



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari College of Computer Application  
Semester-1

**Subject :** Mathematics -MCAXX11301

**Type of course:** Multidisciplinary

**Prerequisite:** Basic Algebra, basic mathematics, binary number system etc.

**Rationale:** The basic concepts of sets, logic functions and graph theory are applied to Boolean algebra and logic networks, while the advanced concepts of functions and algebraic structures are applied to finite state machines and coding theory.

### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		Theory Marks		Practical Marks		CA	
			ESE	MSE	V	P	ALA		
3	0	2	4	60	30	10	20	30	150

*Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.*

### Continuous Assessment:-

(for each Activity maximum minimum range is 5 to 10 marks)

Sr. No.	Active Learning Activities	Marks
1	<b>Program Writing :</b> Students have to write Program as per assigned definition by the faculty. (per students 2 definition will be assigned)	10
2	<b>Assignment :</b> Students have to identify real time application of Maths and describe in 100 words and upload to the Moodle.	10





3	<b>Quiz:</b> Unit wise MCQ test will be conducted on Moodle. Per unit maximum 10 Questions will be allocated to the students.	10
	Total	30

**Course Content:**

Sr. No	Course content	Hrs	% Weightage
1	<b>Chapter – 1 : Set</b> Set operations: union, intersection, difference, complements Power set, Superset, Relations between sets, Venn diagram, cross product, symmetric difference, value of total number in given set by using formula, DE ‘Morgan’s Law and examples.	10	25
2	<b>Chapter – 2 : Functions and Combinatorics</b> Definitions and properties of functions: domain, range, co-domain, injectivity, surjectivity, bijectivity, Composition of functions, Inverse functions, and some elementary functions, Basic counting principles for multiplication, addition, inclusion-exclusion, Permutations and combinations, Generating function and Recurrence relations with applications.	10	25
3	<b>Chapter – 3 : Graph theory</b> Definitions of graphs, vertices, and edges, Types of graphs: directed and undirected, simple and multi graphs, weighted and un-weighted graphs, Degree of vertices, paths, cycles, and connectedness, Graph algorithms: graph traversal algorithms, shortest path algorithm, minimum spanning tree algorithms.  <b>Chapter – 4 : Tree</b> Definition of trees, roots, branches, and leaves, Properties of trees: height, depth, size, and degree, Tree traversal algorithms: preorder, inorder, and postorder traversal, Binary trees and their applications in sorting and searching algorithms	12	25
4	<b>Chapter – 5 ; Number theory and Boolean algebra</b> Properties of integers: divisibility, prime numbers, Greatest common divisor (GCD) and least common multiple (LCM), Decimal, binary, octal, hexadecimal integer numbers in computer logic design, Logical operators, law of commutative, associative, and distributive, De Morgan’s theorem, truth table, Karnaugh map, Boolean functions, simplification techniques for logical expressions.	10	25





**Suggested Specification table with Marks (Theory):60**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	40%	30%	00	00	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

After learning the course the students should be able to:	
CO1	Develop critical thinking skills through problem solving exercise of sets and algebraic formulas of set.
CO2	Understand and apply counting principles, permutations, combinations, and generation of functions.
CO3	Understand and apply graph algorithms, tree structures as a mathematical tool.
CO4	Understand integer number theory and Boolean algebra as a tool to solve complex logic expressions.

**List of Practical:**

Sr. No	Descriptions	Unit No	Hrs
1	Write a C program to determine the greatest common divisor (GCD) and least common multiple (LCM) of two given integers. Your program should take the input integers and output their GCD and least common multiple (LCM).	4	2
2	Write a C program to generate all divisors of a given integer. Your program should take the input integer and output a list of all its divisors.	4	2





3	Write a C program to determine the sum of all divisors of a given integer. Your program should take the input integer and output the sum of its divisors.	4	2
4	Write a C program to implement a set data structure. Your program should allow the user to add and remove elements from the set, check if an element is in the set, and perform set operations such as union, intersection, and difference.	1	4
5	Write a C program to compute the Cartesian product of two given sets. Your program should take the input sets as arrays of integers and output the Cartesian product as a list of pairs.	1	4
6	Write a C program to check if a given function is injective, surjective, or bijective. Your program should take the input function as a list of pairs and output the properties of the function.	2	2
7	Write a C program to implement basic Boolean operations such as AND, OR, and NOT. Your program should take two Boolean values as input and output the result of the specified operation.	4	4
8	Write a C program to implement Karnaugh maps for simplifying Boolean functions. Your program should take the input truth table as a matrix of integers and output the simplified Boolean function as a list of terms.	4	2
9	Write a C program to implement the De Morgan's laws of Boolean algebra. Your program should take the input Boolean expression as a string and output the simplified expression using De Morgan's laws	4	4
10	Write a C program to transpose a matrix. Your program should take the input matrix and output its transpose.	5	2
11	Write a C program to implement a tree data structure. Your program should allow the user to add and remove nodes, check if a node is in the tree, and perform tree algorithms such as finding the height and diameter of the tree.	3	2
12	Write a C program to implement a binary search tree data structure. Your program should allow the user to add and remove nodes, check if a node is in the tree, and perform tree algorithms such as finding the minimum and maximum value in the tree.	3	2
<b>Total</b>			<b>32</b>





**Instructional Method:**

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

**Reference Books:**

- [1] R. S. Agarwal, "Mathematics for computer application"
- [2] M. Morris Mano, "Digital Logic and Computer Design," Pearson Education
- [3] William Stallings, "Cryptography and Network Security," Pearson
- [4] J. P. Tremblay and W. K. Grassman. "Logic and Discrete Mathematics," Pearson Education.

