UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN MATHEMATICS

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">DISCRETE MATHEMATICS</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE COURSE – V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">334E5D</td></tr>
<tr><td>Semester</td><td>V</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td>--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• To understand the fundamental concepts of discrete mathematics.
• To develop the ability to solve problems in combinatorics, propositional and predicate logic, relations and recurrence relations.
• To develop logical thinking skills and problem-solving skills.</td></tr>
<tr><td colspan="2" rowspan="5">Course Outline</td><td colspan="6">UNIT-I: Propositional Logic: Definition, Statements & Notation, Truth Values, Connectives, Statement Formulas & Truth Tables, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Examples Hours: 15</td></tr>
<tr><td colspan="6">UNIT-II: Predicate Logic: Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; The Universe of Discourse, Examples, Valid Formulas & Equivalences, Examples. Hours: 15</td></tr>
<tr><td colspan="6">UNIT-III: Lattices & Boolean Algebra: Properties of lattices – Lattice as Algebraic System-Sub lattices- lattice Homomorphism- Special Lattices – Boolean Algebra- sub algebra- Boolean Expression and Boolean functions- expression of a Boolean function in canonical form-logic Gates- Karnaugh Map Method Hours: 15</td></tr>
<tr><td colspan="6">UNIT – IV: Basics of Counting: The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations, Inclusion-Exclusion Principle. Hours:15</td></tr>
<tr><td colspan="6">UNIT-V: Formal Language: Introduction- Phrase –Structure Grammar- Types – BNF- Finite state Machine – Input output strings-Finite state Automata Hours: 15</td></tr>
<tr><td colspan="2"></td><td colspan="6">Total Hours: 75</td></tr>
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Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	**1.** Discrete Mathematical Structural with applications to Computer Science – J.P. Treambly and R. Manohar, Tata McGraw Hill, New Delhi, 1997 for **Unit 1 and Unit II.** **2.** Discrete Mathematics with Graph Theory and Combinatorics – T. Veerarajan – Tata McGraw Hill Publishing Company Second Reprint 2007, for **Units III, IV and V.**
Reference Books	1. Discrete Mathematical Structures with application toComputer Science, Tremblay and Manohar – (Tata McGraw Hill, New Delhi) 1997. 2. Discrete mathematics, Venkataraman .M.K. and others –2000The National Publishing Company.
Website and e-Learning Source	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-042j-mathematics-for-computer-science-fall-2005/ https://www.khanacademy.org/computing/computer-science/algorithms/intro-to-algorithms/v/discrete-mathematics

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Students will gain an understanding of the Basic definition of Logics with examples.

CLO 2: Students will gain knowledge of Predicate Logic.

CLO 3: Students will be able to implement and evaluate types of Lattices and Boolean Algebra

CLO 4: Students will learn about Pigeon Hole principle and Permutation and Combination.

CLO 5: Students will be able to gather information about Formal Languages.

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	3	1	3	2	1	1	3	3	2
CLO 2	1	3	2	2	1	1	3	3	2
CLO 3	3	2	1	2	1	1	3	3	2
CLO 4	2	2	3	2	1	1	3	3	2
CLO 5	3	2	1	2	1	1	3	3	2