



ALGEBRAIC COMBINATORICS

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PRE-REQUISITES : Knowledge of set theory, linear algebra, and algebra at the undergraduate level, basic undergraduate discrete mathematics (induction, graphs, trees, basic counting techniques, recurrence relations, etc.).

INTENDED AUDIENCE : M.Sc./M.Tech. (Mathematics, Computer Science), PhD coursework (Mathematics, Computer Science), advanced undergraduates, B.Sc., B.E., B.Tech. (Mathematics, Computer Science).

COURSE OUTLINE :

The objective of this course is to introduce the student to some powerful paradigms in modern combinatorics, namely Möbius inversion on partially ordered sets, combinatorial classes and combinatorial species, and the Lindström-Gessel-Viennot lemma. It will also include an introduction to the theory of symmetric functions.

ABOUT INSTRUCTOR :

Prof. Amritanshu Prasad is a faculty at The Institute of Mathematical Sciences, Chennai. His research interest is in representation theory.

Prof. S Viswanath is a faculty at The Institute of Mathematical Sciences, Chennai. His research interest is in representation theory.

COURSE PLAN :

Week 1: Partially ordered sets and Möbius inversion

Week 2: Finite distributive lattices

Week 3: Combinatorial classes and their ordinary generating functions

Week 4: Operations on combinatorial classes

Week 5: Combinatorial specifications

Week 6: Groups of permutations, cycle structure, orbit counting method

Week 7: Polyá's enumeration theorem, the cycle index generating function

Week 8: Combinatorial species and associated generating functions

Week 9: Operations on species

Week 10: The LGV lemma

Week 11: Symmetric functions – elementary, complete, power sum

Week 12: Symmetric functions – Schur functions