DEPARTMENT OF INFORMATION TECHNOLOGY

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

Course Code	IT203	**Course Name**	Discrete Mathematics
Core/Elective/MLC	Core	**L-T-P**	(3-0-0) 3
Course Instructor	Anupama H C	**Contact Hours**	3 per week - Lecture
Type of course (Lecture/Tutorial/ Seminar/Project)	Lecture	**Course Assessment Methods (Both Continuous and End Semester Assessment)**	Quiz = 20M Assignment = 5M Mid Sem Exam = 25M End Sem Exam= 50M

Course Description:

The goal of this course is to introduce students to ideas and techniques from discrete mathematics that are widely used in science and engineering. This course teaches the techniques to think logically, mathematically and apply in solving problems. To achieve this goal, students will learn logic and proof, sets, functions, as well as algorithms and mathematical reasoning. Key topics involving Fundamentals of logic, Fundamental principles of counting, set theory, Induction and Recursion, relations, graph and group theory.

COURSE OUTCOMES: After the completion of this course, the students will be able to

CO1	Understand and Apply concepts of Mathematical Logic, Set Theory, Counting to Solve Problems.
CO2	Apply Logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions prove mathematical theorems using mathematical induction
CO3	Apply, Evaluate and design Graph-Theoretic Models to Solve Real-World Problems.
CO4	Analyze and identify structures of algebraic nature and discover their properties and usages

Detailed Course Plan

Week 1 - 3	**Mathematical Logic and Proofs** : Propositional Logic and Applications, Operations on Propositions, Truth Tables, Tautologies & Logical Equivalence, Predicate Logic, Predicates & Quantifiers, Nested Quantifiers, Inference Rules, Proofs Methods, applications.
Week 4 - 5	**Set Theory** : Sets/Operations, Sequences/Summations, Cardinality of Sets, Functions (Surjections, Injections, and Bijection), applications.
Week 7 - 9	**Induction and Recursion** : Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions, Structural Induction, applications.
Week 10	**Combinatorics** : Counting, Pigeonhole Principle, Permutations/Combinations, Binomial Coefficients, Recurrence Relations, Generating Functions, Inclusion-Exclusion, applications.
Week 11	**Relations** : n-ary Relations and Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orders, applications.
Week 12	**Group Theory** : Groups, Semigroups, Monoids, Rings, Fields, Vector Spaces and Lattices, applications.
Week 13	**Graph Theory** : Graphs and Models, Euler and Hamiltonian Paths, Trees, Tree Traversals, Spanning Trees, Graph Matching, Graph Coloring, applications.

Reference Books

1. K.H.Rosen, Discrete Mathematics and Its Applications, 8th Edition, McGraw-Hill, 2019.
2. C.L.Liu and D.P. Mahapatra, Elements of Discrete Mathematics, 4th Edition, McGraw-Hill, 2012.
3. John A. Dossey, Discrete Mathematics, 5th Edition, Pearson, 2011.
4. Jean-Paul Tremblay and R Manohar, Discrete Mathematical Structures with Apps., 1st Ed., McGraw-Hill, 2017.
5. J .L.Mott, A.Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists, 2nd Ed., Prentice Hall of India, 1986.

Course Instructor

Anupama H C