DISCRETE MATHEMATICAL STRUCTURES

Course Category:	Engineering Science	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practice:**	3-0-0
Prerequisites:	Set theory, functions	**Continuous Evaluation:**	40
		Semester end Evaluation:	60
		Total Marks:	100

COURSE DESCRIPTION

This course provides an in-depth exploration of fundamental concepts in propositional and predicate logic, advanced and basic counting techniques, digraphs and relations, group theory and graph theory. Emphasis is placed on applying these concepts to solve practical engineering problems.

COURSE OBJECTIVES

- Introduce propositional logic and predicate logic with quantifiers to validate arguments.
- Teach the methods of solving combinotrial problems.
- Formation of generating functions and recurrence relations, solve homogeneous and inhomogeneous recurrence relations.
- Explain the different types of relations, and Group homomorphism.
- Introduce various types of graphs, including isomorphism of graphs, graph coloring techniques and determine the chromatic number.

Course Outcomes	Upon successful completion of the course, the student will be able to:	
	CO1	Apply Propositional logic and Predicate logic to infer statements to validate and determining Normal forms.
	CO2	Apply basic counting techniques to solve combinatorial problems
	CO3	Solve the recurrence relations of homogeneous and in homogeneous.
	CO4	Illustrate the types of different relations and Group homomorphism.
	CO5	Analyze the properties, types and applications Isomorphism and chromatic number of graphs.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, M-Medium, H-High)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1	3	3			3				3					
	CO2	3	3			3				3					
	CO3	3	3			2				1					
	CO4	3	3			2				1					
	CO 5	3	3												

Course Content	**UNIT I: Propositional Calculus** Fundamentals of Logic**:** Propositions, Connectives, Propositional functions, Truth tables, Tautology, Contradiction, Logical equivalences, Normal forms, Logical inferences, Methods of proof of an implication. First Order Predicate Logic**:** Predicate, Quantifiers, Rules of inference for Quantified propositions.
	UNIT II: Basics of Counting Sum and product rules, Indirect counting, One to one correspondence, Combinations and permutations, Enumerating combinations and permutations with and without repetitions. Enumerating combinations and permutations with Constrained repetitions.
	UNIT III: Advanced Counting Techniques : Generating function of sequences, Recurrence relations, solving recurrence relations – substitution- Generating functions-The method of characteristic roots, Solution of in homogeneous recurrences relations
	UNIT IV: Relations and Digraphs & Group Theory Relations and directed graphs, Special properties of binary relations, and ordering relations, paths and closures. **Group Theory:** Groups- definition of a group, examples and elementary properties, sub groups, group homomorphism.
	Unit – V: **Graph Theory** Introduction (graphs, sub graphs, circuits, trees) Sum of degrees' theorem, Isomorphism and sub graphs, planar graphs, Euler's formula, Multi graphs and Euler's circuits, Hamiltonian graphs, Grin-berg's theorem, Graph coloring, Chromatic numbers
Text books and Reference books	**Text Book(s):** [1].J.L Mott and A.Kandel, Discrete Mathematics for Computer scientists and Mathematicians, 2nd edition, PHI. [2]. N.Chandra Shekharan and M.Umaparvathi , Discrete Mathematics ,PHI 2010 **Reference Books**: [1].Kenneth H Rosen, Discrete Mathematics and Applications, 6th edition, McGrahill [2]. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, 4th edition(2003), Pearson education
E-resources and other digital material	[1].Kamala Krithivasan, IIT Madras, Discrete Mathematical Structures [NPTEL], (26,may,2021)Available: http://nptel.ac.in/syllabus/syllabus.php?subjectId=106106094 [2].DominikScheduer, Assistant Professor, Department of CSE, Shanghai Jiao Tong Univeristy Discrete Mathematics [COURSERA].,(26,may,2021) Available: https://www.coursera.org/learn/discrete-mathematics [3].Dr. Kamala Krithivasan, IIT Madras, Discrete Mathematical Structures, [NPTEL],(26,may,2021)http://www.infocobuild.com/education/audio-video-courses/computerscience/DiscreteMathematicalStructures-IIT-Madras/lecture-16.html

Course Coordinator		
Head of the Department		