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PROGRAMMING IN 'C' LANGUAGE **Course Code : 312009**

Programme Name/s	**: Digital Electronics/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electronics & Communication Engg./ Electronics Engineering/ Instrumentation & Control/ Industrial Electronics/ Instrumentation/ Medical Electronics/ Electronics & Computer Engg.**
Programme Code	**: DE/ EJ/ EK/ ET/ EX/ IC/ IE/ IS/ MU/ TE**
Semester	**: Second / Third**
Course Title	**: PROGRAMMING IN 'C' LANGUAGE**
Course Code	**: 312009**

I. RATIONALE

C language is basic programming language for enhancing logical and problem solving ability of student . This course enhances and builds confidence in programming skills of diploma students. This course will enable students to inculcate programming concepts and methodology to solve engineering problems.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attain the following industry employer expected outcome through various teaching learning experiences - Develop ‘C’ programs to solve wide-reaching electronic engineering related problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Develop C program using input/output and arithmetic expressions.
- CO2 - Develop C program using decision making statements and loops.
- CO3 - Use predefined and user defined functions to develop C program.
- CO4 - Develop C programs using arrays and strings.
- CO5 - Implement the basics of structures and pointers to enhance the performance of the program.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312009	PROGRAMMING IN 'C' LANGUAGE	CPR	SEC	2	-	2	2	6	3	-	-	-	-	-	25	10	25@	10	25	10	75

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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 - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

1. FA-TH represents average of two class 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 semester.
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 Write the basic structure of C program. TLO 1.2 Differentiate between keywords and identifiers. TLO 1.3 Use relevant data types as per the given situation. TLO 1.4 Construct algorithm and draw flowchart for the given problem. TLO 1.5 Use different types of operators in given situations.	**Unit - I Basics of C Programming** 1.1 Algorithms and Flow Charts: 1.1.1 Steps for writing algorithm 1.1.2 Notations of flow charts. 1.2 Structure of C program , Introduction of Assembler, Linker, Compiler, Interpreter. 1.3 Character set, Keywords, identifiers , constants, Variables 1.4 Data Types: 1.4.1 Predefined Data types :integer-unsigned, signed, long, float, double, character, single ,octal, hexadecimal 1.4.2 User defined Data Types: Arrays, Structures . 1.5 Operators and expressions: 1.5.1 Formatted input and output statements 1.5.2 Types of Operators: Arithmetic, logical, relational, increment and decrement, bitwise, special operators: unary, ternary operators, 1.5.3 Precedence, Associativity of Operators	Chalk-Board Hands-on
2	TLO 2.1 Implement branching and looping. TLO 2.2 Demonstrate control statements using “if-else”. TLO 2.3 Apply different types of loops as per the given problem.	**Unit - II Decision Control & Looping** 2.1 Introduction to decision control, branching and looping 2.2 Decision Control statements: if, if-else, if-else-if ladder, switch case, 2.3 Looping and branching Statements: 2.3.1 while Loop, 2.3.2 for Loop, nested for loop 2.3.3 do-while loop, break, continue 2.3.4 Goto statement	Chalk-Board Demonstration Hands-on

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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.
3	TLO 3.1 Use functions for implementing C program. TLO 3.2 Write 'C' program to pass values between the functions. TLO 3.3 Use library functions for the given problem. TLO 3.4 Develop a recursive function for the given problem.	**Unit - III Functions** 3.1 Concept and Need of a Function. 3.1.1 Declaration ,definition and calling of functions 3.2 Passing Values between Functions: call by value ,call by reference, Scope Rule of Functions. 3.3 Using Library Functions: 3.3.1 math functions like : mod(),sqrt(),pow(),exp(),sum(), round(), 3.3.2 Character Functions like islower(),isupper(),isdigit(),tolower() 3.4 Recursive function.	Chalk-Board Demonstration Hands-on
4	TLO 4.1 List down the steps to declare, initialize and display array elements. TLO 4.2 Write a C program to handle Two dimensional arrays. TLO 4.3 Write steps to declare, initialize and display the strings in C program. TLO 4.4 Apply relevant string library functions as per the given problem.	**Unit - IV Arrays And Strings** 4.1 Concept and need of Arrays, 4.1.1 Declaration, Initialization, Storing Array Elements in Memory, Displaying array elements 4.2 Two-Dimensional Arrays 4.2.1 Initializing a Two-Dimensional Array 4.2.2 Adding elements to 2-D Array 4.2.3 Display elements of 2-D Array 4.3 Introduction of Strings 4.3.1 Declaration, Initialization and Display of string 4.4 Standard Library String Functions 4.4.1 strlen(),strcpy(), strcat( ), strcmp( )	Chalk-Board Demonstration Hands-on
5	TLO 5.1 Develop a program to declare , access and display structures in C. TLO 5.2 Use pointers to access memory and perform pointer arithmetic.	**Unit - V Structures & Pointers.** 5.1 Introduction to structures: 5.1.1 Declaring a Structure 5.1.2 Accessing Structure elements 5.1.3 Displaying Structure elements 5.2 Concept of pointer 5.2.1 Pointer notation 5.2.2 Pointer variables, declaration of pointer 5.2.3 Pointer arithmetic like increment and decrement operation.	Chalk-Board Demonstration Hands-on

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Implement format specifiers available in C language.	1	(*) Write a 'C'program to display hexadecimal, decimal, octal format of entered number using %d, %c. %i. %f, %g, %u, %o ,%s, %x, %n, %%,	2	CO1

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Implement basic/input output statement of C language. LLO 2.2 Apply logical and bitwise operators on given data	2	(*) Write a program to perform following operations. (a) Display the message "Hello World", name. address, date of birth and email id using print( ) function. (b) Logical operations: And(&) , | (OR) for given values , Bitwise operations :<< (LEFT SHIFT), >> (RIGHT SHIFT) for given values	2	CO1
LLO 3.1 Use header files to perform specific task. LLO 3.2 Determine equivalent value of parallel resister using a C program.	3	(*) 1) Write a program to display current time and date using **time.h** header file. 2) Write a program to obtain the equivalent value for parallel resistor by assuming resistor values.	2	CO1
LLO 4.1 Determine the bandwidth of amplifier using a C program.	4	(*) Write a program to Calculate bandwidth of given amplifier having higher 3 dB cutoff frequency at 20 KHz and lower 3dB cutoff frequency 50Hz .Display the bandwidth in KHz.	2	CO1
LLO 5.1 Implement If-else, if-else-if ladder for solving given task.	5	(*) 1) Write a program to check whether given number is even or odd. 2) Write a program to determine leap year using "if-else-if" ladder	2	CO2
LLO 6.1 Implement post tested loop using do-while loop	6	Write a program to reverse a given number using do-while loop	2	CO2
LLO 7.1 Apply switch-case statement for implementing menu driven program.	7	(*) Write a C menu driven program to perform arithmetic operations using switch statement.	2	CO2

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 8.1 Use for loop to implement iteration.	8	(*) Write a program to print table of given number using for loop.	2	CO2
LLO 9.1 Apply Goto statement for implementing branching operation in C.	9	Write a program to implement goto statement	2	CO2
LLO 10.1 Use user defined functions to solve given task.	10	(*) Write a user defined function power (a, b) to calculate the value of a raised to b.	2	CO3
LLO 11.1 Implement call by value and call by reference	11	(*) Write a program to implement swapping of two integer by using following methods i) call by value ii) call by reference	2	CO3
LLO 12.1 Implement inbuilt math functions to perform mathematical operations.	12	(*) Write a program to implement following math functions i) mod() ii) sqrt() iii)pow() iv)exp() v)sum() vi) round()	2	CO3
LLO 13.1 Implement inbuilt character functions to perform operations on character data type.	13	Write a program to implement following character function in C. i) islower() ii) isupper() iii) isxdigit() iv) tolower() v) toupper()	2	CO3
LLO 14.1 Write a program to implement One -Dimensional array. LLO 14.2 Apply 2-Dimnesional array to perform matrix operations	14	(*) 1) Write a program to store 10 numbers in an array and find sum of 10 numbers. 2) Write a program to perform following matrix operations using 2-D array • Addition • Subtraction • Transpose • Sum of digonal of matrix	2	CO4

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.1 Perform string operations using standard library functions	15	Write a program to implement following Standard Library String Functions. i) strlen() ii) strcpy() iii) strcat( ) iv) strcmp( ) v) strrev()	2	CO4
LLO 16.1 Use structures to store multiple data types.	16	(*) Declare a structure Student consisting of following members: • rollno • name • address • percentage Write a program to take data of three students and display the same.	2	CO5
LLO 17.1 Create a C program for implementing pointers	17	Write C program to create, initialize, assign and access a pointer variable	2	CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

Virtual Labs

- Students are encouraged to solve IIT Virtual Labs assignment on any selected topic. Link for Virtual Labs: https://cse02-iiith.vlabs.ac.in/Introduction.html

Micro project

- Unit Convertor: Each batch will prepare a menu driven program to perform different operations unit conversion.
- Patterns: Each batch will prepare a program to display different number patterns
- Basic Mathematical Functions: Each batch will prepare a menu driven program to perform following operations: i) Pascal triangle ii) Armstrong No. iii) Floyd's triangle iv) HCF and LCM.
- Number Conversion System: Each batch will prepare a menu driven program to convert decimal number system to i) binary ii) Octal iii) Hexadecimal number system
- a) Bus Reservation System: Each batch will prepare a menu driven program to following operations i) Book a Ticket ii) List the information of all the tickets booked.

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Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Hardware : Personal Computer , RAM minimum 2 GB onwards. Operating System : Windows 10 onwards / Linux Software : Turbo C / GCC / Visual Studio Code or any relevant C compiler.	All

IX. SUGGESTED 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	Basics of C Programming	CO1	8	0	0	0	0
2	II	Decision Control & Looping	CO2	6	0	0	0	0
3	III	Functions	CO3	6	0	0	0	0
4	IV	Arrays And Strings	CO4	5	0	0	0	0
5	V	Structures & Pointers.	CO5	5	0	0	0	0
Grand Total				**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators.Each practical will be assessed considering 60% weightage to process and 40% weightage to product.t

Summative Assessment (Assessment of Learning)

- End of term examination (Lab performance)viva voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (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	PSO-3
CO1	3	2	2	3	-	-	1			

CO2	3	2	3	3	-	-	1			
CO3	2	2	3	3	-	-	2			
CO4	2	2	3	3	-	-	2			
CO5	2	2	3	3	-	-	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Yashwant Kanetkar	Let Us 'C'	BPB Publication New Delhi ISBN: 978818331630
2	E Balaguruswamy	Programming in 'C'	Tata McGrawHill New Delhi ISBN: 978-1-25-900461-2
3	Herbert Schildt	C: The Complete Reference	McGraw Hill ISBN: 978-0070411838
4	Brian W. Kernighan / Dennis Ritchie	The C Programming Language 2e	Pearson Publication ISBN : 10. 0131103628

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.tutorialpoint.com	Basics of C programming
2	www.cprogramming.com	Cprogramming.com covers both C in-depth, with both beginner-friendly tutorials, more advanced artic
3	www.sourcecodeworld.com	C programming made easier
4	www.programmiz.com	Website provides easy to learn study material with online compiler to learn C programming
5	www.indiastudycente.com	Online portal to study C programming
6	www.c4learn.com	Website provides easy to learn study material with online compiler to learn C programming

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students