

Discrete Geometry and Enumerative Combinatorics (MATH 428)

Credit Hour: 3

Teaching Mode: In Person

Schedule: Monday to Friday (4:00 PM to 5:50 PM)

Instructor: Shaheen Nazir, Imran Anwar

#### Course Description:

This is an introductory course based on enumerative combinatorics and discrete geometry for senior undergraduates, MS and PhD students. Combinatorics is the study of finite structures, many of which arise in other branches of mathematics like Probability or from problems arising in science or engineering. The study of combinatorics involves general questions of enumeration and structure, matroid theory and aspects of graph theory, partially ordered sets, set partitions and permutations and combinatorial structures such as finite geometries and designs. Discrete Geometry is a relatively mature subject within Discrete Mathematics, covering Computational Geometry, Convex Geometry, Polytope Theory and Geometric Graph Theory. In recent years, these have applications in theoretical computer science, discrete optimization and biology, in particular, the study of phylogenetics. It covers the basics in enumerative combinatorics and discrete geometry: set partitions and permutations, graph theory, partially ordered sets, matroids, convex polytopes, faces and face lattices, graph of polytopes, Euler–Poincaré formula, Dehn–Sommerville equations, upper and lower bound theorems and geometry of linear programming.