

गोंय विद्यापीठ

ताळगांव पठार,

गोंय - ४०३ २०६

फोन : +९१-८६६९६०९०४८



(Accredited by NAAC)

Goa University

Taleigao Plateau, Goa-403 206

Tel : +91-8669609048

Email : registrar@unigoa.ac.in

Website : www.unigoa.ac.in

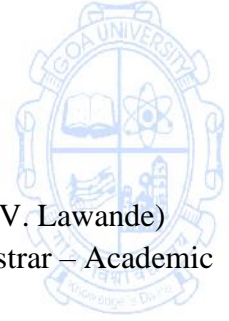
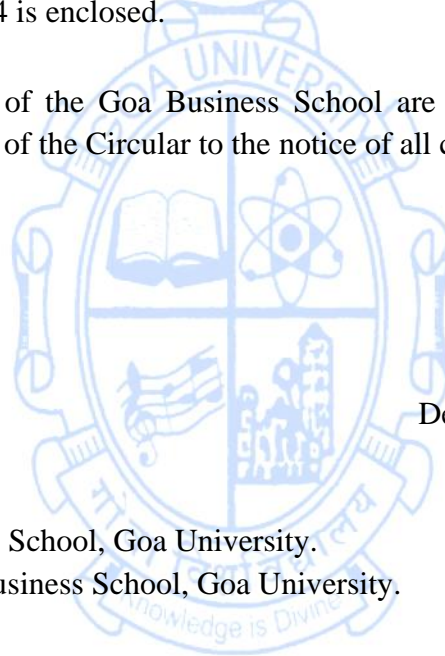
GU/Acad -PG/BoS -NEP/2024/380

Date: 30.07.2024

CIRCULAR

The Syllabus of Semester I and II of the **Master of Science (Integrated) in Data Science Programme** approved by the Standing Committee of the Academic Council in its meeting held on 10th & 11th May 2024 is enclosed.

The Dean/ Vice-Deans of the Goa Business School are requested to take note of the above and bring the contents of the Circular to the notice of all concerned.



(Ashwin V. Lawande)
Deputy Registrar – Academic

To,

1. The Dean, Goa Business School, Goa University.
2. The Vice-Deans, Goa Business School, Goa University.

Copy to:

1. The Chairperson, BOS in Data Science.
2. The Controller of Examinations, Goa University.
3. The Assistant Registrar, UG Examinations, Goa University.
4. The Assistant Registrar, PG Examinations, Goa University
5. Directorate of Internal Quality Assurance, Goa University for uploading the Syllabus on the University website.

Programme Structure for Semester I to X – Master of Science (Integrated) in Data Science

Semester	Major -Core	Minor	MC	AEC	SEC	I	D	VAC	Total Credits	Exit
I	IDS-100 Mathematical Foundations (4T)	IDS-111 Problem Solving and Program Design (3T+1P)	IDS-131 E-Commerce (3T)	AEC-1 (2)	IDS-141 Programming in R (1T+2P)				20	
II	IDS-101 Relational Database and SQL (3T+1P)	IDS-112 Fundamentals of Statistics (4T)	IDS-132 Office Software Automation (3T)	AEC-2 (2)	IDS-142 Programming in Python (1T+2P)				20	
III	IDS-200 Introduction to Data Science (3T+1P) IDS-201 Linear Algebra (4T)	IDS-211 Deductive and Inferential Mathematics (4T) OR IDS-212 Discrete Mathematics (4T)	IDS-231 Website Design (3T)	AEC-3 (2)	IDS-241 Data Science Toolkit (1T+2P)				20	

IV	<p>IDS-202 Data Modeling and Visualization (3T+1P)</p> <p>IDS-203 Linear Programming and Optimization (4T)</p> <p>IDS-204 Fundamentals of Computing Systems Design (4T)</p> <p>IDS-205 LINUX Fundamentals (2P)</p>	<p>IDS-221 Rapid App Development (3T+1P)</p>		<p>AEC-4 (2)</p>				20	
V	<p>IDS-300 Introduction to Machine Learning (3T+1P)</p>	<p>IDS-321 Software Engineering (3T+1P)</p>				<p>Summer Internship (2)</p>		20	

	<p>IDS-301 Data Mining and Warehousing (3T+1P)</p> <p>IDS-302 Business Data Management (4T)</p> <p>IDS-303 Data Structures (2T)</p>								
VI	<p>IDS-304 Big Data (3T+1P)</p> <p>IDS-305 Business Analytics and Intelligence (3T+1P)</p> <p>IDS-306 Thematic Ideas in Data Science (4T)</p>	<p>IDS-322 Cloud Computing (3T+1P)</p>						20	

	IDS-307 Project (4)									
VII	<p>IDS-400 Design and Analysis of Algorithms (4T)</p> <p>IDS-401 Advanced Database Management Systems (3T+1P)</p> <p>IDS-402 Design Thinking for Data Science Applications (4T)</p> <p>IDS-403 Artificial Intelligence (3T+1P)</p>	<p>IDS-411 Programming Paradigms (3T+1P)</p> <p>OR</p> <p>IDS-412 High Performance Computing (3T+1P)</p>							20	

VIII	<p>IDS-404 Numerical Methods and Calculus (4T)</p> <p>IDS-405 Building Data Science Applications (3T+1P)</p> <p>IDS-406 Predictive Analytics (3T+1P)</p> <p>IDS-407 Theory of Sampling and Design of Experiments for Data Analysis (4T)</p>	<p>IDS-413 Natural Language Processing (4T)</p> <p>OR</p> <p>IDS-414 Visual Computing (4T)</p>						20	
IX	<p>IDS-500 Deep Learning (3T+1P)</p>	<p>IDS-511 Text Mining and Sentiment Analysis (4T)</p>						20	

	IDS-501 Research Methodology (4T) REC Course (4) REC Course (4)	OR IDS-512 Image Processing (4T)								
X	REC Course (4)					Dissertation (Research Project in Academic/ Research Institutes OR in R&D Industry) (16)			20	


Name of the Programme : Master of Science (Integrated) in Data Science
Course Code : IDS-100
Title of the Course : Mathematics Foundations
Number of Credits : 4
Effective from AY : 2024-25

Pre-requisites for the Course:	NIL	
Course Objectives:	To introduce the students to 1. develop logical reasoning among students 2. organize all aspects of mathematics 3. understand on the fundamental concepts, assumptions and principles of mathematics	
Units	Content	No. of hours
I	<p>Logic and Propositional Calculus: Propositions and Compound Statements; Basic Logical Operations; Propositions and Truth Tables; Tautologies and Contradictions; Logical Equivalence; Algebra of Propositions; Conditional and Biconditional Statements.</p> <p>Sets: Sets and their representation; The empty set; Finite and Infinite Sets; Equal Sets; Subsets; Power Set; Universal Set; Union and Intersection of sets; Venn Diagrams; Operations on Sets; Complement of a set.</p> <p>Relations and Functions: Cartesian product of sets; Relation and their types; Functions and their types; Algebra of functions; Composition of functions; Invertible functions; Binary operations.</p>	15
II	<p>Limits: Geometric meaning of limits; Standard limits.</p> <p>Continuity: Geometric meaning of continuity; Continuous functions; Algebra of continuous functions; Examples of continuous functions; Discontinuities; Types of Discontinuities.</p> <p>Differentiability: First principle of differentiation; Algebra of differentiability namely sum/product/quotient rule; Examples; Result that every differentiable function is continuous; Derivative of the composition; Chain rule; (Statements of these results only. However, the idea of the proof, though not a part of the syllabus, is encouraged) Examples; Optimization problems.</p>	15

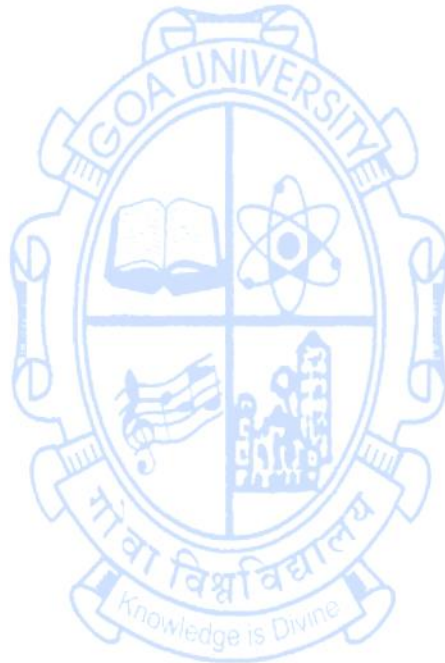
III	<p>Understanding Integrals integration and its relation to differentiation; antiderivatives; indefinite integrals and methods; definite integrals and interpretation as area under curve; linearity of integration; fundamental theorem of calculus</p> <p>Application of Integrals Geometric: area under curve and volumes; Physics: displacement from velocity and velocity from acceleration; Economics: consumer and producer surplus; Probability: probabilities using integrals</p>	15
IV	<p>Complex Numbers: Algebra of complex numbers; Modulus and Complex conjugate; Argand plane and polar representation.</p> <p>Vector Algebra: Types of vectors; Addition of vectors; Multiplication of a vector by a scalar; Dot product and cross product of vectors, and their geometrical interpretation; Concept and computation of gradient, divergence, and curl of a vector field.</p>	15
Pedagogy:	Lectures/ Case Analysis/ Assignments/ Classroom Interaction/Quiz	
References/ Reading:	<ol style="list-style-type: none"> 1. Kumar, A., Kumaresan, S., & Sarma, B. K. (2018). A Foundation Course in Mathematics. Alpha Science International. 2. Lipschutz, S., & Lipson, M. (2022). Schaum's Outline of Discrete Mathematics. 3. Mendelson, E. (2008). BEGINNING CALCULUS 3ed. McGraw-Hill. 4. Nicholson, W. K. (2020). Linear algebra with applications. 5. Spiegel, M. R., Lipschutz, S., Schiller, J. J., & Spellman, D. (2017). Schaum's outline of Complex Variables. McGraw Hill Professional. 6. Spiegel, M. R., Lipschutz, S., & Spellman, D. (2017). Vector Analysis 	
Course Outcomes:	<p>On completion of the course, students will be able to :</p> <ol style="list-style-type: none"> 1. Infer the truth of various sentences and its equivalents and outline various properties of sets. 2. Examine and Identify the types of relations and functions. 3. Make use of the strong and weak induction. 4. Solve systems of linear equations. 5. Discuss the properties of determinants. 	

Name of the Programme : Master of Science (Integrated) in Data Science
Course Code : IDS-111
Title of the Course : Problem Solving and Program Design
Number of Credits : 4(3T+1P)
Effective from AY : 2024-25

Pre-requisites for the Course:	NIL	
Course Objectives:	<ol style="list-style-type: none"> 1. To introduce the learner to various concepts and the problem solving process 2. To gain an understanding and attempt solving problems using various tools and techniques 3. To solve complex and/or large problems using composite data structures 4. To be able to design and build computer programs given a problem 	
Units	Content	No. of hours
I	Basic Concepts <ul style="list-style-type: none"> ● Problems solving process; Solution types; Solving by computer ● Constants & Variables; Data Types & Storage; Functions; Operators; Expression & Equations ● Communicate with computer; methods to organize solution; solution planning tools; solution test & code; SDLC 	15T
II	Problem Solving Techniques <ul style="list-style-type: none"> ● Modules design; Cohesion-Coupling; variable scope, parameters & return value ● Sequential Problem Solving by charts, algorithmic instruction, flowchart symbols and pseudocode ● Decision Problem Solving by various logic types; logic conversion; introduction to decision tables ● Iterative Problem Solving; loop vs go-to; incrementing & accumulating; loop types; Recursion 	15T
III	Problem Solving with Composite Data Structures <ul style="list-style-type: none"> ● Composite data structures; heterogeneous data in structures; dynamic-sized structures ● Lists (or arrays); element & index; two-dimensional & higher; row/column-major storage; map ● Introduction to linked list, graphs, trees ● Introduction to DBMS, class/object & file processing 	15T

<p style="text-align: center;">IV</p> 	<p>Practical Work</p> <p>The assignments in the practicals will reinforce problem solving, programming logic and program design concepts.</p> <p>It is recommended to use building block tools like PictoBlox, Scratch, TurtleArt, etc. and programming learning languages Kojo, Racket (DrRacket), etc.</p> <p>Following is a suggested (non-exhaustive) list of assignments:-</p> <ul style="list-style-type: none"> ● Creating simple geometric lines and shapes ● Creating complex geometric shapes ● Creating shapes for alphabets and numbers ● Creating simple drawings of everyday objects ● Moving character(s) on keyboard arrow ● Demonstrating collision between character(s) ● Creating a simple (points/score)-based game ● Write scripts to perform arithmetic operations ● Write scripts to demonstrate logical operations ● Write scripts to perform string operations ● Write scripts to calculate prime number(s), factorial(s), armstrong number(s), etc. ● Write scripts to perform geometric operations ● Write scripts to perform operation(s) on finite and infinite series' ● Write scripts demonstrating use of parentheses, and nested expressions and invocations ● Write scripts for simple games 	<p style="text-align: center;">30P</p>
<p>Pedagogy:</p>	<p>Lectures, Tutorials. Assignments, Seminars, Presentations 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.</p>	
<p>References/ Readings:</p>	<ol style="list-style-type: none"> 1. Abelson, H., & Sussman, G. J. (1996). Structure and interpretation of computer programs (p. 688). The MIT Press. 2. Felleisen, M., Findler, R. B., Flatt, M., & Krishnamurthi, S. (2018). How to design programs: an introduction to programming and computing. MIT Press. 3. Kuppuswamy, S., Malliga, S., Kanimozhi Selvi, C. S., & Kousalya, K. (2019). Problem Solving and Programming. Tata McGraw Hill. 4. Maureen Sprankle, Jim Hubbard (2013). Problem Solving and Programming Concepts. Pearson Education India. 	

Course Outcomes:	<p>On completion of the course, students will be able to :</p> <ol style="list-style-type: none">1. Remember the basic concepts & terminologies of problem solving, algorithms, flowcharts, pseudo-code, and debugging.2. Understand basic computing concepts, algorithm design, flowchart design, pseudo-code, programming constructs, and debugging.3. Apply problem solving & programming concepts in designing solutions to simpler problems using algorithm, flowchart and pseudocode.4. Analyze a problem and apply the concepts learnt to develop & design solutions and programs
-------------------------	---

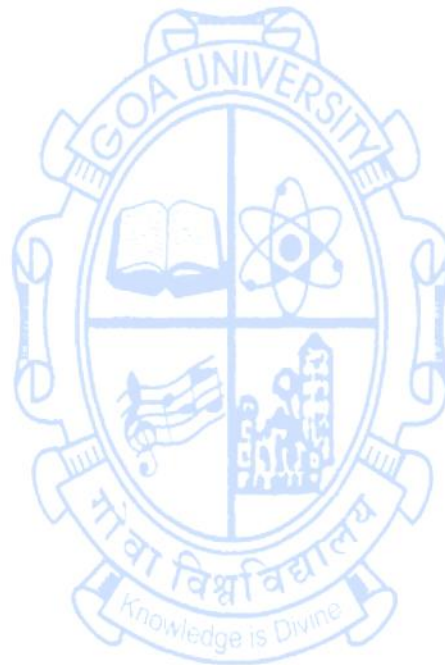


Name of the Programme : Master of Science (Integrated) in Data Science
Course Code : IDS-131
Title of the Course : E-Commerce
Number of Credits : 3
Effective from AY : 2024-25

Pre-requisites for the Course:	NIL	
Course Objectives:	<ol style="list-style-type: none"> 1. To give fundamental understanding of e-commerce and online marketing 2. To instill ideas of Search Engine Optimization and Marketing, Applications of e-commerce and digital payments 3. To identify, define and differentiate the e-commerce models and risks of electronic commerce 	
Units	Content	No. of hours
I	<p>Introduction to Electronic Commerce</p> <ul style="list-style-type: none"> ● Basic Understanding of E-Commerce ● History of e-commerce ● Business applications of e-commerce ● E-Commerce Models (B2B, B2C, C2C, B2G) ● Applications of M-Commerce <p>E-Commerce on Internet</p> <ul style="list-style-type: none"> ● Websites as marketplace ● Role of website in B2C e-commerce ● Website design principles ● Alternative methods of customer communication <p>Online Marketing</p> <ul style="list-style-type: none"> ● Online marketing and advertising ● Push and pull approaches ● Web counters, Web advertisements ● Content marketing ● Need of Digital Marketing for a business 	15

II	<p>Search Engine Optimization</p> <ul style="list-style-type: none"> ● Search Engine Optimization (SEO), Search Engine Marketing (SEM) ● Social Media Marketing (SMM), Web Analytics <p>Applications of E-commerce</p> <ul style="list-style-type: none"> ● Applications of e-commerce to Supply chain management ● Applications of e-commerce to Customer Relationship Management ● Product and service digitization, Remote servicing <p>Electronic Payment System</p> <ul style="list-style-type: none"> ● Types of payment systems, credit cards, debit cards, mobile, etc., Electronic Fund Transfer (EFT) ● Operational credit and legal risk of e-payment, Risk management options for e-payment systems 	15
III	<p>Business to Consumer E-Commerce</p> <ul style="list-style-type: none"> ● Cataloging ● Order planning and order generation, Cost estimation and pricing ● Order receipt and accounting, Order selection and prioritization ● Order scheduling, Order fulfilling, Order delivery ● Order billing, Post sales service <p>Business to Business E-Commerce</p> <ul style="list-style-type: none"> ● Need and Models of B2B e-commerce ● Using public and private computer networks for B2B trading ● EDI and paperless trading, Characteristic features of EDI service arrangement, EDI architecture and standards <p>Security Issues in E-Commerce</p> <ul style="list-style-type: none"> ● Risks of e-commerce ● Types and sources of threats; Security tools ● Risk management approaches 	15
Pedagogy:	Lectures, Tutorials. Assignments, Seminars, Presentations 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/ Reading:	<ol style="list-style-type: none"> 1. Kalakota, Ravi, Andrew Whinston (2015). Frontiers of Electronic Commerce. Pearson Education 2. P. T. Joseph (2015). E-Commerce: An Indian Perspective Paperback. PHI Learning. 3. V. Rajaraman (2015). Essentials of E-Commerce Technology. PHI Learning. 	

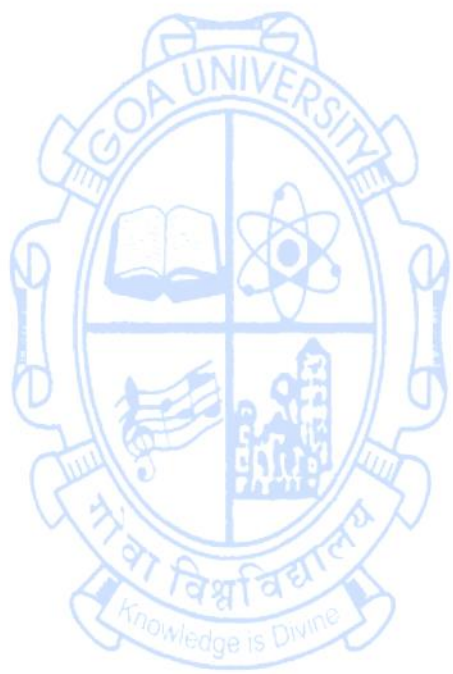
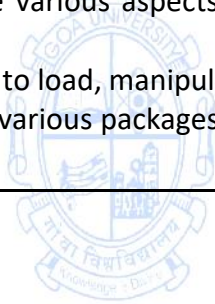
Course Outcomes:	On completion of the course, students will be able to: <ol style="list-style-type: none">1. Understand the foundation of e-commerce, e-commerce websites and Online Marketing and Security Issues2. Explain the importance of Search Engine Optimization, Applications of E-commerce and Electronic Payment Systems3. Have an in-depth understanding of B2B and B2C e-commerce models
-------------------------	--



Name of the Programme : Master of Science (Integrated) in Data Science
Course Code : IDS-141
Title of the Course : Programming in R
Number of Credits : 3 (1T+2P)
Effective from AY : 2024-25

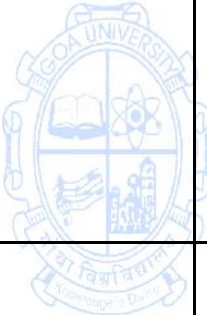
Pre-requisites for the Course:	NIL	
Course Objectives:	1. To understand critical programming language concepts 2. To make use of R loop functions and debugging tools 3. To configure and use various libraries & packages with R	
Units	Content	No. of hours
I	The R programming language <ul style="list-style-type: none"> ● R language; variables, constants & operators; data types, objects & in-built library calls ● Decision & iterative structures; functions ● Vectors, lists, matrices; arrays; data frames, factors ● Visualization using various charts/plots ● Statistical calculations ● Packages & libraries with R 	15T
II	Practical Work (Basic Programming in R) <ul style="list-style-type: none"> ● Assignments to practice arithmetic operations and expressions ● Assignments to practice working with an infinite series ● Assignments to practice working with arrays, matrix, vectors, list, factors ● Assignments to practice with dataframe ● Assignments to work with file processing ● Assignments to practice with various statistical calculations 	30P
III	Practical Work (Visualization, Packages in R) <ul style="list-style-type: none"> ● Assignments to practice with various charts / graphs ● Assignments to use package(s) related to loading, manipulating & modeling data ● Assignments to use package(s) related to visualizing & reporting data ● Assignments to use package(s) related to work with spatial, time-series and financial data 	30P
Pedagogy :	Lectures, Tutorials. Assignments, Seminars, Presentations 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/ Reading :	<ol style="list-style-type: none"> 1. Crawley, M. J. (2012). The R book. John Wiley & Sons. 2. Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for data science. " O'Reilly Media, Inc." 3. https://cran.r-project.org/manuals.html [Accessed: Jan 20, 2024]
Course Outcomes :	<p>On completion of the course, students will be able to :</p> <ol style="list-style-type: none"> 1. Understand the various aspects and concepts in the R programming language 2. Write code in R to load, manipulate, and visualize data 3. Leverage using various packages/libraries of R for various data science related work

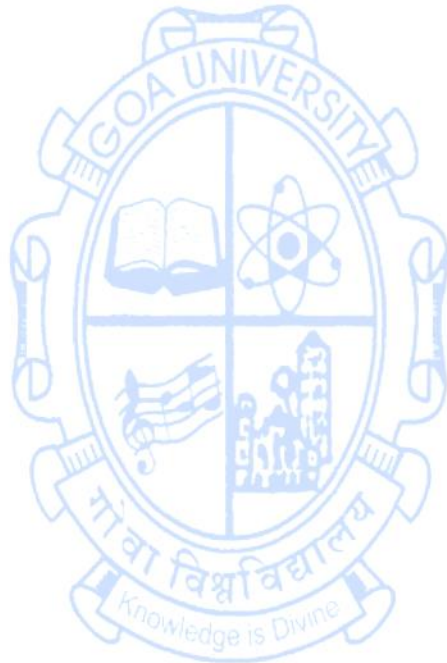


Semester II**Name of the Programme : Master of Science (Integrated) in Data Science****Course Code : IDS-101****Title of the Course : Relational Database and SQL****Number of Credits : 4(3T+1P)****Effective from AY : 2024-25**

Pre-requisites for the Course:	NIL	
Course Objectives:	<ol style="list-style-type: none"> 1. Enables the learner to understand the different issues involved in the design and implementation of a database system 2. Provides both theoretical knowledge and practical skills required in the creation and management of a Relational DataBase Management System. 	
Units	Content	No. of hours
I	Foundational Concepts <ul style="list-style-type: none"> ● Understanding Data; Database (DB) & DB Users; Characteristics; DB chronology; DB Languages ● DB Architectures; Data Models; Schemas & Instances ● Data Modeling using the ER approach ● Relational Data Model & Introduction to Relational Algebra 	15T
II	Relational Model/System & Introduction to SQL <ul style="list-style-type: none"> ● Relational DB Design; Functional Dependencies; ● Introduction to Normalization & Basic Normal Forms ● Dependency Preserving Decomposition ● SQL - DDL, DML, DCL ● Views & Simple Queries 	15T
III	Advanced SQL <ul style="list-style-type: none"> ● Constraints & Indexes in SQL ● Nested & Correlated Subqueries ● Introduction to Advanced SQL, Embedded SQL, Dynamic SQL ● Triggers & Stored Procedures ● Introduction to NoSQL 	15T

<p style="text-align: center;"></p> <p style="text-align: center;">IV</p>	<p>Practical Work</p> <ul style="list-style-type: none"> ● Getting Started (week 01–05) <ul style="list-style-type: none"> ○ Installation of DBMS Software(s) ○ Creation/modification of database tables using DDL statements and GUI tools of the DBMS software ○ Populating tables, Adding Primary Keys, Candidate Keys, Foreign Keys and other Integrity Constraints to relations ○ Updating and Deleting Rows of tables ○ Altering schema of existing tables ○ Writing simple SQL queries ● Querying Data (week 06–10) <ul style="list-style-type: none"> ○ Querying the data dictionary ○ Various Operators ○ Using alias to control column headings ○ Using compound clauses and wildcards ○ Sorting data ○ Arithmetic Operators and Built-in Functions ● Writing Complex Queries (week 11–15) <ul style="list-style-type: none"> ○ Joins ○ Aggregate Functions ○ Group by and Having Clause ○ Subqueries – single row and multiple rows ○ Correlated Subqueries 	<p style="text-align: center;">30P</p>
<p>Pedagogy:</p>	<p>Lectures, Tutorials. Assignments, Seminars, Presentations 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.</p>	
<p>References/ Reading:</p>	<ol style="list-style-type: none"> 1. Connolly, T. M., & Begg, C. E. (2005). Database systems: a practical approach to design, implementation, and management. Pearson Education. 2. Elmasri, R., Navathe, S. B., Elmasri, R., & Navathe, S. B. (2015). Fundamentals of Database Systems. (7th Edition). Pearson Publisher 3. Garcia-Molina, H. (2008). Database systems: the complete book. Pearson Education India. 4. Ramakrishnan, R., Gehrke, J., & Gehrke, J. (2003). Database management systems (Vol. 3). New York: McGraw-Hill. 5. Silberschatz, A., Korth, H. F., & Sudarshan, S. (2011). Database system concepts. (7th Edition). McGraw-Hill. 	

Course Outcomes:	On completion of the course, students will be able to: <ol style="list-style-type: none">1. Understand and evaluate the role of a DBMS in Organizations.2. Recognize a good design and understand the relational database design principles.3. Use logical design methods used in the design of DB applications.4. Understand the basics of SQL and construct queries using SQL.
-------------------------	--



Name of the Programme : Master of Science (Integrated) in Data Science
Course Code : IDS-112
Title of the Course : Fundamentals of Statistics
Number of Credits : 4
Effective from AY : 2024-25

Pre-requisites for the Course:	NIL	
Course Objectives:	To introduce the students to 1. organize, summarize and analyze data 2. draw appropriate conclusions from data 3. apply statistical tools and techniques to real-world problems	
Units	Content	No. of hours
I	<p>Introductory concepts: Definition and scope of Statistics; Concept of population and sample.</p> <p>Types of data: Quantitative; Qualitative; Attributes; Variates.</p> <p>Tabulation of data: Class intervals; Frequency tables.</p> <p>Presentation of data: Diagrams and graphs: Bar diagrams and their types; Pie charts; Frequency polygon; Histogram; Ogives.</p> <p>Consistency and independence of data with special reference to attributes.</p> <p>Scales of measurement: Nominal, Ordinal, Interval, Ratio.</p> <p>Measures of Central Tendency: Mathematical and Positional – Mean, Median, Mode, Quartiles, Percentiles.</p> <p>Measures of Dispersion: Range, Quartile deviation, Standard deviation, Coefficient of variation.</p>	15
II	<p>Bivariate data: Definition; Scatter diagram.</p> <p>Correlation and Regression: Simple, Partial and Multiple Correlation (3 variables only); Rank correlation; Simple linear regression.</p>	15
III	<p>Probability: Introduction; Random experiments; Sample space; Events and algebra of events; Definitions of Probability – Classical, Statistical, and Axiomatic; Conditional Probability; Addition and Multiplication theorem of probability; Independent events; Theorem of Total probability; Bayes' theorem and its applications.</p>	15

IV	<p>Statistical Quality Control: Introduction; Causes of variation in quality; Objective, advantages, and techniques of SQC.</p> <p>Attribute data: P chart, U chart, C chart.</p> <p>Numerical data: X bar chart, R bar chart, S bar chart.</p> <p>Sampling techniques: Various methods of data collection; Census survey and sample survey.</p> <p>Sampling Methods: Simple random sampling; Systematic sampling; Stratified sampling; Clustered sampling.</p> <p>Non – probability Sampling Methods: Convenience sampling; Consecutive sampling; Quota sampling; Purposive or Judgmental sampling; Snowball sampling.</p>	15
Pedagogy:	Lectures/ Case Analysis/ Assignments/ Classroom Interaction/ Quiz	
References/ Reading:	<ol style="list-style-type: none"> 1. Bruce, P., Bruce, A., & Gedeck, P. (2020). Practical statistics for data scientists: 50+ essential concepts using R and Python. O'Reilly Media. 2. Goon, A. M., Gupta, M. K., & Dasgupta, B. (2016). Fundamentals of Statistics. Vol 1. World Press Private Limited. 3. Gupta, S. C. (2018). Fundamentals of statistics. Himalaya Pub. 4. Gupta, S. C., & Kapoor, V. K. (2020). Fundamentals of mathematical statistics. Sultan Chand & Sons. 5. Gupta, S. P. (2017). Statistical methods. Sultan Chand & Sons. 	
Course Outcomes:	<p>On completion of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Interpret data and graphically represent it 2. Calculate measures of central tendencies and variations 3. Analyze correlation and regression 4. Solve problems in Probability theory 5. Understand different data sampling techniques 6. Apply statistical quality control 	

Name of the Programme : Master of Science (Integrated) in Data Science
Course Code : IDS-132
Title of the Course : Office Software Automation
Number of Credits : 3
Effective from AY : 2024-25

Pre-requisites for the Course:	NIL	
Course Objectives:	<ol style="list-style-type: none"> 1. To understand the basics of office automation software and its applications. 2. To develop proficiency in using word processing, spreadsheet, and presentation software. 3. To diagnose and troubleshoot common PC issues and optimize the performance of a PC. 	
Units	Content	No. of hours
I	Basic Concepts <ul style="list-style-type: none"> • Understanding office automation software and its applications; Types of office automation software • Office Suites like (Libre Office, Microsoft Office Suite, Google Workspace) Spreadsheets <ul style="list-style-type: none"> • Introduction to spreadsheet software (LibreOffice Calc, MS Excel, Google Sheet) • Creating and formatting spreadsheets • Working with formulas and functions • Charts and graphs; Collaboration tools 	15
II	Word Processing <ul style="list-style-type: none"> • Introduction to word processing software (LibreOffice Writer, MS Word, Google Doc) • Creating and formatting documents • Working with templates • Mail merge and labels; Collaboration tools Presentation Software <ul style="list-style-type: none"> • Introduction to presentation software (LibreOffice Impress, MS Powerpoint, Google Slide) • Creating and formatting presentations • Working with images, videos, and animations • Collaboration tools 	15

III	<p>Internet and Email</p> <ul style="list-style-type: none"> ● Introduction to the Internet; Web Browsers; Searching Engines; Configuring web browsers ● Introduction to Email; Setting up and configuring email accounts; Composing and sending emails; Managing Email Accounts <p>PC Troubleshooting</p> <ul style="list-style-type: none"> ● Hardware Troubleshooting: Basic hardware components of a PC, Common hardware issues and their solutions, Maintenance and optimization of hardware ● Software Troubleshooting: Common software issues and their solutions, Malware and virus removal, System recovery and backups ● Network Troubleshooting 	15
Pedagogy:	Lectures, Tutorials. Assignments, Seminars, Presentations 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/ Reading:	<ol style="list-style-type: none"> 1. A+ Guide to IT Technical Support (MindTap Course List) by Jean Andrews 2. Discovering Computers 2022: Digital Technology, Data, and Devices by Misty E. Vermaat 3. Meyers, M. (2017). CompTIA A+ Certification All-in-One Exam Guide, Ninth Edition (Exams 220-901 & 220-902). McGraw Hill Professional. 4. Russel, C., & Hoque, M. R. (2018). Google Workspace for Dummies. John Wiley & Sons. 5. Shelly, G. B., & Vermaat, M. E. (2017). Microsoft Office 365 & Office 2016: Introductory. Cengage Learning. 	
Course Outcomes:	<p>On completion of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. To create and format documents, create and format tables and mail merge 2. Understand the use and various functions of spreadsheets 3. Apply the knowledge of tools to create effective presentations 4. Understand PC assembling and troubleshooting 	

Name of the Programme : Master of Science (Integrated) in Data Science
Course Code : IDS-142
Title of the Course : Programming in Python
Number of Credits : 3(1T+2P)
Effective from AY : 2024-25

Pre-requisites for the Course:	NIL	
Course Objectives:	1. To understand critical programming language concepts 2. To make use of python loop functions and debugging tools 3. To write program using class and objects 4. To configure and use various libraries & packages with python	
Units	Content	No. of hours
I	The Python programming language <ul style="list-style-type: none"> ● Python language; variables, constants & operators; data types, objects & in-built library calls ● Selection and Iterative Constructs: Writing conditions, IF-ELSE constructs Conditional operators, SWITCH ,WHILE and FOR loops, Use of BREAK and CONTINUE statements. Nested Loops ● Advance Data types: Lists, Tuples, Set, Dictionaries, Strings, Unicode, formatting strings, docString. Searching and sorting algorithms without using library functions. ● Modular Programming: Importance of User Defined Functions, Hierarchy charts, fan-in/out, cohesion and coupling and loosely coupled modules. Fan-in – Fan-out concepts. ● 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. ● Custom Data Types and File Management: Object of a Class and basic concept of classes & OOP, Files, Exceptions in file handling. ● Introduction to Packages: Python packages for plotting, mathematical computation & linear regression. 	15T

II	<p>Practical Work (Basic Programming in Python)</p> <ul style="list-style-type: none"> ● 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. ● Assignments to practice decision control, branch and loop control structure ● Assignment to practice List, Set, Tuple, Dictionary & Strings ● Assignments to practice functions & Recursion ● Assignments to practice user-defined data types & file handling ● Assignments to work with reading and writing data to file with exception handling 	30P
III	<p>Practical Work (Packages in Python)</p> <ul style="list-style-type: none"> ● Assignment to create custom datatype using classes and objects ● Assignments to use package(s) related to loading, manipulating data using pandas ● Assignment to use Linear regression ● Assignments to practice with various charts / graphs/3-D charts/boxplot 	30P
Pedagogy:	Lectures, Tutorials. Assignments, Seminars, Presentations 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/ Reading:	<ol style="list-style-type: none"> 1. Guttag, J. V. (2016). Introduction to computation and programming using Python: With application to understanding data. MIT press. 2. Kumar, N., & Taneja, S. (2018). Python Programming: A Modular Approach. 3. Sprankle, M., & Hubbard, J. (2012). Problem solving and programming concepts. Prentice Hall Press. 4. https://scikit-learn.org/stable/index.html [Accessed: Jan 20, 2024] 	
Course Outcomes:	<p>On completion of the course, students will be able to :</p> <ol style="list-style-type: none"> 1. Analyze a given problem and develop a Python program to solve it. 2. Identify test cases for a given problem. 3. Understand, test, trace programs written in Python language. 4. Working with python Standard Libraries 	