SCHEME OF COURSE WORK

Course Details:

Course Title	**Discrete Structures**		
Course Code	**22CM1102**	**L T P C**	**: 3 0 0 3**
Program:	**B.Tech.**		
Specialization:	**CSD&CSM**		
Semester	**III Semester**		
Prerequisites	• Fundamentals of Set theory • Elementary algebra and Calculus		
Courses to which it is a prerequisite	**Theory of Computation, Design and analysis of Algorithms, Compiler Design, Principles of Programming Languages, Data Structures.**		

Course Outcomes (COs): ***At the end of the Course, Student will be able to:***

1. Rewrite mathematical arguments using logical connectives and quantifiers and verify the validity of logical flow of arguments using propositional logic, and truth tables.
2. Solve various types of counting techniques.
3. identify various types of relations and their properties.
4. Solve various types of recurrence relations.
5. understand various concepts of graphs and spanning trees.

PROGRAM OUTCOMES:

A graduate of Information Technology Engineering will be able to

PO1: Apply the knowledge of mathematics, science, engineering fundamentals and principles of Information Technology to solve problems in different domains.

PO2: Analyze a problem, identify and formulate the computing requirements appropriate to its solution.

PO3: Design and develop software components, patterns, processes, Frameworks and applications that meet specifications within the realistic constraints including societal, legal and economic to serve the needs of the society

PO4: Design and conduct experiments, as well as analyze and interpret data

PO5: Ability to use appropriate techniques and tools to solve engineering problems.

PO6: Understand the impact of Information technology on environment and the evolution and importance of green computing.

PO7: Ability to analyze the local and global impact of computing on individual as well as on society

PO8: Ability to demonstrate professional ethical practices and social responsibilities in global and societal contexts.

PO9: Ability to function effectively as an individual, and as a member or leader in diverse and multidisciplinary teams.

PO10: Ability to communicate effectively with the engineering community and with society at large.

PO11: Ability to understand engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects.

PO12: Ability to recognize the need for updating the knowledge in the chosen field and imbibing learning to learn skills.

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	S	M										
CO-2	S	M										
CO-3	S	M										
CO-4	S	M										
CO-5	S	M										

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Statements and notations, connectives, Well formed formulas tautologies,	CO-I	Show the following is a tautology by constructing truth table $\lfloor\lceil(P \to Q) \wedge (Q \to R)\rceil\rfloor \to (P \to R)$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
2	Tautological Implications, equivalence of formulas	CO-I	Show the following implication without constructing truth table $(P \to Q) \Rightarrow P \to (P \wedge Q)$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
3	Dualitylaw other connectives, Normal forms, Rules of inference Consistency of premises	CO-I	Obtain the principal conjunctive norm form and principal disjunctive norma form of $(\neg P \to R) \wedge (Q \leftrightarrow P)$ Show that $R \to S$ can be derived fr the premises $P \to (Q \to S), \neg R \vee P$ and Q	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
4	Predicates variables and quantifiers	CO-I	Write a short notes on Quantifiers.	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
5	Basics of counting	CO-II	How many non negative integral solutions are there to $x_1 + x_2 + x_3 + x_4 + x_5 = 20,$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
6	Combinations and permutations	CO-II	How many 5 letter words are there where the first and last letters are consonants	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
7	Enumerating Combinations and permutations with repetitions.	CO-II	How many different strings Can be made from the letters of the word “MISSISSIPPI”	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)

8	The binomial and Multinomial theorems, The principle of inclusion-exclusion	CO-II	what is the coefficient of $x^{101}y^{99}$ in the expansion of $(3x-4y)^{200}$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
9	**Mid Exam-I**				
10	Relations, properties of binary relations in a set, Relation matrix and Graph of a relation	CO-III	Let $A = \{a_1, a_2, a_3\}$, $B=\{b_1, b_2, b_3, b_4\}$ and $R = \{(a_1,b_1),(a_1,b_4),(a_2, b_2),(a_2, b_3),(a_3,b_1),(a_3,b_2)\}$. Then write the relation matrix, graph of the given relation If R and S defined on a set A, are satisfy the transitive then prove that $(R \cap S)$ is also satisfy the transitive property.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
11	Partition and covering of a set, equivalence relations,	CO-III	If R is a Relation in the set of integer defined by $R = \{(x, y) /$ x and y integers and $(x - y)$ is divisible by then prove that R is an equivale relation.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
12	Properties of equivalence relations, Algebraic structure, group, abelian group, subgroup, ring, field- definitions and examples	CO-III	If R and S are equivalence relations on the set A, prove that $(R \cap S)$ is an equivalence relation.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
13	Generating Functions of sequences and its properties	CO-IV	Determine the generating function of the Fibonacci sequence.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
14	Solving Recurrence relations by substitution, generating functions and the method of characteristic roots, solving inhomogeneous recurrence relations.	CO-IV	Solve the recurrence $U_n - 8\,U_{n-1} + 21\,U_{n-2} - 18\,U_{n-3} = 0$ for $n \geq 3$, $U_0 = 2$; $U_1 = 8$, $U_2 = 31$	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
15	Basic concepts of a graph, isomorphism and subgraph	CO-V	Define complete graph , regular graph and bipartite graph	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
16	Trees and their properties, Spanning trees: DFS, BFS, Kruskal's Algorithm for finding minimal	CO-V	Determine the minimal spanning tree of the weighted graph using Kruskal's Algorithm		Mid-Test 2 (Week 18)/ Quiz

	Spanning tree.				
17	Prim's algorithms for finding a minimal spanning tree.	CO-V	Using Prim's algorithm find the minimal spanning tree of the weighted graph		Mid-Test 2 (Week 18)
18	**Mid Exam-II**				
19/20	**END EXAM**				