



COMBINATORICS

PROF. NARAYANAN N

Department of Mathematics
IIT Madras

PRE-REQUISITES : Basic Mathematical Maturity expected from a Mathematics student at the level of 10+2. Familiarity with group theory will be added advantage (not necessary).

INTENDED AUDIENCE : UG students

INDUSTRIES APPLICABLE TO : TCS, Infosys, Microsoft Research, Any companies developing discrete mathematics related areas or algorithms.

COURSE OUTLINE :

We start with the finite and infinite avatars of the Pigeonhole Principle, Basic counting tools and the twelfold way followed by compositions and partitions of integers and Stirling numbers. We then look at Inclusion exclusion and Mobius inversion followed by generating functions. We then look at Polyas theorem, graphs and conclude with a short introduction to species of structures.

ABOUT INSTRUCTOR :

Prof. Narayanan N research interests are related to combinatorics, graph theory and combinatorial algebra.

COURSE PLAN :

Week-1: Pigeonhole Principle.

Week-2: Basic and Bijective counting.

Week-3: Compositions and Partitions.

Week-4: Advanced Counting.

Week-5: Inclusion Exclusion, Mobius Inversion.

Week-6: Generating Functions

Week-7: Graph theory, introduction, trees, connectivity.

Week-8: Menger, Hall, Konig - equivalence and System of Distinct Representatives.

Week-9: Planar graphs.

Week-10: Groups and Polyas theory.

Week-11: Species of structures.

Week-12: An overview, scope and further directions.