COURSE PLAN

Department :	MATHEMATICS				
Course Name & code :	Discrete Mathematics MAT 2138				
Semester & branch :	III	Mathematics and Computing			
Name of the faculty :	**Vinay Madhusudanan**				
No of contact hours/week:	**L**	**T**	**P**	**C**	
	2	**1**	**0**	**3**	

COURSE OUTCOMES (COS)

At the end of this course, the student should be able to:		No. of Contact Hours	Marks	Program Outcomes (POs)	PSO	BL (Recommended)
CO1	Formally define fundamental set-theoretic concepts and set operations.	4	10	1,2,8,12		1,2,3,4
CO2	Understand and the concepts of relations, functions, and their classification, and apply these to formally define cardinalities of sets.	8	10	1,2,8,12		1,2,3,4
CO3	Formulate and solve computing problems in terms of graphs and write mathematically rigorous proofs in graph theory.	12	15	1,2,8,12		1,2,3,4
CO4	Solve enumeration problems using advanced techniques in combinatorics.	12	15	1,2,8,12		1,2,3,4
	Total	**36**	**50**			

*** COURSE LEARNING OUTCOMES (CLOS)

At the end of this course, the student should be able to:		No. of Contact Hours	Marks	Program Outcomes(POs)	Learning Outcomes (LOs)	BL (Recommended)
CLO1	Formally define fundamental set-theoretic concepts and determine the cardinality of a given set.	4	10	1,2,8,9	**1,2,3**	**1,2,3,4**
CLO2	Understand and the concepts of relations, functions, and their classification, and apply these to formally define cardinalities of sets.	8	10	1,2,8.9	**1,2,3**	**1,2,3,4**
CLO3	Formulate and solve computing problems in terms of graphs and write mathematically rigorous proofs in graph theory.	12	15	1,2,8,9	**1,2,3**	**1,2,3,4**
CLO4	Solve enumeration problems using advanced techniques in combinatorics.	12	15	1,2,8,9	**1,2,3**	**1,2,3,4**
	Total	**36**	**50**			

***** Applicable to programs applied for IET accreditation only.**

Assessment Plan

IN – SEMESTER ASSESSMENTS								
S. No.	**Assessment Mode**	**Assessment Method**	**Time Duration**	**Marks**	**Weightage**	**Typology of Questions (Recommended)**	**Schedule**	****Topics Covered**

1	**MISAC**	**1**	**In-semester Exam 1**	**60 Mins**	**15**	**Objective:** 5M 10 MCQs × ½ = 5 marks **Descriptive:** 10 M (2 Questions of 2 marks +2 Questions of 3 marks)	Bloom's taxonomy (B) level of the question should be L3 and above.	18-4-2023	L1 – L15
		2	**Assignment 1**	**15 days**	**5**	10 MCQs × ½ = 5	Bloom's taxonomy (BT) level of the question should be L3 and above.		L1—L10
		3	**Assignment 2**	**15 days**	**5**	2 STQ× 2½= 5	Bloom's taxonomy (BT) level of the question should be L3 and above.		L11—L20
		4	**Assignment 3**	**15 days**	**5**	2 STQ× 2½= 5	Bloom's taxonomy (BT) level of the question should be L3 and above.		L21—L26
		3	**Assignment 4**	**15 days**	**5**	2 STQ× 2½= 5	Bloom's taxonomy (BT) level of the question should be L3 and above.		L27—L34

		4	**In-semester Exam 2**	**60 Mins**	**15**	**Objective:** 5M 10 MCQs × ½ = 5 marks **Descriptive:** 10 M (2 Questions of 2 marks +2 Questions of 3 marks)	Bloom's taxonomy (BT) level of the question should be L3 and above.	18-4-2023	L16—L31
END – SEMESTER ASSESSMENT									
1	**Regular/Make–Up Exam**			180 Mins	50	Answer all 5 full questions of 10 marks each. Each question can have 3 parts of 2/3/4/5/6 marks.	Bloom's taxonomy (BT) level of the question should be L3 and above.	17th week of the semester	Comprehensive examination covering full syllabus.

** ***Individual faculty will be entering the topics***

*** ***Individual faculty must identify the assessment method from table 3 and fill in the details.***

NOTE: ***Information provided in the table is as per the In-semester assessment plan and schedule of V and VII semester B. Tech provided from Academic Section.***

LESSON PLAN

L No	TOPICS	Course Outcome Addressed
1	Elementary set theory – Relations between sets, operations of sets	CO1
2	Relations and their properties. Equivalence relations and partial order relations	CO1
3	Partitions of a set	CO1
4	Characterisation of equivalence relations	CO1
5	Tutorial	CO2
6	Functions, composition of functions, properties	CO2
7	Injective, surjective, and bijective functions	CO2
8	Isomorphism of sets and cardinality	CO2
9	Characterisation of isomorphisms	CO2
10	Countability of rationals	CO2
11	Proof of uncountability of reals	CO2
12	Tutorial	CO2
13	Combinatorics – Introduction and motivating examples	CO2
14	Combinations with unrestricted repetition, distributions	CO2
15	Tutorial	CO2
16	Ordinary and exponential generating functions. Examples of OGFs	CO3
17	OGFs for combinations with repetition	CO3
18	EGFs for permutations with repetition	CO3
19	Combinatorial families and general theory of generating functions	CO3
20	Tutorial	CO3
21	Recurrence relations. Direct solutions of simple recurrences	CO3
22	Recurrence relations solvable by OGFs	CO3
23	Tutorial	CO3
24	Exponential	CO3
25	Enumeration of rooted, labelled trees using generating functions	CO3
26	Simultaneous recurrences. Multivariable generating functions	CO3
27	Tutorial	CO3
28	Definition of graphs, order, size, degrees. Handshaking lemma	CO4
29	Subgraphs and complements	CO4
30	Walks, paths, cycles. Distances in graphs	CO4
31	Connectedness and related theorems	CO4
32	Tutorial	CO4
33	Adjacency matrix and its powers. Application to counting triangles	CO4
34	Graph isomorphism. Self-complementary graphs	CO4
35	Bipartite graphs – Characterisation. Adjacency matrix of a bipartite graph	CO4
36	Trees – Characterisation in terms of uniqueness of paths	CO4
37	Tutorial	CO4
38	Characterisation of trees in terms of order, size, connectedness, and acyclicity	CO4
39	Dijkstra's algorithm for single-source shortest paths	CO4
40	Tutorial	CO4

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3						1				1			
CO2	3	3						1				1			
CO3	2	3						1				1			
CO4	2	2						1				1			
Articulation Level	2.4	2.4						1				1			

FACULTY MEMBERS TEACHING THE COURSE (IF MULTIPLE SECTIONS EXIST):

FACULTY	SECTION	FACULTY	SECTION
VM	A		

References:

1. E. S. Page and L. B. Wilson, An Introduction to Computational Combinatorics, Cambridge Press, 1979.
2. K. H. Rosen, Discrete Mathematics and Its Applications 7th Edition, Tata McGraw Hill, 1988.
3. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill Inc., 1985.
4. A. Tucker, Applied Combinatorics, John Wiley & Sons, Inc., 2012.
5. R. Graham, D. Knuth, and O. Patashnik, Concrete Mathematics 2nd Edition, Pearson Education Publishers, 1996.
6. P. J. Cameron, Combinatorics: Topics, Techniques, Algorithms, Cambridge University Press, 1994.

Submitted by: Vinay Madhusudanan

(Signature of the faculty)

Date: 01/08/2025

Approved by: Dr Kuncham Syam Prasad

(Signature of HOD)