**SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY**

**Discrete Structures**

(Common to CSE, CSM & CSD)

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| **II B.Tech - I Semester SRIT R23** | | | | | | | | |
| **Course Code** | **Category** | **Hours/Week** | | | **Credits** | **Maximum Marks** | | |
|  | **PCC** | **L** | **T** | **P** | **C** | **CIA** | **SEE** | **Total** |
| 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| **Objectives**   * To introduce and illustrate elementary discrete mathematics using propositional Calculus and Predicate Calculus. * To illustrate sets, relations and functions. * To Demonstrate Properties of groups, Monoids, Homorphism, Isomorphism Using Algebraic systems. * To demonstrate graphs, paths, Circuits, Coloring, Covering and spanning trees. * To use the concepts of permutations & combinations for solving the counting problems. | | | | | | | | |
| **Unit I – Mathematical Logic** | | | | | | | | |
| **Propositional Calculus**: Statements and Notations, Connectives, Well Formed Formulas, Truth  Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal  Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method  of Proof.  **Predicate Calculus:** Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.  **Learning Outcomes:**  At the end of this unit, the student will be able to   1. Simplify and evaluate basic logic statements using truth tables. 2. Express a logic sentence in terms of predicates, quantifiers and logical connectives. 3. Apply rules of inference and methods of proof including direct and indirect proof forms. 4. Understand the inference theory for predicate calculus. | | | | | | | | |
| **Unit II – Set, Relations and Functions** | | | | | | | | |
| **Sets:** Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion.  **Relations:** Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams.  **Functions:** Bijective Functions, Composition of Functions, Inverse Functions, Permutation  Functions, Recursive Functions, Lattice and its Properties.  **Learning Outcomes:**  At the end of this unit, the student will be able to   1. Understand the operations of sets and use Venn diagrams to solve applied problems. 2. Determine the domain, range of a function, and apply the properties of functions to application problems. 3. Identify the types of functions, finding the inverse of function and perform the composition of functions. 4. Understand about lattice and its properties. | | | | | | | | |
| **Unit III - Algebraic Structures** | | | | | | | | |
| **Algebraic Structures:** Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism.  **Learning Outcomes:**  At the end of this unit, the student will be able to   1. Understand the various algebraic structures and their properties. 2. To demonstrate Various types of groups and its Homorphism. 3. To demonstrate the properties of Monoids and Isomorphism. | | | | | | | | |
| **Unit IV – Graph Theory** | | | | | | | | |
| Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler‘s Formula, Graph Coloring and Covering, Chromatic Number,  Spanning Trees, Algorithms for Spanning Trees.  **Learning Outcomes:**  At the end of this unit, the student will be able to   1. Represent a graph using adjacency list and adjacency matrix and apply graph theory to problems in computer networks. 2. Determine if a graph has Euler or Hamilton path /circuit. 3. Understand about spanning tree and apply the algorithms for spanning trees in solving the problems. | | | | | | | | |
| **Unit IV – Combinatorics** | | | | | | | | |
| Basic of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Recursive Relations, Generating Functions, Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems. The Principles of Inclusion, Exclusion, Pigeonhole Principle and its Application.  **Learning Outcomes:**  At the end of this unit, the student will be able to   1. Know the fundamentals of counting and understanding the difference between permutation and combination. 2. Solve the counting problems by applying product and sum rules, permutations and combinations. 3. Understand the pigeonhole principle and its applications. 4. Apply Binomial Theorem for solving problems. | | | | | | | | |
| **Text Books:** | | | | | | | | |
| 1. Tremblay J. P., and Manohar P., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill,2015. 2. Liu C. L. and Mohapatra D.P., Elements of Discrete Mathematics-A Computer Oriented Approach, Tata McGraw Hill, 3rd Edition,2008. | | | | | | | | |
| **Reference Books:** | | | | | | | | |
| 1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India,10th Edition, 2014. 2. Ramana B.V., Higher Engineering Mathematics, Mc Graw Hill publishers, Sixth Reprint, 2008. 3. Alan Jeffrey, Advanced Engineering Mathematics, Elsevier, 1st Edition, 2010. | | | | | | | | |
| **Course Outcomes:** | | | | | | | | |
| **At the end of the course, student will be able to**   1. Illustrate discrete structures like statements, sets, Relations, Functions, Groups, monoids, graphs and combinatorics. 2. Evaluate and simplify propositional and predicate calculus using inference theory. 3. Perform the operations on Sets, Relations and functions and their properties. 4. Identify algebraic systems and use their general properties. 5. Use graph algorithms for representing, identifying, generating and evaluating the Graphs. 6. Use Combinatorics for evaluating problems related to basic of counting. | | | | | | | | |