

**PROGRAMMING IN C****Course Code : 312019**

**Programme Name/s** : Automation and Robotics  
**Programme Code** : AO  
**Semester** : Second  
**Course Title** : PROGRAMMING IN C  
**Course Code** : 312019

**I. RATIONALE**

Procedure Oriented Programming language helps the students to solve given problems with help of basic principles of C programming paradigm. This course is basically designed to create a base to develop foundation skills for Embedded C Programming required for automation and robotics applications.

**II. INDUSTRY / EMPLOYER EXPECTED OUTCOME**

The aim of this course is to help the student to attain the following industry identified outcome through various teaching learning experiences: Develop applications in C using Procedure Oriented Programming skills.

**III. COURSE LEVEL LEARNING OUTCOMES (COS)**

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

- CO1 - Use keywords and Operators in C programs.
- CO2 - Use Control Structure to implement decision making problems in C programs.
- CO3 - Develop C programs using Arrays.
- CO4 - Implement C programs using Structures.
- CO5 - Use functions in C program to implement modular programming approach.

**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	
				CL	TL	LL					Practical			SLA							
							FA-TH	SA-TH			Total	FA-PR	SA-PR	SLA							
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min												
312019	PROGRAMMING IN C	CPR	SEC	1	-	2	1	4	2	-	-	-	-	-	25	10	25@	10	25	10	75

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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	<p>TLO 1.1 Identify the basic building blocks of C Program.</p> <p>TLO 1.2 Write C program using keywords.</p> <p>TLO 1.3 Write C program using input output statements.</p> <p>TLO 1.4 Write C program using arithmetic, logical and bitwise operators.</p>	<p><b>Unit - I C Language Basic</b></p> <p>1.1 History of C, General structure of C program.</p> <p>1.2 Header files, main() function, use of comments.</p> <p>1.3 Input statement using scanf() and output statement using printf().</p> <p>1.4 Variable, Data Types, Keywords, Constants ,Type conversion.</p> <p>1.5 Operators: Arithmetic, Relational, Logical, Bitwise, Assignment, Unary, Ternary, Scope Resolution.</p>	<p>Chalk-Board Demonstration</p> <p>Hands-on</p>
2	<p>TLO 2.1 Write 'C' program using decision making structure to solve the given problem</p> <p>TLO 2.2 Write 'C' program using loop statements to solve the given iterative problem</p> <p>TLO 2.3 Use Appropriate statements to alter the program flow in the given loop</p>	<p><b>Unit - II Decision Making</b></p> <p>2.1 If statement, If-else statement, Nested if statement, else if Ladder, Switch statement.</p> <p>2.2 Loop statements: While Loop, do-while Loop, for Loop, Nested for loop.</p> <p>2.3 Goto statement, break statement, continue statement.</p>	<p>Chalk-Board Demonstration</p> <p>Hands-on</p>

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<b>Sr.No</b>	<b>Theory Learning Outcomes (TLO's) aligned to CO's.</b>	<b>Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.</b>	<b>Suggested Learning Pedagogies.</b>
3	TLO 3.1 Write C program to create one and two dimensional arrays. TLO 3.2 Write C program to demonstrate operations on arrays. TLO 3.3 Write C program using an array of characters.	<b>Unit - III Array</b> 3.1 Need of Array, Types of Array: One dimensional arrays and Two dimensional array. 3.2 Array declaration and Initialization, Accessing One and Two-Dimensional array elements, Operations on array. 3.3 Array of characters	Chalk-Board Demonstration Hands-on
4	TLO 4.1 Write C program to demonstrate how to declare and initialize structure. TLO 4.2 Write C program using an array of structures	<b>Unit - IV Structures</b> 4.1 Introduction and Features of Structures. 4.2 Declaration and Initialization of Structures. 4.3 Array of Structure, Typedef, Enumerated Data Type.	Chalk-Board Demonstration Hands-on
5	TLO 5.1 Write C program using predefined string and math library functions. TLO 5.2 Write C program using user defined functions. TLO 5.3 Write C program to solve recursive problems using user defined recursive functions.	<b>Unit - V Functions</b> 5.1 Concept and need of functions. 5.2 Library functions: Math functions, String handling functions, other miscellaneous functions. 5.3 Writing User defined functions, scope of variables. 5.4 Different ways of function calling: Functions Without Arguments and Return Value, Functions With No Arguments But has a Return Value , Functions With Arguments But No Return Value, Functions That Accept Arguments and Give a Return Value , Parameter passing: call by value and call by reference. 5.5 Recursive functions.	Chalk-Board Demonstration Hands-on

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

<b>Practical / Tutorial / Laboratory Learning Outcome (LLO)</b>	<b>Sr No</b>	<b>Laboratory Experiment / Practical Titles / Tutorial Titles</b>	<b>Number of hrs.</b>	<b>Relevant COs</b>
LLO 1.1 Use variables, constants and keywords. LLO 1.2 Apply type conversion concept.	1	* Develop minimum two program using constants, variables and exhibiting data type conversion.	2	CO1
LLO 2.1 Use arithmetic operators to build arithmetic expressions. LLO 2.2 Use relational operators to build relational expressions.	2	Develop a C programs using arithmetic and relational operators.	2	CO1
LLO 3.1 Use logical operators to solve logical expressions. LLO 3.2 Use bitwise operators to solve bitwise operations	3	* Develop a C programs using logical and bitwise operators.	2	CO1
LLO 4.1 Apply decision making if statements for given situations.	4	* Develop a program to implement decision making statements i.e. if statement and if..else.	2	CO2

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<b>Practical / Tutorial / Laboratory Learning Outcome (LLO)</b>	<b>Sr No</b>	<b>Laboratory Experiment / Practical Titles / Tutorial Titles</b>	<b>Number of hrs.</b>	<b>Relevant COs</b>
LLO 5.1 Use multi-way decision making statement to solve the problem	5	* Develop C program using if..else, while, for loop statements	2	CO2
LLO 6.1 Use break and continue statement..	6	Develop a program to demonstrate the use of break and continue statements	2	CO2
LLO 7.1 Use entry controlled while loop statement for the given situation. LLO 7.2 Use entry controlled for loop statement for the given situation.	7	* Develop a program using while and for loop to solve the given iterative problem.	2	CO2
LLO 8.1 Use exit controlled do... while loop statement for the given situation.	8	* Develop a program using do..while loop to solve the given iterative problem.	2	CO2
LLO 9.1 Apply the concepts of array.	9	* Develop a program to implement one dimensional array.	2	CO3
LLO 10.1 Perform arithmetic operations on a two-dimensional matrix.	10	* Develop a program to perform arithmetic operations on two dimensional array.	2	CO3
LLO 11.1 Perform operations using two dimensional array	11	Develop program to perform transpose operation on a two dimensional matrix	2	CO3
LLO 12.1 Apply the concept of structure.	12	* Write C program using Structure.	2	CO4
LLO 13.1 Apply the concept of array of structure.	13	Write C program to demonstrate the use of arrays of structure.	2	CO4
LLO 14.1 Use string handling library functions. LLO 14.2 Use math library functions.	14	* Develop a C program to demonstrate the use of standard library functions.	2	CO5
LLO 15.1 Define user defined function. LLO 15.2 Write a C program to call user defined function.	15	* Develop a C program using user defined functions.	2	CO5
LLO 16.1 Use recursion concept to define recursive function.	16	* Develop a C Program using recursion.	2	CO5
<b>Note : Out of above suggestive LLOs -</b> <ul style="list-style-type: none"> <li>• '*' Marked Practicals (LLOs) Are mandatory.</li> <li>• Minimum 80% of above list of lab experiment are to be performed.</li> <li>• Judicial mix of LLOs are to be performed to achieve desired outcomes.</li> </ul>				

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

### Micro project

- 1. Develop simple calculator to perform mathematical operations.
- 2. Develop food menu card for restaurant.

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3. Develop menu driven program for invoice management system.

4. Develop menu driven program for number conversion system such as Hexadecimal to Decimal, Decimal to Binary etc.

**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 judicious 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	1. Computer System (Any computer system with basic configuration RAM: 8GB Minimum, OS: DOS or Any Windows OS version) 2. C Compiler (Turbo C Compiler/GCC Compiler / or any other 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	C Language Basic	CO1	3	0	0	0	0
2	II	Decision Making	CO2	4	0	0	0	0
3	III	Array	CO3	3	0	0	0	0
4	IV	Structures	CO4	2	0	0	0	0
5	V	Functions	CO5	3	0	0	0	0
<b>Grand Total</b>				<b>15</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**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  
40% weightage to Product

**Summative Assessment (Assessment of Learning)**

- End Semester Examination, Lab performance, viva voce

**XI. SUGGESTED COS - POS MATRIX FORM**

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

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	E Balagurusamy	PROGRAMMING IN ANSI C	McGraw Hill Education,8TH EDITION ISBN: 978-9351343202
2	Yashavant Kanetkar	Let Us C: Authentic guide to C programming language	BPB Publications, 19th Edition ISBN:9789355512765
3	Kernighan Brian W, Ritchie Dennis	C Programming Language	Pearson Education India, ISBN: 978-9332549449
4	Herbert Schildt	C: THE COMPLETE REFERENCE	McGraw Hill Education, Second Edition ISBN:978-0070411838

**XIII . LEARNING WEBSITES & PORTALS**

Sr.No	Link / Portal	Description
1	<a href="https://www.w3schools.com/c/c_intro.php">https://www.w3schools.com/c/c_intro.php</a>	C Introduction
2	<a href="https://www.geeksforgeeks.org/c-programming-language/">https://www.geeksforgeeks.org/c-programming-language/</a>	C Programming Language Tutorial
3	<a href="https://www.tutorialspoint.com/cprogramming/index.htm">https://www.tutorialspoint.com/cprogramming/index.htm</a>	C Tutorial
4	<a href="https://www.javatpoint.com/c-programming-language-tutorial">https://www.javatpoint.com/c-programming-language-tutorial</a>	C Programming Language Tutorial

**Note :**

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

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**MSBTE Approval Dt. 01/10/2024**

**Semester - 2, K Scheme**