

FYUGP Data Science

Course Outline for Semester 1st

S. No.	Category	Course Code	Course Title	Credits	L	T	P	S	Hours per week
1	Major	DS100MJ	Fundamentals of Information Technology	4	3	0	2	0	5
2	Minor 1	MTHS100MN	Foundation course in Mathematics	4	4	0	0	0	4
4	Multidisciplinary		Student to choose	3	3	0	0	0	3
5	Ability Enhancement		Communication Skills	3	3	0	0	0	3
6	Skill Enhancement		Student to choose	2	3	0	0	0	3
7	Value-added		Digital and Technological Solutions	2	2	0	0	0	2
			Health and Wellness	2	2	0	0	0	2

Multidisciplinary: Choose any one course from Open basket, Business School or Humanities & Social Sciences basket

Skill: Choose any one course from the list of skill courses

S. No.	Name of the Course	Department offering the Course
<u>Skill Courses:</u>		
<u>1</u>	Fruit and Vegetable Processing Technologies	Department of Food Technology
<u>2</u>	Multimedia Editing	Department of Journalism and Mass Comm.
<u>3</u>	Workshop Technologies	Central Workshop
<u>4</u>	Refrigeration AC Conditioning	Department of Mechanical Engineering
<u>5</u>	Health Care Skills	Centre for Ayush Science
<u>Multidisciplinary Courses:</u>		
A) Open Basket		
<u>1</u>	Statistics	Department of Mathematical Sciences
<u>2</u>	Generative AI	Centre for AI
<u>3</u>	Exploring Neighbourhood with Space Technologies	Department of Planning and Geomatics
B) Humanities & Social Sciences Basket		
<u>1</u>	Lessons from History	Department of Political Sciences/IR
C) Business School Basket		
<u>1</u>	Principles of Economics	Department of Economics

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Course Title: Fundamentals of Information Technology	L	T	P	S	Semester: 1st
Course Code: DS100MJ	3	x	2	x	Max Marks: 100
Credits: 4					

Course objective

- To deal with the basic concepts of computers.
- To discuss about the computer hardware, its components and basic computer architecture.
- Explain computer software, including operating systems and basic software tools.
- Teach basic utility applications for creating documents, presentations, and managing information.

Course outcomes: After successful completion of this course, students will be able to;

1. Identify the components of a computer and their functions.
2. Understand basic computer systems, hardware and software.
3. Understand the concepts of number systems and their conversion.
4. Use MS-Office applications to create documents, presentations and data management.

Unit-I: Input Output Devices: Introduction, Keyboard, Video Display Devices, Touch Screen Display, E-Ink Display, Printers, Audio Output.

Data and Information: Introduction, Types of Data, Simple Model of a Computer, Data Processing Using a Computer, Desktop Computer. Acquisition of Numbers and Textual Data: Introduction, Internal Representation of Numeric Data, Representation of Characters in Computers, Error-Detecting Codes.

Unit-II: Data Storage: Introduction, Storage Cell, Physical Devices Used as Storage Cells, Random Access Memory, Read Only Memory, Secondary Storage, Compact Disk Read Only Memory (CDROM), Archival Store Central Processing Unit: Introduction, Structure of a Central Processing Unit, Specifications of a CPU, Interconnection of CPU with Memory and I/O Units, Embedded Processors

Unit III: Introduction to number systems, decimal, binary, octal and hexadecimal systems, basic conversions between number systems, simple binary addition and subtraction, introduction to 1's and 2's complement, and basic representation of characters using ASCII.

Unit IV: MS Office: MS word- Word Basics, Work with Text, Format Documents.; MS Excel-Worksheets, workbooks, Entering information and data, Use of Labels, Data Visualization; MS Power Point- New presentations, Slid Designing, themes, colors, Animate objects

Text Books/References:

1. V Rajaraman. Introduction to Information Technology, 3rd Edition, PHI Learning Private Limited, 2018
2. Pankaj Jalote. Concise Introduction to Software Engineering, Springer, 2011 Linear Algebra and its Applications, Fourth Edition, Cengage India Private Limited by Gilbert Strang, 2005.
3. Anita Goel, Computer Fundamentals, Pearson Publications, First Edition 2010

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Course Title: Foundation course in Mathematics	L	T	P	S	Semester: 1st
Course Code: MTHS100MN	4	x	x	x	Max Marks: 100
Credits: 4					

Course Objective: To provide a foundational understanding of algebra and matrix theory, equipping students with the essential mathematical concepts required for basic sciences, data science, artificial intelligence and advanced coursework in the program.

Course Outcomes: After completing the course students will be able to

1. Apply set theory and functions to model and analyze real-life situations, construct Venn diagrams and mapping diagrams and interpret linear and quadratic functions using graphical and computational tools.
2. Apply counting principles, algebraic identities and linear equations and inequalities to solve real-life problems using analytical, graphical and collaborative approaches.
3. Classify and analyze matrices and determinants, understand special matrix types and their properties and apply these concepts to real-life data and problem-solving.
4. Analyze and evaluate logical statements using connectives, truth tables and logical laws to model and solve reasoning problems.

Unit-I: Review of sets and operations through real-life surveys and group activities, construct and interpret Venn diagrams to illustrate set identities, subset relationships and syllogistic arguments. Simulate Cartesian products using pairing activities and grid representation. Model relations with real-life examples (e.g., student–subject preferences) and classify them, demonstrate functions with mapping diagrams and input-output activities, Role-play to understand types of functions: one-one, onto and bijective, Identify domain, co-domain and range through hands-on exercises, collect and analyse data to explore real-valued functions, Plot and interpret linear and quadratic models using graph paper or Excel, or Python, apply models to real-world contexts such as cost, profit and growth.

Unit II: Introduction to counting principles, counting principles through games, puzzles, and real-life arrangements, permutation and combinations, apply permutations and combinations in classroom activities like seating plans and team selections, binomial theorem, algebra and algebraic identities by modeling patterns and verifying identities through activities, Linear equations in one and two variables will be solved using role-play situations (age, distance or cost problems), while linear inequalities and their graphical representations will be learned through hands-on plotting tasks, systems of linear equations and inequalities (up to three variables) using collaborative problem-solving and real-world applications like budgeting and resource allocation.

Unit III: Review of matrices and determinants, classify matrices by creating examples from real-life data (student marks, timetable, seating plan), Perform operations on matrices created from real data (attendance, expenses), solve puzzles and geometric problems (e.g., area of triangle using determinants), generalization of reversal law of transpose, symmetric, skew symmetric, Hermitian and skew- Hermitian matrices, Representation of a square matrix as $P + iQ$, where P and Q are both Hermitian, Adjoint of a matrix, For a square matrix A , $A(\text{adj}A) = (\text{adj}A)A = |A|I$. Commutative and associative laws in matrix operations. Necessary and sufficient condition for a square matrix to be invertible. Generalization of reversal law for the inverse of matrices under multiplication.

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Unit-IV: Introduction to logic, statements and propositions, logical connectives, conjunction (AND), disjunction (OR), negation (NOT), implication (IF-THEN), Biconditional (IF AND ONLY IF), truth tables, logical equivalences and laws (De Morgan's laws, distributive laws, associative laws, tautologies and contradictions).

Suggested Textbooks/Reference Books:

1. Ajit Kumar, S. Kumaresan and B. K. Sarma, A Foundation Course in Mathematics, Alpha Science International Ltd. Oxford, U.K, 2018
2. Shanti Narayan, A textbook of Matrices, Schaum S. Chand and Company, 1957.
3. S. Lipschutz & M. Lipson, Linear Algebra, Schaum's outline series, Tata McGraw-Hill, 4th Edition 2009..
4. S. Lipschutz & M. Lipson, Theory and Problems of Discrete Mathematics, Schaum's outline series, Tata McGraw-Hill, Third Edition 2009.