



Module PMRF-ISSS075/II/2025

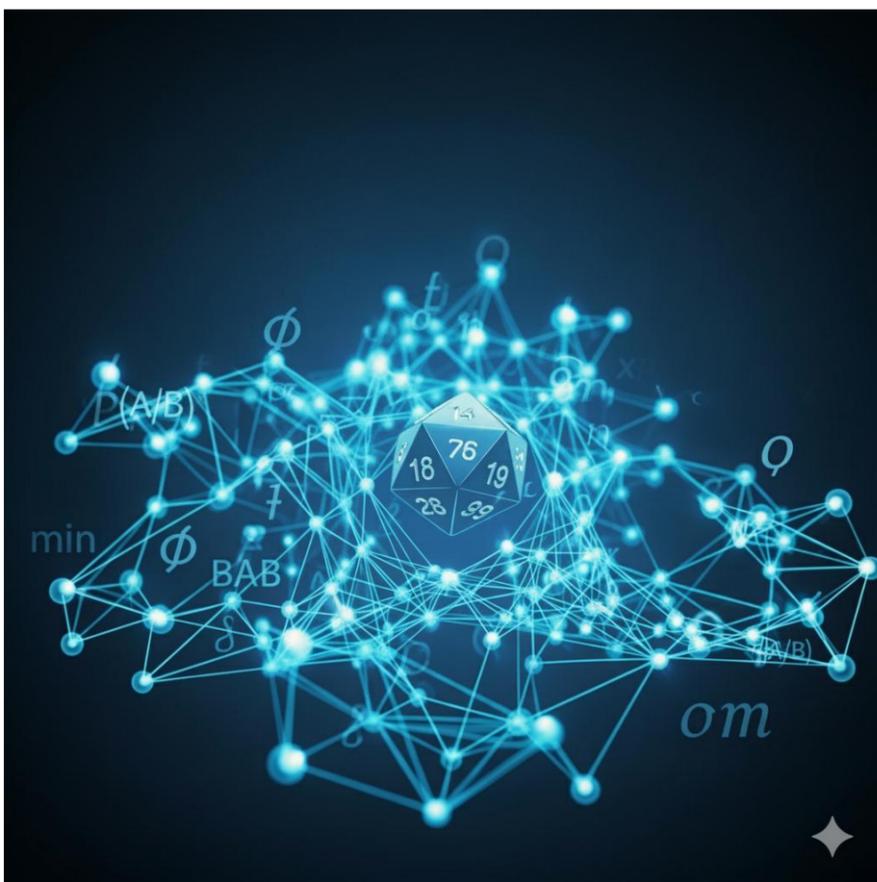
Probabilistic Methods in Combinatorial Optimization

Name of the PMRF student

Kirtan Vora

Required background of the students taught

Basic Probability Theory
mainly basic understanding of
notion of independence and
expectation



Details of the content of the module

We will closely follow the book THE
PROBABILISTIC METHOD By Noga Alon and Joel
Spencer

- 1) Demonstration of basic methods in various graph and hypergraph problems such as: lower bounds on Ramsey number, dominating set problem, hypergraph coloring problem.
- 2) Linearity of Expectation: Max Cut, Vector Balancing etc.
- 3) Alterations: How modifying the basic methods can give better bounds on the existing problems.
- 4) Second Moment Method: Using variance to get sharp bounds on problems in random graphs, number theory, distinct sums.
- 5) Local Lemma: How independence assumption can be weakened to few dependencies to give better bounds.

Schedule of the module

Course Starts: 15th September 2025

Course Ends: 18th October 2025

Classes: Monday, Wednesday, Saturday: 6PM-7:30PM

Classes will also focus on the calculations skipped in
the book

Meeting link : Will be shared later

Contact email ID: iss.forum@gmail.com

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Registration link:

<https://forms.gle/gPTmUjh3ZCnhzxCr5>