

## CSE 2033:ADVANCED DISCRETE MATHEMATICS

### REQUIRED COURSE TEXTBOOK:

1. Introductory Combinatorics by Richard A. Brualdi, Fifth Edition, Pearson India
2. Introduction to Lattices and order by B. A. Davey and H. A. Priestley, Cambridge University
3. abstract Algebra, 3<sup>rd</sup> Edition by David S. Dummit, Wiley India

**Course format: 4 Classes / week/, 1 hr. / Class,**

**Grading - internal: 15 % Mid Term + 10% quizzes +10% assignments + 5% attendance = 40 %**

SI No.	Topics	Lecture Hours	Chapters	Problems to be discussed in class
<b>COMBINATORICS</b>				
3	Counting Principles	1	2.1	
	Permutations of Sets	1	2.2	
4	Combination of Sets *(Th2.3.1,2.3.2,2.3.3,2.3.4)	1	2.3	
5	Permuatations of Multisets	1	2.4	2.7(6, 7,10)
6	Combinatios of Multisets *(Th 2.4.1,2.4.2,2.4.4,2.5.1)	1	2.5	2.7(11,16,32)
7	Pigeonhole Principle:Simple form	1	3.1	
8	Pigeonhole Principle: Strong form	1	3.2	3.4(3,4,10)
9	Generating Permutaions (algorithm I, II)	1	4.1	
10	Inversions in permutations	1	4.2	
11	Generating Combinations (Base 2 algorithm)	1	4.3	4.6 (1,3,9,10)
12	Pascal's Triangle ,The Binomial Theorem (Th 5.2.2)	1	5.1 5.2	
13	Unimodality of Binomial Coefficients (Th 5.3.1, Cor: 5.3.2)	1	5.3	
14	The Multinomial Theorem and Newton's Binomial Theorem, (Th 5.4.1, Th 5.5.1)	1	5.4	5.7(8 ,15,18,38)
15	The Inclusion – Exclusion Principle Th 6.1.1	1	6.1	
16	Combinations with repetition,	1	6.2	
17	Derangements (Th 6.3.1( without proof)	1	6.3	6.7(2,4,6)
18	Some Number Sequences	1	7.1	
19	Generating Sequences	1	7.2	

20,21	Solving Linear Homogeneous Recurrence Relations	2	7.4	7.7(2,3,4,34)
<b>Note: 1. Few examples will be discussed by teacher in class and remaining all examples are strictly to be covered from each mentioned topics by the students.</b> <b>2. Theorems proof are not compulsory</b>				
<b>ABSTRACT ALGEBRA</b>				
22	Introduction to groups: axioms and exaamples (Proposition 1 and 2)	1	1.1	3,6,12
23	Dihedral Groups	1	1.2	1
	The Quaternion Group	1	1.5	1
24	Subgroups: Definitions and examples (Proposition 1)	1	2.1	1(a),1(b), 2(a),2(b),8
25	Centralizers and Normalisers	1	2.2	4,10
26	Cyclic Groups( Examples and Proposition 2,3)	1	2.3	1,3,12
27	The lattice of subgroups of a group	1	2.5	2(a), 2(b), 6
29	Quotient Groups: Definitions and Examples	1	3.1	4,17
30	Lagrange's Theorem	1	3.2	1, 4
31	Ring Theory: Basic Definitions and Examples	1	7.1	1,2
32	Polynomial Rings, Matrix Rings and Group Rings	1	7.2	1.a
<b>LATTICES</b>				
33	Ordered sets : Definition and Examples from social science and computer science	1	1.1 to 1.7	
34	Constructing and deconstructing orders sets	1	1.14 to 1.25	
35	Down Sets and up sets	1	1.27 to 1.32	
36	Lattices and complete lattices: lattices as ordered sets	1	2.1 to 2.6	
37	Formal Concept analysis:	1	3.1 to 3.6	
38	The fundamental theorem of concept lattices	1	3.7 to 3.11	

39	Modular Distributive	1	4.1 to 4.7	
40	Boolean Algebra	1	4.16 to 4.20	