SEMESTER S2

DISCRETE MATHEMATICS

Course Code	**DCM205**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs.30Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. To equip students with the ability to analyze and solve problems using discrete mathematical techniques.
2. To give a deeper understanding of mathematical logic, set theory, and proof techniques such as direct proofs, proof by contradiction, and mathematical induction.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Set Theory** Sets, Functions, and Relations Sets and Subsets, Venn Diagrams, Set Operations, Set Identities, Generalized Unions and Intersections, The Principle of Inclusion-Exclusion (Basic and Generalized versions), and applications. Function definition, Injections, Surjections and Bijections, Inverse Functions, and Compositions of Functions, Cardinality of Sets, Cantor diagonalization argument Relations and Their Properties, Composition of relations, n-ary Relations, Representing Relations Using Matrices, Equivalence Relations, Equivalence Classes, Partial Orderings, Hasse Diagrams, Maximal and	11

	Minimal Elements, Lattices	
2	**Mathematical logic and proofs** Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs, Methods of Proving Theorems - Direct proof, Indirect proof (Proof by Contraposition), Proof by Contradiction, Proof by counter examples, The Pigeonhole Principle. 11	11
3	**Induction and Recurrences** Mathematical Induction, Weak and Strong induction Recursive (Inductive) definitions and recurrence relations, Modeling with Recurrence Relations, Solving Linear Recurrence Relations (homogeneous and nonhomogeneous), Generating Functions, Using Generating Functions to Solve Recurrence Relations.	11
4	**Group theory** Groups - Definition, Examples, and Elementary Properties, Abelian group, Permutation group, Subgroup, Homomorphisms, Isomorphisms, and Cyclic Groups, Cosets and Lagrange's Theorem	11

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	**Assignment/ Microproject**	**Internal Examination-1 (Written)**	**Internal Examination-2 (Written)**	**Total**
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

PartA	PartB	Total
• 2 Questions from each module. • Total of 8Questions,each carrying 3 marks **(8x3=24marks)**	• Each question carries 9 marks. • Two questions will be given from each module,out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9=36marks)**	**60**

CourseOutcomes(COs)

Attheendofthecoursestudentsshouldbeableto:

CourseOutcome		Bloom's Knowledge Level(KL)
CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic	**K3**
CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion.	**K3**
CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science.	**K2**
CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science	**K3**
CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients	**K3**
CO6	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients	**K2**

Note:*K1-Remember,K2-Understand,K3-Apply,K4-Analyse,K5-Evaluate,K6-Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	1
CO4	3	2	2	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	2
CO6	3	2	-	-	-	-	-	-	-	-	1

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

TextBooks				
Sl.No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	1 Discrete Mathematics and its Applications	Kenneth H. Rosen, Kamala Krithivasan	McGraw Hill	8/e, 2021

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Schaum's Outline of Discrete Mathematics	Marc Lipson, Seymour Lipschutz	McGraw-Hill	3/e, 2021
2	Discrete Mathematics	Kenneth A. Ross, Charles R.B.	Wright Pearson	5/e, 2012

VideoLinks(NPTEL,SWAYAM…)	
Module No.	**LinkID**
1	https://nptelvideos.com/lecture.php?id=6033
2	https://nptelvideos.com/lecture.php?id=6024
3	https://nptelvideos.com/lecture.php?id=6051
4	https://nptelvideos.com/lecture.php?id=6058