GOA UNIVERSITY
Taleigao Plateau, Goa 403 206

R E V I S E D   M I N U T E S

of the 2nd Meeting of the Standing Committee of the

X ACADEMIC COUNCIL

Day & Date

25th February, 2021

Time

10.30 a.m.

Venue
Council Hall
Goa University

Revised Minutes of the Second Meeting of the Standing Committee of the X Academic Council

Date: 25.02.2021
Time: 10.30 a.m.
Venue: Council Hall, Goa University

The following members were present for the meeting:

1. Prof. Varun Sahni   - Chairperson
   Vice-Chancellor
   Goa University

2. Prof. K. S. Priolkar   - Member
   Dean
   School of Physical and Applied Sciences Goa University.

3. Prof. P. K. Sharma   - Member
   Dean
   Faculty of Life Sciences & Environment, Goa University

4. Prof. M. S. Dayanand   - Member
   Dean
   Goa Business School, Goa University

5. Prof. Jyoti D. Pawar   - Member
   Goa Business School, Goa University

6. Dr. Savio da Piedade Falleiro   -Member
   Principal
   Fr. Agnel College of Arts & Commerce, Pilar.

7. Dr. Naguesh Colvalcar   - Member
   V.M. Salgaoncar College of Law, Miramar, Panaji, Goa

8. Prof. Anuradha Wagle   - Member
   Controller of Examinations
   Goa University

9. Prof. Radhika S. Nayak   - Member Secretary
   Registrar
   Goa University

Director, Directorate of Internal Quality Assurance Cell sought leave of absence.

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The Chairperson (Vice-Chancellor) welcomed the members and thanked them for attending the Second meeting of the Standing Committee of the X Academic Council. He also welcomed Dr. Falleiro who has been nominated in place of Prof. Krupashankara who is on EOL.

He informed the members that a special meeting of the Academic Council was scheduled on 1st March, 2021.

Thereafter, the agenda was taken up for discussion.

D	DISCCUSSION
D 3	**BOARD OF STUDIES**
D 3.1	**Minutes of the meeting of the Board of Studies in Interdisciplinary Courses held on 09.02.2021.** The Standing Committee of the Academic Council approved the minutes of the meeting of the Board of Studies in Interdisciplinary Courses held on 09.02.2021 with the following observations: 1. Course codes to be included in the Programme structure. 2. The title of the Course in Business Analytics in Semester II in the Programme structure to be corrected as to Business Analytics (Finance). 3. The title of the Course in Semester X to be corrected as Research Project/Dissertation. The word 'Optionals' to be deleted. 4. Research component and Internship to be made compulsory. **(Action: Assistant Registrar Academic - PG)**
D 3.2	**Minutes of the meeting of the Board of Studies in Dentistry held on 05.02.2021.** The Standing Committee of the Academic Council approved the minutes of the meeting of the Board of Studies in Dentistry held on 05.02.2021. **(Action: Assistant Registrar Academic -PG)**
D 3.3	**Minutes of the meeting of the Board of Studies in Indian Classical Music held on 17.02.2021.** The Standing Committee of the Academic Council approved the minutes of the meeting of the Board of Studies in Indian Classical Music held on 17.02.2021. **(Action: Assistant Registrar Academic - PG)**
D 3.4	**Minutes of the meeting of the Board of Studies in Special Education held on 21.01.2021 and 19.02.2021 in online mode.** The Standing Committee of the Academic Council approved the minutes of the meeting of the Board of Studies in Special Education held on 21.01.2021. **(Action: Assistant Registrar Academic - PG)**
D 3.5	**Minutes of the meeting of the Board of Studies in Special Education held on 19.02.2021 in online mode.** The Standing Committee of the Academic Council approved the minutes of the meeting held on 19.02.2021 with the following observations:

GOA UNIVERSITY
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F I N A L   A G E N D A

For the 2nd Meeting of the Standing Committee of

X ACADEMIC COUNCIL

Day & Date

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Time

10.30 a.m.

Venue
Council Hall,
Goa University

Second Meeting of the Standing Committee of the X Academic Council

Date: 25-02-2021

Time: 10.30 a.m.

Venue: Council Hall, Office of the Vice-Chancellor, Goa University.

D	DISCUSSIONS
D 3	**BOARDS OF STUDIES**

D 3.1	**Minutes of the meeting of the Board of Studies in Interdisciplinary Courses held on 09.02.2021**
	
	 Part A
	   i. Recommendations regarding courses of study in the subject or group of subjects at the undergraduate level: **NIL**
	  ii. Recommendations regarding courses of study in the subject or group of subjects at the postgraduate level:
	
	 a) Syllabus for the II semester Integrated Interdisciplinary MSc programme consisting of following courses has been recommended (Annexure I refer page no 1):
	   1. IMC 201 Business Analytics (Finance) - 2 credits
	   2. IMC 202 Microeconomics - 4 credits
	   3. IMC 203 Linear Algebra - 4 credits
	   4. IMC 204 Algorithms and Data Structures - 6 (4T+2P) credits
	   5. IMC 205 Probability & Statistics - II - 4 credits
	   6. IMC 206 Soft Skills: Written Communication - 2 credits
	
	 Part B
	   i. Scheme of Examinations at undergraduate level: **Nil**
	  ii. Panel of examiners for different examinations at the undergraduate level: **Nil**
	 iii. Scheme of Examinations at postgraduate level: **Nil**
	 iv. Panel of examiners for different examinations at post-graduate level: **Nil**
	
	 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: **NIL**
	
	 Part D
	   i. Recommendations regarding general academic requirements in the Departments of University or affiliated colleges: **Nil**
	  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 undergraduate level: **NA**

ii. Recommendations of the text books for the course of study at post graduate level: **Recommended along with syllabus**

Part F

Important points for consideration/approval of the Standing Committee of the Academic Council

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

a. **Approval of syllabus of second semester courses for IIMSc.**

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

(a) It is hereby declared that minutes have been read out at the meeting itself and approved by the members.

Date: 09.02.2021
Place: Goa University

Sd/-
Signature of the Chairperson
(M K Janarthanam)

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 the Academic Council.

iv) Special remarks if any.

Date: 09.02.2021
Place: Goa University

Sd/-
Signature of the Dean

D 3.2	**Minutes of the meeting of the Board of Studies in Dentistry held on 05.02.2021.**
	
	PART A
	    i. Recommendations regarding courses of study in the subject or group of subjects at the under-graduate level. **NIL**
	    ii. Recommendations regarding courses of study in the subject or group of subjects at the Post-graduate level
	       Application for replacement of Post Graduate Guide in Periodontics on account of Voluntary Retirement of Dr. Jyoti Rao.
	
	PART B
	    i. Scheme of examinations at the Under-graduate level
	    The Existent and proposed distribution of marks and scheme of Theory Examination for all B.D.S. Goa University exams in the Dental subjects is as follows:

D 3.1 Minutes of the meeting of the Board of Studies in Interdisciplinary Courses held on 09.02.2021.

Integrated B.Sc. (Data science), M.Sc.(Computer Science/Data Science/Decision Science/Economics): Programme Structure (Approved)

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	

Syllabus (Semester II)

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)

Course Code: IMC 201

Title of the Course: Business Analytics (Finance)

Number of Credits: 2 **Total Contact Hours: 24**

Effective from AY: 2020-21

Prerequisites for the course:	Programme requisites	
Objective:	To introduce fundamentals of financial data analysis.	
Content:	Reading of Annual Report, Balance Sheet, Profit and Loss Account, Vertical Form, Cash Flow statements, Comparative statements, Common Size Statements, Profitability Ratios. Basic Accounting Standards. Directors' Report, Auditor's Report, Notes to Accounts.	8 hours
	Understanding Annual Reports of Companies with Ratio Analyses and making basic performance decisions.	8 hours
	Time Value of Money, Forecasting cash flows, Estimation of Project Cost, Techniques of Capital Budgeting, Net Present Value (NPV), Internal Rate of Return (IRR), Discounted Payback, profitability Index.	8 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:	1. The participants will be able to analyze financial information that facilitates long term and short term financial decisions. 2. The participants shall be able make primary basic assessment of making capital investment decisions.	
References/ Readings:	1. N. Ramchandran, Ram Kumar Kakani: 'How to Read A Balance Sheet', Tata McGraw-Hill Professional: Finance Made Easy Series,2009. 2. N. Ramchandran, Ram Kumar Kakani: 'How to Read A Profit and Loss Account', Tata McGraw-Hill Professional: Finance Made Easy Series, 2017. 3. N. Ramchandran, Ram Kumar Kakani: 'How to Read A Cash Flow Statement', Tata McGraw-HillProfessional: Finance Made Easy Series, 2017.	

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)

Course Code: IMC 202

Title of the Course: Microeconomics

Number of Credits: 4 Total Contact Hours: 48

Effective from AY: 2020-21

Prerequisites for the Course:	Programme requisites	
Objective:	Equip the students to understand consumer and firm behavior under profit and non-profit maximizing framework.	
Content:	**Module 1: Introduction and Basic Concepts** Nature and scope of micro economics – concept of equilibrium – static, dynamic and neutral equilibrium – Partial Vs. General equilibrium – role and limitations of price mechanisms in a free market economy	10 hours
	Module 2: Theory of Demand Theory of Consumer Behavior- Utility, indifference curve, [income and substitution effects, Slutsky's theorem, compensated demand]; Revealed preference; consumer surplus;	14 hours
	Module 3: Theory of production and costs Production function –short period and long period; law of variable proportions and returns to scale; Isoquants – least cost combination of inputs; Returns of factors; Economies of scale; Elasticity of substitution; Euler's Theorem; Cobb-Douglas,Constant Elasticity of Substitution (CES), Variable Elasticity of Substitution (VES) and Translog. Cost functions,cost curves, Elasticity of supply.	14 hours
	Module 4: price and output determination Demand and supply equilibrium; Cobweb theorem. Market forms – perfect and imperfect forms – equilibrium under perfect, monopoly, monopolistic, duopoly and oligopoly – importance of time element in price theory – price discrimination and measure of monopoly power – control and regulation of monopoly.	10 hours
Pedagogy:	Lectures/ tutorials/assignments/self-study	
Reference/ Readings:	1. Hal Varian, W. W. Norton and Company, Intermediate Microeconomics 2010, Sixth Edition or later 2. S.A. Greenlaw and D. Shapiro, Principles of Microeconomics, OpenStax Resource, Rice University, Second edition, 2017	
Learning Outcomes:	Understand the factors that determine consumption and production decisions under different market structures. **(Back to Index) (Back to Agenda)**	

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)

Course Code: IMC 203

Title of the Course: Linear Algebra

Number of Credits: 4   **Total Contact Hours: 48**

Effective from AY: 2020-21

Prerequisites for the course:	Programme requisites	
Objectives:	To provide students an introduction to vectors and matrices and their use in Data Sciences.	
Content:	Linear Equations in Linear Algebra: Systems of linear equations, row reduction, and echelon forms, Vector equations, matrix equation, solution sets of linear systems, linear independence, Matrix of linear transformation.	8 hours
	Matrix Algebra: characteristics of invertible matrices, Partitioned matrices, matrix factorizations, application to computer graphics, dimension and rank.	4 hours
	Determinants: Properties, Cramer's rule, volume and linear transformations.	4 hours
	Vector Spaces: vector spaces and subspaces, linear transformations, Bases, coordinate systems, Dimension of a vector space, rank, change of bases	8 hours
	Eigenvalues and eigenvectors: Characteristics equation, diagonalization, eigenvectors and linear transformations, discrete dynamical systems	8 hours
	Orthogonality: inner product, length, and orthogonality, orthogonal sets, orthogonal projections, Gram-Schmidt process, inner product spaces	8 hours
	Symmetric matrices and quadratic forms: diagonalization of symmetric matrices, quadratic forms, constrained optimization, Singular Value Decomposition (SVD).	8 hours
Pedagogy:	Lectures/ tutorials/assignments/self-study	
References/ Readings:	1. David C. Lay, Steven Lay, Judi Mc Donald, Linear Algebra and its Applications, Pearson, 2016. 2. Jim DeFranza and Daniel Gagliardi, Introduction to Linear Algebra with Application, McGraw Hill Education (India), 2015. 3. Steven J. Leon, Linear Algebra with Applications 8th Edition,	

	Pearson, 2009 4. Gilbert Strang, Introduction to Linear Algebra 5th Ed. South Asian Edition, Wellesley-Cambridge Press, 2016.	
Learning Outcomes:	The student will be able to use computational techniques and algebraic skills essential for the study of systems of linear equations to understand, formulate and solve problems.	

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)

Course Code: IMC 204

Title of the Course: Algorithms and Data Structures

Number of Credits: 6 (4L+2P)   **Total Contact Hours: 48L + 48P**

Effective from AY: 2020-21

Prerequisites for the course:	IMC104 : Programming in Python	
Objectives:	To introduce the fundamental concepts of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.	
Content:	Introduction: Three level Approach - Application/User level, Abstract/Logical level, Physical/Implementation level; Concept of Abstract Data Types (ADTs), Data Structure definition, Data type vs. data structure, Applications of data structures,	4 hours
	Algorithms analysis and its complexity, Best case, worst case , and Average case performance,time-space tradeoff, AsymptoticAnalysis,Big-O notation.	4 hours
	Linear Data Structures: Array and its application: Polynomials, Sparse matrices, String-pattern Matching.Linked Lists, Doubly linked list, Circular linked list, Stack and Queues.	10 hours
	Nonlinear Data Structures: Trees:Binary tree representation, Binary Search Trees, AVL Trees, M-way Search Trees, B-trees. B tree algorithms, Heap Structures; Graphs: Graph representations; Graph Traversals	12 hours
	Complexity of Searching & Sorting algorithms: Bubble sort, Quick sort, Selection sort, Insertion sort, Merge sort and Heap sort. An Empirical Comparison of Sorting Algorithms, Lower bounds for Sorting. Linear search, binary search.	12 hours
	Dynamic programming and Greedy algorithms:Assembly line scheduling, Matrix-chain multiplication;Prim's Algorithm, Kruskal's Algorithm	6 hours

Pedagogy:	lectures/Practical/ tutorials/assignments/self-study
References/ Readings:	1. Horowitz, Ellis, Sartaj Sahni, and Susan Anderson-Freed. "Fundamentals of data structures in C". WH Freeman & Co., Latest edition. 2. Benjamin Baka, Basant Agarwal, "Hands on Data Structure and Algorithms with Python", Second Edition, O'Reilly, 2018. 3. Cormen Thomas, L. Charles, R. Ronald, S. Clifford, "Introduction to Algorithms", Second Edition,EEE, PHI. 4. Allen, Weiss Mark. "Data structures and algorithm analysis in C". Pearson Education India, 2011. 5. Dasgupta, Papadimitriou, and Vazirani. "Algorithms". McGraw-Hill, 2006.
Learning Outcomes:	Upon successful completion of the course, a student will be able to ● Implement common data structures such as lists, stacks, queues, graphs, and binary trees for solving programming problems. ● Identify and use appropriate data structures in the context of solution to a given problem.

Suggested Lab Assignments:

Object-Oriented Design Goals, Object-Oriented Design Principles.
1. The programming assignment should introduce and enforce the concepts of encapsulation, polymorphism and Inheritance.

ADT Specifications and Implementation of following basic data structures
2. Singly Linked Linear Lists
3. Singly Linked Circular Lists
4. Doubly Linked Linear Lists
5. Doubly Linked circular Lists
6. Stack using linked list
7. Queue using linked list

ADT Specifications and Implementation of following non-linear data structures
8. Binary Trees
9. Binary Search Trees
10. AVL Trees
11. B-Trees and its variants

Application of stack
12. Program to convert the given infix expression to postfix expression using stack.
13. Program to evaluate a postfix expression using stack.
14. Program to traverse a binary tree in the following way: Pre-order, In-order, Post-order

Applications of Binary Trees
15. Write a program to implement Huffman encoding using Binary tree.
16. Write a program to create a binary tree for the given infix expression.

Applications of AVL Trees
17. Write a program that reads a list of names and telephone number from a text file and inserts them into an AVL tree. Write function to allow the user to search the tree.
Searching and sorting
18. Program to implement Binary search technique using Iterative method and Recursive methods.
19. Programs to implement following sorting algorithm- Bubble sort, Selection sort, Insertion sort, Quicksort, Merge sort and Heap sort

Implementation of Dynamic programming
20. Assembly line scheduling
21. Matrix-chain multiplication

Implementation of Greedy algorithms
22. Prim's Algorithm
23. Kruskal's Algorithm

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)

Course Code: IMC 205

Title of the Course: Probability & Statistics - II

Number of Credits: 4   **Total Contact Hours: 48**

Effective from AY: 2020-21

Prerequisites for the course:	IMC 103: Probability and Statistics - I	
Objectives:	To introduce the basic theory and techniques of parameter estimation and tests of hypotheses.	
Content:	**Module 1:** Continuous distributions: Uniform, exponential, normal, standard normal, T-distribution, Chi-Square and F-distribution	12 hours
	Module 2: Sampling distributions, Parameter Estimation of mean and proportion.	12 hours
	Module 3: Hypothesis tests about mean and proportion, Chi-square tests, analysis of variance, least squares curve fitting, the coefficient of Determination, Confidence Intervals	12 hours
	Module 4: Non parametric tests: sign test, Rank test, Median test	12 hours
Pedagogy:	Lectures/ tutorials/assignments/self-study	
References/Readings:	1. David M. Levine, David F. Stephan, Timothy C. Krehbiel, and Mark L. Berenson, Statistics for Managers: Using Microsoft Excel, Pearson Education, Inc., (2008) Fifth Edition or later 2. Christian Heumann, Michael Schomaker, and Shalabh, Introduction to Statistics and Data Analysis: With Exercises, Solutions and Applications in R, Springer, (2016). 3. James T. McClave, P. George Benson, Terry Sincich Statistics for Business and Economics, Perason, (2018). 4. Robert S. Witte and John S. Witte, Statistics, Wiley, Eleventh Editio, (2017).	
Learning Outcomes:	Students will be able to design samples for data collection, summarise data visually and in tabular form, and execute statistical analyses with spreadsheet software.	

[8]

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)

Course Code: IMC 206

Title of the Course: Soft Skills: Written Communication

Number of Credits: 2   **Total Contact Hours: 24**

Effective from AY: 2020-21

Prerequisites for the course:	Programme requisites	
Objective:	To introduce the essentials of effective communication in different contexts	
Content:	Written Communication: Fundamentals of effective writing; different forms of written communication; report writing; Structure and content of various types of reports; Creativity in Communication.	10 hours
	Content Writing: Writing content for the website, Writing profiles. Writing content for brochures of events, Designing and writing for newsletters. Handling Public relations through Press release/reports/advertisements.	8 hours
	E-Correspondence: Email etiquette (components, formats, attachments, content and language) , Maintaining social media presence.	6 hours
Pedagogy:	Lectures/ tutorials/outreach activities/vocational training/ seminars/ term papers/assignments/ presentations/ self-study/ Case Studies etc. or acombination of some of these. Sessions shall be interactive in nature to enable peer group learning.	
Learning Outcomes:	Students will be able to communicate effectively in various written forms.	
References/ Readings:	1. Stanton, Nicky. Mastering Communication (5th Edition), Macmillan, 2009. 2. Dalmar, Fisher. Communication in Organisation, West Pub, 1993. 3. Kilian, Crawford. Writing for the Web. Self-Counsel Press, Fifth edition, 2015. 4. Kallos, Judith. Email Etiquette Made Easy, Lulu.com. 2007.	