

Branch Name:	BCA (Bachelor of Computer Application)
Program Code:	CS101
Course Title:	Mathematics Foundations
Course Code:	21-CAM101-1C
Pre-requisite Course:	Understanding various types of mathematical problems and their applications.

Course Objective:

This course is intended to make the students 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				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	
3	-	-	3	18	50	09	25	-	-	-	-	75

Course Contents:

Sr. No	Topics	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 modeling, 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
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Course Learning Outcomes (CLO):

At the end of this course, the student would be able

- CLO1:** To Understand the Basics Set Theory.
- CLO2:** To Understand Various Kinds of Functions and Methods.
- CLO3:** To Implement Various Matrices and Types.
- CLO4:** To Understand Various Graph Theory and Permutations & Combinations.

List of Textbooks:

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

List of Reference Books:

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

E-Resource / Web Links:

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

Mapping of CLO, PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H	M	L										H	M	
CLO2	H	H	M	M									H	M	
CLO3	H	M	H	M									M	H	
CLO4	M	H	M	H	M								H	H	

H: High, M: Medium, L: Low