

	<b>DPG Institute of Technology and Management</b> <b>Sector 34, Gurugram HR 122004</b>		
	<b>Lesson Plan</b>		
	<b>Course Name: Discrete Mathematics</b>		
	<b>Faculty Name: DR. RITU BHATIA</b>		

<b>No. of Lecture Hours/Week</b>	<b>4 (3L+1T)</b>	<b>Exam Hours</b>	<b>3</b>
<b>Total No. of Lecture Hours</b>	<b>51</b>	<b>Exam Marks</b>	<b>75</b>
<b>Course Code:</b>	<b>PCC-CSE-202G</b>		

### Course Objectives:

1. To motivate the students to understand mathematical problems based on concepts of set theory, relations, functions, lattices and logical statements.
2. To encourage the students to apply basic counting techniques to solve permutation and combination problems.
3. To inspire the students to classify algebraic structure of any given mathematical problem
4. To lead the students to develop the given problem as graph networks and solve with techniques of graph theory.

Lecture No	Topics to be covered	Teaching Methodology / Pedagogy	Activity	Remarks
<b>SECTION A(Unit-1) (CO-201.1)</b>				
1	Introduction to Sets. Operations and Laws of Sets	PPT/Smart Board		
2	Cartesian Products, Representation of relations, Binary Relation	Chalk &Talk		
3	Equivalence Relation, Partial Ordering Relation, POSET	Chalk &Talk		
4	Finite and infinite Sets, Countable and Uncountable Sets	NPTEL <a href="https://youtu.be/6jBu-ls3ZwU?si=IRKqN_GgOcGtjdf6">https://youtu.be/6jBu-ls3ZwU?si=IRKqN_GgOcGtjdf6</a>	Quiz/MCQ	
5	Cantor's diagonal argument and The Power Set theorem	Chalk &Talk		
6	Function, Bijective functions, Inverse and Composite Function	Chalk &Talk		
7	Inverse and Composite Function	Chalk & Talk		
8	Hasse Diagram	Chalk &Talk		
9	Lattices and its types	<a href="https://youtu.be/3UkC3sXLqhQ?si=5Nb5ZfD4vClfKm4u">https://youtu.be/3UkC3sXLqhQ?si=5Nb5ZfD4vClfKm4u</a>		
10	Schroeder-Bernstein theorem	Chalk &Talk		

11	Propositions and Logical operations	Chalk &Talk		
12	Conditional Statements, Tautologies, Contradictions, Logical Relation	Chalk &Talk	Group Discussion	
<b>SECTION B(Unit-2) (CO-201.2)</b>				
13	Basic Counting principle	Chalk &Talk		
14	Pigeon-hole principle, Permutation and Combination	PPT		
15	Concept of Division algorithm	Chalk &Talk	Assignment	
16	Prime Numbers, The GCD: Euclidean Algorithm	Smart Board		
17	The Fundamental Theorem of Arithmetic	Chalk & Talk		
18	Linear recurrence relation with constant coefficients	NPTEL <a href="https://youtu.be/LyX37QRmliI?si=CPJN8zTjGtikfJgX">https://youtu.be/LyX37QRmliI?si=CPJN8zTjGtikfJgX</a>		
19	Homogenous Solutions, Particular Solutions, Total Solution	Chalk &Talk		
20	Solving non-homogeneous recurrence relation	Chalk &Talk		
21	Introduction to generating function	Chalk &Talk		
22	Solving recurrence relation using generating functions	Chalk &Talk		
23	Class Test			
<b>SECTION (Unit-3) (CO-201.3)</b>				
24	Definitions and examples of Algebraic Structures with one Binary Operation	Chalk &Talk		
25	Semi Groups, Monoids, Groups	PPT		
26	Congruence Relation and Quotient Structures	Chalk &Talk		
27	Permutation Groups, Cyclic groups	Chalk &Talk		
28	Examples of group and cyclic group	Chalk & Talk		
29	Coset and Normal Subgroups	Chalk &Talk		
30	Lagrange's theorem for finite group	Chalk &Talk		
31	Definitions and examples of Algebraic Structures with two binary operation	Chalk &Talk		
32	Numericals on Algebraic Structures with one and two binary operation	Chalk &Talk		
33	Rings, Integral Domain, Fields,	Chalk & Talk		
34	Boolean Algebra and Boolean Ring	Flip Class		
35	Duality, Representation of Boolean Function	Chalk & Talk	Students Presentation	
36	Disjunctive and Conjunctive Normal Form	Chalk & Talk		
<b>SECTION D(Unit-4) (CO-201.4)</b>				

37	Graphs and their properties, Degree and Connectivity	PPT		
38	Path, Cycle, Sub Graph, Isomorphism	Chalk & Talk	Quiz	
39	Multigraph and Weighted graph	NPTEL <a href="https://youtu.be/BdGuz3Agbag?si=7sMOywcFXAvgE8Dq">https://youtu.be/BdGuz3Agbag?si=7sMOywcFXAvgE8Dq</a>		
40	Eulerian paths and circuits	Chalk & Talk		
41	Shortest path in Weighted graphs	Chalk & Talk		
42	Hamiltonian path and circuits	Chalk & Talk		
43	Planar Graphs	Chalk & Talk	Group Discussion	
44	Euler's formulae and Euler's Theorem	Chalk & Talk		
45	Graph Colouring	Chalk & Talk		
46	Trees Sorting, Spanning tree	Chalk & Talk		
47	Minimal Spanning tree	Chalk & Talk		
48	Doubt Session	Chalk & Talk		
49	Class Test			
<b>Content Beyond Syllabus</b>				
50	Extra theorem on sets and group	NPTEL video		
51	Adjacency and Incidence Matrix Representation of graph	PPT		

### Suggested Text / Reference Books

#### Text books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw-Hill
2. Satinder Bal Gupta: A Text Book of Discrete Mathematics and Structures, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw-Hill.
4. J.P. Tremblay and R. Manohar, Discrete mathematical structures with applications to computer science, TMG Edition, Tata McGraw-Hill
5. Discrete Mathematics, Babu Ram, Pearson Publication
6. Discrete Mathematics, Semyour, Lipschutz and Marc Lipson, Schaum's outline

### Course Outcomes:

At the end of the course, the student will be able:

CO201.1	To solve mathematical problems based on concepts of set theory, relations, functions, lattices and express logic sentence in terms of quantifiers and logical connectives.
CO201.2	To apply basic counting techniques to solve permutation and combination problems and solve recurrence relations.
CO201.3	To classify algebraic structure of any given mathematical problem and evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

CO201.4	To develop the given problem as graph networks and solve with techniques of graph theory.
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**CO-PO-PSO Mapping:**

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	1	1		1	1				1	2	3	2	1	2
CO2	2	1	3	2	2		1		2	2	2	3	2	2	2
CO3	2	1	3	2	2		1		2	2	2	3	2	2	2
CO4	2	1	3	2	2		1		2	2	2	3	2	2	2

Signature of Staff In-charge

Dr. Ritu Bhatia

Signature of HOD

Dr. Simpi Mehta