# 20CS2101 - DISCRETE MATHEMATICAL STRUCTURES

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| Course Category: | Program Core | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 3-0-0 |
| 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 | Become familiar with the various counting techniques. |
| CO4 | Identify different recurrence relations and their usage. |
| CO5 | Provide a generic view on the fundamentals of graphs |
| 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, Normal forms.  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, 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 colouring.  UNIT-VI  **Algebraic Structures:** Introduction, Structure of algebras, Semi groups, Monoids, Groups, Homomorphisms, Normal sub-groups, Rings. | |
| Text Books &  References  Books | **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> | |

**CO-PO Mapping:** 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 2 | 2 | 1 | 1 | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - |
| **CO3** | 1 | 2 | 3 | 2 | 3 | 1 | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 2 | 2 | 1 | 1 | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - |
| **CO6** | 1 | 2 | 3 | 2 | 3 | 1 | - | - | - | - | - | - |