

Course Code (BCA-CR2103) Semester-II
Course Title: Mathematics in Computing
Total Credits: 06

Maximum Marks: 90
External (Theory): 60
Internal Assessment:30

Course Objective

This course is designed to provide students the requisite mathematical background in several topics that will help them to develop and analyze algorithms in new ways.

Unit-I

Sets & Relations: Sets, representation of sets, types of sets, subset, power set, number of subsets of a finite set, universal set, operation on sets, union, intersection, difference, complement of a set, algebra of sets, De Morgan's law.

Cartesian product of sets, relation, types of relations, domain and range of a relation, Equivalence relation, partial ordering relation.

Unit-II

Function: Definition and types of function, injective, surjective and bijective functions.

Algebraic systems: Binary operations, groups & Semi groups, Abelian groups, examples, $(\mathbb{Z}, +)$, $(\mathbb{Q}, +)$, (\mathbb{Q}^*, \times) , $(\mathbb{R}, +)$, (\mathbb{R}^*, \times) , set of cube roots of unity/ 4 fourth roots of unity/ n th roots of unity form groups under multiplication, Group of integers modulo n , general properties of groups.

Unit-III

Mathematical logic: Statement, conjunction, disjunction, negation, Conditional and Bi-conditional statements, Tautology, Contradiction, Validity of argument, Logical equivalence (truth tables) and principle of duality, Boolean Algebra, Basic theorems, applications of Boolean algebra to switching circuits.

Unit-VI

Graph Theory: Basic definitions (Graph, types, vertex, edge, incidence, degree). Walks, paths and circuits. Connected graphs, disconnected graphs & components, A simple graph with n vertices and k components cannot have more than $(n-k)\frac{(n-k+1)}{2}$ edges.

Regular graph, Complete graph, Isomorphism, Konigsberg bridge problem, Euler graph, A connected graph is Eulerian if and only if its all vertices are of even degree, traveling-salesman problem, Hamiltonian paths & circuits. Graph colouring, five colour theorem.

Text Books Recommended

- (1) Discrete Mathematics and its applications by Kenneth H. Rosen, Mcgraw Hill Education.
- (2) Introductory discrete mathematics by V. Balakrishnan, Dover Books on Computer Science.