**Third Semester**

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| **Name of The Course** | Discrete Mathematics | | | | |
| **Course Code** |  | | | | |
| **Prerequisite** |  | | | | |
| **Corequisite** |  | | | | |
| **Antirequisite** |  | | | | |
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**Course Objectives:**

The objective of this course is to familiarize the prospective computer scientists with the techniques of mathematical reasoning, logical thinking, abstract mathematical discrete structures so that they may apply a particular set of mathematical facts in relevantsituations.

**Course Outcomes**

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| CO1 | Apply rule of inference for connecting and validating logical statements and use proof techniques. |
| CO2 | Use counting techniques to solve various counting problems. |
| CO3 | Apply the concepts of sets, relation, functions and mathematical induction. |
| CO4 | Classify thealgebraic structures as Group, Ring, field. |
| CO5 | Classify the structures of graph and tree and use them to simplify various problem. |
| CO6 | Define terminology of Lattice. |

**Text Books**

T1: *Kenneth H. Rosen*, **Discrete Mathematics and Its Applications**,McGraw-Hill.

T2: Susanna S Epp, **Discrete Mathematics with Applications,** 4th edition, Wadsworth

Publishing Co.Inc

T3: *C L Liu and Mohapatra*, **“Elements of Discrete Mathematics”,** a computer oriented

approach, 3rd edition, McGrawHill.

**Reference Books**

R1: *J P Trembley, R Manohar,* **Discrete Mathematical Structures and its Application**

**toComputer Science,** TMG Edition, TataMcGraw-Hill.

R2: *Norman L Biggs*, **Discrete Mathematics,** 2nd Edition, Oxford UniversityPress.

R3: *Semyour, Lipschutz and Marc Lipson*, **Schaum’s OutlinesSeries**

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| **Unit-1Hours 8** |
| **Propositional Logic:** Validity and Satisfiability, Basic connectives and Truth Tables, Logical Equivalence, the laws of logic, Logical implication, Rules of inference, Normal form (CNF, DNF), Predicate logic, Universal and Existential quantifiers.  **Proof Techniques:** Some terminologies, Proof methods and strategies, Forward proof, Proof by contradiction, Proof by contraposition, Proof of necessity and sufficiency. |
| **Unit-2Hours6** |
| **Counting Techniques:** Basic counting techniques, inclusion and exclusion, pigeon-hole principle, permutation and combination |
| **Unit-3 Hours 12** |
| **Sets, Relation and Function:** Operations and laws of sets**,** Cartesian product, binary relation, partial order relation, Equivalence relation, Functions, Bijective function, inverse and composition of function, size of a set, countable and uncountable set, Cantor’s diagonal argument and the power set theorem (without proof), Schroeder-Bernsteintheorem (without proof), the well-Ordering principle, First and second mathematical induction, Recursive definition, prime numbers, greatest common divisor, Euclidean algorithm, the fundamental theorem of arithmetic. |
| **Unit-4 Hours 10** |
| **Algebraic Structures**: Algebraic structures with one binary operation: Semi Group, Monoid, Groups, Subgroups, Congruence relation and quotient structures, Free and Cyclic Monoid and Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism, Algebraic structures with two binary operation: Ring, Integral domain and Field. |
| **Unit-5 Hours 9** |
| **Graphs & Trees:** Graphs and their properties, degree, connectivity, path cycle, sub graphs, isomorphism, Eulerian and Hamiltonian walks, Graph coloring, coloring maps and planer graphs, coloring vertices and edges, list coloring, perfect graph. Trees:Definitions, properties and examples, rooted trees, trees and sorting, weighted trees and prefix codes, bi-connected components and articulation points, shortest distances. |
| **Unit-6 Hours 4** |
| **Lattice Algebra:** Partial orders, Lattices |

**Continuous Assessment Pattern**

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| **Internal Assessment (IA)** | **Mid Term Test (MTE)** | **End Term Test (ETE)** | **Total Marks** |
| 30 | 20 | 50 | 100 |