

PG DEPARTMENT OF COMPUTER SCIENCE				CLASS: I M.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Major Core - 1	21P1DMC1	Mathematical Foundations For Computer Science	4	5	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

Course Objectives

1. To introduce the concepts of Mathematical Logic.
2. Students should develop mathematical thinking and problem-solving skills associated with writing proofs.
3. To discover various groups, properties of groups and its operations.
4. To construct a K – map to minimize the Boolean Expressions.
5. To apply theoretical knowledge to solve realistic problems in real life.

Unit	Content	Hrs	K-Level	CLO
I	Mathematical Logic: Statements and Notation- Connectives- Negation-Conjunction-Disjunction-Statement formulas and truth tables –Conditional and Biconditional –Well-formed formulas –Tautologies-Equivalence of Formulas- Duality law-Tautological Implications-Normal forms-Disjunctive Normal forms-Conjunctive Normal forms-Principal Disjunctive Normal forms- Principal conjunctive normal forms-Ordering and Uniqueness of Normal forms-The theory of Inference for the statement calculus-Validity using Truth tables-Rules of Inference Consistency of Premises and Indirect method of proof-The Predicate Calculus-Predicate formulas- Free and Bound variables-The Universe of Discourse.	15	Up to K3	1
II	Set Theory : Basic concepts of Set theory-Notation-Inclusion and Equality of Sets-The Power set-Some Operations on sets-Venn Diagrams-Some Basic set Identities-Cartesian Products-Relations and Ordering-Relations-Properties of Binary Relations in a set-Relation Matrix and the graph of a Relation-Equivalence Relations-Composition of Binary Relations-Partial Ordering-Partially Ordered set: Representation and Associated Terminology-Functions-Definition and Introduction- Composition of Functions-Inverse Functions-Binary and n-ary Operations.	15	Up to K3	2

III	Algebraic Structures: Semigroups and Monoids-Definitions and Examples-Homomorphism of semigroups and Monoids-Subsemigroups and Submonoids-Grammars and Languages- Discussion of Grammars-Formal Definition of a Language-Groups-Definitions and Examples-Subgroups and Homomorphisms.	15	Up to K2	3
IV	Lattices and Boolean Algebra: Lattices as Partially Ordered sets-Definition and Examples-Some properties of Lattices-Lattices as Algebraic systems-Sub lattices, Direct product and Homomorphism-Some special Lattices-Boolean Algebra-Definition and Examples-Subalgebra, Direct product and Homomorphism-Boolean Functions-Boolean forms and free Boolean algebras-Values of Boolean Expressions and Boolean functions-Representation and Minimization of Boolean functions-Representation of Boolean Functions-Minimization of Boolean Functions.	15	Up to K4	4
V	Graph Theory: Introduction-Graph-Finite and Infinite Graphs-Incidence and Degree-Isolated Vertex, Pendant vertex and Null graph-Paths and Circuits-Isomorphism-Subgraphs- Walks, paths and Circuits-Connected Graphs, Disconnected Graphs, and Components-Euler Graphs-Operations on Graphs-Trees-Some Properties of Trees-Pendant vertices in a tree-Distance and Centres in a tree.	15	Up to K4	5

Books for Study

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay and R. Manohar, McGraw-Hill Publishing Company Limited.
2. Graph Theory with Applications to Engineering and Computer Science, Narsingh Deo, Prentice Hall of India Private limited, New Delhi, 2003.

Chapters

Text Book 1

Unit I: 1.1-1.5

Unit II: 2.1, 2.3, 2.4

Unit III: 3.2, 3.3, 3.5

Unit IV: 4.1-4.4

Text Book 2

Unit V -1.1, 1.3-1.5, 2.1, 2.2, 2.4 - 2.6, 2.7, 3.1 - 3.4

Books for Reference

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th edition, McGraw Hill education (India) Private Limited.
2. Outline Discrete Mathematics by Seymour, 2nd Edition Tata McGraw- Hill Publications.
3. Discrete Mathematics, D.S. Malik and M.K. Sen, Revised edition Cengage Learning.

Web Resources

1. <https://youtu.be/ELmAjt1E8w>
2. <https://youtu.be/0WL4fO2MGwY>
3. <https://youtu.be/F71odJrr5Bs>

Rationale for Nature of the course

- Learn working principle of Turing machine related mechanism.

Activities on Knowledge and Skill

- Practice to Solve Problems
- Group Discussion
- Seminar

Pedagogy

Chalk and talk, Materials, PPT, Assignment, Seminar, Problem solving, Group discussion, Interaction and Demonstration.

Course Designer(s) Name

1. Dr. M. Revathi
2. Mrs. S. Rajalakshmi

Lesson Plan

Unit	Topics to be Covered	Hrs	Mode
I	Statements and Notation—Conditional and Biconditional.	3	Chalk and Talk, Quiz, Chalk and Talk, Problem Solving
	Duality law- Normal forms. The theory of Inference for the statement calculus.	3	Chalk and Talk, Group Discussion
	Rules of Inference Consistency of Premises and Indirect method of proof.	5	Chalk and Talk
		4	Chalk and Talk
II	Basic concepts of Set theory - Cartesian Products.	4	Chalk and Talk,
	Relations and Ordering - Relation Matrix and the graph of a Relation	5	Group Discussion, Problem Solving
	Composition of Binary Relations Partially Ordered set	4	Chalk and Talk,
	Composition of Functions.	2	Chalk and Talk
III	Semigroups and Monoids	3	Chalk and Talk, Seminar
	Grammars and Languages - Discussion of Grammars.	3	Chalk and Talk, quiz
	Formal Definition of a Language – Groups - Definitions and Examples.	5	Chalk and Talk
	Subgroups and Homeomorphisms.	4	Chalk and Talk, Tutorial
IV	Lattices as Partially Ordered sets.	2	Chalk and Talk, quiz
	Sublattices, Direct product and Homomorphism-Some special Lattices-Boolean Algebra.	4	Chalk and Talk, Problem Solving
	Boolean forms and free Boolean algebras.	5	Chalk and Talk, Tutorial
	Representation of Boolean Functions-Minimization of Boolean Functions.	4	Chalk and Talk,
V	Graph-Finite and Infinite Graphs-Incidence and Degree.	3	Chalk and Talk, quiz
	Paths and Circuits.	5	Chalk and Talk,
	Disconnected Graphs and Components-Trees.	5	Chalk and Talk, Seminar
	Trees-Some Properties of Trees-Pendant vertices in a tree.	5	Chalk and Talk Tutorial.
		2	Assignment

Course Learning Outcomes

On the completion of the course, the students will be able to

CLOs	COURSE LEARNING OUTCOMES	K - Level
CLO 1	Evaluate mathematical problems.	Up to K3
CLO 2	Make use of the Concept of Set Theory and its functions.	Up to K3
CLO 3	Discover various groups, properties of groups and its operations.	Up to K2
CLO 4	Apply the concepts of Lattices as Partially Ordered sets.	Up to K4
CLO 5	Model and solve real-world problems using graphs and trees.	Up to K4

Mapping of CLOs with POs

CLOs / POs	PO1	PO2	PO3	PO4	PO5	PO6
CLO 1	2	1	2	2	2	-
CLO 2	2	1	3	3	3	2
CLO 3	2	1	1	1	1	-
CLO 4	2	2	2	1	1	-
CLO 5	2	2	3	3	3	2

(3– Advanced Application, 2 – Intermediate Level, 1- Basic Level)

Continuous Internal Assessment (CIA): 25 Marks

Components	Marks	K Level
Test (Average of two tests) (Conducted for 40 marks and converted into 10 marks)	10	(Refer Next Table)
Assignment	5	K4
Seminar	5	K4
Quiz	5	K4
Total	25	

Learning Outcome Based Education & Assessment (LOBE)

Formative - Blue Print – Model for Mathematical Foundations for Computer Science Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Internal	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
CIA I	CLO 1	Up to K3	2	K1	2(K2&K2)	2(K3)
	CLO 2	Up to K3	3	K2	2(K3&K3)	1(K3)
CIA II	CLO 3	Up to K2	2	K1	2(K1&K1)	2(K2)
	CLO 4	Up to K4	3	K2	2(K4&K4)	1(K4)
Question Pattern (CIA I & II)	No. of Questions to be asked		5		4	3
	No. of Questions to be answered		5		2	2
	Marks for each question		2		5	10
	Total Marks for each section		10		10	20

- CLO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Distribution of Section-wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated %
K1	4	-	-	4	6.67	33
K2	6	10	-	16	26.67	
K3	-	10	30	40	66.67	67
K4	-	-	-	-	-	-
Total Marks	10	20	30	60	100	100
K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	4	10	-	14	23.33	66
K2	6	-	20	26	43.33	
K3	-	-	-	-	-	-
K4	-	10	10	20	33.33	34
Total Marks	10	20	30	60	100	100

Learning Outcome Based Education & Assessment (LOBE)
Summative - Blue Print – Model for Mathematical Foundations for Computer Science
Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No of Questions	K - Level	No of Questions	K - Level		
1	CLO 1	Up to K3	2	K2 & K3	1	K1	2(K2&K2)	1(K3)
2	CLO 2	Up to K3	2	K2 & K3	1	K2	2(K3&K3)	1(K3)
3	CLO 3	Up to K2	2	K1 & K1	1	K1	2(K1&K1)	1(K2)
4	CLO 4	Up to K4	2	K3 & K4	1	K2	2(K4&K4)	1(K4)
5	CLO 5	Up to K4	2	K3 & K4	1	K3	2(K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1 – Remembering and recalling facts with specific answers
- K2 – Basic understanding of facts and stating main ideas with general answers
- K3 – Application oriented – Solving Problems
- K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels *

K Levels	Section A (No Choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of Marks without choice	Consolidated
K1	2	4	10	-	16	13.33%	13%
K2	2	4	10	10	26	21.67%	22%
K3	4	2	10	20	36	30%	30%
K4	2	-	20	20	42	35%	35%
Total Marks	10	10	50	50	120	100	100