

Branch Name:	IMCA
Program Code:	CS301
Course Name:	Mathematics Foundations to Computer Science
Course Code:	2CS3010103T
Prerequisite Course:	Understanding various types of mathematical problems and the applications.

Course Objective:

This course is intended to equip students with mathematical tools for precise specification, analysis, and reasoning in computer science.

1. To Use Sets, Functions, Relations, And Sequences for Abstract Problem Modeling.
2. To Apply Logic and Proof Techniques (E.G., Induction) For Validating Solutions.
3. To Develop Skills for Analyzing Algorithm Efficiency Using Counting and Combinatory.
4. To Build a Strong Foundation in Mathematics for Computing Applications.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	-	3	50	50	-	-	100

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Set Theory: Introduction to Set Theory, Definition and Representation of Sets (Roster and Set-Builder Forms) Types of Sets: Finite, Infinite, Equal, Null, Singleton, Universal, Subset, Power Set Set Operations: Union, Intersection, Difference, And Complement of Sets, Venn Diagrams and Verification of Laws Using Venn Diagrams, Algebra of Sets: Commutative, Associative, And Distributive Laws, De Morgan's Laws.	12	25

2	Functions: Introduction to Functions, Definition of A Function, Domain, Codomain, And Range Types of Functions: One-One (Injective), Onto (Surjective), Functions, Identity, Polynomial, Rational, Modulus, Exponential, Logarithmic Algebra of Functions: Sum, Difference, Product, And Quotient of Functions, Composition of Functions, Inverse of a Function Special Functions: Floor and Ceiling Functions Applications of Functions: Simple Real-Life Problems Involving Functions.	12	25
3	Matrices: Introduction to Matrices, Definition and Notation Types of matrices: row, column, square, zero, diagonal, scalar, identity symmetric, skew- symmetric Matrix Operations: Addition, subtraction, and scalar multiplication, Matrix multiplication, Transpose of a matrix, Determinant of a square matrix (up to order 3×3).	12	25
4	Graph Theory: Applications in Computer Science: Only theory Graphs in data structures (e.g., network models), Social network modelling, Routing algorithms – basic overview, Real-life applications: maps, GPS, game theory, etc. Permutation and Combination: Definition and Prove That nPr and nCr Theorem with examples.	12	25

Text Books:

1. Garg, Reena, Engineering Mathematics, Khanna Book Publishing Company, 2024. (AICTE Recommended Textbook)
2. Garg, Reena, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2023.
3. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.
4. Deo Narsingh, Graph Theory with Application to Engineering and Computer Science, Prentice Hall, India, 1979.
5. Vasishtha A. R. and Vasishtha A. K., Matrices, Krishna Prakashan, 2022.
6. Graph Theory with Applications to Engineering and Computer Science, 1974.

Reference Books:

1. Seymour Lipschutz & Marc Lipson – Schaum's Outline of Set Theory and Related Topics, McGraw-Hill Education.
2. E. Kamke – Theory of Sets, Dover Publications.
3. Sanjay Mishra – Discrete Mathematics, PHI Learning.
4. J.P. Tremblay & R. Manohar – Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill.
5. Grimaldi Ralph P. and Ramana B. V., Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Education, 2007.
6. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
7. West Douglas B., Introduction to Graph Theory, Second Edition, Pearson Education, 2015.

List of Open Source Software/learning website/E-Resource / Web Links:

1. <https://nptel.ac.in/courses/106103205>
2. <https://nptel.ac.in/courses/111101115>
3. <https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-set-theory>
4. https://www.youtube.com/results?search_query=set+theory+lectures
5. https://www.youtube.com/results?search_query=permutations+and+combinations
6. https://www.youtube.com/results?search_query=graph+theory

Course Learning Outcomes (CLO):

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

CLO	Description	Bloom's Taxonomy Level
CLO1	To Understand the Basics Set Theory.	1 Remembering 2 Understanding
CLO2	To Understand Various Kinds of Functions and Methods.	1 Remembering 2 Understanding
CLO3	To Implement Various Matrices and Types.	2 Understanding 3 Applying, 4 Analyzing
CLO4	To Understand Various Graph Theory and Permutations & Combinations.	2 Understanding 4 Analyzing 5 Evaluating

Mapping of CLOs with Pos & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CLO1	H	M	L	-	-	L	-	-	-	M	-	L	H	M
CLO2	H	H	-	M	-	-	M	L	-	-	-	-	H	M
CLO3	H	M	H	-	-	M	-	-	H	M	-	L	M	H
CLO4	M	H	M	H	M	-	M	-	-	-	-	-	H	H

H: High, **M:** Medium, **L:** Low