

Discrete Mathematics & Graph Theory

Course Code	23BS1305	Year	II	Semester	I
Course Category	BS&H	Branch	CSE / IT / CSE(AI&ML) CSE(DS)	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Basic Mathematics
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Understand the fundamental concepts of discrete mathematics and graph theory. (L2)
CO2	Apply principles of mathematical logic and predicate calculus to solve problems and validity of logical arguments. (L3)
CO3	Utilize the method of characteristic roots to solve recurrence relations. (L3)
CO4	Analyze properties of relations, graphs, and trees, using graph algorithms to solve complex graph theory problems. (L4)

MICRO SYLLABUS		
Unit No.	Contents	Mapped CO
I	Mathematical Logic: Introduction-Statements and notations-Connectives (Negation, Conjunction, Disjunction)-Statement formulas and Truth tables, Conditional and Bi-conditional, Well-Formed Formulas, Tautologies, Equivalence of formulas, Duality law, Tautological Implication, Functionally Complete sets of Connectives, Other Connectives. (NAND, NOR, XOR) Normal Forms: Disjunctive Normal Forms (DNF), Conjunctive Normal Forms (CNF), Principal of Disjunctive Normal Forms (PDNF), Principal of Conjunctive Normal Forms (PCNF).	CO1,CO2
II	Theory of Inference for Statement Calculus: Validity using truth tables-Rules of Inference – Consistency & Inconsistency of Premises and Indirect method proof. Predicate calculus: Introduction to Predicates - Statement functions, Variable and Quantifiers- Predicate formulas-Free and Bound Variables-Universe of Discourse.	CO1,CO2
III	Recurrence Relations -Recurrence relations-Solving recurrence relations by method of characteristic roots-Solution of Inhomogeneous Recurrence relations.	CO1,CO3
IV	Relations and Directed Graphs -Special Properties of Binary Relations- Equivalence Relations- Ordering Relations-Poset diagrams, Special elements in Posets-Lattices-Operations on Relations- Representation of relation. Graphs - Basic Concepts- Operations on Graph-Matrix representation of Graph-Adjacency Matrix, Incidence Matrix-Paths and Closures- Warshall's Algorithm-and Sub graphs	CO1,CO4

	–Isomorphic Graphs- Directed Graphs	
v	Planar Graphs -Euler's Formula- Multi-graphs and Eulerian Graphs-Hamiltonian Graphs-Chromatic Number. Trees and Their Properties - Spanning Trees-Breadth First and Depth First Spanning Trees –BFS and DFS algorithms-Minimal Spanning tree-Prim's and Kruskal's algorithms.	CO1,CO4
Learning Resources		
Text Books:		
<ol style="list-style-type: none"> 1. Discrete Mathematical Structures with Applications to Computer Science , J P Trembly and R Manohar, 1988, McGraw-Hill (Unit-I,II) 2. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott. Abraham Kandel and Theodore P. Baker, Second Edition, 2017, PHI. (Unit-III,IV,V) 		
Reference Books		
<ol style="list-style-type: none"> 1. Discrete Mathematics and its Applications, Kenneth H. Rosen, Seventh Edition, 2017, McGraw-Hill. 2. Discrete Mathematics, Swapna Kumar Chakraborty, BikashKanti Sarkar, First Edition, 2011, Oxford University Press 		
E-Resources:		
<ol style="list-style-type: none"> 1. https://www.geeksforgeeks.org/engineering-mathematics-tutorials/ 2. https://www.tutorialspoint.com/discrete_mathematics/index.htm 3. http://www.alas.matf.bg.ac.rs/~mi10164/Materijali/DS.pdf 4. https://nptel.ac.in/courses/111107058/ 		