COURSE HANDOUT

DISCRETE MATHEMATICS (BSC-401)

CSE AI\ML – 4TH SEMESTER

ACADEMIC YEAR (2023-24)

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
BSC-401	Discrete Mathematics	Core	4	3	1	0	50	100	150

COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Understand basic principles of sets and operations in sets.
CO2	Analyze relations and functions and be able to determine their properties.
CO3	Apply logical notation to describe an argument.
CO4	Evaluate the basics concepts of groups, its examples and related results.
CO5	Create graphs and trees using different transversal methods.

Unit-I

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Finite and infinite sets, countable and uncountable sets, Binary Relation and its types, Functions and its types, Principles of Mathematical induction, Principle of inclusion and exclusion, pigeon-hole principle.

(10 Hours)

Unit-II

Algebraic Structure: Groups and Subgroups, related theorems, cosets, Normal subgroups and group homomorphism. Rings, Integral domains and Fields: examples and related results.

(8 Hours)

Unit-III

Basic Logic: Propositional logic, Logical connectives, Truth tables, Normal forms (conjunctive and disjunctive), Validity of well-formed formula, Propositional inference rules (concepts of modus ponens and modus tollens), Predicate logic, Universal and existential quantification.

(10 Hours)

Unit- IV

Graphs: Basic terminology, multi-graphs and weighted graphs, connectivity, walk and path, circuits and cycles, shortest path in weighted graphs, Algorithm of shortest path. Hamiltonian and Eulerian paths and circuits, Eulerian graphs, Hamiltonian graphs, Konigsberg bridge problem, Chinese postman problem, Travelling salesperson problem, Planar graph and Euler's formula.

(11 Hours)

Unit-V

Trees and cut sets: Trees, rooted trees, path lengths in rooted trees, spanning trees and cut sets.

(3 Hours)

Textbooks

S.No	Name of the Books	Name of the Author	Publisher Name	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)

Reference Books

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Concrete Mathematics	Ronald Graham, Donald Knuth, and Oren Patashnik	Pearson Education Publishers	2nd (2008)
2	Elements of Discrete Mathematics	C. L Liu	McGraw-Hill Inc	2nd (1985)
3	Discrete Mathematics Schaum 's Outlines	Lipschutz, S. and Mark Lipson	Tata McGraw Hill	3rd (2007)

COURSE PLAN		
Unit-I Sets, Relation and Functions		
S.No	**Topics**	**Recommended Books**
1	Operations and Laws of Sets	Book 1, Ch.1
2	Cartesian Products, Finite and infinite sets, countable and uncountable sets	Book 1, Ch.1
3	Binary Relation and its types	Book 1, Ch.1
4	Functions and its types	Book 2, Ch.2
5	Principles of Mathematical induction	Book 2, Ch.2
6	Principle of inclusion and exclusion	Book 2, Ch.2
7	Pigeon-hole Principle	Book 2, Ch.2
Unit-II Algebraic Structure		
8	Groups and subgroups with their related theorems	Book 1, Ch.2
9	Cosets, Normal subgroups and Group homomorphism.	Book 1, Ch.2
10	Rings and Integral domains	Book 1, Ch.1
11	Fields: examples and related results	Book 2, Ch.2
Unit-III Basic Logic		
12	Propositional logic, Logical connectives, Truth tables and Predicate logic	Book 2, Ch.2
13	Normal forms (conjunctive and disjunctive)	Book 2, Ch.2
14	Validity of well-formed formula	Book 2, Ch.2
15	Concepts of modus ponens and modus tollens	Book 2, Ch.2
16	Universal and existential quantification	Book 2, Ch.2
Unit-IV Graphs		
17	Basic terminology of graphs and multi-graphs	Book 2, Ch.3
18	Connectivity, walk and path, circuits and cycles	Book 2, Ch.4
19	Weighted graphs, shortest path in weighted graphs, Algorithm of shortest path	Book 2, Ch.4
20	Hamiltonian and Eulerian paths and circuits	Book 2, Ch.3
21	Eulerian graphs, Hamiltonian graphs	Book 1, Ch.3
22	Konigsberg bridge problem, Chinese postman problem, Travelling salesperson problem	Book 2, Ch.3
23	Planar graph and Euler's formula	Book 1, Ch.3
Unit-V Trees and cut sets		
24	Trees and rooted trees	Book 2, Ch.8
25	Path lengths in rooted trees	Book 1, Ch.8

26	Spanning trees and cut sets	Book 2, Ch.8

ADDITIONAL WEB RESOURCES

1.	https://nptel.ac.in/content/storage2/111/106/111106102/MP4/mod01lec01.mp4. This video link contains basic concepts of **graph theory**.
2.	https://nptel.ac.in/content/storage2/111/106/111106113/MP4/mod01lec02.mp4. This link contains **definition of Group and its examples**.
3.	https://nptel.ac.in/content/storage2/111/106/111106113/MP4/mod02lec08.mp4. This link contains the topic **Subgroup of a Group**.
4.	https://nptel.ac.in/content/storage2/111/106/111106131/MP4/mod01lec01.mp4. This video contains introduction to **Rings and Fields**.

GRADING AND ASSESSMENT

- **Sessional Test**: 20 marks
- **Assignment**: 20 marks
- **Attendance**: 10 marks
- **Final Examination**: 100 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.

FACULTY INFORMATION

- **Office Hours**

  Monday (12:05 PM - 12:55 PM)
  Thursday (12:05 PM - 12:55 PM)

- **Contact Information**
  pallavi.ash@mietjammu.in