GOA UNIVERSITY
Taleigao Plateau, Goa 403 206

REVISED MINUTES

of the 7th Meeting of the

X ACADEMIC COUNCIL

Day & Date

25th February, 2022

Time

10.00 a.m.

Conference Hall, Goa University

X AC- 7
25.02.2022

Minutes of the Seventh Meeting of the X Academic Council

Date: 25-02-2022

Time: 10.00 a.m.

Venue: Conference Hall

A list of members who attended the meeting of the Academic Council and those who sought leave of absence is appended.

The Chairperson (Vice-Chancellor) welcomed the members to the Seventh meeting of the X Academic Council.

Thereafter, the agenda was taken up for discussion.

D	**DISCUSSION ITEMS**
D 1	**CONFIRMATION**
D 1.1	**To confirm the minutes of the Sixth Meeting of the X Academic Council held on 17.11.2021.** The minutes of the Sixth Meeting of the X Academic Council held on 17.11.2021 were confirmed. With regard to Ordinance OC-66 relating to the Three-Year Choice Based Credit System Programmes, the Chairperson informed the House that the said amendment has been kept on hold with the information to Hon'ble Chancellor, as it would have been disadvantageous to the students at this stage and the decision to repeal the same would be taken at a later stage. **(Action: Assistant Registrar Academic – General/Assistant Registrar Academic - PG)**
D 1.2	**To confirm the minutes of the Fourth Meeting of the Standing Committee of the X Academic Council held on 09.12.2021.** As no observations were received from the members, the minutes of the Fourth meeting of the Standing Committee of the X Academic Council held on 09.12.2021 were confirmed. **(Action: Assistant Registrar Academic - General)**
D 2	**FOLLOW UP ACTION**
D 2.1	**Follow up action on the minutes of the Sixth Meeting of the X Academic Council held on 17.11.2021.** The Academic Council noted the action taken/initiated on various decisions taken in its meeting held on 17.11.2021. **(Action: Concerned Assistant Registrars)**
D 2.2	**Follow up action on the minutes of the Fourth Meeting of the Standing Committee of the X Academic Council held on 09.12.2021.**

D 3.12	**Minutes of the meeting of the Board of Studies in Information Technology (Engineering) held on 06.12.2021.** The Academic Council approved the minutes of the meeting of Board of Studies in Information Technology (Engineering) held on 06.12.2021 with the following minor modification (as underlined) to the OCS note under the revised Scheme of examination for Information Technology. Notation " # " below the Scheme of Instructions, should be read as "Students should mandatorily undertake one NPTEL Course of only 3 credits from the list of approved online courses of Goa University to be offered during the V/ VI/VII Semester." It was suggested to the Chairperson, BoS to specify the version of UML in the syllabus and also to add reference books relating to UML. **(Action: Assistant Registrar Academic - PG)**
D 3.13	**Minutes of the meeting of the Board of Studies in Mechanical Engineering held on 13.12.2021.** The Academic Council approved the minutes of the meeting of Board of Studies in Mechanical Engineering held on 13.12.2021 with the following minor modification (as underlined) to the OCS note under the revised Scheme of examination for Mechanical Engineering. Notation " # " below the Scheme of Instructions, should be read as "Students should mandatorily undertake one NPTEL Course of only 3 credits from the list of approved online courses of Goa University to be offered during the V/ VI/VII Semester." **(Action: Assistant Registrar Academic - PG)**
D 3.14	**Minutes of the meeting of the Board of Studies in M.Sc. integrated (Data Sciences) held on 20.12.2021.** The Academic Council approved the minutes of the meeting of Board of Studies. The House approved the syllabus for Semester IV. It was suggested to restructure the B.Sc. and M.Sc. integrated (Data Sciences) programme to bring clarity. **(Action: Assistant Registrar Academic - PG)**
D 3.15	**Minutes of the meeting of the Board of Studies in International Hospitality Management held on 26.11.2021.** The Academic Council did not approve the minutes of the meeting of Board of Studies in International Hospitality Management held on 26.11.2021 due to multiple errors and lack of transparency and uniformity in Ordinance. The House strongly suggested to withdraw the five days a week practice by the college. The concerned Dean was requested to review the Ordinance of the Programme. The House suggested to resubmit the revised Ordinance in the next meeting of the Academic Council. **(Action: Assistant Registrar Academic -PG)**

X AC- 7
25.02.2022

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U P D A T E D A G E N D A

For the 7th Meeting of the

X ACADEMIC COUNCIL

Day & Date

25th February, 2022

Time

10.00 a.m.

	Date: 13.12.2021 Sd/- Place: Farmagudi Signature of the Dean (Back to Index)
D 3.14	**Minutes of the meeting of the Board of Studies in M.Sc. integrated (Data Sciences) held on 20.12.2021.** **Part A** i. Recommendations regarding courses of study in the subject or group of subjects at the undergraduate level: **Syllabus for Semester IV of M.Sc. Integrated (Data Science) at Annexure I (refer page no. 163)** ii. Recommendations regarding courses of study in the subject or group of subjects at the postgraduate level: **NIL** **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: **NIL** **Part E.** i. Recommendations of the text books for the course of study at undergraduate level: **Part of syllabus of Semester IV.** ii. Recommendations of the text books for the course of study at post graduate level: **NIL** **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) as mentioned below: ii.The decisions/minutes were read out by the Chairman at the meeting itself. Date: 08.02.2022 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: 08.02.2022 Sd/- Place: Goa University Signature of the Dean (Back to Index)
D 3.15	**Minutes of the meeting of the Board of Studies in International Hospitality Management held on 26.11.2021.** **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: **NIL** **Part B** i. Scheme of Examinations at undergraduate level: **Scheme of Examination at OC-57.4 has been included for B.Sc. Culinary Arts programme in Ordinance OC-57 as per common grading system of the University.** ii. Panel of examiners for different examinations at the undergraduate level: **NONE** iii. Scheme of Examinations at postgraduate level: **NIL** iv. Panel of examiners for different examinations at post-graduate level: **NONE** **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: **The Board recommends inclusion of B.Sc. Culinary Arts as a programme which is eligible for admission to M.Sc. International Hospitality and Tourism Management.** ii. Recommendations of the Academic Audit Committee and status thereof: **NIL** **Part E.** i. Recommendations of the text books for the course of study at undergraduate level: **NIL** ii. Recommendations of the text books for the course of study at post graduate level:**NIL** **Part F.**

D 3.14 Minutes of the meeting of the Board of Studies in M.Sc. integrated (Data Sciences) held on 20.12.2021.

Annexure I

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)
Course Code: IMC 401
Title of the Course: Machine Learning
Number of Credits: 6(4L+2P) **Total Contact Hours: 48L + 48P**

Effective from AY: 2021-22

Prerequisites for the course:	Familiarity with linear algebra, statistics & probability theory	
Objectives:	This course provides students with an in-depth introduction to three main areas of Machine Learning: supervised and unsupervised and reinforcement learning.this course will cover some of the main models and algorithms for regression, classification, clustering and Markov decision processes. Topics will include linear and logistic regression, regularisation, SVMs and kernel methods, ANNs, clustering, and dimensionality reduction ,sequential learning Like HMM and deep learning CNN and RNN and language models (transformers BERT , GPT3	
Content:	**1. Introduction:** well posed learning problem, designing a learning system, perspectives and issues in machine learning-types of learning - supervised, unsupervised and reinforcement learning **2. Concept learning:** concept learning task , notation, inductive learning hypothesis, concept learning as search, version space and candidate elimination algorithm, decision tree, random forest. **3. linear regression:** logistic regression-Support vector machine kernel, Model selection and feature selection-Ensemble methods: Bagging, boosting, Evaluating and debugging learning algorithms. **4. Continuous Latent Variables:** Principal Component Analysis, Maximum variance formulation, Minimum error formulation, Applications of PCA, PCA for high-dimensional data. **5. Neural Networks:** -Feed-forward Network, Functions, perceptron, -Weight-space symmetries, Network Training, Parameter optimization, Local quadratic approximation, Use of gradient information, Gradient descent optimization, Error Backpropagation, Evaluation of error-function derivatives, Efficiency of backpropagation, The Jacobian matrix, The Hessian Matrix, Diagonal approximation, Outer product approximation, Inverse Hessian, Finite differences, Exact evaluation of the Hessian, Fast multiplication by the Hessian. **6. Deep learning:** Deep Feedforward Networks, Gradient-Based Learning, Hidden Units, -Architecture Design, CNN and RNN (simple RNN and LSTM).	3 hours 5 hours 5 hours 5 hours 10 hours 5 hours

	7. Unsupervised learning ; Clustering, K-means, EM.Mixture of Gaussians. **8. Sequential Data:** Markov Models, Hidden Markov Models, Maximum likelihood for the HMM, The forward-backward algorithm, The sum-product algorithm for the HMM, Scaling factors, -The Viterbi algorithm. **9. Reinforcement learning:** introduction- learning task-Q learning, non deterministic rewards and actions-temporal difference learning.	5 hours 5 hours 5 hours
Pedagogy:	lectures/ tutorials/assignments/self-study/lab assignment/ project work	
References/Readings	Main Reading :- 1. James, Gareth, et al. An introduction to statistical learning. Vol. 112. New York: springer, 2013. 2. Alpaydin, Ethem. Introduction to machine learning. MIT press, 2020. 3. Hart, Peter E., David G. Stork, and Richard O. Duda. Pattern classification. Hoboken: Wiley, 2000. 4. Flach, Peter. Machine learning: the art and science of algorithms that make sense of data. Cambridge University Press, 2012. 5. Bishop, Christopher M. "Pattern recognition and machine learning: springer New York." (2006). 6. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep learning. MIT press, 2016. 7. Mitchell, Tom, and Machine Learning McGraw-Hill. "Edition." (1997). 8. machine learning and AI online google course by cassie kozyrkov	
Learning Outcomes	By the end of the course , students should: ▪ develop an appreciation for what is involved in learning from data. ▪ understand a wide variety of learning algorithms. ▪ understand how to apply a variety of learning algorithms to data. ▪ understand how to perform evaluation of learning algorithms and model selection. ▪ Equips them with a general understanding of deep learning.	

Suggested Lab assignments/work with respect to the following using python (scikit /keras libraries) /amazon sage maker/matlab toolbox

1. write a program to implement version space.
2. write a program to implement a decision tree for given data.
3. write a program to implement linear regression for given data.
4. write a program to implement logistic regression.

5. write a program to implement SVM.
6. write a program to implement perceptron.
7. write a program to implement a multilayer perceptron.
8. write a program to implement RNN.
9. write a program to implement CNN.
10. write a program to implement HMM.

capstone mini project work be given to assess the overall learning.

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)
Course Code: IMC 402
Title of the Course: Data modeling and visualization
Number of Credits: 4 **Total Contact Hours: 48**

Effective from AY: 2021-22

Prerequisites for the course:	-A basic understanding of data management concepts and knowledge of relationship database tables	
Objective:	1.Learn to understand practical techniques to analyze and model data as part of the overall data management lifecycle 2. to expose students to visual representation methods and techniques that increase the understanding of complex data. 3. Learn to design good design practices for visualization, tools for visualization of data from a variety of fields and visualization software like Processing, GapMinder and Tableau.	
content	Data modeling fundamentals : The purpose and role of data modelling- basic data modeling concepts and terminology, data modeling building blocks- hierarchies for the entities, data model	9 hours
	constraints for your attributes: specify cross-entity dependencies through strong and weak entities -summary of real-world entity and attributes complexities	4 hours
	real-world complexities to relationships why relationship cardinality and complexities matter - build real-world complexities into data model relationships-define the maximum cardinality of a relationship -define the minimum cardinality of relationship -use crow's foot notation for minimum and maximum cardinality -summary of cardinality and complex relationships.	6 hours
	move across the different levels of data model: Harmonize different levels of data model - brief look a relational database normalization -forward-engineering your conceptual data model - more data model forward engineering - reverse engineer a physical model back into conceptual model -	4 hours

	summary - how to work with different levels of data model Software for data modeling : The importance of data modeling software -build a data model with a drawing program - build model with data modeling software tool Visualization : Right graph for right data, Components of a Data Visualisation-Different Types of Graphs, Deadly Sins of Graph Design,How to Avoid Being Mislead with GraphsSession The Value of Visualization Sessions - Effective Use of Form and Space Fundamentals of Graphs - Integrity in Visualization-Visual Perception and Quantitative Communication Reading - Effective Use of Form and Space Detailed Design of Tables and Graphs Readings: Summary at a Glance: Table Design Summary at a Glance: Graph Design Session Additional Constructs and Multivariate Analysis- Escaping 2 Dimensions: Animated Scatter-Plots-Introduction to Information Design summary -data modeling and visualization	4 hours 4 hours 4 hours 3 hours 4 hours 4 hours 2 hours
Pedagogy:	lab assignments/ theory assignments /mini case study/capstone project	
References/Readings	1. Hoberman, Steve. Data modeling made simple: a practical guide for business and IT professionals. Technics Publications, 2015. 2. Edward Tufte, The Visual Display of Quantitative Information 3. Tufte, Edward R., Nora Hillman Goeler, and Richard Benson. Envisioning information. Vol. 2. Cheshire, CT: Graphics press, 1990. 4. Fry, Ben. Visualizing data: Exploring and explaining data with the processing environment. " O'Reilly Media, Inc.", 2008.	
Learning Outcomes	1.Learning to build data model by carrying out mini project 2.The use of a data visualization software for investigating a substantial data-set .	

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Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)
Course Code: IMC 403
Title of the Course: Linear Programming & Optimization
Number of Credits: 4 **Total Contact Hours: 48**

Effective from AY: 2021-22

Prerequisites for the course:	IMC 203	
Objective:	To provide students the theoretical knowledge to effectively formulate linear programming problem and optimization.	
Content:	**Introduction to Operational Research (OR):** Origin & Development, Different Phases of OR study, Methodology of OR, Scope and Limitations of OR, Applications of OR. **Linear Programming:** Linearly independent / dependent vectors, Basis, Convex sets, Extreme points. Graphical method. **Simplex method and its variant:** Simplex method, Artificial variable techniques- Two Phase Method; M-Charnes Method, Special cases in LPP. **Duality:** Definition of the dual problem, Primal-dual relationships, Economic Interpretation of Duality, Dual simplex Method. **Sensitivity analysis:** Changes in cost and resource vector **Special Cases of Optimization Problems:** Assignment Problems, Transportation Problem	4 hours 10 hours 12 hours 12 hours 4 hours 6 hours
Pedagogy:	Lectures/ tutorials/assignments/class presentations and debates/peer reviews/workshops/self-study	
References/ Readings	1. G. Hadley: Linear Programming. Narosa, 2002 (reprint). 2. A. Ravindran, D. T. Phillips and James J. Solberg: Operations Research-Principles and Practice, John Wiley & Sons, 2005. 3. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 8th Edition, 2008. 4. F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata McGraw Hill. 2010.	
Learning Outcomes	1. Understand applications of OR 2. Formulation of Linear programming problem 3. Understanding primal dual relationship	

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

Course Code: IMC 404

Title of the Course: Econometrics I

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

Effective from AY: 2021-22

Prerequisites for the Course:	Understanding of probability and statistics	
Objective:	Equip the students to make sense of empirical data using multiple variables and analytical approaches	
Content:	**Module 1:** The Nature of Econometrics and Economic; Regression Analysis with Cross-Sectional Data; The Simple Regression Model **Module 2:** Multiple Regression Analysis: Estimation and Inference; OLS Asymptotics **Module 3:** Multiple Regression Analysis with Qualitative Information: Binary (or Dummy) Variables; Heteroskedasticity; Other Specification and Data Issues **Module 4:** Regression Analysis with Time Series: Basic Regression Analysis with Time Series Data; Serial Correlation and Heteroskedasticity in Time Series Regressions	12 hours 12 hours 12 hours 12 hours
Pedagogy:	Lectures/ tutorials/assignments/self-study	
Reference/Readings:	Essential Reading Wooldridge, J. (2018). *Introductory econometrics: A modern approach* (7th edition). Cengage Learning. Additional Reading Angrist, J. D., & Pischke, J.-S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press. Heiss, F. (2020). *Using R for introductory econometrics*. https://elopage.com/s/florian-heiss/using-r-for-introductory-econometrics	
Learning Outcomes:	Understand causality among variables and draw inferences based on data relations	

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Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)
Course Code: IMC 405
Title of the Course: Soft Skills: Public Speaking Skills
Number of Credits: 2 **Total Contact Hours: 24**

Effective from AY: 2021-22

Prerequisites for the course:	Nil	
Objective:	To provide students with an ability to address larger audiences confidently.	
Content:	**Preparation for delivering a speech: S**election of topic, Relevant data collection, Draft preparation etc. **Listening to famous speeches.:** The faculty will choose some famous public speeches and make them listen to the students. The students then will have to analyse them. **Making speeches:** The students will be asked to make public speeches by implementing the learning.	8 hours 8 hours 8 hours
Pedagogy:	Lectures/ tutorials/assignments/class presentations/Role plays and debates/peer reviews/workshops/self-study	
References/ Readings	1. Dale Carnegie with J. Berg Eisenwen: The art of public speaking, Rupa publications India Pvt. Ltd., Latest edition. 2. Topher Morrison: The Book on Public Speaking, MJ Publishers, Latest Edition.. 3. Chris Anderson et.al: HBR's 10 Must Reads on Public Speaking and Presenting, HBR, Latest Edition	
Learning Outcomes	At the end of the course, the participant will be able to make a public speech with confidence.	

Programme: M.Sc. Integrated (Data Science/ Decision Science/ Computer Science/ Economics)
Course Code: IMC 406
Title of the Course: Perspective Building Course: Music Appreciation
Number of Credits: 2 **Total Contact Hours: 24**
Effective from AY: 2021-22

Prerequisites the for course:	Nil	
Objective:	To make the participants appreciate different genres of music.	

Content:	• What is Sound/Music?, Facets of Music, Art of listening to Music. • How Music works, Elements of Music. • Fundamentals of Music. Rhythm, Melody, Harmony, Timbre. • Music instruments genres- Strings, Wood wind, Percussion, Brass EDM. • Different Musical Eras, History of Music, Genres of Music. • Appreciating forms, styles and genres of Classical Music: Film music, fusion music	4 hours 4 hours 4 hours 4 hours 4 hours 4 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:	At the end of the course student will develop the ability to distinguish different genres of music, Indian & Western; and appreciate the works of some famous artistes	
References/Readings:	1. Music Videos from Dave Conservatoire. 2. Music Videos from Stephen Titra. 3. Baugh's Music Theory videos from YouTube. 4. The Young Person's Guide to the Orchestra. Harcourt Childrens Books, 1996 or later edition 5. How Music Works series by Howard Goodall, Channel 4 Network; 2010 or latest edition	

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