Computer Programming Lab

(Common to all Branches)

CourseCode	23ES1152	Year	I	Semester	I
Course Category	Engineering Sciences	Branch	ECE	Course Type	Lab
Credits	1.5	L-T-P	0-0-3	Prerequisites	Basic Mathematics
Continuous Internal Evaluation:	30	Semester End Exam:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Apply C programming language constructs to solve the given problem L2
CO2	Implement programs as an individual on different IDE's/ onlineplatforms. L3
CO3	Develop an effective report based on various programs implemented. L3
CO4	Apply technical knowledge for a given problem and express it with effective oralcommunication. L3
CO5	Analyze outputs using given constraints/test cases. L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H: High, M: Medium, L:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												1	
CO2	2				1								1	
CO3										3			1	
CO4										3			1	
CO5		3										1	1	

Syllabus		
Expt. No.	Contents	Mapped CO
1	**Objective: Getting familiar with the programming environment on the computer and writing the first program.** Suggested Experiments/Activities: Tutorial 1: Problem-solving using Computers. Lab1: Familiarization with programming environment i) Basic Linux environment and its editors like Vi, Vim & Emacs etc. ii) Exposure to Turbo C, gcc iii) Writing simple programs using printf(), scanf()	CO1-CO5

2	**Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.** Suggested Experiments /Activities: Tutorial 2: Problem-solving using Algorithms and Flow charts.Lab 1: Converting algorithms/flow charts into C Source code. Developing the algorithms/flowcharts for the following sample programs i) Sum and average of 3 numbers ii) Conversion of Fahrenheit to Celsius and vice versa iii) Simple interest calculation	CO1-CO5
3	**Objective: Learn how to define variables with the desired datatype, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.** Suggested Experiments/Activities: Tutorial 3: Variable types and type conversions: Lab 3: Simple computational problems using arithmetic expressions. i) Finding the square root of a given number ii) Finding compound interest iii) Area of a triangle using heron's formulae iv) Distance travelled by an object	CO1-CO5
4	**Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and howoperator precedence works.** Suggested Experiments/Activities: Tutorial4: Operators and the precedence and as associativity: Lab4: Simple computational problems using the operator' precedence and associativity i) Evaluate the following expressions. a. A+B*C+(D*E) + F*G b. A/B*C-B+A*D/3 c. A+++B---A d. J= (i++) + (++i) ii) Find the maximum of three numbers using conditional operator iii) Take marks of 5 subjects in integers, and find the total, average in float	CO1-CO5
5	**Objective: Explore the full scope of different variants of "if**	CO1-CO5

	construct" namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct". Suggested Experiments/Activities: Tutorial 5: Branching and logical expressions: Lab 5: Problems involving if-then-else structures. i) Write a C program to find the max and min of four numbers using if-else. ii) Write a C program to generate electricity bill. iii) Find the roots of the quadratic equation. iv) Write a C program to simulate a calculator using switch case. v) Write a C program to find the given year is a leap year or not.	
6	**Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.** Suggested Experiments/Activities: Tutorial 6: Loops, while and for loops Lab 6: Iterative problems e.g., the sum of series i) Find the factorial of given number using any loop. ii) Find the given number is a prime or not. iii) Compute sine and cos series iv) Checking a number palindrome v) Construct a pyramid of numbers.	CO1-CO5
7	**Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.** Suggested Experiments/Activities: Tutorial 7: 1 D Arrays: searching. Lab 7:1D Array manipulation, linear search i) Find the min and max of a 1-D integer array. ii) Perform linear search on1D array. iii) The reverse of a 1D integer array iv) Find 2's complement of the given binary number. v) Eliminate duplicate elements in an array.	CO1-CO5
8	**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character	CO1-CO5

	and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays. **Suggested Experiments/Activities:** **Tutorial 8:** 2 D arrays, sorting and Strings. **Lab 8:** Matrix problems, String operations, Bubble sort i) Addition of two matrices ii) Multiplication two matrices iii) Sort array elements using bubble sort iv) Concatenate two strings without built-in functions **v)** Reverse a string using built-in and without built-in string functions	
9	**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C **Suggested Experiments/Activities:** **Tutorial 9:** Pointers, structures and dynamic memory allocation **Lab 9:** Pointers and structures, memory dereference. i) Write a C program to find the sum of a 1D array using malloc() ii) Write a C program to find the total, average of n students usingstructures iii) Enter n students data using calloc() and display failed students list iv) Read student name and marks from the command line and display thestudent details along with the total. v) Write a C program to implement realloc()	CO1-CO5
10	**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures **Suggested Experiments/Activities:** **Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists **Lab10 :** Bitfields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields anddifferentiate the same without using bit- fields i) Create and display a singly linked list using self-referential structure. ii) Demonstrate the differences between structures and unions using a Cprogram.	CO1-CO5

	iii) Write a C program to shift/rotate using bitfields. Write a C program to copy one structure variable to another structure of thesame type	
11	**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basicmethods of numerical integration **Suggested Experiments/Activities:** **Tutorial 11:** Functions, call by value, scope and extent, **Lab 11:** Simple functions using call by value, solving differential equationsusing Eulers theorem. i) Write a C function to calculate NCR value. ii) Write a C function to find the length of a string. iii) Write a C function to transpose of a matrix. iv) Write a C function to demonstrate numerical integration ofdifferential equations using Euler's method.	CO1-CO5
12	**Objective:** Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at- least five distinct problems that have naturally recursive solutions. **Suggested Experiments/Activities:** **Tutorial 12: Recursion, the structure of recursive callsLab 12: Recursive functions** i) Write a recursive function to generate Fibonacci series. ii) Write a recursive function to find the lcm of two numbers. iii) Write a recursive function to find the factorial of a number. iv) Write a C Program to implement Ackermann function using recursion. v) Write a recursive function to find the sum of series.	CO1-CO5
13	**Objective**: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers **Suggested Experiments/Activities:** **Tutorial 13: Call by reference, dangling pointers** **Lab 13: Simple functions using Call by reference, Dangling pointers.** i) Write a C program to swap two numbers using call by reference. ii) Demonstrate Dangling pointer problem using a C program. iii) Write a C program to copy one string into another using	CO1-CO5

	pointer. iv) Write a C program to find no of lowercase, uppercase, digits and othercharacters using pointers.	
14	**Objective:** To understand data files and file handling with various file I/Ofunctions. Explore the differences between text and binary files. **Suggested Experiments/Activities:** **Tutorial 14:** **File handling** **Lab 14: File operations** i) Write a C program to write and read text into a file. Write a C program to write and read text into a binary file using fread()and fwrite() iii) Copy the contents of one file to another file. iv) Write a C program to merge two files into the third file usingcommand-line arguments. v) Find no. of lines, words and characters in a file vi) Write a C program to print last n characters of a given file.	CO1-CO5

Learning Resources
Text Books
1. Ajay Mittal, Programming in C: A practical approach, Pearson. 2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill
Reference Books
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India 2. Forouzan, Gilberg, Prasad, C Programming, A Problem-Solving Approach, Cengage
e- Resources & other digital material
1. https://www.geeksforgeeks.org/c-programming-language/ 2. https://www.greatlearning.in/academy/learn-for-free/courses/c-programming 3. https://onlinecourses.nptel.ac.in/noc22_cs101/course