

**NIRMA UNIVERSITY**

<b>Institute:</b>	Institute of Technology
<b>Name of Programme:</b>	B.Tech.(All Programmes), Integrated B.Tech. (CSE)-MBA
<b>Course Code:</b>	XXXX
<b>Course Title:</b>	Computer Programming
<b>Course Type:</b>	Common
<b>Year of Introduction:</b>	2022-23

L	T	Practical Component				C
		LPW	PW	W	S	
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**Course Learning Outcomes (CLOs):**

At the end of the course, the student will be able to –

1. demonstrate the significance and application of C language constructs in program development (BL2)
2. apply the programming skill to solve real-life problems through software or hardware/software co-design (BL3)
3. build task-specific, user-oriented, time-constrained program (BL3)
4. analyze logically the problem and select the optimized method to solve the problem (BL4)

**Syllabus:**

**Total Teaching hours: 30**

Unit	Syllabus	Teaching hours
Unit-I	<b>Introduction to Computers:</b> Introduction to Computers and the Internet in Industry and Research, Web Resources, Hardware and Software, Computer Organization, Programming Languages, Introduction to the C Programming Language, Typical C Program Development Environment and steps.	03
Unit-II	<b>Introduction to Programming:</b> Understanding logic using Flowchart, Algorithms, Pseudocode, Test-cases Programming with C: keywords, syntax and library functions, data types, operators and expressions, declarative, imperative and decision statements, control structures.	05
Unit-III	<b>Functions:</b> Math Library Functions, User-defined functions, Function Call Stack and Stack frames, Passing Arguments by Value and By Reference, Scope Rules, Recursion, Recursion vs. Iteration. Arrays: Defining Arrays, Sorting Arrays, Searching Arrays, Multidimensional Arrays, Variable-Length Arrays, Passing Arrays to Functions.	07
Unit-IV	<b>Pointers:</b> Pointer Variable Definitions and Initialization, Pointer Operators, Passing Arguments to Functions by Reference, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Arrays of Pointers, Pointers to Functions. Introduction to dynamic memory allocation. Characters and Strings: Fundamentals of Strings and Characters, Character-Handling Library Functions, String-Conversion Functions, Standard Input/Output Library Functions for string, String-Manipulation Functions of the String-Handling Library, Comparison Functions of the String-Handling Library.	07

Unit-V **Structures:** Structure Definitions, Defining Variables of Structure Types, Operations That Can Be Performed on Structures, Initializing Structures, Accessing Structure Members, Using Structures with Functions

**File Processing:** Files and Streams, creating a File, Reading and writing Data from a File.

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents

- Suggested Readings/References:
1. Deitel and Deitel, 'C How to program', Pearson
  2. E Balagurusamy, 'Programming in ANSI C', McGraw Hill
  3. Yashwant Kanitkar, 'Let Us C', BPB Publications
  4. V Rajaraman, 'Fundamentals of Computers', Prentice Hall of India
  5. Joyce Farrell, 'Programming Logic and Design Comprehensive', Cenage Learning
  6. David Gries, 'The Science of Programming', Springer, New York, Hedelberg, Berlin
  7. Dromey R.G., 'How to solve it by computers', Prentice Hall of India
  8. Jean-Paul Tremblay, Richard B. Bunt, 'Introduction to Computer Science', McGraw-Hill
  9. Kernighan., Ritchie, 'ANSI C Language', Prentice Hall of India
  10. Sedgewick R., 'Algorithms in C', Addison Wesley
  11. Schaum Ourline Series, 'Programming in C', McGraw-Hill
  12. E Balagurusamy, 'Pointers in C', McGraw-Hill

Suggested List of Experiments:	Sr. No.	Title	Hours
	1	<b>Introduction to CodeBlocks IDE, Writing and compiling a simple C program</b> a. Introduction to CodeBlocks IDE. Use CodeBlocks to write and compile a simple C program ("Hello World"). b. Write C programs: i. To scan and print values of different types of variables ii. To print address of a variable iii. To demonstrate different escape sequences	02
	2-3	<b>C programs to demonstrate various operators</b> Write C programs for the following: a. To scan two numbers and display result of different arithmetic operations (+, -, *, / and %) b. A company has following scheme for payment to their staff.  <ul style="list-style-type: none"> <li>• Net salary = Gross salary – Deduction</li> <li>• Gross salary = Basic + DA + HRA + Medical</li> <li>• Deduction = Insurance + PF</li> <li>• DA (Dearness allowance) = 50% of Basic</li> </ul>	04

- HRA (House rent allowance) = 10% of Basic
- Medical = 4% of Basic
- PF (Provident Fund) = 5% of Gross
- Insurance = 7% of Gross

Calculate the net payment to any employee.

- c. The driver is driving a car from city Ahmedabad to city Mumbai, in Ahmedabad temperature displays in Celsius while in Mumbai the temperature displayed in Fahrenheit, a driver wants to find the difference between the temperatures of two cities in Celsius.
- d. To calculate simple interest.
- e. A boy was punished and asked to cover 5 rounds of the circular ground. Area of the ground is 32000 sq mtr. Calculate how many kilometres the boy has covered.
- f. Read the price of item in decimal form. For example, 12.52 and separate rupee and paise from the given value. For example, 12 rupees and 52 paise.
- g. To swap the value of two numbers (i) using and (ii) without using a temporary variable.
- h. To find greatest of two and three numbers using the ternary operator.

4-5

**C programs to demonstrate use of conditional statements** 04

Write C programs for the following:

- a. Write a program to take the values for A, B, C of a quadratic equation  $A \cdot X^2 + B \cdot X + C = 0$  and then find all the roots of the equation. It is guaranteed that  $A \neq 0$  and that the equation has at least one real root.
- b. Write a C program to make a simple calculator using the following:
  - i. if...else if
  - ii. switch-case
- c. In an organization, employees are paid on hourly basis. Clerks are paid 100/hr, Teachers are paid 200/hr and Principal is paid 400/hr. If the weekly hours exceed 44, then employee should be paid 2 times their regular pay for the overtime. Write a C program to compute the weekly salary of the employee and also the program should take care that the employee should not be paid for hours beyond 50 in a week. Use best suitable control construct to implement the program.

- d. Ajay and Amit are playing a game with a number X. In one turn, they can multiply X by 2. The goal of the game is to make X divisible by 10. Write a C program to find the number of turns necessary to win the game (it may be possible to win in zero turn, 1 turn or it might be impossible (-1 turns)).
- e. Write a program to implement a simple number guessing game. Program should generate an integer randomly and ask the user to guess the integer. Based on the number guessed, it should display the appropriate message (correct or incorrect).
- f. Write a C program to find the grade of a student based on the following policy.  
 Class test: 12% weightage, Tutorial-12%,  
 SE:16%, LPW:20%, SEE:40%.  
 Grade is decided based on the below range of total marks.

Grade	Range of total marks
A+	91-100
A	81-90
B+	71-80
B	61-70
C+	51-60
C	>40
Fail	<40

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**C programs to demonstrate use of loop constructs**

02

Write C Programs:

- a. To display following patterns:

A	1	1
A B	0 1	1 2 1
A B C	1 0 1	1 2 3 2 1
A B C D	0 1 0 1	1 2 3 4 3 2 1
1	*	1
A B	***	1 2
2 3 4	*****	1 2 3
C D E F	*****	1 2 3 4

- b. To check whether the input number is an Armstrong number
- c. To check whether the entered number is Prime
- d. To check whether the entered number is Palindrome
- e. Enhance the number guessing game developed earlier. The program should now display more appropriate message (Greater, Smaller or Correct). It should allow maximum 5 attempts from the user and still if the user cannot guess the number correctly, it should display "Sorry".

**C programs based on arrays**

- a. Write a program
  - i. To read data from keyboard and store into 1-D array
  - ii. To read data from array and copy its square back to another array
  - iii. To reverse all elements of original array
  - iv. To find out maximum element of an original array and print its location
- b. Write a program to delete an element from 1-D array.
- c. Write a program that fills a 5 x 5 matrix with the following data:
  - i. Upper left triangle with -1
  - ii. Lower right triangle with 1
  - iii. Right to left diagonal with 0
 Display the matrix on the screen.
- d. Suppose that a class has 5 students. Each student study four subjects; CP, CS, Math, and Physics. Make a 2D array for the same. Write a C program
  - i. To find total marks in all subjects obtained by each student.
  - ii. To find average marks obtained by all 5 students in C programming subject.

**C programs to explore String manipulation**

Write C programs:

- a. Write a program to delete a character entered by the user from the input string. All occurrences of the input character should be deleted from the string.
- b. Write a program to swap even positioned characters with odd positioned characters in a given string.
- c. Read a name from keyboard and find out how many times same character (case insensitive) is repeating.  
Example:

Input: Anand

Output: a is repeating two times, n is repeating two times

Input: Kunal

Output: None of the character are repeating.

- d. Write a program to sort the strings entered by user as per dictionary order.

**C programs to understand user defined function and parameter passing**

- a. Find union and intersection of two input integer arrays using user defined function. The function should return the resultant array to the main function.

- b. Consider a currency system in which there are notes of seven denominations, namely Rs. 1, Rs. 2, Rs. 5, Rs. 10, Rs. 20, Rs. 50 and Rs. 100. A sum of Rs. N is entered as an input. Write a function to compute the smallest number of notes that will combine to give Rs. N.
- c. Write a program to compute  $F(n)$  such that  $F(n) = 0$ , if  $n = 0$ ,  $F(n) = 1$ , if  $n = 1$ , otherwise  $F(n) = F(n - 1) + F(n - 2)$ .
- d. Aman has 10 balls that have different numbers on it and Shoaib has 6 balls. They both arrange balls in all different possible ways. What is the ratio of number of arrangements made by Aman to that made by Shoaib? Use recursive function to calculate.
- e. Perform Q 7c using user defined function iteratively.

02

### Understanding C programs based on structures using virtual lab

(<https://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html>)

- a. Create a structure which holds various attributes (e.g., name, id, basic\_salary, DA%, HRA%, total\_salary etc.) of an employee. Write a program which allows you to scan these (except total\_salary) attributes for 3 employees. The program should support following operations:
  - i. Display (total salary of the selected employee)
  - ii. Max (find and display name of the employee with maximum salary)
- b. Write a structure to accept item information such as name, quantity and unit price. Structure should take information about 5 items. Create a user defined function that calculates the cost of each item. Print details of each item such as:

Name	Quantity	Price	Cost
Notebook	5	50.0	250.0
Pen Drive	2	500.0	1000.0
Pen	20	5.0	100.0

- c. Write a structure for a complex number which has a real part and an imaginary part. Add the 2 complex numbers, store it in another complex number using user defined function and display the result as a complex number.

13-14

**C programs to demonstrate use of pointers**

04

- a. Write a UDF using concept of pointers which can accept a one-dimensional array as an argument. The function should add 1 to all odd element of the array and 2 to all even elements of the array. The final array should be displayed by the main () function. Repeat this program for two-dimensional array.
- b. Write a function that swaps values of three numbers in a cyclic order and prints the output from main function.  
Example: a = 1, b = 2, c = 3 → Output: a = 3, b = 1, c = 2
- c. Write a program to print array elements in reverse using pointer.
- d. Write a UDF which accepts three strings as arguments. The function should concatenate first two strings and keep the result in the third string which should be displayed by the main () function.

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**C Programs for file processing**

02

Write C Programs:

- a. To calculate the length of a file
- b. To concatenate two files
- c. To copy content of one file in to another file

Suggested Case  
List:

-NA-

