# 19CS2201 - DISCRETE MATHEMATICAL STRUCTURES

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| **Course Category:** | Program Core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3-1-0 |
| **Prerequisite:** | Basic mathematical structures and Identification of simple notations. | **Sessional Evaluation:**  **Univ. Exam Evaluation:**  **Total Marks:** | 40  60  100 |
| **Objectives** | * To understand the concepts of predicates and proofs. * To get the basic view on mathematical structures. * To provide generic view on counting techniques. * To explore the fundamental concepts of graphs trees and algebraic systems. | | |

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| **Course Outcomes** | Upon successful completion of the course, the students will be able to: | |
| CO1 | Learn the basics of logical connectives, rules of inference and normal forms. |
| CO2 | Review the basic mathematical topics useful to provide base for other areas. |
| CO3 | Study various algorithms based on integers and division. |
| CO4 | Identify different recurrence relations and their usage. |
| CO5 | Provide a generic view on the fundamentals of graphs and trees. |
| CO6 | Understand the basic structure of algebras and a specific view on coding theory. |
| **Course Content** | UNIT-I  **Logic and Proofs:** Propositional logic and equivalences, Predicates and Quantifiers, Nested quantifiers, Rules of Inference, Introduction to proofs, Normal forms, Proof methods and strategy.  UNIT-II  **Basic Structures:** Sets and operations, Functions, Recursive functions, Sequences and summations, Cardinality of Sets.  UNIT-III  **Counting Principles:** Basics of counting, Permutations and Combinations, Binomial Coefficients, Generalized permutations and combinations.  **Recurrence Relations:** Introduction and Definitions, Solving Linear recurrence relations.  UNIT-IV  **Recurrence Relations:** Generating functions, Inclusion - Exclusion.  **Relations:** Relations and their properties, n-ary Relations and their applications, Representation and closures of relations, Equivalence relations and partial orderings.  UNIT-V  **Graphs:** Introduction, graph models, Graph terminology and special types of graphs, Representing graphs and graph isomorphism, Graph connectivity, Euler and Hamilton paths, Planar graphs and Graph coloring.  **Trees:** Introduction, Applications, Tree traversals.  UNIT-VI  **Algebraic Structures:** Introduction, Structure of algebras, Semi groups, Monoids, Groups, Homomorphisms, Normal sub-groups and Congruence relations, Rings, Integral domains and fields. | |
| **Text Books and References:** | Text Books:   1. Discrete mathematics and its applications with combinatorics and graph theory, Kenneth H.Rosen, 7th Edition, TMH. | |
| Reference Books:   1. Discrete mathematics for computer scientists and mathematicians, Joe L Mott., Abraham Kandel, Theodore P Baker, 2nd Edition PHI, 2012. 2. An Introduction to data structures and applications, Trembley and Sorenson, PHI. 3. Discrete mathematical structures with applications to computer science, J.P. Tremblay R. Manohar McGraw-Hill. | |
| **E-Resources** | 1. <https://nptel.ac.in/courses> 2. <https://freevideolectures.com/university/iitm> | |