



# DEPARTMENT OF MATHEMATICS

Semester : IV

Integrated M.Sc. Mathematics

Academic Year : 2017-18

Subject : 060090404 SEC2 Combinatorial Mathematics

## Teaching Schedule

**Course Objectives:** • An introduction to fundamental combinatorial objects, their uses in other fields of Mathematics and its applications, and their analysis.

Unit	Sub Unit	No. of Lect.(s)	Topics	Reference Chapter/ Additional Reading	Teaching Methodology to be used
<b>Unit 1: Permutation and Combination</b>					<b>[10]</b>
1	1.1	1	Basic counting principles	Brualdi, R. A. – Chap : 3	Chalk & Talk
	1.2	2	Permutations and Combinations of Sets and Multi-sets		
	1.3	2	Generating Permutation and Combinations		
	1.4	1	Inversions in permutations		
	1.5	1	Generating r-Combinations		
	1.6	1	Partial orders and equivalence relation		
<b>Unit 2: Binomial Coefficients</b>					<b>[15]</b>
2	2.1	1	Pascal's Formula and Identities	Brualdi, R. A. – Chap : 5	Chalk & Talk
	2.2	1	Binomial theorem		
	2.3	1	Unimodality of binomial coefficients		
	2.4	1	Multinomial theorem		
	2.5	1	Newton's Binomial theorem		
	2.6	1	More on partially ordered set		
<b>Unit 3: Inclusion-Exclusion Principle and Applications</b>					<b>[17]</b>
3	3.1	1	Principles of inclusion exclusion	Brualdi, R. A. – Chap : 6	Chalk & Talk
	3.2	2	Combination with repetition		
	3.3	1	Derangements		
	3.4	2	Permutations with forbidden positions		
	3.5	1	Another forbidden position problem		
<b>Unit 4: Recurrence relations and Generating functions</b>					<b>[10]</b>
4	4.1	1	Number sequences	Brualdi, R. A. – Chap : 6	Chalk & Talk
	4.2	1	Linear homogeneous recurrence relations		
	4.3	1	Non-homogeneous recurrence relations		
	4.4	1	Generating Functions		
	4.5	1	Recurrence relations and Generating functions		
	4.6	1	Geometry Example and Exponential generating functions		

### Text books:

1. Brualdi, R. A.: "Introductory Combinatorics", Pearson Education Inc. (5thEd.) 2009
2. Krishnamurthy, V.: "Combinatorics: Theory and Applications", Affiliated East-West Press 1985
3. Cameron, P. J.: "Combinatorics: Topics, Techniques, Algorithms", Cambridge University Press 1995



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**Reference books:**

1. Hall, M. Jr.: "Combinatorial Theory", John Wiley & Sons (2nd Ed.) 1986
2. Sane, S. S.: "Combinatorial Techniques", Hindustan Book Agency 2013
3. Lint, J. H. van, and Wilson, R. M.: "A Course in Combinatorics", Cambridge University Press (2nd Ed.) 2001.



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