

Discrete Mathematics - Web course

COURSE OUTLINE

- Module 1: Natural Numbers & Principle of Mathematical Induction,
- Module 2: Set Theory
- Module 3: Functions
- Module 4: Basic Counting Principles
- Module 5: Advanced Counting.
- Module 6: Group Theory
- Module 7: Group Action, Orbit Stabilizer Theorem and its applications
- Module 8: Recurrence Relations, Generating Functions
- Module 9: Basic Graph Theory

COURSE DETAIL

Module No.	Topic/s	Lectures
1	Natural Numbers: Well Ordering Principle, Principle of Mathematical Induction	2
2	Set Theory: Ordered Sets, Relations, Equivalence Relations and Partitions, Modular Arithmetic.	3
3	Functions: Functions, Composition of Functions, one-one, onto and Inverse of a function.	3
4	Basic Counting Principles: Number of	5



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Mathematics

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	one-one, Permutation, Combinations, Number of onto functions, Partitions and Stirling Numbers of Second kind.	
5	Advanced Counting: Pigeon-hole Principle, Inclusion-Exclusion Principle, Putting Balls into boxes, Round Table Configurations, Counting using Lattice Paths, Catalan Numbers.	6
6	Group Theory: Groups, Subgroups, Cyclic Groups, Characterisation of Cyclic Groups, Lagrange's Theorem, Normal Subgroups, Homomorphism and the first Isomorphism theorem of groups, Symmetric Group till definition of Alternating Group.	8
7	Group Action, Orbit Stabilizer Theorem and its applications to Polya's Counting Principle and Polya's Inventory Problems.	7
8	Recurrence Relations, Generating Functions, Using generating functions to prove results related to certain binomial coefficients.	4
9	Basic Graph Theory: Graphs, Trees, Characterisation of Trees, Rooted Trees.	5

References:

1. D. I.A. Cohen, Basic Techniques of Combinatorial Theory, John Wiley and Sons, New York, 1978.
2. G. E. Martin, Counting: The Art of Enumerative Combinatorics, UTM, Springer, 2001.
3. R. Merris, Combinatorics, 2th edition, Wiley-Interscience, 2003.
4. H. S. Wilf, Generatingfunctionology, Academic Press, 1990.
5. Ronald L. Graham, Donald E. Knuth, and Oren Patashnik, Concrete Mathematics: A Foundation for Computer Science (2nd ed.), 1994.

6. J. A. Gallian, Contemporary Abstract Algebra (4th ed.), Narosa Publication, New Delhi, 1998.
7. R. A. Brualdi, Introductory Combinatorics (5th ed.), Prentice Hall, 2009.