



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

COURSE CONTENT

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE								
I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
2515801	Foundation	3	0	0	3	40	60	100
		Practical Classes: Nil			Total Classes: 45			
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			

Prerequisites: An understanding of Math in general is sufficient.

Course Overview:

This course introduces the essential mathematical concepts and techniques that form the theoretical basis of computer science. It focuses on developing logical reasoning, problem-solving skills, and the ability to model computational systems using mathematical tools.

Course Objectives:

1. To understand the fundamental concepts of logic, sets, relations, and functions used in computer science.
2. To develop problem-solving skills using mathematical reasoning, proof techniques, and induction.
3. To analyze algorithms, recursion, and complexity using discrete mathematical methods.
4. To apply probability, counting techniques, and recurrence relations in computational problems.
5. To model and solve real-world problems using graph theory, trees, and combinatorial structures.

Course Outcomes: After Completion of the Course, Students should be able to

1. Apply the principles of propositional and predicate logic to solve problems in computer science and engineering domains.
2. Analyze set-theoretic structures, relations, and functions to establish mathematical foundations for advanced algorithms and computational models in real world scenarios.
3. Make Use of mathematical induction, recursion, and program verification techniques in terms of complexity and correctness for the challenging algorithms.
4. Utilize Bayes' theorem, and advanced counting techniques to optimize combinatorial problems of the problems in multidisciplinary domains.
5. Create mathematical models using recurrence relations, generating functions, and graph- theoretic techniques to solve real-world research-oriented problems.

UNIT - I: The Foundations Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

UNIT - II: Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations: Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

UNIT - III: Algorithms, Induction and Recursion: Algorithms, The Growth of Functions, Complexity of Algorithms. Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

UNIT - IV: Discrete Probability and Advanced Counting Techniques:

An Introduction to Discrete Probability. Probability Theory, Bayes' Theorem, Expected Value and Variance.

Advanced Counting Techniques:

Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

UNIT - V: Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe I. Mott, Abraham Kandel, Theodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

ELECTRONIC RESOURCES:

1. <https://www.coursera.org/learn/discrete-mathematics>
2. <https://www.sanfounry.com/certification/discrete-mathematics-certification/>
3. <https://math-cs-compass.com/>
4. <https://allthemath.org/>

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)

