



Kot Bhalwal, Jammu

Model Institute of Engineering
& Technology (Autonomous)
Course Handout

COURSE HANDOUT

DISCRETE MATHEMATICS (MCA-104)

MCA-1st SEMESTER

ACADEMIC YEAR (2024-25)

Dr. Sooraj Singh

Assistant Professor

Department of Masters of Computer Applications



Department of Masters of Computer Applications

Model Institute of Engineering & Technology (Autonomous)

Kot Bhalwal, Jammu - 181122

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Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Internal	Final Exam	Total
MCA-104	Discrete Mathematics	PCC	4	4	0	0	40	60	100
Faculty Details	sooraj.ash@mietjammu.in								

Course Outcomes

At the end of the course the student will be able to	
CO1	Explain problems using recurrence relations.
CO2	Analyze the role of Relations and Functions in computer science
CO3	Model problems in Computer Science using graphs and trees.
CO4	Describe basic terminology of mathematical logic to solve a variety of problems.
CO5	Model problems in Computer Science using, trees and Graph coloring

Section-A

Unit I Overview of Counting: Basic principles of counting, pigeon-hole principle, generating functions, recurrence Relations, linear recurrence relations with constant coefficients, modelling various problems as recurrence relations, Homogenous recurrence relations and their solutions, particular solutions and total solution.

Problems of Fibonacci Numbers and tower of Hanoi and their solution using recurrence relation.

(10 Hrs.)

Unit II: Relations and Functions: Domain, range and inverse of Relation, Composition of relations, Types of elations, Closure of relations etc. Relation Vs Function, Types of functions, Sum and product of functions, functions used in Computer Science (Floor and Ceil function, Remainder, characteristic and hash function).

(10 Hrs.)

Unit III: Theory of Graphs: Basic terminology of graphs, multigraphs, directed and weighted graphs, paths and circuits, Types of graphs, Computer representation of graphs, Operations on Graphs, spanning trees using BFS, DFS and their applications, shortest path in weighted graphs and planar graphs, Detection of planarity.

Eulerian paths and circuits, Hamiltonian paths and circuits.

(10 Hrs.)

Section B

Unit-IV: Trees and Graph Coloring: Tree and its properties, Center of a tree and rooted trees, tree traversals, minimal spanning trees, cut sets, etc. Coloring of graphs, dual graph; Vertex coloring, Chromatic number; Chromatic polynomial, The four color problem, edge coloring, Coloring algorithms. Applications of trees and graph coloring

(10Hrs.)

Unit-V: Mathematical Logic: Propositions, connectives, conditionals and biconditionals, well-formed formulas, tautologies, equivalence of formulas, duality law, normal forms, inference theory for propositional calculus; predicate calculus: predicates, free and bound variables, inference theory of predicate calculus. Introduction to algebraic structures, groups

(10Hrs)



Textbooks

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Discrete Mathematics	Kenneth Rosen	McGraw Hill Education	7th (2017)
2	Graph Theory with applications to Engineering and Computer Science	Narsingh Deo	Prentice Hall	1st (2016)
3	Discrete Mathematics structure with applications to Computer Science	Jean-Paul Tremblay and R Manohar	McGraw Hill Education	1st (2017)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Concrete Mathematics	Ronald Graham, Donald Knuth, and Oren Patashnik	Pearson Education Publishers	2nd (2008)

Other Recommended Books

1.	An Introduction to Graph Theory	S. Pirzada	Universities Press	1st
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COURSE PLAN		
Unit-I Overview of Counting		
S.No	Topics	Recommended Books
1	Basic principles of counting	Book 1, Ch.1
2	Pigeon-hole principle	Book 1, Ch.1
3	Generating functions	Book 1, Ch.1
4	Recurrence relations	Book 1, Ch.2
5	Linear recurrence relations with constant coefficients	Book 1, Ch.2
6	Fibonacci sequence	Book 1, Ch.2
7	Tower of Hanoi	Book 1, Ch.2
Unit-II Relations and Functions		
8	Domain, range and inverse of relation	Book 2, Ch.3
9	Types of relations	Book 2, Ch.3
10	Closure of relations	Book 2, Ch.3
11	Function and its types	Book 2, Ch.3
12	Sum and product of functions	Book 2, Ch.3
13	Floor and Ceil functions	Book 2, Ch.3
14	Remainder, characteristic and hash function	
Unit-III Theory of Graphs		
15	Basic terminology of graphs	Book 3, Ch.4
16	Types of graphs	Book 3, Ch.4
17	Operations on graphs	Book 3, Ch.4
18	Spanning trees and their applications	Book 3, Ch.4



19	Shortest path in graphs	Book 3, Ch.4
20	Planarity of graphs	Book 3, Ch.4
21	Eulerian and Hamiltonian paths and circuits.	Book 3, Ch.4
Unit-IV Trees and Graph Coloring		
22	Tree and its properties	Book 3, Ch.5
23	Minimal spanning trees	Book 3, Ch.5
24	Cut sets	Book 3, Ch.5
25	Coloring of graphs	Book 3, Ch.5
26	Chromatic number and Chromatic polynomial	Book 3, Ch.5
27	The four color problem	Book 3, Ch.5
28	Edge coloring and Coloring algorithms	Book 3, Ch.5
29	Applications of trees and graph coloring	Book 3, Ch.5
Unit-V Mathematical Logic		
30	Propositions, connectives, conditionals and biconditionals	Book 3, Ch.7
31	Well-formed formulas and equivalence of formulas	Book 3, Ch.7
32	Tautologies and duality law	Book 3, Ch.7
33	Normal forms	Book 3, Ch.7
34	Inference theory for propositional calculus	Book 3, Ch.7
35	Predicate calculus	Book 3, Ch.8
36	Inference theory for predicate calculus	Book 3, Ch.8
37	Introduction to algebraic structures	Book 3, Ch.8

GRADING AND ASSESSMENT

- **Sessional Test:** 20 marks
- **Assignment:** 10 marks
- **Attendance:** 10 marks
- **Final Examination:** 60 marks

COURSE POLICIES

- **Attendance:** Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity:** MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions:** Assignments and projects must be submitted by the specified timelines.





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FACULTY INFORMATION

- **Contact Information**
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