

Programme Name: Artificial Intelligence and Machine Learning / Computer Engineering / Information Technology

Programme Code: AN / CO / IT

Course Code	Course Title	Course Abbr.	Semester
7R104	C Programming	CPR	FIRST

I. RATIONALE

This Course intends to develop programming skills in the students, using a popular structured programming language 'C'. The students will learn step by step procedure (i.e. flowcharting &Algorithm) of any program development process. The programming skills thus acquired can be used for developing programs with programming features which in turn will help in developing practical applications for the scientific, research and business purposes.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcomes through various teaching learning experiences: **Develop structured, modular and memory efficient programs in 'C' using arrays, functions, pointers.**

III. COURSE LEVEL LEARNING OUTCOMES (COs)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

CO1 - Develop algorithm and draw the flowchart for 'C' Programming.

CO2 - Write Simple C Program

CO3 - Develop a program using decision and loop statement.

CO4 - Implement program using array

CO5 - Implement programs based on functions, structure and pointers.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme			Credits	Paper Duration	Assessment Scheme										Total Marks					
				Actual Contact Hrs. / Week					SLH	NLH	Theory			Based on LL & TSL				Based on SL						
				CL	TL	LL					Theory			Based on LL & TSL										
				Max	Max	Max					FA-TH	SA-TH	Total	FA-PR	SA-PR	SLA								
7R104	C Programming	CPR	DSC	4	-	4	2	10	5	3	30	70	100	40	50	20	50#	20	25	10	225			

Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - SelfLearning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online ExaminationNote :

1. FA-TH represents average of two Progressive tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that course.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V.THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Describe structure of C Program TLO 1.2 Describe steps for writing algorithm. TLO 1.3 Draw flow chart to solve given problem logically TLO 1.4 Describe guidelines for developing flowchart.	Unit – I: Introduction to Flowcharts and Algorithms 1.1 History of C, General structure of C program, header files. 1.2 Algorithm: Definition, steps for developing and writing algorithm using pseudo codes. 1.3 Flowchart: Definition and Importance of flowchart, Symbols of Flowchart: Flow lines, Terminals, Input/Output, Processing Decision, Connection off-page connectors. 1.4 Guidelines for preparing Flowchart, Flowchart structure: Sequence, selection, repetition. Limitation of flowchart.	Chalk Board/ White Board/ Hands-on Demonstration/ Presentations
2	TLO 2.1 Choose appropriate data type for variable. TLO 2.2 . Declare and define variables. TLO 2.3 Describe format specifiers and escape characters. TLO 2.4 Write and execute simple program in ‘C’ TLO 2.5 Use arithmetic, relational and logical operators for forming expressions. TLO 2.6 Format input and output using ‘C’ statements.	Unit – II: Basics of C programming 2.1 Character set ‘C’ tokens, Keywords, and Identifiers, Data Types in C Storage Capacity range for data types, Modifiers and type conversion 2.2 Constants and Variables. 2.3 Format specifiers and escape sequences 2.4 Input and Output statements in ‘C’: printf(), scanf(), usegetc(), putc(), getchar() and putchar() 2.5 Types of Operators and Expression: Arithmetic, Relational, Assignment, Logical, conditional operators. Expressions. 2.6 Write, compile, execute a simple ‘C’ program Programming Errors in C: Syntax error, run time error, linker error, logical error, and semantic error	Chalk Board/ White Board/ Hands-on Demonstration Presentations
3	TLO 3.1 Develop programs using decision making statements in ‘C’ language. TLO 3.2 Describe unconditional branching goto. TLO 3.3 Develop programs using structured loop control statements in ‘C’ language TLO 3.4 Differentiate between while loop and do while. TLO 3.5 Use break and continue statements in loop.	Unit – III: Control Statements in C 3.1 Decision Statements: Simple If statement, If..else statement, Nested If else statement, elseif ladder and switch case statements 3.2 Unconditional branching: goto statement 3.3 Loop and nested loop Statements: for loop, While loop, 3.4 Do while loop, Difference between for loop and while loop, while loop and Do while loop. 3.5 Break, continue statements.	Chalk Board/ White Board/ Hands-on Demonstration Presentations
4	TLO 4.1 Declare and define array. TLO 4.2 Develop programs using 1-D array in ‘C’ language. TLO 4.3 Develop programs using 2-D array in ‘C’ language TLO 4.4 Enlist Advantages of arrays	Unit –IV: Introduction to Arrays 4.1 Definition, characteristics and types of arrays. 4.2 One Dimensional array: Declaration syntax, initialization and use. 4.3 Two Dimensional Array: Declaration syntax, initialization and use. 4.4 Advantages of arrays.	Chalk Board/ White Board/ Hands-on Demonstration Presentations

5	<p>TLO 5.1 Use library function.</p> <p>TLO 5.2 Describe string function.</p> <p>TLO 5.3 Define user define function and its prototypes.</p> <p>TLO 5.4 Describe Function Prototypes</p> <p>TLO 5.5 Describe Local and global variables.</p> <p>TLO 5.6 Explain introduction to Structures and Pointers</p> <p>TLO 5.7 Explain the concept of array of structures.</p> <p>TLO 5.8 Describe features of pointers.</p>	<p>Unit V: Functions, Structures and Pointers</p> <p>5.1 Definition and types of function: Library and user defined functions.</p> <p>5.2 String Functions puts(), gets(), strlen(), strcmp(), strcpy(). Strrev(), streat()</p> <p>5.3 User Defined functions: Declaration, calling and definition.</p> <p>5.4 Function Prototypes: i) No return type - no parameter list ii) No return type- with parameter list iii) Return type-no parameter list iv) Return type- with parameter list</p> <p>5.5 Local and global variable.</p> <p>5.6 Introduction to Structures and Pointers Need of structure, definition, declaration. accessing members of structures.</p> <p>5.7 array of structure,</p> <p>5.8 Introduction and Features of Pointers,</p>	Chalk Board/ White Board/ Hands-on Demonstration Presentations
Curriculum for Progressive Test:			
Progressive Test-1: Unit-1, Unit-2, and Unit-3: up to 3.1 Progressive Test-2: Unit-3: 3.2 onwards, Unit-4, and Unit-5: up to 5.3			

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Numb erof hrs.	Relevant COs
LLO 1.1 Install and cite the turbo C ++ Help Contents.	1	Install Turbo C++ and study various Help options given in it.	2	CO1
LLO 2.1 Design algorithm for given problem statement.	2*	Write algorithm for given problem statement (Any Four)	2	CO1
LLO 3.1 Identify the symbols of flowchart LLO 3.2 Create flowchart for given problem.	3*	Draw Flow Chart for given problem statement(Any four)	2	CO1
LLO 4.1 Use standard input output Header files LLO 4.2 Use input output statements	4	Write simple C program , compile and execute it.	2	CO2
LLO 5.1 Select appropriate data types for variables. LLO 5.2 Declare and initialize variables.	5*	Write a program for displaying the values of variables with various data types.	2	CO2
LLO 6.1 Apply the arithmetic operators.	6*	Write the program for arithmetic operators.	2	CO2
LLO 7.1 Use appropriate format specifiers.	7	Write a program for displaying formatted output on the screen.	2	CO2
LLO 8.1 Use character input and output function.	8*	Implement program to use getc(),putc(), getchar() and putchar()	2	CO2
LLO 9.1 Solve errors occurred in program	9	Execute a C program to solve errors in a program	2	CO2
LLO 10.1 Identify the types of errors.	10	Write a program to find out Compile and run time errors.	2	CO2
LLO 11.1 use simple conditional statement.	11*	Write a program for simple if statement such as i)To check the given number is Positive. ii) To check the given number is even	2	CO3

LLO 12.1 use if else statement for a given problem statement.	12*	Write a program for if -else statement such as i)To check the given number is even or odd. ii)To check condition of Leap year.	4	CO3
LLO13.1 use Nested if statement for a given problem statement.	13	Write a program for Nested if else statement such as i)To find the largest number amongst three. ii)To find the grade of student.	4	CO3

Teacher should assign the suitable problem statement for implementing following concepts.

LLO14.1 Apply if else ladder for a given problem statement.	14*	Implement a program for if else Ladder statement	2	CO3
LLO15.1 Apply switch case for given problem statement.	15	Implement a program for switch case statement.	2	CO3
LLO 16.1 Apply WHILE LOOP for given problem statement.	16*	Execute a program using while loop.	2	CO3
LLO 17.1 use DO-WHILE LOOP for the given problem statement.	17	Execute a program using Do-while loop.	2	CO3
LLO 18.1 Apply FOR LOOP for given problem statement.	18*	Execute a program using For loop.	2	CO3
LLO 19.1 use break and Continue statement in loops.	19	Execute a program using break and continue statements in loops.	2	CO3
LLO 20.1 use One Dimensional array.	20*	Execute program to display 1-Dimensional array.	2	CO4
LLO 21.1 Use conditional statements in an array.	21	Implement a program to search a number in an array.	2	CO4
LLO 22.1 use 2 Dimensional array.	22*	Execute program to display 2-Dimensional array.	4	CO4
LLO 23.1 Use 2 Dimensional array for mathematical problems.	23	Execute a program for matrix addition.	4	CO4
LLO 24.1 Use Library functions of math.h	24	Implement program for library functions of math.h	2	CO5
LLO 25.1 Use Library function of String.h	25*	Implement Program for following string functions. puts(), gets(),strlen(), strcmp(), strcpy(). Strrev(), strcat()	2	CO5
LLO 26.1 Design functions for given problem statement.	26*	Implement a program for user defined function	2	CO5
LLO 27.1 Apply various function prototype to design functions. LLO 27.2 Create user defined functions with different prototypes.	27	Implement a program for with different prototypes. i) No return type - no parameter list ii) No return type- with parameter list iii)Return type-no parameter list iv) Return type- with parameter list	4	CO5
LLO 28.1 Create Structure data type. LLO 28.2 Access values of members of structures.	28*	Execute a program for displaying structure members and function.	4	CO5
LLO 29.1 Create Structure data type. LLO 29.2 Access values of members of structures.	29	Execute a program for displaying the values of members in structure.	2	CO5
LLO 30.1 Access memory address using pointer.	30	Execute program to initialize and display values of pointer.	2	CO5

Note: A suggestive list of LLOs is given the above table. A judicial mix of minimum 20 LLOs needs to be performed out of 30. The LLOs which marked as '*' are compulsory, so that the students reach the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.

VI. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLSDEVELOPMENT (SELF LEARNING)

Micro project

The micro-project has to be industry application based, internet-based, workshop-based, laboratory-based or field-based as suggested by Teacher

1. Design a program for Simple Calculator. Implement all the four arithmetic operators in it.
2. Implement Bank Management System using C structure, create 3 modules user data, transaction, and display.
3. Implement School management system using C structure. Create 3 modules student data, grades, and teacher module.
4. Implement Library management system using C structures. Create 3 modules student data, book information and book issue module.
5. Implement Employee management system using C structures. Create 4 modules Employee data, recruitment, department data and display.
6. Implement Hospital Management system using C structures. Create 3 modules Patient data, admission discharge and billing.
7. Implement Bus reservation system. create 3 modules, customer data, reservation/ cancellation and billing
8. Implement Cricket score board. Create 2 modules score acceptance and display.
9. Implement Telecom Billing system. Create 3 modules customer data, usage and bill generation.
10. Implement a program for display of Snake game.

Any new topic (other than mentioned list) related to the curriculum can be given for microproject.

Assignments

1. Need of programming languages and its types.
2. Prepare chart for Compilation process in C.
3. Implement program for matrix multiplication.
4. Study and compare various compilers
5. Describe the structure of a basic C program with an example.
6. Explain the need for programming languages and classify their types with examples.
7. Explain Data Types and Storage Classes in C.
8. Write a Program to Implement String Operations.
9. Demonstrate the Use of Pointers in C.
10. Study and Implement File Handling in C.

Self-Learning Activities:

1. Complete any one course related to Programming in C on Infosys Springboard
2. Develop C language code for relevant topics suggested by the teacher.
3. Practice **reading and fixing buggy code** to improve your understanding.
4. Intentionally create bugs (e.g., wrong loop condition) and try fixing them
5. Use platforms like: [HackerRank](#), [CodeChef](#), [LeetCode](#)

Note for Teacher: The marks distribution for self-learning activities should be decided by the teacher based on the nature and quality of Micro-projects, Assignments, and/or other self-learning tasks.

VII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr. No	Equipment Name with Broad Specifications	Relevant LLO Number
1	a) Computer System with all necessary Peripherals and Internet connectivity. b) Turbo C / any other desktop application for C programs.	1.1 To 30.1

VIII. SUGGESTED FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Flowcharts and Algorithms	CO1	10	2	6	4	12
2	II	Basics of C programming	CO2	12	4	4	4	12
3	III	Control Statements in C	CO3	14	4	6	4	14
4	IV	Introduction to Arrays	CO4	10	4	6	6	16
5	V	Functions, Structures and Pointers	CO5	14	4	6	6	16
Grand Total				60	18	28	24	70

Legends: R – Remember Level, U – Understand Level, A – Application Level

IX. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Lab performance, Assignment rubrics, Progressive test.

Summative Assessment (Assessment of Learning)

- End term Lab. Performance (practical examination), Viva voce

X. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Program me Specific Outcome s* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2
CO1	1	1	1	-	-	-	3	1	-
CO2	2	2	2	2	-	-	2	2	-
CO3	3	3	3	3	-	2	2	3	-
CO4	1	1	1	1	-	1	2	1	-
CO5	3	3	3	3	-	2	2	3	2
CO6	1	1	1	1	-	1	2	1	1

XI. SUGGESTED LEARNING MATERIALS / BOOKS

Sr. No	Author	Title	Publisher
1	E. Balaguruswamy	Programming in ANSI 'C'	Mcgraw Hill Publications ISBN 0070534772
2	Yashwant Kanetkar	Let us 'C'	BPB Publication ISBN 9788183331630

3	David Griffiths, Dawn Griffiths Head	First C	O'Reilly Media, Inc. ISBN: 9781449345013
4	Brian W. Kernighan & Dennis M. Ritchie	The C Programming Language	Prentice Hall, Second Edition ISBN: 978-0131103627
5	Pradip Dey & Manas Ghosh	Programming in C	Oxford University Press, ISBN: 978-0195687910

XIII. LEARNING WEBSITES & PORTALS

Sr. No	Link / Portal	Description
1	https://nptel.ac.in/courses/106104128	C Programming
2	https://jsommers.github.io/cbook/control.html	Control structures, flow control statements in C
3	https://www.learn-c.org/en/Functions	Functions
4	https://www.simplilearn.com/tutorials/c-tutorial/pointers-in-c	Pointers
5	https://www.w3schools.com/c/	C Programming
6	https://www.coursera.org	C programming Course