Discrete Mathematics   L-T-P: 3-1-0   Credit:4   MAxxxxx
Prerequisite: None

Syllabus:

Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Rules of Inference. **[5 lectures]**

Relations, n-ary Relations and their Applications, Representing Relations through matrices and diagrams, Asymmetric and Anti Symmetric relation, Equivalence Relations, Closures of Relations, Warshall Algorithm. **[5 lectures]**

Partial Orderings, lattices, Boolean algebra, atomic structure of Boolean algebra, Boolean functions, DNF and CNF forms, minimization of Boolean expressions/functions, Karnough map technique. **[9 lectures]**

Big-O, Big-Omega and Big-Theta functions, Division Algorithm, Modular Arithmetic, Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms. **[5 lectures]**

Counting principles, The Pigeonhole Principle and its applications, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations. Generating Functions, the principle of Inclusion–Exclusion and its applications. **[8 lectures]**

Stirling Numbers, Eulerian Numbers, Harmonic Numbers, Harmonic Summation, Bernoulli Numbers, Fibonacci Numbers and their applications, Partitions. **[4 lectures]**

Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations. **[4 lectures]**

Around 12 tutorial classes will be taken.

References:

1. Discrete Mathematics and Its Applications - Kenneth H Rosen,8ᵗʰ edition2021, Mc Graw Hill
2. Discrete Mathematical Structures - Bernad Kolman, Robert C Busby and Sharon Cutler Ross,2015, Pearson
3. Discrete Mathematics: Elementary and Beyond - L´aszlo´ Lov´asz, Jo´zsef Pelik´an, Katalin Vesztergombi, 2003, Springer
4. Discrete Mathematics with Applications - Susanna S Epp, 2021, Cengage
5. Concrete Mathematics - Donald Knuth, 1994, Addison Wesley