Program: B Tech All Program (except Data Science, Civil and Mechanical, CSE(DS) 311 (VT)] MBA Tech All Program (except Data Science), B Tech Integrated Computer	**Semester:** III /IV /V / VII
Course: Discrete Mathematics	**Course Code:** 702BS0C047

Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks - 100)**
2	0	1	3	Marks Scaled to 50	Marks Scaled to 50

Pre-requisite: Linear Algebra and Ordinary Differential Equations

Course Objective

The principal objective of the course is to train the students in the construction and understanding of mathematical proofs and common mathematical arguments. It will instil sound knowledge of different topics of discrete mathematics which students will readily apply in the subsequent courses of their programme.

Course Outcomes

After completion of the course, students will be able to -

1. Define and relate basic notions of discrete mathematics
2. Demonstrate the ability to understand mathematical logic, concepts in abstract algebra and mathematical proof techniques
3. Solve problems based on combinatorics, graph theory and abstract algebra
4. Demonstrate understanding of the applications of algebra, combinatorics and graph theory

Detailed Syllabus

Unit	**Description**	**Duration**
1.	**Set Theory, Relations and Functions** ***Revision of prerequisite concepts - 'Sets, Venn diagrams, Operations on sets, Laws of set theory'.*** Power set, The principle of Inclusion-Exclusion, Partitions of sets. Relations, Properties and types of binary relations, Equivalence relation. Functions, injective, surjective and bijective functions, Composition, inverse of a function.	06

2.	**Logic** ***Revision of prerequisite concepts – 'Propositions, Truth table, Laws of logic, Equivalence'.*** Satisfiability, tautology, validity, disjunctive and conjunctive normal forms, Predicates and Quantifiers, Proof Techniques, Mathematical Induction.	06
3.	**Combinatorics** Pigeonhole principle, Homogeneous and non-homogeneous linear recurrence relations with constant coefficients, Generating functions.	04
4.	**Graphs and Trees** Graphs and their properties, Degree, Connectivity, Path, Cycle, Eulerian graph, Hamiltonian graph, Planar graphs, Graph Coloring. Trees, Rooted trees, Spanning tree and minimum spanning tree, Kruskal's and Prim's algorithms for minimal spanning trees.	08
5.	**Abstract algebra** Definition and examples of groups, subgroups, cyclic groups, group homomorphism, group isomorphisms. Definitions and Examples of Rings and Fields.	06
	Total	**30**

Text Books

1. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, 8th Edition, Tata McGraw Hill, 2018.
2. Kolman, Busby and Ross, *Discrete Mathematical Structures*, 6th Edition, Prentice Hall India, 2015.

Reference Books

1. C. L. Liu, *Elements of Discrete Mathematics*, 4th Edition, McGraw Hill, New Delhi, 2017.
2. Seymour Lipschutz and Mark Lipson, *Discrete Mathematics*, 3rd Edition, McGraw Hill education, Schaum's Outline Series, 2017.
3. I. N. Herstein , "*Topics in Algebra*", , 2nd Edition, John Wiley and Sons, 1975.
4. Narsingh Deo, *Graph theory with Applications to Engineering and computer science*, 1st Edition, Prentice Hall India, 2016.

Laboratory/ Tutorial Work

8 to 10 tutorials based on the syllabus.