SCHEME OF COURSE WORK

Course Details:

Course Title	**Discrete Mathematical Structures**		
Course Code	**13BM1106**	**L T P C**	**: 4 1 0 4**
Program:	**B.Tech.**		
Specialization:	**Information Technology**		
Semester	**I 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, predicate logic and truth tables.***
2. ***Identify and give examples of various types of relations and describe various properties of the relations. Classify certain basic algebraic structures and discuss their properties.***
3. ***demonstrate the ability to solve problems using Combinatorics***
4. ***Determine isomorphism of graphs and spanning tree of a given graph using DFS / BFS. Also determine minimal spanning tree of a given graph.***
5. ***Explain fundamental concepts of fuzzy sets and apply them to an expert system.***

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: 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: Analyze the local and global impact of computing on individual as well as on society and incorporate the results in to engineering practice.

PO8: Demonstrate professional ethical practices and social responsibilities in global and societal contexts.

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

PO10: Communicate effectively with the engineering community and with society at large.

PO11: 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: 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, Tautological Implications, equivalence of formulas, Duality law other connectives	CO-I	Show the following implication witho constructing truth table $((P\vee\neg P)\to Q)\to((P\vee\neg P)\to R)\Rightarrow Q\to R$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
2	Normal forms, Rules of inference Consistency of premises and Indirect method of proof.	CO-I	Obtain the principal conjunctive norm form and principal disjunctive normal form of $(\neg P\to R)\wedge(Q\leftrightarrow P)$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
3	Rules of inference, Consistency of premises and Indirect method of proof. Predicates, the statement function, variables and quantifiers	CO-I	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	predicate formula, free and bound variables, universe of discourse , inference theory of the predicate calculus	CO-I	Show that $(\forall x)(p(x)\vee q(x))$ $\Rightarrow(\forall x)\,p(x)\vee(\exists x)\,q(x)$	Lecture / Problem solving	Assignment (Week 2 - 4) / Mid-Test 1 (Week 9)
5	Relations, properties of binary relations in a set, Relation matrix and Graph of a relation	CO-II	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 1 (Week 9) / Quiz
6	Partition and covering of a set, equivalence relations, Compatible relation, Composition of binary relations.	CO-II	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 1 (Week 9)/ Quiz
7	Partial ordering, partially ordered set Hasse diagrams	CO-II	Let $A=\{a,b,c\}$, $p(A)$ is the power set of A. Let $\subseteq$ be the inclusion relation on the elements of $p(A)$. Draw Hasse diagram of $(p(A),\subseteq)$.	Lecture / Problem solving	Mid-Test 1 (Week 9) / Quiz
8	Definitions and examples of some simple algebraic systems, Definition and Examples of semi group and monoid, general properties. Groups: Definitions and examples.	CO-II	Prove that the set of idempotent elements of M for any abelian monoid $(M,*)$ forms a submonoid.	Lecture / Problem solving	Mid-Test 2 (Week 10) / Quiz
9	**Mid Exam-I**				

10	Basics of counting, Combinations and permutations, Enumerating Combinations and permutations with repetitions,	CO-III	Find the number of 4 digit numbers formed by the digits 1, 2, 3, 4, 5, 6, 7 and 8 which are more than 5000, if each digit is not used more than once in a number.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
11	Multinomial theorems, Generating Functions of sequences, Calculating coefficients of generating functions,	CO-III	Find the generating function of the Fibonacci sequence.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
12	Recurrence relations, Solving Recurrence relations by substitution, generating functions and the method of characteristic roots	CO-III	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)
13	Basic concepts: Graph, Directed Graph, Multi Graph, Degree of vertex and their properties,	CO-IV	In every graph, show that the sum of degrees of all the vertices is twice the number of edges.	Lecture / Problem solving	Mid-Test 2 (Week 18) / Assignment (12-14)
14	Adjacency Matrix, Cycle Graph, Bipartite graphs, Isomorphism and Subgraphs,	CO-IV	Determine whether the following graphs are isomorphic	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
15	Trees and their properties, Spanning trees: DFS, BFS, Kruskal's Algorithm for finding minimal Spanning tree.	CO-IV	Find the minimal spanning tree of the weighted graph	Lecture / Problem solving	Mid-Test 2 (Week 18)/ Quiz
16	Introduction to Fuzzy Sets, Fuzzy Relations, Applications of Fuzzy set theory	CO-V	Given $U_1 = U_2 = 1 + 2 + 3$, - $A_1 = .5/1 + 1./2 + .6/3$ and $A_2 = 1./1 + .6/2$, Find $A_1 \times A_2$		Mid-Test 2 (Week 18)/ Quiz
17	Possibility theory, Possibility – Probability relationship	CO-V	Show that the fuzzy set A defined over $\mathbb{R}$ with membership function $m_A(x) = \frac{u(x-\alpha) - u(x-(\alpha+a))}{a}$, is convex		Mid-Test 2 (Week 18)
18	**Mid Exam-II**				
19/20	**END EXAM**				