# PRASAD V POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

# II B.Tech- I Semester

**Discrete Mathematics & Graph Theory**

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| **Course**  **Code** | **23BS1305** | **Year** | II | **Semester** | I |
| **Course**  **Category** | BS&H | **Branch** | CSE | **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 |

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| **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)** |

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| **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 –Isomorphic Graphs- Directed Graphs | **CO1,CO4** |
| **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:** | | |
| 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> 3. <http://www.alas.matf.bg.ac.rs/~mi10164/Materijali/DS.pdf> 4. <https://nptel.ac.in/courses/111107058/> | | |