MC121-Discrete Mathematical Structures

Objective: Discrete mathematics is the study of mathematical structures that are discrete rather than continuous. Discrete mathematics deals with discrete objects. Its objective is to extend student's Logical and Mathematical ability to deal with abstraction. Also its goal is to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

Course Outcomes:

At the end of the course, students would have knowledge of the concepts needed to test the logic of a program.

- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Be aware of the counting principles
- Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.

UNIT I - Mathematical reasoning

Propositions; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; use in program proving; resolution principle; application to PROLOG.

UNIT II - Set theory

Paradoxes in set theory; inductive definition of sets and proof by induction; Peono postulates; Relations; representation of relations by graphs; properties of relations; equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets;

UNIT III -Graph Theory

Elements of graph theory, cut vertices and edges, covering, matching, Euler graph, Hamiltonian path, trees traversals, spanning trees Independent sets, Isomorphism, planarity.

UNIT IV - Functions

Mappings; injection and surjection; composition of functions; inverse functions; special functions; Peono postulates; pigeonhole principle; recursive function theory;

UNIT V -Group Theory& Elementary Combinatorics

Definition and elementary properties of groups, semigroups, monoids, rings, fields, vector spaces and lattices; Elementary combinatorics; counting techniques; recurrence relation; generating functions;

TEXT BOOKS:

1. K.H.Rosen, Discrete Mathematics and applications, Tata McGraw Hill, fifth edition, 2003.
2. C.L.Liu, Elements of Discrete Mathematics, McGraw-Hill Book, Second Edition, 2006.

REFERENCE BOOKS:

1. J.L.Mott, A.Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India, second edition, 1986.
2. W.K.Grassmann and J.P.Trembnlay, Logic and Discrete Mathematics, A Computer Science Perspective, Prentice Hall, First edition, 1996.