COURSE INFORMATION SHEET

Course code: MA24205
Course title: Discrete Mathematics
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:1 P:0 C:4
Class schedule per week: 3 Lectures, 1 tutorial
Class: IMSc
Semester / Level: IV/2
Branch: Mathematics and Computing
Name of Teacher:

Course Objectives: This course enables the students to

1.	exposed to a wide variety of mathematical concepts that are used in the Computer Science discipline, which may include concepts drawn from the areas of Number Theory, Graph Theory and Combinatorics.
2.	come across a number of theorems and proofs. Theorems will be stated and proved formally using various techniques.
3.	gain the various graphs algorithms along with its analysis
4.	apply graph theory-based tools in solving practical problems.

Course Outcomes: After the completion of this course, students will be able to

CO1.	understand and simplify basic logic statements, predicates and quantifiers and proofing methodologies.
CO2.	able to solve set theoretic and generating function problems
CO3.	apply mathematical logic and reasoning to solve real time problems
CO4.	be familiar with algebraic systems, groups, subgroups and Lagrange's theorem
CO5.	understand the concepts in graph theory and would able to apply in real world problems

Syllabus

MA24205 Discrete Mathematics 3-1-0-4

Module I

Mathematical logic and Mathematical Reasoning, Compound Statements, Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Mathematical Induction, Well-ordering principal, Recursive Definition and Algorithms. [9L]

Module II

Recurrence Relations, Classification of Recurrence Relations and their solutions by Characteristic Root method, Generating function and their various aspects, Utility of Generating function in solving Recurrence Relations. [9L]

Module III

Set, Operations on Set, Computer representation of Set, Relations, Properties/Classification of Relations, Closure operations on Relations, Matrix representation of Relations, Digraphs. Functions and their Representation, Classification of Functions, Warshall's algorithm, Discrete Numeric Functions, Growth of Functions, Big O , Big Θ , Hash Function, Growth Functions. [9L]

Module IV

Binary Operations, Groups, Product and Quotients of Groups, Semi group, Products and Quotients of Semi groups, Permutation Group, Composition of Permutation, Inverse Permutation, Cyclic Permutation, Transposition, Even and Odd Permutation, Coding of Binary Information and Error Correction, Decoding and Error Correction. [9L]

Module V

Introduction to Graph, Graph Terminologies and their Representation, Connected & Disconnected graphs, Isomorphic Graph, Euler & Hamilton graphs. Introduction to Trees, Versatility of Trees, Tree traversal. Spanning Trees, Minimum Spanning Tree. [9L]

Text Books:

1. Mott, Joe L., Abraham Kandel, and Theodore P. Baker Discrete Mathematics for Computer Scientists & Mathematicians, PHI, 2nd edition 2002.
2. Swapan Kumar Chakraborty and Bikash Kanti Sarkar: Discrete Mathematics, Oxford Univ. Publication, 2010.
3. Kolman, Bernard, Robert C. Busby, and Sharon Ross. Discrete mathematical structures, Prentice-Hall, Inc., 2003.

Reference Books:

1. Bikash Kanti Sarkar and Swapan Kumar Chakraborty, *Combinatorics and Graph Theory*, PHI, 2016.
2. Seymour Lipschuz and Mark Lipson, *Discrete Mathematics*, Shaum's outlines, 2003.
3. Liu, Chung Laung, *Elements of Discrete mathematis*, Mcgraw Hill, 2nd edition, 2001.
4. Bondy and Murty, Grapg Theory with Applications, American Elsevier,1979.
5. Robin J. Wilson, Introduction to Graph Theory, Pearson, 2010.

Gaps in the Syllabus (to meet Industry/Profession requirements)

1. Permutations and combinations
2. Relation between group theory and coding of binary information
3. Connectivity concept in graphs.

POs met through Gaps in the Syllabus

3, 4, 10

Topics beyond syllabus/Advanced topics/Design

1. Boolean algebra and lattices
2. Counting the number of sub groups in a finite group
3. Planar graphs and graph coloring

POs met through Topics beyond syllabus/Advanced topics/Design

2, 3, 4, 10, 12

Course outcome (co) attainment assessment tools & evaluation procedure

Direct assessment

Assessment tool	% contribution during co assessment
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment components	CO1	CO2	CO3	CO4	CO5
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	

Indirect assessment –

1. Student feedback on course outcome

Mapping of course outcomes onto program outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO2	3	2	2	2	1	1	2	1	3	3	2	2	2	3	3
CO3	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO4	2	2	3	1	1	1	1	1	3	3	2	2	2	3	3
CO5	2	2	3	3	1	2	1	1	3	3	2	2	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If satisfying< 34%=1, 34-66% =2, > 66% = 3

CD Code	Course delivery methods
CD1	Lecture by use of boards/lcd projectors/ohp projectors
CD2	Tutorials/assignments
CD3	Seminars
CD4	Mini projects/projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of nptel materials and internets
CD9	Simulation

Mapping Between COs and Course Delivery (CD) methods

Course Outcome	Course Delivery Method Used
CO1	CD1, CD 8
CO2	CD1, CD8
CO3	CD1, CD2 and CD3
CO4	CD1 and CD2
CO5	CD1 and CD2