GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Course Code: GR15A2062 L:3 T:1 P:0 C:4
II Year I Semester

Prerequisites:
1. Fundamentals of Mathematical Notations.
2. Fundamentals of Sets and Functions.
3. Fundamentals of Graphs and Trees.

Course Objectives
1. To provide the foundations on basic computer related concepts for a coherent development to the students for the courses like Fundamentals of Computer Organization, Data Structures, Design and Analysis of Algorithms, Computer Graphics and others.

2. To Comprehend different Properties of Binary Relations on a Set theory, Reflexivity, Symmetry, Transitivity, Graphical representation of symmetric relations, transitive relations, Hasse diagram and their applications apart from that they also learn topics like Monoid, Groups, Semi group, Homomorphism and Isomorphism systems.

3. To Develop skills in understanding and applying basic concepts on Basis of counting,Combinations and Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorems, the principles of Inclusion – Exclusion along with their applications.

4. To Develop an appreciation for the use of Sequential functions and Calculating Coefficient of generating function, Characteristics roots, Solution of homogeneous , Recurrence Relation.

5. To Design and Develop DFS, BFS and Spanning Trees, planar Graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers and their applications

Course Outcomes
1. Able to demonstrate knowledge on the foundations of many mathematical computer related concepts.
2. Attained exposure to different Properties of Binary Relations subsequent to the course.

3. Ability to think logically and mathematically on topics like Basis of Counting combinations and Permutations, with repetitions, Constrained repetitions, Binomial Coefficients etc.
4. Instill the belief that Mathematical logic is important for scientific research in Calculating Coefficient. Design and Development of Trees and Graphs and their applications

Unit-I

Mathematical Logic: Statements and notations, Connectives, Well formed formulas, Truth Tables, Tautology, Equivalence implication, Normal forms.

Predicates: Predicative logic, Free and Bound variables, Rules of inference, Consistency, Proof of contradiction.

Unit-II

Set Theory: Properties of Binary Relations, Equivalence, Compatibility and partial ordering relations, Hasse diagram. Functions: Inverse Function, Composition of functions, Recursive Functions, Lattice and its Properties, Pigeon hole principle and its applications.

Algebraic structures: Algebraic systems, Examples and general properties, Semi groups and monoids, Groups, Sub groups, Homomorphism, Isomorphism.

Unit-III

Elementary Combinatorics: Basis of counting, Permutations and Combinations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorems, Principles of Inclusion – Exclusion.

Unit-IV

Recurrence Relation: Generating Functions, Function of Sequences, Calculating Coefficient of generating function, Recurrence relations, Solving recurrence relation by substitution and Generating functions, Characteristics roots solutions of In homogeneous Recurrence Relations.

Unit-V

Graph Theory: Representation of Graphs, DFS, BFS, Spanning Trees, Planar Graphs

Graph Theory and Applications: Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

Teaching Methodologies

1. Board
2. Markers
3. LCD Projector

Text Books

1. Discrete and Combinational Mathematics- An Applied Introduction-5th Edition – Ralph. P.Grimaldi, Pearson Education
2. Discrete Mathematical Structures with applications to computer science Trembly J.P. & Manohar .P, TMH
3. Mathematical Foundations for Computer Science Engineers, Jayant Ganguly, Pearson Education
4. Discrete Mathematics and its Applications, Kenneth H. Rosen, Fifth Edition.TMH.

Reference Books

1. Discrete Mathematics with Applications, Thomas Koshy, Elsevier
2. Discrete Mathematical Structures, Bernand Kolman, Roberty C. Busby, Sharn Cutter Ross, Pearson Education/PHI.
3. Discrete Mathematical structures Theory and application-Malik & Sen
4. Discrete Mathematics for Computer science, Garry Haggard and others, thomson.
5. Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker Prentice Hall.
6. Logic and Discrete Mathematics, Grass Man & Trembley, Person Education.