Sh. L. N. Hindu College, Rohtak (Haryana)CoursePlan

Department of Mathematics

Program: BCA

Mathematical Foundations of Computer Science

(23BCA401DS01)

SCHEME

Course Name	**Mathematical Foundations of Computer Science**	**Course Type**	**Theory**
Course Code	**23BCA401DS01**	**Class**	**BCA 1st sem Sec. A/B**
Instruction Delivery	**PerweekLectures: 4** **Total No. of Classes Per Sem: 45(L), 5(T)** **Assessment in Weightage: Sessional (30%),End Term Exams(70%)**		
Course Coordinator	**Mrs. Priyanka Sahni/ Ms.Sonam**	**Course Instructors**	**Theory:** Mrs. Priyanka Sahni/ Ms.Sonam

COURSEOVERVIEW

This course tells about set theory , venn diagrams and applications of sets, relations and functions matrices and determinants ,trigonometry , limits and continuity , differentiation.

PREREQUISITE

Number system, solution of quadratic and cubic equations, basic trigonometric functions and formulae

COURSEOBJECTIVE

The objective of this course is to inculcate in students the fundamental mathematical background in Computer Science and to provide reasoning, learning and understanding skills. The students get exposure of various concepts of mathematics such as sets, relations, and functions, trigonometry, limit, continuity, derivatives, matrix and determinants.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CONo.	CourseOutcomes
1	Understand and solve the problems on set, relation and functions
2	Understand the concepts of trigonometry
3	Solve the problems on limit and continuity
4	Understand the concepts of derivative and solve the problems on derivative and Understand the concept of Matrix and Determinants.

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COURSE CONTENT

Content
UNIT-I Sets: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Practical applications of set theory. Relations And Functions: Properties of Relations, Equivalence Relation, Partial Order Relation. Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions. **UNIT-II** Trigonometry: Introduction, Measurement of angles, trigonometric functions, relation between trigonometric functions, signs of trigonometric functions, trigonometric functions of standard angles. Basic of inverse trigonometry. Limits & Continuity: Limit at a Point, properties of limit, computation of limits of various types of functions, Continuity of a function at a point, Continuity over an interval. **UNIT-III** Differentiation: Derivative of a function, Derivatives of sum, differences, product & quotient of functions, Derivatives of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, Logarithmic Differentiation, Chain rule and differentiation by substitution. **UNIT-IV** Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices. Determinants: Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle, Adjoint of matrix, Inverse of matrix, solving a system of linear equations using matrix method.

LESSON PLAN(THEORY AND TUTORIAL CLASSES)

L. No	Topic to be Delivered	Tutorial Plan	Unit
1	Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets.	Practice questions on set theory	1
2	Operation on Sets, Union, Intersection and Complements of Sets,		
3	Practical applications of set theory.		

4	Cartesian Product of two sets		
5	Theorems		

6	Theorems	Practice questions on limits of a function.	**1**
7	Theorems		
8	Limit at a Point, properties of limit.		
9	Computation of limits of various types of trigonometric functions.		**2**
10	Computation of limits of various types of inverse trigonometric functions.		
11	Continuity of a function at a point and its examples.		**2**
12	Continuity over an interval.		
13	Derivative of a function.		**3**
14	Derivatives of sum, differences, product & quotient of functions		
15	Derivatives of polynomial, trigonometric functions.		
16	Derivatives of inverse trigonometric functions.		**3**
17	Questions on derivatives of trigonometric and inverse trigonometric functions		
18	Derivatives of inverse Logarithmic functions		
19	Derivatives of inverse Exponential functions.		
20	Differentiation of implicit functions.		
21	Differentiation of parametric functions	Practice questions on differentiation of a function.	**4**
22	Differentiation of a function with respect to another function.		
23	Matrices: Definition, Types of Matrices		
24	Addition, Subtraction, Scalar Multiplication		
25	Multiplication of Matrices.		

26	Determinants and its properties	Practice questions on matrices.	4
27	Minors and Cofactors of a matrix		
28	Elementary operations		
29	Applications of determinants in finding area of triangle		
30	Transpose of a matrix ,symmetric and Skew-symmetric matrices		
31	Adjoint of matrix		4
32	Inverse of matrix		
33	Solving a system of linear equations using matrix method		
34	Properties of Relations, Equivalence Relation ,Partial Order Relation		1
35	Onto, Into and One to One Functions, Domain and Range and its questions		
36	Composite and Inverse Functions.		1
37	Numericals on inverse functions		
38	Introduction, Measurement of angles, trigonometric functions		
39	Relation between trigonometric Functions		2
40	Numericals on trigonometric functions		
41	Numericals on trigonometric functions	Practice questions on trigonometric functions and inverse trigonometric functions.	2
42	Trigonometric functions of standard angles		
43	Basic of inverse trigonometry		
44	Questions of inverse trigonometry		
45	Questions of inverse trigonometry		

TextBook

Jeevansons publications

ReferenceBooks

1. D.c. Sancheti
2. ASMITA , dr. Shankar p. khanal ,dr. durga jang K.C.
3. J.K. Sharma

Web/Links for e-content

Sets chapter
https://youtube.com/playlist?list=PLKlq83rNAtyUB02of1QCy4DNkgAOjKpgZ&si=jUcxlkQuW_hpeXeg

Differentiation
https://youtube.com/playlist?list=PLKlq83rNAtyUYndQfLIlJg58VYTTM2YZf&si=WaUPTHhjBvci6fzF

Matrices and Determinants
https://youtube.com/playlist?list=PLKlq83rNAtyVfe0Wz6VLln7kSoYShwe9W&si=MGKJM59DPW8QyYkF

NOTES

https://drive.google.com/drive/folders/1ArlcAozhq0-YM78et55dLy1QCsXxDGfL

MDU Question Papers

https://drive.google.com/file/d/1AT9SuK0VCulHA8l9xa-A4giwJMRK08cp/view?usp=drivesdk

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PRACTICE QUESTIONS (QUESTION BANK)

S.No	Problem
	Practice Questions
1	Define set.
2	Define union of set.
3	Define power set.
4	Write the P(A) if A ={1,2,3}.
5	Write the P(A) if A={ a,(b,c)}.
6	Write down all the subsets of {a,b,c}.
7	How many subsets can be formed from the set: {}
8	State whether the set is finite or infinite: The set of months of a year.
9	Whether the set null or not: A={0}
10	Write down the set builder form: { 2,4,6 8,……}
11	a)Write the roster form : set of all primes which are even.
	b)Set of all +ve integers which are common factors of 30 and 45.
12	Define equivalence relation.
13	Define partial order relation.
14	Define limit of a function.
15	Explain the method of factors in limit with examples.
16	Explain the substitution method in limit with examples.
17	State and prove Sandwich theorem.
18	Find $\lim_{x\to 0}\frac{\sin 5x}{\sin 15x}$.
19	What do you mean by left and right hand limits of a function?
20	Define continuity of a function.
21	Explain discontinuity of first kind with the help of an example.
22	Define discontinuity of second kind.
23	Explain removable continuity.
24	State and prove intermediate value theorem.
25	Explain the concept of differentiation of a function.

26	Find the derivative of sin(x), cos(x).
27	Find the derivative of product of two functions.
28	Find the derivative of $\sin^2(x)$.
29	Find the derivative of $\tan^{-1}(x)$.
30	Find the derivative of $(\sin^{-1}x)^x$.
31	Differentiate 1+xsin(x) with respect to x^2.
32	Define matrix and write down its applications.
33	If a matrix has 24 elements, what are the possible orders it can have?
34	Discuss the commutative property of matrix under addition.
35	Define positive integral power of a matrix.
36	Find the minors and cofactors of a matrix of order 2.
37	Find the area of a triangle using determinants.
38	Find the adjoint of a matrix of order 3.
39	Define the inverse of a matrix.
40	Solve : x+4y-2z=3 3x+y+5z=7 2x+3y+z=5 by matix method and also by cramer's rule.
41	In a survey of 5000 people , it was found that 2800 read 'Indian Express' and 2300 read 'The Tribune' ,while 400 read both the papers. (i) How many read neither Indian Express nor Tribune? (ii)How many read Indian Express only? (iii)How many read Tribune only?
42	Prove that (A-B)U(B-A) = (AUB) – (A∩B)
43	Prove that A U(B UC)=(A UB) UC
44	Prove that A∩ (B ∩C)=(A ∩B) ∩C
45	Prove that A U (B∩ C)=(A U B) ∩(A U C)
46	A College awarded 38 medals in football , 15 in basketball and 20 in cricket. If these medals went to a total of 58 sportsmen and only three sportsmen got medals in all the three sports , how many sportsmen received medals in exactly two of the three sports?
47	Prove that (AUB)' = A'∩B'

Sh. L. N. Hindu College, Rohtak (Haryana)
Course Plan

Department of Computer Science

Program: BCA 1st Year

'Computer Fundamentals & Problem Solving Using C'

23BCA401DS02

SCHEME

Course Name	**'C' Programming**	**Course Type**	**Theory**
Course Code	**23BCA401DS02**	**Class**	BCA I Sem.
Instruction Delivery	**Per week Lectures: 4, Tutorial:1, Practical: -** **Total No. Classes Per Sem: 60(L)** **Assessment in Weightage: Sessional (20%), End Term Exams (80%)**		
Course Coordinator	**Dr. Reena Katyal**	**Course Instructors**	**Dr. Reena Katyal** **Mrs. Kirti**

COURSE OVERVIEW

This Course is all about the basic programming skills. Students will learn how to design the algorithms to solve simple problems and how to program the designed algorithms. Students will study the programming constituents in C from basic to advance level. At the end of the course, students will be able to understand the problems and design and write appropriate computer programs in C to solve those problems.

PREREQUISITE

Algorithms and Flowcharts

COURSE OBJECTIVE

This is first course in Programming. The objective of this course is to inculcate knowledge about fundamental concepts of computer and logical thinking amongst the young minds and to teach the Programming Language C. However, the process of learning a computer language will also be emphasized. Emphasis is also on semantics and problem solving. Students will be able to develop logics which will help them to create programs, applications in C. By learning the basic programming constructs, they can easily switch over to any other language in future.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO No.	Course Outcomes
1	Understand the concepts of computer and its applications in various fields.
2	Understand the fundamental concepts of programming in C language.
3	Demonstrate an understanding of data types, control structures, functions, arrays and pointers.

4	Develop basic programming solutions using C language.
5.	Apply basic programming concepts to solve practical problems.

COURSE CONTENT

Content
Unit – I Computer Fundamentals: Generations of Computers, Block Diagram along with its components, classification of computers, Applications of computers in various fields. Input/output Devices, Memory: Concept of primary & secondary memory, Cache Memory, Secondary storage devices. Overview of Networking & Operating System: Introduction to computer networking, Network types, Network topologies, Internet and its applications; Operating system and its functions. Unit – II Planning the Computer Program: Problem definition, Program design, Debugging, Types of errors in programming, Techniques of Problem Solving- Flowcharting, Algorithms Overview of C: History of C, Importance of C, Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant, Structure of a C Program,printf(), scanf() Functions, Operators & Expression, type casting and conversion, operator hierarchy & associativity. Unit – III Decision making & Branching: Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switch statement, go to statement. Decision making & Looping: while, do-while and for loop, jumps in loops, break, continue statement, Nested loops Unit – IV Functions: Standard Mathematical functions, Input/output: Unformatted & formatted I/O function in C, input functions output functions, string manipulation functions. User defined functions: Introduction/Definition, function prototype, Local and global variables, passing parameters, recursion. Arrays & Pointers: Definition, types, initialization, processing an array, passing arrays to functions, Declaration and initialization of string, Input/output of string data, Introduction to pointers.

LESSON PLAN (THEORY AND TUTORIAL CLASSES)

L. No	Topic to be Delivered	Tutorial Plan	Unit
1	Introduction to Computer and its Components	Computer and its components and its classifications.	1
2	Generations of Computers		
3	Classification of Computers		
4	Applications of Computer		
5	Input Devices and its types		

6	Output Devices and its types	Input and Output devices & its types	1
7	Memory and its types	Memory and its types	
8	Primary memory and its types		
9	Secondary Memory and its types		
10	Operating System and its Functions	.	
11	Computer Network and its types	Computer networks & its types& various topologies of network .	
12	Network Topologies and its types		
13	Internet and its applications		
14	Introduction to Problem Definition and Program Design		2
15	Errors and its Types		
16	Problem Solving and its types	Algorithm and flowchart with examples	
17	Introduction to Algorithm		
18	Introduction to Flowchart and its types		
19	Introduction to C language and its Importance	C language and its Characteristics & its Structure	
20	Elements of C language		
21	Structure of C language		
22	Introduction to print and Scanf	Practice of Program to demonstrate the use of 'printf()' and 'scanf'() function.	
23	Introduction to operator and its types	Practice of programs of various operators and expressions.	
24	Introduction to Expression and its types		
25	Type Casting and Type Conversion		
26	Operator Hierarchy and		

	Associativity		
27.	Introduction to Condition Control Statements		3
28.	IF Statement		
29.	IF-ELSE Statement	Practice of Program to check whether a given no. is odd or even using If-Else Statement.	
30.	NESTED-IF Statement	Practice of Program to find the largest of three given numbers using Nested IF Statement.	
31.	ELSE -IF ladder Statement	Practice of Program to display the grade of the Student using Else –If Ladder. Practice of Program to check whether a given alphabet is vowel or not using Switch Statement. Practice of program to find square root of a no. using go to statement.	
32.	Switch statement		
33.	Go to statement		
34.	Introduction to loop and while Loop	Practice of program to find the sum of first 10 natural numbers using while loop.	
35.	Do –While Loop	Practice of program to print the first 10 multiplies of a given number using Do-while loop.	
36.	For Loop	Practice of program to print the first 10 multiplies of a given number using For loop.	

37.	Jumps in loops and Nested Loops		4
38.	Break and Continue statement	Practice of programs of Break & Continue Statement	
39.	Introduction to Function and its Structure	Practice of Program to find the largest of three given numbers using local and global variable.	
40.	Function Prototype		
41.	Local and global variables	Practice of Programs of Call by Value & Call by reference methods. Program to find the factorial of a number by using Recursion.	
42.	Passing Parameters in Functions		
43.	Recursion		

44.	Formatted and Unformatted I/O Functions in C	Practice of Program to read a string from the user and then display its length and convert it to the uppercase and lowercase. Practice of program for string palindrome. Practice of Program to find the Average Marks of a class using One-Dimensional Array. Practice of Program to find the product of two Matrices using Two-Dimensional Array.	
45.	Introduction to String and its declaration & Initialization		
46.	I/O of String data		
47.	String manipulation Functions		
48.	Introduction to Array and Declaring Arrays and initializing Arrays		
49.	One –Dimensional Array		
50.	Two dimensional array		
51.	Passing Array to Functions		
52.	Introduction to pointer & various operators of Pointer		

Text Book

Dr. Ramesh Saini and Dr. Pooja Chawla, Computer Fundaments and Problem solving using C, Unique Publications.

Reference Books

- Gottfried, Byron S.: Programming with C, Tata McGraw Hill Gill
- Nasib Singh: Computing Fundamentals and Programming in C, Khanna Book Publishing Company(Private) Limited, New Delhi.
- Balagurusamy, E.: Programming in ANSI C, Tata McGraw-Hill
- Yashwant Kanetker: Let us C, BPB.
- **Web/Links for e-content**
- https://www.geeksforgeeks.org/c-programming-language/
- https://www.w3schools.com/c/

PRACTICE QUESTIONS (QUESTION BANK)

S No	Problem
1	Define Computer and Various Components of Computer
2	Explain Classification of Computer in detail?
3	Define Applications of computers in Various Fields?
4	Explain Memory and various types of Memory in detail?

5	Define Computer Network and Various types of Computer Network?
6	Explain Network Topologies and Its types?
7	Define Internet and Its applications?
8	Define Operating System and its Functions?
9	Define Algorithm. Explain it with a suitable example?
10	Explain Flowchart and its types?
11	Define C language and its Characteristics?
12	Explain Data Type and various data types in C language?
13	Explain structure of C language with suitable example?
14	Write a Program to demonstrate the use of 'printf()' and 'scanf'() function.
15	Write a Program to define and use Symbolic Constants.
16	Define Operators and various Types of Operators with examples?
17	Write a Program to demonstrate the use of various arithmetic Operators.
18	Write a Program to demonstrate the use of Relational and Logical Operators.
19	Write a Program to demonstrate the use of Increment & Decrement Operators.
20	Write a Program to demonstrate the use of Conditional & Bitwise Operators.
21	Define Expression and its types with suitable Examples?
22	Write a Program to demonstrate the use of Mixed Mode Expression.
23	Explain Type casting and Type Conversion With Suitable Example?
24	Define Conditional Control Statements and is types?

25	Write a program to implement If Statement.
26	Write a Program to check whether a given no. is odd or even using If-Else Statement.
27	Write a Program to find the largest of three given numbers using Nested IF Statement.
28	Write a Program to display the grade of the Student using Else –If Ladder.
29	Write a Program to check whether a given alphabet is vowel or not using Switch Statement.
30	Write a program to find square root of a no. using go to statement.
31	Write a program to find the sum of first 10 natural numbers using while loop.
32	Write a program to print the first 10 multiplies of a given number using Do-while loop and for loop.
33	Write a program to implement Nested Loops.
34	Write a program to determine whether a no. is prime or not using break Statement.
35	Write a program to implement Continue Statement.
36	Write a program to find the sum of the numbers present in an array.
37	Define Function and Function Prototype with suitable examples.
38	Write a Program to find the largest of three given numbers using local and global variable.
39	Write a Program to implement Call by Value method.
40	Write a Program to implement Call by Reference method.
41	Write a Program to find the factorial of a number and Fibonacci number sequence using recursion.
42	Define Array and initialization of an array with examples?

43	Write a Program to find the Average Marks of a class using One-Dimensional Array.
44	Write a Program to find the product of two Matrices using Two-Dimensional Array.
45	Define String? Explain Input and Output of String Data with suitable examples?
46	Write a program to read a string from the user and then display its length and convert it to the uppercase and lowercase.
47	Write a program for string palindrome.
48	Explain Formatted and unformatted I/O functions with suitable examples?
49	Explain Pointer and various operators in Pointer with suitable examples?