

Department	Department of Applied Sciences(Mathematics)		
Program Name	CSE		
Course Code	AML4209		
Course Name	Discrete Structures		
Lecture / Tutorial (per week)	5-1-0	Course Credits	5
Course Coordinator Name	Ms Deepika Goyal		

1. Objectives of the Course

- To understand the theory and techniques of logic, graphs and trees, and algebraic systems.
- To apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems.
- To communicate mathematical ideas and to make effective use of appropriate technology.
- To comprehend discrete structures and their relevance within the context of computer science, in the areas of data structures and algorithms, in particular (Enabling Knowledge).
- To apply discrete structures into other computing problems such as formal specification, verification, databases, and cryptography (Problem Solving).

2. Course Learning Outcomes

CLO1: To apply the knowledge obtained to investigate and solve a variety of live problems related to sets,

Relations and Functions.

CLO2: To solve real life problems using combinatorics.

CLO3: To understand and apply the theory and techniques of Lattice, Logic and Boolean algebra.

CLO4: To comprehend Graph Theory and its relevance within the context of computer science and finding

solutions of live problems related to shortest path etc.

3. Recommended Books

1. 'Elements of Discrete Mathematics', C.L. Liu, McGraw-Hill.
2. 'Discrete Mathematics', Babu Ram, Pearson Education.
3. 'Discrete Mathematics' by Lipschutz/Lipson, Schaum Series, 2nd Edition, TMH, Edition.
4. 'Discrete Mathematics and its Applications' by Kenneth H. Rosen, McGraw- Hill, 2007, Sixth Edition.
5. 'The Discrete Mathematics', Chitkara University Publications.
6. 'Logic and Discrete Mathematics' Trembly/Grassmann, Pearson Education.

4. Other readings and relevant websites

S.No.	Link of Journals, Magazines, websites and Research Papers
1.	http://www.studyjaar.com/index.php/module-video/watch/111-sets-difference-operation-power-set-and-laws-of-set-operations
2.	http://faculty.simpson.edu/lydia.sinapova/www/cmssc180/LN180_Johnsonbaugh-07/L17-EquivalenceRel.htm
3.	http://web.cs.wpi.edu/~cs504/s00m/notes/recurrence/solve/step2/step2.html
4.	http://www.iep.utm.edu/prop-log/
5.	http://plato.stanford.edu/entries/boolalg-math/
6.	http://www.math.uvic.ca/faculty/gmacgill/guide/M222Graphs.pdf



7.	http://www.math.leidenuniv.nl/~hfinkeln/seminarium/toepassingenEuler.pdf
8.	http://staff.scem.uws.edu.au/cgi-bin/cgiwrap/zhuhan/dmath/dm_readall.cgi?page=16
9.	https://www.youtube.com/watch?v=WN3Rb9wVYDY

Lecture Number	Topics
1-5	Introducing sets: Properties & Operations on sets, Subsets, Power set, Inclusion-exclusion principle. Principle of duality, Cartesian product of sets, Partition of sets, Minsets, Maxsets.
6-8	Introduction to relations: Types of relation, Pictorial & Matrix representation of relation, Inverse relation, Composition of relation, Properties of relation.
9-10	Equivalence relation, Partial order relation.
11-12	Introduction to functions: Types of functions, Domain & Range of functions, Inverse function, Injective, Surjective, Bijective & Composition of functions, Recursive function.
13-15	Permutations & Combinations, Pigeonhole principle.
16-20	Recurrence relation: Homogeneous and Non-homogeneous recurrence relation with constant coefficients.
21-24	Characteristic polynomial & Introduction to generating functions: Methods of generating functions.
Sessional Test (ST)-1 (18th-23rd February, 2017)	
25-27	Logic: Propositions & logical operators, Truth table. Laws of logic & Quantifiers, Validity of arguments, Truth values.
28-33	Lattices: Definition of lattice, Sub lattice, Isomorphic lattices, Bounded lattice, Distributive lattice, Complemented lattice, Modular lattice.
34-36	Boolean Algebra: Atoms, Boolean expressions, Applications of Boolean algebra to switching theory & Logic Gates.
37-38	Graph Theory: Introduction to graphs & Sub graphs. Directed & Undirected graph, Order & Size of graph, Degree of vertex, Source, Sink, Eccentricity, Trail, Walk, Path, Distance, Diameter, Cycle, Wheel.
39-40	Multi graph, Planer graph, Pseudo graph, weighted graph, Regular, Complete and Traversable graph. Isomorphism of graphs, Sub graphs, Complement of graph.
41-42	Adjacency Matrix, Adjacency List, Incidence Matrix, Regular, Complete and Traversable graph.
43-45	Complete Bipartite graph & Spanning Graph, Cut vertex, Cut edge, Region, Eulerian & Hamiltonian graphs.
Sessional Test (ST)-2 (1st, 5th -8th April, 2017)	
46-48	Euler's formula & its applications: Traveling salesman problem, Konigsberg Bridge problem, Chromatic number & Graph coloring by Welch polch Algorithm.
49-50	Tree: Binary trees, Traversing binary trees, Rooted & spanning tree, Algebraic expression trees, Depth-First Search Algorithm, Breadth-First Search Algorithm.
51-55	Shortest path algorithm: Kruskal's Algorithm, Increasing order Algorithm, Dijkstra's Algorithm
56-60	Warshall's Algorithm, Prim's Algorithm
Sessional Test (ST)-3 (1st -5th May, 2017)	

Evaluation Scheme:

Component 1	Internal Evaluation Components(IEC's)*	10
Component 2*	Sessional Tests (STs)**	30
Component 3**	End Term Examination***	60
	Total	100

- * There will be two IEC's (Internal Evaluation Components) one is before ST-1 & other is before ST-2.
 - ** There are three Sessional Tests (STs) for all theory papers. The average of the best two will be taken as final internal assessment.
 - ***The End Term Comprehensive examination will be held at the end of semester.
- The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

SYLLABUS

Contents	Lectures
Introducing sets: Properties & operations on sets, Subsets, Power set, Inclusion exclusion principle, Principle of duality, Cartesian Product of Sets, Partition of sets, Minsets, Maxsets.	5
Introduction to relations: Types of relation, Pictorial & Matrix representation of relation, Inverse relation, Composition of relation, Properties of relation, Equivalence relation, Partial order relation	5
Introduction to functions: Types of functions, Domain & Range of functions, Inverse function, Injective, Surjective, Bijective & Composition of functions, Recursive function, Permutations & Combinations, Pigeonhole principle	5
Recurrence relation: Homogeneous and Non-homogeneous recurrence relations with constant coefficients.	5
Characteristic polynomial & Introduction to generating functions: Methods of generating functions.	4
Logic: Propositions & Logical operators, Truth table. Laws of logic & Quantifiers, Validity of arguments, Truth values.	3
Lattices: Definitions of lattice, Sub lattice, Isomorphic lattices, Bounded lattices, Distributive lattices, Complemented lattices, Modular lattice.	6
Boolean Algebra: Atoms of Boolean algebra, Boolean expressions, Applications of Boolean algebra to switching theory & Logic Gates.	3
Graph Theory: Introduction to graphs & Sub graphs. Directed & Undirected graph, Order & Size of graph, Degree of vertex, Source, sink, Eccentricity, Trail, Walk, Path, Distance, Diameter, Cycle, Wheel.	12
Multi graph, Planer graph, Pseudo graph, Weighted graph, Regular, Complete and Traversable graph. Isomorphism of graphs, Sub graphs, Complement of graph, Adjacency Matrix, Adjacency List, Incidence Matrix, Regular, complete and Traversable graph.	
Complete Bipartite graph & Spanning Graph, Cut vertex, Cut edge, Region, Eulerian & Hamiltonian graphs.	
Euler's formula & its applications: Traveling salesman problem, Konigsberg Bridge problem, Chromatic number & Graph coloring by Welch polch Algorithm.	
TREES: Binary trees, Traversing binary trees, Rooted & Spanning tree, Algebraic expression trees, Depth-First Search Algorithm, Breadth-First Search Algorithm.	12
Shortest path algorithm: Kruskal's Algorithm, Increasing order Algorithm, Dijkstra's Algorithm, Warshall's Algorithm, Prim's Algorithm.	

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Ms Deepika (Assistant Professor)	
HOD	Dr Mohit Kakkar (Professor)	

Deputy Dean	Dr Jyotsna Kaushal (Professor)	
Date	09/01/2017	