**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**(Established by Govt. of A.P., ACT No.30 of 2008)**
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Computer Science & Engineering**

| Course Code | Discrete Mathematics & Graph theory | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20A54304 | (Common to CSE, IT, CSE( DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS) | | 3 | 0 | 0 | 3 |
| **Pre-requisite** | **Basic Mathematics** | **Semester** | **III** | | | |

Course Objectives:

Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions and Solve problems using counting techniques and combinatorics and to introduce generating functions and recurrence relations. Use Graph Theory for solving real world problems

Course Outcomes (CO):

After completion of the course, students will be able to

- Apply mathematical logic to solve problems.
- Understand the concepts and perform the operations related to sets, relations and functions.
- Gain the conceptual background needed and identify structures of algebraic nature.
- Apply basic counting techniques to solve combinatorial problems.
- Formulate problems and solve recurrence relations.
- Apply Graph Theory in solving computer science problems

| UNIT - I | **Mathematical Logic** | 8 Hrs |
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Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

| UNIT - II | **Set theory** | 9 Hrs |
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Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion-Exclusion, Pigeon hole principle and its application,Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

| UNIT - III | **Elementary Combinatorics** | 8 Hrs |
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Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

| UNIT - IV | **Recurrence Relations** | 9 Hrs |
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Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

| UNIT - V | **Graphs** | 9 Hrs |
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| Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem |
| Textbooks: |
| 1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.<br>2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002. |
| Reference Books: |
| 1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.<br>2. Graph Theory with Applications to Engineering and Computer Science byNarsinghDeo. |
| Online Learning Resources: |
| http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf |