

# CS203 Discrete Structures

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Credits: 3-0-0-3

Approval: Approved in 3rd Senate

Students intended for: 2ndyear B. Tech. CSE

Elective or Core: Core

Prerequisite: Consent of the faculty member

Semester: Odd or Even

## Course objective:

According to Wikipedia article on this topic, “discrete structure is the study of mathematical structures that are fundamentally discrete rather than continuous.”The objective of this course is to teach students how to think logically and mathematically. The course stresses on mathematical reasoning and describes different ways in which mathematical problems could be solved. There are four thematic areas covered in this course: mathematical reasoning, combinatorial analysis, discrete structures, and mathematical modeling. Topics in this course include logic, proofs, set theory, counting, probability theory (the discrete part of the subject), graph theory, trees, Boolean algebra, and modeling computation. This course serves as an introductory course in discrete mathematics for second year B. Tech. Computer Engineering students.

## Evaluation:

Final exam

Quiz 1

Quiz 2

Surprise Quizzes

Assignments

## Course content:

- Logics and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategies.
- Sets, Functions, Sequences, Sum, and Matrices: Sets, Set operators, Functions, Sequences and Summations, Cardinality of Sets, Matrices
- Counting and Discrete Probability: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Introduction to Discrete Probability, Probability Theory, Bayes’ Theorem, Expected Value and Variance
- Relations: Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings
- Graphs: Graphs and Graph Models, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring
- Trees: Introduction to Trees, Application of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees
- Boolean Algebra and Modeling Computation: Boolean Algebra, Representing Boolean Functions, Logic Gates, Minimization of Circuits, Language and Grammars, Finite-State Machines, Language Recognition, Turing Machines

## Readings (including but not restricted to the following):

Kenneth Rosen [KR]. *Discrete mathematics and its applications* (6th edition).2006. McGraw-Hill Science/Engineering/Math.

## Reference Books:

C. Liu, D. Mohapatra[CM]. *Elements of Discrete Mathematics*. 2008. Tata McGraw-Hill.

T.Koshy [TK].*Discrete mathematics with applications*.2003. Academic Press.

J. Hein [JH]. *Discrete structures, logic and computability*.2009. Jones & Bartlett Publishers.