

# Course Syllabus

MA4090: Combinatorics and Graph Theory

## 1 Syllabus

### Combinatorics: (2/3rd of the course)

- Enumeration: Basic counting techniques, inclusion-exclusion principle, permutations, combinations and binomial coefficients
- Bijections, double-counting, pigeon-hole principle, parity arguments
- Recurrences and generating functions, asymptotics
- Partial-orders, Dilworth's theorem, equivalence relations, countability
- Combinatorics of groups, Polya's theorem

### Graph Theory: (1/3rd of the course)

- Basics of graphs, trees
- Matchings and Hall's theorem
- Extremal problems
- Planar graphs.
- Graph coloring

## 2 Reference Books

1. Combinatorial Techniques by Sharad Sane
2. Lecture Notes on Mathematics for Computer Science by Eric Lehman, Thomson Leighton and Albert Meyer (available online)
3. A Path to Combinatorics for Undergraduates by Andreescu and Feng
4. Problem-solving Strategies by Arthur Engel
5. Graph Theory by Douglas West
6. Any book on discrete mathematics