or outdoors. • handle aquarium fishes and different aquarium tools and accessories • Identify various aquarium fishes and know about their breeding biology. • common health problems with fish, in an aquarium. • Understand the scope of the subject concerning entrepreneurship. • Gain knowledge about techniques of ornamental fish breeding, rearing, and its marketing to make them self-sustainable.	
References/ Reading	1. Saha S. (2022): Concept of Aquarium Fish Keeping(2nd Edition). Techno world Publisher. 2. David Alderton (2005), Encyclopedia of Aquarium and Pond Fish , DK Publishing, Inc. 3. Datta, Subhendu. (2014). Aquarium Water Quality Management. 10.13140/2.1.2747.6164 4. Dick Mills, Derek Lambert (2004): Aquarium Fish Handbook, Quatro In 5. Glen S. Axelrod, Brian M. Scott, Neal Pronek (2005): Encyclopedia of Exotic Tropical Fishes For Freshwater Aquariums, TFH Publications. 6. Harro Hieronimus (2009): Guppies, Mollies, Platies, A Complete Pet Owner's Manual, Barron's Educational Series, Inc. 7. Stephen Spottee. (1993.) Marine aquarium keeping. John Wileyy and sons, U.S.A.	

Course Code: ZOOP316 **Course Title: Ornamental Fish Management (Practicals)**
Number of Credits: 1
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of fish biology and diversity.
Objectives:	To understand the potentiality of ornamental fisheries in India. To introduce the nature and scope of aquarium management and ornamental fish culture

	To impart knowledge on self-employment opportunities in ornamental fish culture and aquarium management. To impart practical skills to students on aquarium management and ornamental fish culture.	
Content:	1. Sexual dimorphism in ornamental fishes. 2. Propagation methods of ornamental aquarium plants. 3. Identification of formulated fish feeds, preparation and practicing feeding schedules. 4. Maintenance of Freshwater and Marine aquariums. (accessories, water quality, Lighting and aeration; décor etc) 5. Study of Water filtration systems: biological, mechanical, and chemical. 6. Culture of live feed organisms. 7. Identification of common diseases. 8. Demonstration of fish handling and packaging method. 9. Demonstration of ornamental fish breeding.	**15 x 2 hours**
Pedagogy:	Lectures/Tutorials/Videos/Assignments/Group discussion/Self-study.	
Learning Outcome:	Students will be able to • fabricate an aquarium at home or outdoors. • handle aquarium fishes and different aquarium tools and accessories • Identify various aquarium fishes and know about their breeding biology. • common health problems with fish, in an aquarium. • Understand the scope of the subject concerning entrepreneurship. • Gain knowledge about techniques of ornamental fish breeding, rearing, and its marketing to make them self-sustainable.	
References/ Reading	8. Saha S. (2022): Concept of Aquarium Fish Keeping(2nd Edition). Techno world Publisher. 9. David Alderton (2005), Encyclopedia of Aquarium and Pond Fish , DK Publishing, Inc. 10. Datta, Subhendu. (2014). Aquarium Water Quality Management. 10.13140/2.1.2747.6164 11. Dick Mills, Derek Lambert (2004): Aquarium Fish Handbook, Quatro In 12. Glen S. Axelrod, Brian M. Scott, Neal Pronek (2005): Encyclopedia of Exotic Tropical Fishes For Freshwater Aquariums, TFH Publications. 13. Harro Hieronimus (2009): Guppies, Mollies, Platies, A Complete Pet Owner's Manual, Barron's Educational Series, Inc. 14. Stephen Spottee. (1993.) Marine aquarium keeping. John Wileyy and sons, U.S.A.	

Course Code: ZOOT317 **Course Title: Biology of Animal Reproduction**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Elementary knowledge of animal anatomy and physiology.	
Objectives:	To provide fundamental knowledge of animal reproduction at an anatomical, physiological, and endocrinological level to deal with the management of reproduction and fertility in animals and humans.	
Content:	**Module 1** Anatomy, Development, and Hormones: Introduction to reproduction. Male Reproductive System: Biology of spermatozoa. Seminiferous epithelial cycle, Spermatogenesis, sperm activation, Hormonal control of spermatogenesis, hormonal regulation of accessory male reproductive organs. Biochemistry of semen, semen analysis, and its utility in medico-legal cases Female Reproductive System: Reproductive cycles in mammals and their regulations; Oogenesis and ovarian cycle. Hormonal regulation, sequence, and types of implantation. Menstruation, puberty, reproductive aging, and menopause. **Module 2** Endocrine control of pregnancy, Parturition, and Lactation. Contraception: Types and various methods (Hormonal, barrier, spermicides, IUDs, Periodic abstinence, etc.). Advantages and disadvantages. Male and Female sexual response. Surgical sterilization. Reproductive health concern: Infertility (factors responsible). Assisted Reproductive Techniques (ART). Reproductive Tract Disorders: - Symptoms and treatment – Onco-fertility (Endometriosis, Testicular Cancer, Ovarian Cancer, Ovarian cysts). Myths and facts on reproduction.	**8 hours** **7 hours** **8 hours** **7 hours**
Pedagogy:	Lectures/Tutorials/Videos/Assignments/Group discussion/Self-study.	
Learning Outcome:	● Explanation of how to apply reproductive information to strategies for the management of reproduction and fertility in animals. ● Critically evaluation of the advantages/disadvantages of current and developing reproductive technologies	
References/ Reading	1. Knobil E and Neil JD, Physiology of Reproduction (Vol. I and II),.2015. Raven Press Ltd., New York. Mandal A, A Handbook of Neuroendocrinology, Emkay Publication, New Delhi 2. Schatten H. 2016. Human Reproduction: Updates and New Horizons. Wiley Online Library.	

	3. Avise, J. C. 2008. Clonality: The Genetics, Ecology, and Evolution of Sexual Abstinence in Vertebrate Animals. New York, NY: Oxford University Press.CrossRef 4. Nelson RJ, An Introduction to Behavioral Endocrinology, Sinaeur Associates, Inc., USA. 5. Pablo De, Scanes CG, and Weintraub BD, Handbook of Endocrine Research Techniques, Academic Press Inc., USA. 6. Saidpur SK, Reproductive Cycles of Indian Vertebrates, Allied Publishers Ltd. New Delhi. 7. Schatten H and Constantinescu GM, Comparative Reproductive Biology, Willey Blackwell Publications, UK.

Course Code: ZOOT318 **Course Title: Fish Processing**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of Fish biology, Fishery sciences.	
Objectives:	1. To develop knowledge about post-harvest management of fishes. 2. To understand the various aspects of fish preservation and processing	
Content:	**Module 1** Module 1: Post-Harvest Technology: Principles and importance of fish preservation. Fish spoilage-post mortem changes and rigor mortis, post rigor spoilage. Methods of fish preservation-Icing, Freezing, Cold storage, Drying, Salting, Smoking, Canning, and Fish Pickling. Fish products and Byproduct: Fish Oil, Fish liver oil, Fish meal, Fish manure, Fish flour, fish glue and isinglass, chitin, pearl essence fish silage Perishability of seafood – Microbial spoilage of fish and shellfish. Spoilage microflora. Fish products (frozen food items) Intrinsic and extrinsic factors affecting spoilage. Microflora is associated with body parts. Foodborne pathogens. Sources of contamination. Seafood biotoxins **Module 2** Quality Assurance of Fishery Products: Quality control: basic concepts, quality, and quality control. Sanitation procedures in	**15 hours** **15 hours**

	seafood processing plants. Waste management in fish processing industries. Quality analysis – organoleptic, physical, chemical, microbiological, and instrumental methods. Quality standards in India and major importing countries like the USA, Japan, and the EU. Export of fishery products from India – major countries, important products, export documents, and procedures. Traceability, Quality certifications, Eco-labeling.	
Pedagogy:	Lectures/Tutorials/Videos/Assignments/Group discussion/Self-study.	
Learning Outcome:	1. Understand the basic concepts of fish preservation. 2. Identify the main microbes concerned with fish processing 3. To Understand the importance of quality control in fish farm	
References/ Reading	1. Biswas K.P. (2004). Fish Processing and Preservation. Daya Pub. House. 2. Govindan T.K (1985). Fish Processing Technology. Oxford & IBH Pub. Co. 3. Badapanda K.C (2013). Fish processing and preservation technology. Narendra Publishing House 4. Fernandes R. (2009) Microbiology Handbook: Fish and Seafood. Leatherhead Food Research Association; 2nd New edition. 5. Harry W. Seeley, Paul J. Vandemark, and John J. Lee (1990)- Microbes in Action: A Laboratory Manual of Microbiology 6. Pawar and Diganawala (2010)- General Microbiology – Vol. I and Vol. II. Himalaya Publishing House.	

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Course Code: ZOOT401 **Course Title: Nutritional Biochemistry**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic knowledge of physiology and biochemistry	
Objectives:	1. To make aware the students about the importance of nutrition in maintaining health. 2. To cultivate proper feeding habits. 3. To learn the proper and scientific value of different food items	
Content:	**Module 1** Basic concepts of energy and energy expenditure; Calorific values of food – Basal metabolic rate, energy requirements of man, women, infants and children. Dietary Carbohydrates : Functions, classification, food sources, storage in body, biomedical importance; Dietary Proteins - Functions, classification, food sources, composition, essential & non-essential amino acids, protein deficiency, biomedical importance; Dietary Fats: Function of fats, classification, food sources, composition, saturated and	**15 hours**

	unsaturated fatty acids, biomedical importance. Vitamins: sources and functions, deficiency status. **Module 2** Water as nutrient; Electrolyte concentrations of body fluids; Minerals: macro & micronutrients functions, sources. Bioavailability and deficiency of Calcium, Iron, Iodine, Sodium & Potassium (very brief account); concept of acidosis and alkalosis. Nutritional requirements during pregnancy and lactation; Nutrition during infancy, Nutrition in children, Nutrition during adolescence, Nutrition during adulthood. Nutrigenomics of omega 3 and omega 6 fatty acids, essential amino acids, vitamin A, C, D, E and B complex.	**15 hours**
Pedagogy:	Lectures/ tutorials/self-study/videos	
Learning Outcome:	1. Gaining the knowledge of importance about the nutrition and keeping ourselves in well- being state. 2. Understanding the importance of some nutrients in controlling the expression of genes	
References /Reading:	1. Gopalan.C, BS. Ramasastri & SC Balasubramanian: 1971, Nutritive value of Indian foods. National Institute of Nutrition, Hyderabad. 2. Gopalan.D & K. Vijaya raghavan 1971, Nutrition atlas of India, ICMR, New Delhi. 3. Ghosh.S 1981, The feeding care of infants and young children, UNICEF, New Delhi. 4. Mudambi.SR ,1995. Fudementals of food and nutrition. New age international, New Delhi. 5. Swaminathan.M, 1989. Handbook of food and nutrition. Bappco, Bangalore. 6. Swaminathan.M, 1974 Essentials of food and nutrition. Vol I & II, Ganesh and Co. Madras. 7. Brody T, Nutritional, Biochemistry, Academic Press, New York. 8. Elia M, Ljungqvist O, Stratton R and Lanham SA, Clinical Nutrition, Willey Blackwell Publication, UK. 9. Swaminathan MS, Nutritional Biochemistry, T R Publication, India	

Course Code: ZOOT402 **Course Title: Stem Cell Biology**
Number of Credits: 2
Effective from AY: 2022 -23

Prerequisite for the Course:	Basic understanding of cytology, histology and cellular types of embryo and adult.
Objectives:	1. To provide broad awareness of current issues and approaches in stem cell biology 2. To get a thorough understanding of stem cell science and the molecular nature of pluripotency and differentiation. 3. To appreciate ways in which stem cell science is utilized in therapeutic contexts.

Content:	**Module 1** Basic Biology of stem cells: Introduction to stem cells and basis of stemness; Embryonic stem cells, embryonal carcinoma cells, adult stem cells, hematopoietic stem cells, mesenchymal stem cells, cancer stem cells, induced pluripotent stem cells. Cellular Mechanisms of Stem Cells: Molecular basis of pluripotency, stem cell niche, mechanisms of stem cell self-renewal. **Module 2** Stem cells isolation and culture: Isolation, characterization and maintenance of embryonic stem cells isolated from: Mouse and Human. Applications of stem cells: Neurodegenerative diseases, spinal cord injury, heart disease, diabetes, burns and skin ulcers, muscular dystrophy, orthopedic applications, eye diseases, stem cells and gene therapy, Ethical and regulatory issues in the use of stem cells.	**8 hours** **7 hours** **7 hours** **8 hours**
Pedagogy:	Lectures/ tutorials/self-study/videos	
Learning Outcome:	1. Understand the isolation process, cultivation and characterization of embryonic stem cells. 1. Understand basic biology/mechanisms of pluripotency, self-renewal of stem cells and stem cell niche in regulating stem cell fate. 2. Gain knowledge of applications of stem cells in diseases, injury and gene therapy. 3. Appreciate the ethical and regulatory issues associated with use of stem cells	
References /Reading:	1. Atala A & Lanza R, (2012). Handbook of Stem Cells, 2nd Edition, Academic Press, 2012. 2. Lanza R, et al, (2013). Essential of Stem Cell Biology, Elsevier Academic Press. 3. Mao JJ, et al, (2007). Translational Approaches in Tissue Engineering & Regenerative Medicine, Artech House. 4. Habib NA, Levièar NY, Gordon M, Jiao L & Fisk N, (2007). Stem Cell Repair and Regeneration, Volume-2, Imperial College Press, 2007	

Course Code: ZOOT403 **Course Title: Clinical Genetics I (Theory)**

Number of Credits: 3
Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and genetics.
Objectives:	• Acquaint students with recent genetic techniques • Know about the structure and function of genetic material • Learn about structural and numerical abnormalities their inheritance pattern and pedigree analyses.

Content:	**Module 1: Introduction to Human Genetics** Growth of human genetics; levels of genetics. Structure and composition of the human chromosome: basic structure of DNA; molecular structure and organization. Classification of Human chromosomes: Paris nomenclature / ISCN; methods of studying chromosomes; identification of individual chromosomes; Flow Karyotyping (Quantification on DNA of individual chromosomes); FACS – Fluorescence-activated cell sorter. **Module 2: Chromosomal Abnormalities** Numerical abnormalities (somies; ploidies; mosaic; chimera; syndromes). Structural: Translocations; Deletions; Duplications; Inversion; isochromosomes; Ring chromosomes; causes for genetic abnormalities- meiotic and mitotic nondisjunction; uniparental disomy; mutations; single gene disorders. **Module 3: Pattern of Inheritance** Autosomal Dominant, Autosomal Recessive, X-linked Dominant, X-linked Recessive, Y-linked, sex limited inheritance, sex influenced inheritance, X inactivation, Multifactorial inheritance, mitochondrial inheritance, imprinting. Pedigree analysis of some genetic disorders: Haemophilia, Color blindness, Duchenne Muscular Dystrophy (DMD), achondroplasia and PKU.	15hrs 15hrs 15hrs
Pedagogy:	Lectures/tutorials/assignments/ Presentations/demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Understand the functions of the genetic material. 2. Correlate genetic mutations to diseases in human population. 3. Perform Karyotyping using software. 4. Construct and analyse human pedigrees.	
References	1. Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979. 2. Singh BD (2014): Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi. 3. Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 9780190681111 4. Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore 5. De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia. 6. Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine,Elsevier Publication, Philadelphia.	

Course Code: ZOOP403 **Course Title: Clinical Genetics I (Practicals)**

Number of Credits: 2
Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and genetics.	
Objectives:	• Acquaint students with recent genetic techniques • Know about the structure and function of genetic material • Learn about structural and numerical abnormalities their inheritance pattern and pedigree analyses.	
Content:	**Practical Module :** • Specimen procurement and logging for cytogenetic procedure. • Culture media preparation • Identification of Chromosomes. • Inoculation of Lymphocyte culture/peripheral blood culture. • Harvesting of Lymphocyte culture to obtain metaphase plates. • Chromosomal banding technique: GTG Banding. • Karyotyping of Human chromosomes: o use of Cytovision/any other Karyotyping software o Microphotography o Image capturing, image processing, and analysis • Study of Karyotypes: Normal male and female and various syndromes • Construction of Pedigree from given data. • Analysis of pedigree charts to determine the mode of inheritance	4 hrs 4 hrs 4 hrs 4 hrs 4 hrs 4 hrs 4 +4 +4 hrs 4+ 4 hrs 4+4 hrs 4+ 4hrs
Pedagogy:	Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Understand the functions of the genetic material. 2. Correlate genetic mutations to diseases in human population. 3. Perform Karyotyping using software. 4. Construct and analyse human pedigrees.	
References	1. Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979. 2. Singh BD (2014): Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi. 3. Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 9780190681111 4. Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore 5. De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia.	

	6. Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine,Elsevier Publication, Philadelphia. 7. Arumuga N, MeyyanRP (2016): Advances in Genetics Volume 1(Dr. N. Arumugam, R P Meyyan, Saras Publication, Nagercoil, Tamil Nadu. 8. GardnerA and Davies T(2010) Human Genetics 2nd Edition,Viva books publication,Delhi.	

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Course Code: ZOOT404 **Course Title: Clinical Genetics II (Theory)**

Number of Credits: 3

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of Cell biology and genetics	
Objectives:	• To get acquainted with recent procedures used in artificial reproductive techniques and their acceptance in the society. • Techniques for analysis of samples for success of procedures conducted. • Knowledge of recent techniques used for better results and treatment. • To learn about genetic counseling and steps to help guide patient for particular medical treatment available.	
Content:	**Module 1: Molecular genetics, Genetics of Cancer, Dermatoglyphics** Molecular genetic techniques used in genetic diagnosis: Blotting techniques – Southern, Northern and Western, PCR/ RFLP, FISH, DNA sequencing & DNA fingerprinting. Genetics of Cancer: introduction, characteristics of cancer cells, origin of cancer cells, genes associated with cancer, environmental causes of cancer, human genome data tailor diagnosis and treatment. Dermatoglyphics: Introduction, classification, Flexion creases. Dermatoglyphics in clinical disorders, Clinical application & its advantages and limitations. **Module 2: Reproductive technologies, Genetics and Society** Reproductive technologies: infertility and subfertility, assisted reproductive technologies (IUI, surrogate motherhood, IVF, GZIT, ZIFT), preimplantation genetic diagnosis. Genetics and Society : (i) Human genome project : (ii) Forensic science (iii) DNA finger printing application (iv) Gene therapy (v) Eugenics. vi) Stem cell research. **Module 3: Prenatal Diagnosis, Genetic Counselling** Prenatal Diagnosis: Definition: Various procedures - Amniocentesis, Chorionic villus sampling, Ultrasonography and Fetoscopy. Genetic Counselling (Stage1: History and Pedigree Construction,	15hrs 15hrs 15hrs

	Stage 2: Examination, Stage 3: Diagnosis, Stage 4: Counselling; and Stage 5: Follow up).	
Pedagogy:	Lectures/tutorials/assignments/ Presentations/demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Describe and explain the molecular genetic techniques used in genetic diagnosis and reproductive techniques which can be recommended to overcome infertility. 2. Demonstrate the application of dermatoglyphic prints in disease detection. 3. Perform procedures of DNA isolation, Molecular size determination, and disease detection for inborn errors of metabolism. 4. Analyze FISH images and DNA fingerprints.	
References	1. Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979. 2. Singh BD (2014): Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi. 3. Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 978019068111. 4. Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore 5. De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia. 6. Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine, Elsevier Publication, Philadelphia. REFERENCE BOOKS FOR PRACTICALS: 1. Arumuga N, MeyyanRP(2016): Advances in Genetics Volume 1(Dr. N. Arumugam, R P Meyyan, Saras Publication, Nagercoil, Tamil Nadu. 2. GardnerA and Davies T(2010) Human Genetics 2nd Edition, Viva books publication, Delhi.	

Course Code: ZOOP404 **Course Title: Clinical Genetics II (Practical)**

Number of Credits: 2

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of Cell biology and genetics
Objectives:	• To get acquainted with recent procedures used in artificial reproductive techniques and their acceptance in the society. • Techniques for analysis of samples for success of procedures conducted. • Knowledge of recent techniques used for better results and treatment.

	• To learn about genetic counseling and steps to help guide patient for particular medical treatment available.	
Content:	**Practical Module:** • Introduction to molecular genetic lab: general rules, handling of chemicals, equipments and biological materials; waste disposal. • Isolation of DNA from human blood. • Determination of the molecular size of DNA. • Analysis of DNA fingerprints and FISH images • Dermatoglyphics: Recording of print of fingertips and palm. • Manual DNA sequencing and data analysis. • Amniotic fluid culture: Flask method and Coverslip method. • Chorionic villi culture: Short-term culture • Chromosomal analysis from the product of conception (abortus study) (03 Practicals) • Disease suspection by spot tests: Fanconi's syndrome, PKU, maple syrup urine disease, Tryptophanuria.	30 hrs x 2
Pedagogy:	Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 5. Describe and explain the molecular genetic techniques used in genetic diagnosis and reproductive techniques which can be recommended to overcome infertility. 6. Demonstrate the application of dermatoglyphic prints in disease detection. 7. Perform procedures of DNA isolation, Molecular size determination, and disease detection for inborn errors of metabolism. 8. Analyze FISH images and DNA fingerprints.	
References	7. Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979. 8. Singh BD (2014): Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi. 9. Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 978019068111. 10. Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore 11. De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia. 12. Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine, Elsevier Publication,	

	Philadelphia. REFERENCE BOOKS FOR PRACTICALS: 3. Arumuga N, MeyyanRP(2016): Advances in Genetics Volume 1(Dr. N. Arumugam, R P Meyyan, Saras Publication, Nagercoil, Tamil Nadu. 4. GardnerA and Davies T(2010) Human Genetics 2nd Edition, Viva books publication, Delhi.	

Course Code: ZOOI401 **Course Title: Internship**

Number of Credits: 2

Effective from AY: 2022 -23

Prerequisites for the course:	Completion of 40 credits of Sem I and Sem II	
Objective:	To impart skill-based hand-on training and experience.	
Content	Skill-Based hands-on training schedule and techniques adopted by the Institute offering the internships.	**30 x 2 hours**
Pedagogy:	Internship	
References/Readings	As per the instructions of the Institute offering the internships.	
Learning Outcomes	Implementation of the acquired knowledge for entrepreneurship/research opportunities.	

Course Code: ZOOD401 **Course Title: Dissertation**

Number of Credits: 16

Effective from AY: 2022 -23

Prerequisites for the course:	**As per the ordinance applicable for Dissertation**	

Objective:	**To initialize independent thinking and applications in the research field.**	
Content	**Chosen scientific area.**	
Pedagogy:	**Discussion/ Experimental work/ field study/ /self-study/Presentations**	
References/Readings	1. Scientific Journals 2. Reference Books 3. Any other authentic source	
Learning Outcomes	1. Designing of research work 2. Formulation of research methodology 3. Methods implementation and Gathering of research data and application of statistics. 4. Research result formulation and interpretation.	

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D 3.32 Minutes of the Board of Studies in PGDCG & MLT meeting held on 26.07.2022.

Annexure I

Goa University

Taleigao Plateau, Goa 403206

POST GRADUATE DIPLOMA IN CLINICAL GENETICS AND MEDICAL LABORATORY TECHNIQUES

(PGDCG&MLT)

For the Academic year 2022-23

To be implemented from:2022-23 and approved in BOS of PGDMLT held on 26th July 2022. To be approved by AC, Goa University)

A brief description of the course:

Purpose: Skilled development of student w.r.t. various Clinical Genetics and Medical Laboratory techniques.

Prerequisite: Science graduate with either Zoology, Microbiology, Biotechnology ~~with chemistry as subject up to SY BSc~~. Candidates should compulsorily obtain minimum of 55% marks in the PGDMLT GU-ART conducted by Goa University.

Duration: This Post graduate diploma shall consist of two semesters with four courses in Semesters I and II each followed by compulsory one-month hands-on training in each of the laboratories viz. Biochemistry, Blood Bank and Central Laboratory, Pathology and Microbiology in Goa Medical College/ Govt. Hospital.

Course Fee: The course fees will be decided ~~by the appropriate authority.~~by Goa University.

Special Feature: A collaborative teaching programme between Department of Biochemistry, Pathology, Microbiology of Goa Medical College and Zoology, School of Biological Sciences and Biotechnology, Goa University.

Every course consists of 5 credits with 3 theory (3 x 15 hrs.) and 2 practical (2 x 30 hrs.) credits. There are eight courses accounting for a total of 40 credits distributed over two semesters. Semester one has four core courses of five credits each and semester two has four optional courses of five credits each.

All the courses will be evaluated by internal as well as external examiners.

COURSE STRUCTURE

Paper code	Course Title	Theory Credits	Practical Credits	Marks for Theory Credits	Marks for Practical credits	Page No.
Semester I						
MLC101	Clinical Genetics I	03	02	75	50	03
MLC102	Clinical Biochemistry I	03	02	75	50	05
MLC103	Clinical Microbiology (General & Systematic)	03	02	75	50	08
MLC104	Clinical Pathology & Histology	03	02	75	50	10
Semester II						
MLO201	Clinical Genetics II	03	02	75	50	13
MLO202	Clinical Biochemistry II	03	02	75	50	15
MLO203	Clinical Parasitology, Mycology and Virology	03	02	75	50	17
MLO204	Hematology and Transfusion medicine	03	02	75	50	20
+ Six months Compulsory Internship						

Note:

Each theory credit will be for 15 contact hrs and will account for 25 marks.

Each practical credit will be for 30 contact hrs and will account for 25 marks.

Course Code: MLC101 **Course Title: Clinical Genetics I**

Number of Credits: 3T + 2P = 5

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and genetics.	
Objectives:	• Acquaint students with recent genetic techniques • Know about the structure and function of genetic material • Learn about structural and numerical abnormalities their inheritance pattern and pedigree analyses.	
Content:	**Module 1: Introduction to Human Genetics** Growth of human genetics; levels of genetics. Structure and composition of the human chromosome: basic structure of DNA; molecular structure and organization. Classification of Human chromosomes: Paris nomenclature / ISCN; methods of studying	15hrs

	chromosomes; identification of individual chromosomes; Flow Karyotyping (Quantification on DNA of individual chromosomes); FACS – Fluorescence-activated cell sorter. **Module 2: Chromosomal Abnormalities** Numerical abnormalities (somies; ploidies; mosaic; chimera; syndromes). Structural: Translocations; Deletions; Duplications; Inversion; isochromosomes; Ring chromosomes; causes for genetic abnormalities- meiotic and mitotic nondisjunction; uniparental disomy; mutations; single gene disorders. **Module 3: Pattern of Inheritance** Autosomal Dominant, Autosomal Recessive, X-linked Dominant, X-linked Recessive, Y-linked, sex limited inheritance, sex influenced inheritance, X inactivation, Multifactorial inheritance, mitochondrial inheritance, imprinting. Pedigree analysis of some genetic disorders: Haemophilia, Color blindness, Duchenne Muscular Dystrophy (DMD), achondroplasia and PKU. **Practical Module :** • Specimen procurement and logging for cytogenetic procedure. • Culture media preparation • Identification of Chromosomes. • Inoculation of Lymphocyte culture/peripheral blood culture. • Harvesting of Lymphocyte culture to obtain metaphase plates. • Chromosomal banding technique: GTG Banding. • Karyotyping of Human chromosomes: o use of Cytovision/any other Karyotyping software o Microphotography o Image capturing, image processing, and analysis • Study of Karyotypes: Normal male and female and various syndromes • Construction of Pedigree from given data. • Analysis of pedigree charts to determine the mode of inheritance	15hrs 15hrs 4 hrs 4 hrs 4 hrs 4 hrs 4 hrs 4 hrs 4 +4 +4 hrs 4+ 4 hrs 4+4 hrs 4+ 4hrs
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 5. Understand the functions of the genetic material. 6. Correlate genetic mutations to diseases in human population. 7. Perform Karyotyping using software. 8. Construct and analyse human pedigrees.	
References	7. Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979. 8. Singh BD (2014): Fundamentals of Genetics. Second Edition,	

	Kalyani Publishers, New Delhi. 9. Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 9780190681111 10. Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore 11. De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia. 12. Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine,Elsevier Publication, Philadelphia. REFERENCE BOOKS FOR PRACTICALS: 1. Arumuga N, MeyyanRP (2016): Advances in Genetics Volume 1(Dr. N. Arumugam, R P Meyyan, Saras Publication, Nagercoil, Tamil Nadu. 2. GardnerA and Davies T(2010) Human Genetics 2nd Edition,Viva books publication,Delhi.	

Course Code: MLC102 **Course Title: Clinical Biochemistry I**

Number of Credits: 3T + 2P = 5 Credits

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and biochemistry	
Objectives:	• Understanding concepts of human cell organization for further study of its role in metabolic functions • Study of chemistry of various body enzymes, vitamins, minerals, carbohydrates, proteins and lipid for further estimation of the same from blood and body fluid samples such as urine etc.	
Content:	**Module 1: Cell and Physical Chemistry** Cell : Cell definition, Eukaryotic cell, cell organelles and its functions, Subcellular fractionation, cell markers, cell membrane	4hrs
	Physical Chemistry: Define:- pH, Hydrogen ion concentration and buffers, blood buffers, Regulation of blood pH, Acid Base metabolism	4hrs
	Module 2: Carbohydrate, Lipid, Proteins (Chemistry) Carbohydrate chemistry: Definition, Classification, (Mono / Di / Polysaccharides / MPS) sources, functions & its Biomedical importance	3hrs
	Lipid chemistry with Prostaglandins: Lipids:-Definition, Classification, Functions of Phospholipids, lipoproteins, cholesterol, Prostaglandins, Essential fatty acids	4hrs
	Protein chemistry: Definition, Classification of proteins & aminoacids, essential amino acids, biologically important amino	3hrs

	acids and peptides, Structure of proteins, Functions and importance of plasma proteins	
	Haemoglobin & Hb Metabolism: Structure & Functions of Hb,Heme synthesis, Hb breakdown, Abnormal Hb	3hrs
	Module 3: Enzymes, Vitamins and Minerals Enzymes: Definition, Classification, factors affecting enzyme action, Coenzymes, enzyme inhibition, Isoenzymes, Diagnostic enzymes	7hrs
	Vitamins: Definition, Classification, Vitamins, RDA, dietary sources, functions, deficiency manifestations of Vitamin A, D,E,K,C, B1,B6,B12 & Folic Acid	8hrs
	Mineral Metabolism: Digestion, Absorption, Transport, Excretion, Functions, Disorders; Dietary sources of Ca, P, Mg, Cu, Fe, I, Zinc	6hrs
	Viva/Tutorial/ Small Group Discussion: Above all topics	3hrs
	Practical Module: • Demonstration: Estimation of pH. Use of pH meter	4hrs
	• Qualitative Carbohydrate chemistry –Monosaccharides	4hrs
	• Qualitative Carbohydrate chemistry- Disaccharides & Polysaccharides	4hrs
	• Qualitative Protein chemistry -Colour Reactions & Precipitation	4hrs
	• Qualitative Protein chemistry -Albumin/ Globulin, Casein & Gelatin	4hrs
	• Qualitative Lipid chemistry & Estimation of Cholesterol	4hrs
	• Estimation of Serum Proteins, A/G ratio	4hrs
	• Estimation of chloride in serum	4hrs
	• Estimation of serum Calcium	4hrs
	• Estimation of serum Inorganic Phosphorus	4hrs
	• Demonstration: Chromatography	4hrs
	• Demonstration: Electrophoresis	4hrs
	• Demonstration: Colorimeter	4hrs
	• Demonstration: Autoanalyser	4hrs
	• Revision	4hrs
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Explain the chemical organization of cells. 2. Compare and contrast the chemistry of biomolecules. 3. Perform quantitative and qualitative tests for biomolecules.	

	4. Estimate enzymes and minerals from serum.	
References	1. Lieberman MA and Ricer R(2019). BRS Biochemistry, Molecular Biology, and Genetics.Wolter Kulver Publication. 2. Nelson DL and Cox MM(2019). LehningerPrinciples of Biochemistry, Seventh edition. Wiki publications. 3. Panini RS(2013).Medical biochemistry – an illustrated review. Thieme Medical Publishers, New York. 4. Vasudevan DM(1995): Textbook of Biochemistry for medical student's first edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. 5. Pankaja Naik. (Latest edition). Medical Biochemistry. 6. Sood R (1999) fifth edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. 7. Sood R(1985) first edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. REFERENCE BOOKS FOR PRACTICALS: 1. Mukherjee KL (2017) Volume II:Medical Laboratory Technology,Tata McGraw-Hll Publishing Company Ltd. New Delhi. 2. Kamat G(2011). Practical manual of Hematology. Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.	

Course Code: MLC103 **Course Title: Clinical Microbiology**

Number of Credits: 3T + 2P = 5 **(General & Systematic)**

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and microbiology	
Objectives:	• Hands-on training on preparation of culture media for isolation of bacteria from blood or body fluid samples provided. • To be aware of diagnostic features of bacteria for reporting the correct results observed after analyses using definite procedures • Learning about the advanced techniques used in recent times to obtain better and faster results to provide immediate treatment.	
Content:	**Module 1: Introduction to microbiology** Historical perspective, the principle of microbiology, microscopes (types and uses), Bacteria: Classification, anatomy, reproduction, growth and nutrition, Sterilization: - methods employed, both physical and chemical, Media used in Microbiology: - Classification, types, constituents, methods of preparation, adjustment of pH, sterilization, Culture methods and antimicrobial sensitivity testing, Hospital acquired infections, Biomedical Waste Management, Inventory and stock, Quality control in Microbiology.	15hrs

	Module 2: Serology Serology: Antigen, antibody, antigen-antibody reaction including flow cytometry, Methods for identification of bacteria (morphology), Methods for identification of bacteria (biochemical), Molecular methods (PCR, Biofire Film Array, LAMP), Automated systems for bacterial identification (MALDI-TOF, VITEK 2), Automated culture techniques, Standard precautions.	15hrs
	Module 3: Systemic (Individual Bacteria) Systemic (Individual Bacteria): Diagnosis features (morphology, cultured characters, biochemical reaction, antigenic characters, pathogenicity and laboratory diagnosis) of Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteria, Clostridia, Escherichia coli, Klebsiella species, Salmonella, Shigella, Proteus, Pseudomonas, *Mycobacterium tuberculosis*, *Treponema pallidum*.	15hrs

	Practical Module :
	• Preparation of smears for staining and fixation from samples and culture media (both liquid and solid media).
	• Care and use of microscopes (including Fluorescent microscope).
	• Staining techniques: (Gram staining, zeihl nelson, Fluorescent method): preparation of satins, procedure, reporting of smears, principle involved.
	• Equipments used in sterilization: Description (structure), working principle involved, articles sterilized, advantages and disadvantages.
	• Culture media: types, constituents of each media, method of preparation, adjustment of pH, sterilization, uses.
	• Culture techniques: different methods of inoculation from clinical samples and bacterial growth from media.
	• Antimicrobial sensitivity testing.
	• Preparation of wet mount and motility of organisms.
	• Identification of bacteria-morphology and biochemical.
	• Antigen antibody reactions.
	• Biomedical waste management.
	• Standard precautions.
	• Systemic bacteriology: Practical demonstration of diagnostic features of:
	  ○ Gram positive organisms.
	  ○ Gram negative organisms.
	  ○ Anaerobes, spirochetes.
	• Mycobacteria.
		30 hrs x 2

Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Explain the basis of bacterial culture and identification. 2. Correlate the microbial techniques with clinical conditions in humans.	

	3. Perform various staining techniques and tests for microbial analysis. 4. Process body samples to detect pathogenic bacteria.	
References	REFERENCE BOOKS FOR THEORY & PRACTICAL: 1. Ananthanarayan and Paniker's Textbookj of Microbiology- Latest edition. 2. Essential of Medical Microbiology by Apurba S. Satry and Sandhya Bhat- Latest edition. 3. Complete microbiology by C. P. Baveja and V. Baveja. Latest edition.	

Course Code: MLC104 **Course Title: Clinical Pathology & Histology**

Number of Credits: 3T + 2P = 5

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of Anatomy and Physiology.	
Objectives:	• Learning techniques of collection of samples such as body fluids and tissues for studying cytological aspects. • Hands-on training in learning techniques of processing the tissue samples for further analyses and treatment of particular diseases.	
Content:	**Module 1: Histopathological techniques** Fixatives and fixation, Preparation of fixatives , Neutral formalin, buffered formalin, mercuric Zenker's sol. Schaudinns sol, k-dichromate- orth's solution Regaud's sol picric acid – Bouins sol: Hollande's sol. clearing, embedding, microtome knives, section cutting, errors, decalcification, Decalcifying fluids, formic acid, gooding & stewarts fluid, nitric acid, aqueous nitric acid. frozen section, mounting media, automation. Staining: Theory of staining, dyes and stains, mordants, differentiation, haematoxylin and eosin staining- principles and procedures, Hematoxylin stains: composition and techniques preparations & application of , iron hematoxylins , weigert's iron hematoxylin, heidenhains iron hematoxylin. Tungsten Hematoxylins , PTAH, Molybdenum Hematoxylin , phophomdybdic acid hematoxylin. special stains, carbohydrate stins and glycoconjugates, P.A.S. alcian blue techniques combine alcian blue – PAS , muciccarmine , colloidal iron, high iron diamine. Lipid staions, oil red o , suddan black b., pigments and minerals perls pursian blue for ferric iron , masson Fontana method for melanin, von kossa for calcium.elastic tissue stains, weigert method, Verhoff's,method Connective tissue stains, history of connective tissue composition preparation and application of Masson's trichrome, Von Giessons, Reticulin stain Gomoris silver methanamine. fat stains, and other stains. Microorganism , Grams method & modified method , Z N stains for mycobacteria, fluorescent method for mycobacteria, modified fite method for mycobacteria leprac, cresyl violet stains for helicobacter, grocott methamine silver for fungi, Mc manus PAS method for	15hrs

	glycogen & fungal wall, Amyloid congo red techniques. **Module 2: Examination of body fluids** Sample collection, physical and chemical tests, principles and methods, reagent strip method, microscopic examination- crystals, casts, sediments, pregnancy tests. Stool examination, semen analysis, sputum examination. Cytocentrifugation and application Lab diagnosis/ urine/ blood/ findings in kidney disorders. **Module 3: Cytological techniques** Exfoliative cytology, fixation, pap staining, cytological processing of fluids. Fine needle aspiration cytology (FNAC): procedure, staining of slides, automation, H & E and MGG staining. Examination of CSF and other body fluids: pleural, peritoneal, synovial fluid. Quality control in clinical pathology lab, automation in clinical pathology lab. enzyme histochemistry and its diagnostic application, immuno histochemicals techniques, tissue microarray, molecular pathology techniques In situ hybridation/ F.I.S.H **Practical Module:** • Histopathological techniques: fixation, dehydration, clearing, impregnation, embedding, decalcification.microtome's , base sledge, rocking type, rortary, sliding microtome, autotechnicon automated tissue processor, principle, working, paraffin embedding bath etc. • Microtomes knives and their sharpening, automated knives sharpners section cutting, errors in section cutting,refregirated micotome, freezing micotome , cryostat etc. frozen sectioning, mounting media. • Routine staining techniques: routine staining, hematoxylin and eosin (H &E) staining. • Special staining demonstration: P.A.S., Verhoeff's, Massons trichrome, Von Giessons, fat stains and other stains. • Grossing and Museum techniques. • Examination of urine: Physical and chemical. • Examination of urine: multiple reagent strips methods, microscopic.Urinometer, ESbach's Albuminometer, automated urine analyser, dipstick readers etc. • Pregnancy tests. • C.S.F. examination • Examination of body cavity fluids: pleural, peritoneal, and synovial. • Sputum examination • Stool examination • Semen analysis. • Exfoliative cytology: principles, Papanicolaou staining	15hrs 15 hrs 30 hrs x 2

	procedure. • Fine needle aspiration cytology (F.N.A.C): hematoxylin and eosin (H &E), MGG staining. • Needles lumbar puncture needle, vim silverman needle, bone marrow aspiration biopsy needle, trephine biopsy needle etc. • Miroscopes, compound, dark ground illumination, phase contrast, fluroscent microscopy, polarizing microscopy.	
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Describe and demonstrate staining techniques for pathological evaluations. 2. Explain different techniques used for examining body fluids. 3. Process tissue and Perform histopathological techniques. 4. Examine body sample for pathological analysis.	
References	1. Lieberman MA and Ricer R(2019). BRS Biochemistry, Molecular. 2. Kawthalkar SM(2018). Essential of Clinical Pathology. Second Edition. Jaypee Medical publishers, New Delhi. 3. Vasudev DM(2013): Textbook of Biochemistry for medical student's seventh edition Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. 4. Sood R(1985) first edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. 5. Chakraborty P(1995): A text book of microbiology, New Central Book Agency Pvt Ltd, Calcutta. 6. Dereck AC and Cameron IR(2012). Histopathology Specimens: Clinical, Pathological and Laboratory Aspects. Springer publication. REFERENCE BOOKS FOR PRACTICAL: 7. Mohan H(2017).Practical pathology. Jaypee Medical publishers, New Delhi. 8. Mukherjee KL (2017) Volume II: Medical Laboratory Technology, Tata McGraw-Hll Publishing Company Ltd. New Delhi. 9. Chatterjee MN (2013): Textbook of Medical Biochemistry eight edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.	

Course Code: MLO201 **Course Title: Clinical Genetics II**

Number of Credits: 3T + 2P = 5

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of Cell biology and genetics

Objectives:	• To get acquainted with recent procedures used in artificial reproductive techniques and their acceptance in the society. • Techniques for analysis of samples for success of procedures conducted. • Knowledge of recent techniques used for better results and treatment. • To learn about genetic counseling and steps to help guide patient for particular medical treatment available.	
Content:	**Module 1: Molecular genetics, Genetics of Cancer, Dermatoglyphics** Molecular genetic techniques used in genetic diagnosis: Blotting techniques – Southern, Northern and Western, PCR/ RFLP, FISH, DNA sequencing & DNA fingerprinting. Genetics of Cancer: introduction, characteristics of cancer cells, origin of cancer cells, genes associated with cancer, environmental causes of cancer, human genome data tailor diagnosis and treatment. Dermatoglyphics: Introduction, classification, Flexion creases. Dermatoglyphics in clinical disorders, Clinical application & its advantages and limitations.	15hrs
	Module 2: Reproductive technologies, Genetics and Society Reproductive technologies: infertility and subfertility, assisted reproductive technologies (IUI, surrogate motherhood, IVF, GZIT, ZIFT), preimplantation genetic diagnosis. Genetics and Society : (i) Human genome project : (ii) Forensic science (iii) DNA finger printing application (iv) Gene therapy (v) Eugenics. vi) Stem cell research.	15hrs
	Module 3: Prenatal Diagnosis, Genetic Counselling Prenatal Diagnosis: Definition: Various procedures - Amniocentesis, Chorionic villus sampling, Ultrasonography and Fetoscopy. Genetic Counselling (Stage1: History and Pedigree Construction, Stage 2: Examination, Stage 3: Diagnosis, Stage 4: Counselling; and Stage 5: Follow up).	15hrs
	Practical Module: • Introduction to molecular genetic lab: general rules, handling of chemicals, equipments and biological materials; waste disposal. • Isolation of DNA from human blood. • Determination of the molecular size of DNA. • Analysis of DNA fingerprints and FISH images • Dermatoglyphics: Recording of print of fingertips and palm. • Manual DNA sequencing and data analysis. • Amniotic fluid culture: Flask method and Coverslip method. • Chorionic villi culture: Short-term culture • Chromosomal analysis from the product of conception (abortus study) (03 Practicals) • Disease suspection by spot tests: Fanconi's syndrome, PKU,	30 hrs x 2

	maple syrup urine disease, Tryptophanuria.	
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 9. Describe and explain the molecular genetic techniques used in genetic diagnosis and reproductive techniques which can be recommended to overcome infertility. 10. Demonstrate the application of dermatoglyphic prints in disease detection. 11. Perform procedures of DNA isolation, Molecular size determination, and disease detection for inborn errors of metabolism. 12. Analyze FISH images and DNA fingerprints.	
References	13. Jorde L, Carey J and Bamshad M(2016). Medical Genetics. Fifth edition. Elsevier Publication imprint. eBook ISBN: 9780323391979. 14. Singh BD (2014): Fundamentals of Genetics. Second Edition, Kalyani Publishers, New Delhi. 15. Matheiesen A and Roy K(2018). Foundation of Perinatal Genetic counseling. eISBN: 978019068111. 16. Gardner EJ, Simmons MJ and Snustad DP (2013): Principles of Genetics, Eighth Edition, John Wiley Publication, Singapore 17. De Robertis EDP, De Robertis EMF (2012): Cell and Molecular Biology, Eigth Edition. Wolter Kluwer Publication, Philadelphia. 18. Thompson JS, Thompson MW(1966): Thompson & Thompson Genetics in Medicine, Elsevier Publication, Philadelphia. REFERENCE BOOKS FOR PRACTICALS: 5. Arumuga N, MeyyanRP(2016): Advances in Genetics Volume 1(Dr. N. Arumugam, R P Meyyan, Saras Publication, Nagercoil, Tamil Nadu. 6. GardnerA and Davies T(2010) Human Genetics 2nd Edition, Viva books publication, Delhi.	

Course Code: MLO202 **Course Title: Clinical Biochemistry II**

Number of Credits: 3T + 2P = 5

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of cell biology and biochemistry.
Objectives:	• Testing, observing and analyzing blood function test • Knowledge about the Clinical aspects and use of it during a performance of test.

Content:	**Module 1: Carbohydrate, Protein, Lipid Metabolism**	
	Carbohydrate Digestion, Absorption & Metabolism: Digestion & Absorption of Carbohydrates, Glycolysis, TCA cycle, Gluconeogenesis, Glycogen Metabolism, DM, Ketosis, Blood Glucose and its regulation; Hypoglycemia	9hrs
	Lipid Digestion, Absorption & Metabolism: Digestion & Absorption of Lipids, ketone body metabolism, lipoprotein metabolism, Atherosclerosis, Normal Lipid profile	9hrs
	Protein Digestion, Absorption & Metabolism: Digestion & Absorption of Proteins, Transamination, Deamination, Urea cycle, Functions of Glycine Phenylalanine,Tyrosine, Tryptophan, Phenylketonuria, Alkaptonuria,Albinism, Maple syrup urine disease, Kwashiorkar & Marasmus	9hrs
	Water & Electrolyte Balance: Electrolyte balance (Na, K & Cl) and Imbalance	2hrs
	Module 2: Function Tests 1	
	Cardiac Function Tests: Cardiac Markers, tests used to estimate risk of CVD	2hrs
	Gastric Function Tests: Gastric function and HCL secretion, Gastric juice analysis	2hrs
	Module 3: Function Tests 2	
	Liver Function Tests: Tests based on excretory, detoxification, synthetic functions of liver, Enzymes in diagnosis of liver diseases	4hrs
	Pancreatic Function Tests: Pancreatic juice, functions, Assessment of Pancreatic functions	1hr
	Thyroid Function Tests: Thyroid gland functions, Classification of thyroid function tests	1hr
	Kidney Function Tests: Glomerular and Tubular functions, Normal and Abnormal constituents of Urine, Renal clearance tests, Tests for tubular functions	3hrs
	Viva/Tutorial/ Small Group Discussion: All above topics	3hrs
	Practical Module:	
	• Chemistry of gastric juice	4hrs
	• Demonstration: Quality Control	4hrs
	• Estimation of bilirubin	4hrs
	• Estimation of glucose in blood	4hrs
	• Estimation of serum proteins	4hrs

	• Estimation of blood urea	4hrs
	• Estimation of creatinine in blood	4hrs
	• Estimation of uric acid in blood	4hrs
	• Normal urine	4hrs
	• Full urine report	4hrs
	• Demonstration: Kidney function tests, Thyroid function tests	4hrs
	• Demonstration: Liver function tests,Cardiac function tests	4hrs
	• Demonstration: Lipid Profile	4hrs
	• Demonstration: C. S. F. Examination	4hrs
	• Revision	4hrs
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Understand and explain clinical significance of metabolism of biomolecules. 2. Explain the significance of function tests of body systems. 3. Perform Chemical examination of body fluids. CO4: Conduct Liver, Thyroid and Kidney function tests.	
References	1. Lieberman MA and Ricer R(2019). BRS Biochemistry, Molecular Biology,and Genetics.Wolter Kulver Publication. 2. Nelson DL and Cox MM(2019). LehningerPrinciples of Biochemistry, Seventh edition. Wiki publications. 3. Panini RS(2013).Medical biochemistry – an illustrated review. ThiemeMedical Publishers, New York. 4. Vasudevan DM(1995): Textbook of Biochemistry for medical student's first edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. 5. Pankaja Naik. (Latest edition). Medical Biochemistry. 6. Sood R (1999) fifth edition: Medical Laboratory Technology, Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. 7. Chatterjee MN (2013): Textbook of Medical Biochemistry eight edition: Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi. REFERENCE BOOKS FOR PRACTICALS: 8. Mukherjee KL (2017) Volume II:Medical Laboratory Technology,Tata McGraw-Hll Publishing Company Ltd. New Delhi. 9. Kamat G(2011). Practical manual of Hematology. Jaypee BrothersMedical Publishers Pvt Ltd, New Delhi.	

Course Code: MLO203 **Course Title: Clinical Parasitology, Mycology and Virology**

Number of Credits: 3T + 2P = 5

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of pathogens and their characteristics.

Objectives:	• Learning about the parasitological, mycological and virological aspects, their life cycle and understanding clinical aspects about the same for analyses and treatment. • Awareness of virus spread and tests performed for the same for their analyses	
Content:	**Module 1: Parasitology** Introduction to parasitology, terminologies, definitions, relationships. Protozoa: geographic distribution, habitat, morphology, life cycle, pathologenecity, laboratory diagnosis of the following parasites: ▪ *Entamoeba histolytica* ▪ *Giardia lamblia* ▪ *Trichomonas vaginalis* ▪ *Leishmania donovani* ▪ *Plasmodium* ▪ Cocoidian parasites causing diarrhea Cestodes: On the same line as protozoan parasites for the following: ▪ *Taenia sagenata* ▪ *Taenia solium* ▪ *Echinococcus granulosus* Helminths: On the same line as protozoan parasites for the following: ▪ *Trichuris trichiura* ▪ *Ankylostoma duodenale* ▪ *Ascaris lumbricularis* • *Enterobius vermicularis* • *Wuchereria bancrofti* **Module 2: Mycology** Introduction to mycology, Classification of fungi and fungal diseases, Laboratory diagnosis of fungal infections, *Candida albicans* and other candida species Dermatophytes, Cryptococcus, Opportunistic fungi (Aspergillus, Pencillium, Mucor), Subcutaneus mycoses (Mycetoma, Sporotrichosis, Rhinosporidiosis), Histoplasmosis, Fungal toxins. **Module 3: Virology** General virology: Definations, classification, properties of viruses, viral replication, cultivation, laboratory diagnosis. • Systemic virology: On the basis of structure, cultivation, pathogenicity, Laboratory diagnosis of the following viruses: i) Bacteriophage ii) Picomaviruses (Polio viruses) iii) Rhabdoviruses (Rbies virus) iv) Arboviruses(Dengue, Chikungunya, JE) v) Influenza virus vi) Hepatitis virus vii) HIV viii) Herpes virus	15hrs 15hrs 15hrs

	Practical Module: • Stool examination: gross, microscopic, for adult parasite, segment of Taenia, ova, cysts, and larvae of parasite . • Gross and microscopic features *(whenever applicable)* of intestinal/ vaginal protozoa. • Laboratory diagnosis of malaria: demonstration of whole parasite, parasite antigen, enzymes, serology. • Gross and microscopic features of cestodes: to include adult worms, segment, larvae, eggs. • Gross and microscopic features of Helminthes: to include adult worms, eggs, larvae. • Diagnostic features-practical demonstration of gross and microscopic features (wet mount, slide culture) and other tests whenever applicable for following: Candida, Cryptococcus, Dermatophyte, Opportunistic fungi. • General virology: types of symmetry, morphology of virus models, cultivation in embryonated egg. • Laboratory diagnosis of the following viruses: Poliovirus, Rhabdovirus, HIV, Hepatitis, Herpes, Influenza, Arboviruses. • Bacteriophage—structure using a model.	30 hrs x 2
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Describe the pathogenecity and laboratory diagnosis of protozoans, Cestodes and Helminthes. 2. Know the basis of identification and classification of Fungi and viruses. 3. Perform Gross and microscopic observation procedures for detecting endoparasites.	
References	REFERENCE BOOKS FOR THEORY & PRACTICAL: 1. Ananthanarayan and Paniker's Textbook of Microbiology- Latest edition. 2. Essential of Medical Microbiology by Apurba S. Sastry and Sandhya Bhat- Latest edition. 3. Complete microbiology by C. P. Baveja and V. Baveja. Latest edition. 4. Panikar's Texbook of Medical Parasitology. Latest edition.	

Course Code: MLO204 **Course Title: Hematology and Transfusion medicine**

Number of Credits: 3T + 2P = 5

Effective from AY: 2022 -2023

Prerequisite for the Course:	Basic knowledge of blood components and their applications

Objectives:	• To get acquainted to blood collection and analyses of blood. • To learn various components of blood • Understanding importance of blood donation and learn grouping systems.	
Content:	**Module 1: Hematology–Blood composition and Hemolytic disorders** Blood: composition, haemopoesis, RBC'S- structure function, synthesis: Hemoglobin- structure, function, abnormal haemoglobin, reticulocytes, blood indices, peripheral blood smear, parasites in blood. Hemolytic disorders: investigations, screening tests, sickling, osmotic fragility, Heinz bodies, G-6-P-D screening, Hb electrophoresis, Hb-F estimation. Applied pathology, lab diagnosis of anemia, lab diagnosis and CSF picture in diff types of meningitis, lab diagnosis of hemorrhages disorders, lab diagnosis and LFT findings in diff types of jaundice, lab diagnosis	15hrs
	Module 2: WBCs and Platelets White blood corpuscles: Description, morphology, leucocyte counts, leucopenia, leukocytosis, leukemia, leukemoid reaction, absolute count, differential count, bone marrow iron staining, special stains for leukemias. Platelet structure and function: Bleeding disorders and investigations, coagulation process and theory, disorders. Flow cytometry and application.	15hrs
	Module 3: Transfusion medicine Blood groups: ABO and sub groups, antigen and antibodies, Rh blood grouping, other blood group systems, compatibility testing, antihuman globulin test. Blood transfusion: Selection of blood donors, blood transfusion procedures, Complications of blood transfusion, Blood component therapy, organization and administration of blood bank, blood safety. Equipments for blood component separation in blood bank, refrigerated centrifuge, plasma expresser ,refrigerated water bath, laminar air flow bench etc. Administrations and medico legal aspects, accreditation of lab.	15hrs
	Practical Module: • Use and care of microscopes, study of improved Neubaur chamber • Anticoagulants and blood collection • Haemoglobinometry: Sahli's method, Cyanmethemoglobin method.colori meter / spectrophotometer , principles part workings • Coagulometer • Haemoglogin electrophoresis, agar gel, CAM, HPLC, capillary electrophoresis etc. • Hematology analyser , 3 part/5 part differential counters (cell counter, semi automated, fully automated) • Haemocytometry: Erythrocyte count ,RBC pipette • Haemocytometry: Total WBC count, WBC pipette	30 hrs x 2

	• Blood smear preparations: Staining, differential WBC count • Peripheral blood smear examination and morphological abnormalities • Hemolytic work-up osmotic fragility test, Heinz bodies, sickling, G-6-P-D estimation, Hb-electrophoresis, Hb-F estimation. • Reticulocyte count- absolute eosinophil count • E.S.R, P.C.V, Blood indices (02 Practicals) • Platelet count, BT, CT, CRT • Prothrombin time, A.P.P.T, FDP estimation • Bone marrow examination- staining of smear, special stains- PAS, Sudan black, Myeloperoxidase • ABO grouping and Rh typing. • Demonstration of Coombs test and compatibility testing.	
Pedagogy:	Lectures/tutorials/assignments/ Presentations/Practicals/ demonstrations.	
Learning Outcome:	By the end of this course, students will be able to 1. Explain the composition of blood and changes in Hemolytic disorders. 2. Describe the structure and functions of WBCs and explain the tests associated with detection of Hemolytic disorders. 3. Perform various hemocytometric procedures. 4. Perform various hematological tests for disease detection.	
References	1. Rao GH, Eastlund T and Jagannath L(2006).Handbook Of Blood Banking & Transfusion Medicine. Jaypee Medical Publishers, New Delhi. 2. A.B. Dutta (2006) :Blood Banking and Transfusion, Satish Kumar Jain for CBS Publishers, New Delhi. 3. Rudmann SV(2005).Textbook of Blood Banking and Transfusion Medicine. Second Edition. Elsevier Saunders Publication. 4. Bharadwaj K(2015). Transfusion Update. Indian Society of Blood Transfusion and Immunohaematology. Jaypee Medical Publishers, New Delhi. REFERENCE BOOKS FOR PRACTICAL: 1. Mukherjee KL (2017) Volume II:Medical Laboratory Technology, Tata McGraw-Hll Publishing Company Ltd. New Delhi. 2. Kamat G(2011). Practical manual of Hematology. Jaypee Brothers Medical Publishers Pvt Ltd, New Delhi.	

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X AC- 9 (Special)
30.07.2022

Annexure II

FORMAT OF EXAMINATION (THEORY PAPER)

P.G. Diploma in Clinical Genetics and
Medical Laboratory Techniques Examination
Month, Year
MLC102: Clinical Biochemistry I
MLO202: Clinical Biochemistry II

Duration: 2 ½ Hours **Total Marks: 75**

Instructions**: 1. **All** Questions are **compulsory
*2. **Draw** diagrams **wherever** required*

1. Answer briefly (**3** marks **each**) **30**

a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

2. Give an account of **any three** of the following (**5** Marks **each**): **15**

a)
b)
c)
d)

3. Write on **any three** of the following (5 Marks **each**): **15**

a)
b)
c)
d)

4. Write short notes on **any three** of the following (**5** marks **each**): **15**

a)
b)
c)

d)

SCHEME OF THEORY EXAMINATION

Total Marks: 75

All Questions are compulsoryNumber of Questions: 4

Question No. 1:

- Marks: 30
- From Module 1, 2 and 3
- Ten sub questions
- Three marks for each sub questions
- No choice
- To be answered briefly

Question No. 2:

- Marks: 15
- From Module 1
- Four sub questions
- Five marks for each sub questions
- To be answered briefly

Question No. 3:

- Marks: 15
- From Module 2
- Four sub questions
- Five marks for each sub questions
- To be answered briefly

Question No. 4:

- Marks: 15
- From Module 3
- Four sub questions
- Five marks for each sub question
- To be answered briefly

PRACTICAL EXAMINATION PATTERN

Total Marks: 50

Practical Exercise: 35 marks

Viva Voce: 10 Marks

Journal: 5 marks

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X AC- 9 (Special)
30.07.2022

FORMAT OF EXAMINATION (THEORY PAPER)

P.G. Diploma in Clinical Genetics and Medical Laboratory Techniques Examination
Month, Year
MLC101: Clinical Genetics I
MLO201: Clinical Genetics II
MLO103: Clinical Microbiology (General & Systematic)
MLO203: Clinical Parasitology, Mycology and Virology
MLC104: Clinical Pathology and Histology
MLO204: Hematology and Transfusion

Duration: 2 ½ Hours **Total Marks: 75**

Instructions**: 1. **All** Questions are **compulsory
*2. **Draw** diagrams **wherever** required*

1. Answer briefly (**3** marks **each**) **30**
a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

2. Give an account of **any three** of the following (**5** Marks **each**): **15**
a)
b)
c)
d)

3. Write on **any three** of the following (5 Marks **each**): **15**
a)
b)
c)
d)

4. Write short notes on **any three** of the following (**5** marks **each**): **15**
a)

b)
c)
d)

SCHEME OF THEORY EXAMINATION

Total Marks: 75

All Questions are compulsory
Number of Questions: 4

Question No. 1:

- Marks: 30
- From Module 1, 2 and 3
- Ten sub questions
- Three marks for each sub questions
- No choice
- To be answered briefly

Question No. 2:

- Marks: 15
- From Module 1
- Four sub questions
- Five marks for each sub questions
- To be answered briefly

Question No. 3:

- Marks: 15
- From Module 2
- Four sub questions
- Five marks for each sub questions
- To be answered briefly

Question No. 4:

- Marks: 15
- From Module 3
- Four sub questions
- Five marks for each sub questions
- To be answered briefly

PRACTICAL EXAMINATION PATTERN

Total Marks: 50

Spots: 20 marks

Practical Exercise: 15 marks

Viva Voce: 10 Marks

Journal: 5 marks

Annexure III

GU-ART Syllabus for Post Graduate Diploma in Clinical Genetics and Medical Laboratory Techniques(PGDCG&MLT)

I. BIOCHEMISTRY

1. Overview of Metabolism

Metabolism, Stages of catabolism, Sub divisions of Metabolism, Catabolism vs. Anabolism, regulation of Metabolic pathways, Shuttle systems and membrane transporters

2. Bioenergetics

Concept of Energy, Laws of Thermodynamics, Free energy, ATP as "energy currency" of the cell.

3. Carbohydrate Metabolism

Sequence of Reactions and Regulation of Glycolysis, Pentose phosphate pathway, Oxidative decarboxylation, Citric acid cycle, Gluconeogenesis, Glycogenolysis and Glycogenesis., Mitochondrial respiratory Chain

4. Oxidative Phosphorylation

Mechanism of oxidative phosphorylation - Chemical coupling Hypothesis, Conformational coupling Hypothesis, Chemiosmotic Coupling Hypothesis.Inhibitors and Uncouplers of Electronic Transport system.

5. Amino acid metabolism

Catabolism of amino acids: Transamination, Deamination, Urea Cycle, Fate of C-skeleton of Glucogenic and Ketogenic amino acids,inborn errors of Amino acid catabolism (Albinism, Alkaptonuria, Phenylketonuria)

6. Lipid Metabolism

Beta-oxidation of fatty acids – a. Palmitic acid {saturated (C 16:0) b. Linoleic acid {unsaturated (C 18:2) Alpha and Omega oxidation of fatty acids, ketogenesis- Ketogenic and Antiketogenic substances, Regulation of ketogenesis

II. GENETICS

1. Mendelian Genetics & its Extension

Overview of Mendelian Genetics Epistasis and Hypostasis, Multiple genes and multiple alleles, Sex linked, sex limited and sex influenced inheritance (with one example each)

2. Chromosome Structure

Eukaryotic Chromosome, Types of Eukaryotic Chromosome (based on centromere position), Eukaryotic and prokaryotic chromosomal organisation, Giant chromosomes (polytene and lampbrush)

3. Gene Mutation

Natural and Induced Mutations, Types of gene mutation (base pair substitution and frame shift) Types of chromosomal aberration, Causative agents of Mutation.

4. Inbreeding and Heterosis

Definition of Inbreeding, Inbreeding depression, Practical applications of Inbreeding. Heterosis – Genetic basis; Application and Evolutionary significance.

5. Inheritance of Human traits

Human karyotype, Pedigree analysis Inheritance of human traits: Brown eyes, Polydactyly, Diabetes insipidus, Sickle cell anemia, PKU Eugenics and Genetic counseling

III. MOLECULAR BIOLOGY

1. DNA structure and replication

DNA as genetic material, Structure of DNA, Types of DNA, Replication of DNA in prokaryotes and eukaryotes: Semi conservative nature of DNA replication, Bi-directional replication, DNA polymerases, The replication complex: Pre-primming proteins, primosome, replisome, Rolling circle replication, Unique aspects of eukaryotic chromosome replication, Fidelity of replication.

2. DNA damage, repair and homologous recombination

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair: Photoreactivation, base excision repair, nucleotide excision repair, mismatch repair, translesion synthesis, recombinational repair, nonhomologous end joining. Homologous recombination: models and mechanism.

3. Transcription and RNA processing

RNA structure and types of RNA, Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains Transcription in eukaryotes: Eukaryotic RNA polymerases, transcription factors, promoters, enhancers, mechanism of transcription initiation, promoter clearance and elongation RNA splicing and processing: processing of pre-mRNA: 5’ cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

4. Regulation of gene expression and translation

Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system), Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNAsynthetases, Mechanism of initiation, elongation and termination of polypeptide

IV. ENDOCRINOLOGY

1. Introduction

Endocrinology, Endocrine glands. Concept of homeostasis - Glucose and Calcium Homeostasis.

2. Endocrine Hypothalamus

Hypothalamohypophyseal portal system, Hypothalamohypophysealneurosecretary tracts, Hypothalamic nuclei, - Magnocellular and Parvicellular elements. Hypothalamic releasing and inhibitory hormones/factors.

3. Hormones

Chemical messengers, type of chemical messengers. Hormones, types of hormones (proteins and steroids).Hormonal regulation of secretion – Feedback system- long loop, short loop, positive and negative feedback.

4. Hypophysis

Gross anatomy, blood supply, histology of Adenohypophysis- identification of cell types based on staining affinities. Division and nomenclature of hypophysis. Hormones of Adenohypophysis, their functions and effect on target organs, Disorders of growth hormones.Neurohypophysis – Hormones of the neurohypophysis, Biological effects of Oxytocin and Vasopressin, Diabetes insipidus.

5. Thyroid

Structure, blood supply and nerves.Structure of thyroid follicles, principal cells and parafollicular cells. Biochemistry of Thyroid Hormones, Factors affecting thyroid functions. Clinical aspects of thyroid functions (Cretinism, Myxoedema, and Graves‟ disease) Parathyroid – Histology, hormones, Regulation of Blood Calcium level, Parathyroid tetany.

6. Endocrine Pancreas

Histology of Pancreas, Endocrine pancreas- Islets of Langerhans, types of cells (α,β,γ and δ). Effects of Insulin and Glucagon.Regulation of blood glucose level – Diabetes Mellitus (IDDM and NIDM).

7. Adrenal

Anatomy of adrenal gland, Functional morphology of adrenal cortex, Zones of adrenal cortex - Histology. Adrenal steroid hormones - Glucocorticoids, Mineralo corticoids and Adrenal sex steroids. Regulation of Adrenocortical function. Adrenal medulla – Functional morphology of adrenal medulla, Hormones of medulla, Catacholamines and their roles in metabolism. Adrenocortical disorders – Cushing‟s syndrome and Virilism.

8. Gonads as endocrine structures

Testes – endocrine component of testes (Leydig cells and Sertoli cells). Hormones of testes – Androgens and their biological role. Ovary - Endocrine components of ovary (Follicular wall Theca and Granulosa). Corpus luteum and Interstitial cells. Hormones of ovary and their biological function .Placenta –Placenta and its Hormones.

V. MEDICAL MICROBIOLOGY

1. Normal microflora of the human body and host pathogen interaction

Normal microflora of the human body: Importance of normal microflora; normal microflora of skin, throat, gastrointestinal tract, genito - urinary tract

Host pathogen interaction: Pathogen, Invasion, Infection, Pathogenicity, Virulence, Virulence

factors (Pili, fimbriae, flagella, capsule, glycocalyx, adhesins, enzymes, chelators (siderophores), endotoxin, exotoxin)

Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection, Pathophysiological effects of LPS.

2. Sample collection, transport and diagnosis

Sample types and collection, transport and culturing from clinical samples.

Principle and methodology of different diagnostic techniques - ELISA, Immunofluorescence, Agglutination based tests, Complement fixation, PCR, DNA probes and Microarray.

3. Bacterial diseases

List of diseases of various organ systems and their causative agents. The following diseases in detail with mode of transmission, pathogenesis, symptoms, chemotherapy and prophylaxis:

A. Respiratory Diseases: Pneumonia (Streptococcus pneumoniae), Influenza (Haemophilusinfluenzae), Tuberculosis (Mycobacterium tuberculosis).

B. Gastrointestinal Diseases: Bacterial diarrhea (Escherichia coli), typhoid (Salmonella typhi), Cholera (Vibrio cholerae), bacterial dysentery (Shigella dysenteriae).

C. C. Skin infections- Staphylococcus aureus, Vibrio parahaemolyticus

D. Genito-Urinary Tract Infections: Syphilis (Treponema pallidum), UTI(E. coli and Proteus vulgaris)

4. Viral diseases

List of diseases of various organ systems and their causative agents.

The following diseases in detail with mode of transmission, pathogenesis, symptoms, chemotherapy and prophylaxis. Polio, Hepatitis (A, B, C, D and E), Rabies, Dengue, AIDS.

5. Protozoan diseases

List of diseases of various organ systems and their causative agents. The following diseases in detail with mode of transmission, pathogenesis, symptoms, chemotherapy and prophylaxis. Malaria, Amoebic dysentery

6. Fungal diseases

List of diseases of various organ systems and their causative agents. The following diseases in detail with mode of transmission, pathogenesis, symptoms, chemotherapy and prophylaxis. Cutaneous mycoses: Athlete's foot (Tinea pedis) Opportunistic mycoses: Candidiasis (Candida albicans)

VI. HAEMATOLOGY AND CLINICAL BIOCHEMISTRY

1. Haematology

Overview of blood circulatory system of humans, Blood, plasma, serum - definition, Blood components and their functions, Buffering system – role of proteins, carbonate system and other

ions in buffering, deviations in pH and their impact, Haematopoiesis-erythropoiesis, leukopoiesis and thrombopoeisis.

Structure and function of erythrocytes, Hemoglobin- structure, function, synthesis, metabolism of iron, abnormal erythrocytes andhaemoglobins, types of Hbs and its derivatives (carboxy Hb andmet Hb, sickle cell Hb).

Structure and function of different types of

leucocytes. Structure and function of thrombocytes.

2. Blood counts

Collection of blood - methods, skin puncture and venipuncture; type and use of Anticoagulants, handling and processing of bloodsamples, disposal of samples.

Determination of hemoglobin- significance, principle and method.

Blood cell counts – RBC count and Total leucocyte count byHaemocytometer, differential leucocyte count, total platelet count , determination of haematocrit –micro haematocrit and macrohaematocrit method, Erythrocyte sedimentation rate (ESR) - Westergren's and Wintrobe's method. Overview of automatedmethods of blood analysis.

3. Hemostasis and coagulation

Mechanism of blood coagulation – intrinsic and extrinsic pathways, routine coagulation tests – bleeding time, clottingtime.

4. Hematological diseases

Anaemia - Introduction and etiological classification, types of anaemias – iron deficiency, aplastic anaemia, megalobastic anaemia, sideroblastic anaemia, pernicious anaemia.

Thalassemia – alpha and beta – underlying causes, clinical 21features, diagnosis and treatment

Leukemia - introduction, types of leukemia - Acute myelogenousleukemia (AML), Chronic lymphocytic leukemia (CLL), Acutelymphoblastic leukemia (ALL)

5. Clinical Biochemistry

Carbohydrate metabolism: Clinical aspects of Regulation of Bloodsugar and Diabetes, Diabetic profile test.

Protein metabolism: starvation, and protein energy malnutrition, blood urea.

Lipid metabolism: Clinical aspects of lipid profile- HDL, LDL, VLDL, cholesterol, triglycerides. Atherosclerosis.

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