

## Discrete Mathematics and Graph Theory

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

### Course Outcomes

Upon successful completion of the course, the student will be able to

<b>CO1</b>	Understand the fundamental concepts of discrete mathematics and graph theory. <b>(L2)</b>
<b>CO2</b>	Apply principles of mathematical logic and predicate calculus to solve problems and validity of logical arguments. <b>(L3)</b>
<b>CO3</b>	Utilize the method of characteristic roots to solve recurrence relations. <b>(L3)</b>
<b>CO4</b>	Analyze properties of relations, graphs, and trees, using graph algorithms to solve complex graph theory problems. <b>(L4)</b>

### Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations(3:Substantial,2:Moderate,1:Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	2													
<b>CO2</b>	3													
<b>CO3</b>	3													
<b>CO4</b>		3							1	1				

### SYLLABUS

Unit No.	Contents	Mapped CO
<b>I</b>	<b>Mathematical Logic:</b> 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) <b>Normal Forms:</b> Disjunctive Normal Forms (DNF), Conjunctive Normal Forms (CNF), Principal of Disjunctive Normal Forms (PDNF), Principal of Conjunctive Normal Forms (PCNF).	<b>CO1,CO2</b>
<b>II</b>	<b>Theory of Inference for Statement Calculus:</b> Validity using truth tables-Rules of Inference – Consistency & Inconsistency of Premises and Indirect method proof. <b>Predicate calculus:</b> Introduction to Predicates - Statement functions, Variable and Quantifiers- Predicate formulas-Free and Bound Variables-Universe of Discourse.	<b>CO1,CO2</b>

<b>III</b>	<b>Recurrence Relations-</b> Recurrence relations-Solving recurrence relations by method of characteristic roots-Solution of Inhomogeneous Recurrence relations.	<b>CO1,CO3</b>
<b>IV</b>	<b>Relations and Directed Graphs-</b> Special Properties of Binary Relations- Equivalence Relations- Ordering Relations-Poset diagrams, Special elements in Posets-Lattices-Operations on Relations- Representation of relation. <b>Graphs-</b> Basic Concepts- Operations on Graph-Matrix representation of Graph-Adjacency Matrix, Incidence Matrix-Paths and Closures- Warshall's Algorithm-and Sub graphs – Isomorphic Graphs- Directed Graphs	<b>CO1,CO4</b>
<b>V</b>	<b>Planar Graphs-</b> Euler's Formula- Multi-graphs and Eulerian Graphs-Hamiltonian Graphs-Chromatic Number. <b>Trees and Their Properties</b> - Spanning Trees-Breadth First and Depth First Spanning Trees –BFS and DFS algorithms-Minimal Spanning tree-Prim's and Kruskal's algorithms.	<b>CO1,CO4</b>

#### Learning Resources

##### Text Books:

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

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:

1. <https://www.geeksforgeeks.org/engineering-mathematics-tutorials/>
2. [https://www.tutorialspoint.com/discrete\\_mathematics/index.htm](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/>