

Short Syllabus

Discipline-Linked Engineering Sciences

BMAT205L Discrete Mathematics and Graph Theory (3-1-0-4)

Mathematical Logic-Tautologies, Predicate Calculus; Algebraic Structures-Groups, Subgroups, Homomorphism; Counting Techniques-Pigeonhole principle, Permutations and combinations, Inclusion-exclusion principle, Recurrence relations; Lattices and Boolean algebra-Partially Ordered Relations, Boolean algebra; Fundamentals of Graphs- Planar, Complete graph, Euler and Hamilton Paths, Shortest Path algorithms; Trees, Fundamental circuits, Cut sets-Trees, Spanning Trees, Fundamental circuits and cut-sets; Graph colouring, covering, Partitioning-Chromatic number, Four Colour problem.

BMAT205L	Discrete Mathematics and Graph Theory	L	T	P	C
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Pre-requisite	NIL	Syllabus Version			
		1.0			
Course Objectives:					
1. To address the challenges of the relevance of lattice theory and algebraic structures to computer science and engineering problems.					
2. To use Counting techniques, in particular recurrence relations to computer science problems.					
3. To understand the concepts of graph theory and related algorithm concepts.					
Course Outcomes:					
At the end of this course, students are expected to					
1. Learn proof techniques and concepts of inference theory					
2. Use algebraic structures in applications					
3. Counting techniques in engineering problems.					
4. Use lattice and Boolean algebra properties in Digital circuits.					
5. Solve Science and Engineering problems using Graph theory.					
Module:1	Mathematical Logic	7 hours			
Statements and Notation-Connectives–Tautologies-Equivalence - Implications–Normal forms - The Theory of Inference for the Statement Calculus - Predicate Calculus - Inference Theory of the Predicate Calculus					
Module:2	Algebraic Structures	6 hours			
Semigroups and Monoids - Groups – Subgroups – Lagrange’s Theorem Homomorphism – Properties-Group Codes.					
Module:3	Counting Techniques	6 hours			
Basics of counting - Pigeonhole principle - Permutations and combinations - Inclusion-exclusion principle - Recurrence relations - Solving recurrence relations - Generating functions-Solution to recurrence relations.					
Module:4	Lattices and Boolean algebra	6 hours			
Partially Ordered Relations -Lattices as Posets – Hasse Digram – Properties of Lattices – Boolean algebra-Properties of Boolean Algebra-Boolean functions.					
Module:5	Fundamentals of Graphs	6 hours			
Basic Concepts of Graph Theory – Planar and Complete graph - Matrix representation of Graphs – Graph Isomorphism – Connectivity–Cut sets-Euler and Hamilton Paths–Shortest Path algorithms					
Module:6	Trees, Fundamental circuits, Cut sets	6 hours			
Trees – properties of trees – distance and centres in tree – Spanning trees – Spanning tree algorithms- Tree traversals- Fundamental circuits and cut-sets					
Module:7	Graph colouring, covering, Partitioning	6 hours			
Bipartite graphs - Chromatic number – Chromatic partitioning – Chromatic polynomial - matching – Covering– Four Colour problem.					
Module:8	Contemporary Issues	2 hours			
	Total Lecture hours:	45 hours			
	Total Tutorial hours:	15 hours			
Text Books:					
1. Discrete Mathematical Structures with Applications to Computer Science, J .P. Trembley and R. Manohar, Tata McGraw Hill-35 th reprint, 2017.					
2. Graph theory with application to Engineering and Computer Science. NarasingDeo.					

Prentice Hall India 2016.			
Reference Books:			
1. Discrete Mathematics and its applications, Kenneth H. Rosen, 8 th Edition, Tata McGraw Hill, 2019. 2. Discrete Mathematical Structures, Kolman, R.C.Busby and S.C.Ross, 6 th Edition, PHI, 2018. 3. Discrete Mathematics, Richard Johnsonbaugh, 8 th Edition, Prentice Hall, 2017. 4. Discrete Mathematics, S. Lipschutz and M. Lipson, McGraw Hill Education (India) 2017. 5. Elements of Discrete Mathematics—A Computer Oriented Approach, C.L.Liu, Tata McGraw Hill, Special Indian Edition, 2017. 6. Introduction to Graph Theory, D. B. West, 3 rd Edition, Prentice-Hall, Englewood Cliffs, NJ, 2015.			
Mode of Evaluation: CAT, Quizzes, Digital Assignments, FAT			
Recommended by Board of Studies	15.02.2022		
Approved by Academic Council	No. 65	Date	17-03-2022