

**Government of Karnataka**  
**Department of Technical Education**  
**Board of Technical Examinations, Bengaluru**

Course Title: <b>C PROGRAMMING LAB</b>	Course Code : <b>15EE23P</b>
Semester : <b>II</b>	Course Group : <b>Core</b>
Teaching Scheme in Hrs (L:T:P) : <b>0:2:4</b>	Credits : <b>3 Credits</b>
Type of course : <b>Tutorial + Practical</b>	Total Contact Hours : <b>78</b>
CIE : <b>25 Marks</b>	SEE : <b>50 Marks</b>

**Pre-requisites** : Mathematics and Science in secondary education, Basic computer skills lab.

**Course Objectives** : To develop programming skills using computer languages by learning programming concepts in C.

### Course Contents

Unit No.	Topics	Tutorial Hours	Practical Hours
1	Introduction to programming.	02	04
2	Keywords, constants, variables, Data types.	03	06
3	Operators and Expressions, Library functions	03	06
4	Formatted Input-output operations	04	08
5	Decision control statement	02	04
6	Loop control statements	03	06
7	Switch case statement	02	04
8	Arrays	04	08
9	Strings	03	06
<b>Total</b>		<b>26</b>	<b>52</b>

## Course Outcome:

On successful completion of the course, the students will be able to:

1. Learn the basic concepts of C programming.
2. Distinguish different programming approaches.
3. Write C programs and execute.
4. Debug different types of errors.

## Course Contents:

**Staff-in-charge must teach one hour tutorial for each Lab. The Contents to be taught in the one hour tutorial are**

### Note:

- i. Tutorial – 1Hour and Practice -2 Hours
- ii. Write flow chart for all the programs.

### Tutorial 1

Steps involved in problem solving using Algorithms and Flowcharts.

Basic structure of C program, Steps to be followed for–Creation, Compilation and Execution of a C program, use of simple scanf( ) and printf( ) functions.

### Program 1

1. Write a Program to print the text “Welcome to C programming”

### Tutorial2

Character set, keywords and identifiers, constants, variables, data types.

### Program 2

2. Write a program to find the area and circumference of a circle.

### Tutorial3

Operators and expressions, Library functions.

### Program 3, 4

3. Write a program to calculate the instantaneous value of an AC quantity like  $v=V_m \sin \omega t$
4. Write a program using ternary operator to find the minimum of two resistor values.

## Tutorial 4

Managing input-output operations – using functions like `getchar()` – reading a character, `putchar()` – writing a character, `scanf()` – formatted input and `printf()` – formatted output.

## Program 5, 6, 7, 8

5. Write a program to display the electrical units in the following format:

Electrical quantity	Unit
Resistance	Ohm
Current	Ampere
Voltage	Volt
Power	Watt

6. Write a program to find equivalent resistance when resistors are connected in series, equivalent capacitance when capacitors are connected in parallel.

7. Write a program to calculate the total cost of 2 Laptops and 1 Printer, assuming cost price and discount offer.

8. Write a program to find impedance in series RLC circuit.

## Tutorial 5

Decision making and branching using **if**, **if -else**, multi branch if, nested if statements.

## Program 9

9. Write a program to generate the electricity bill according to the units consumed for AEH and lighting installation as per present KPTCL tariff.

## Tutorials6

**Switch –case** statement

## Program 10

10. Write a program using **switch – case** to calculate

- i. Power dissipated in resistance
- ii. Energy stored in capacitor
- iii. Energy stored in inductor

## Tutorial 7

Looping - while, do-while & for statements

## Program 11, 12, 13

11. Using for loop find the current through a resistor, for voltage varying from 5V to 20V in steps of 5V, using Ohm's Law.

12. Using **while** loop find the current through a resistor, for voltage varying from 50V to 100V in steps of 10V, using Ohm's Law.

13. Using **do...While** loop find the current through a resistor, for voltage varying from 16V to 8V in steps of 4V, using Ohm's Law.

### **Tutorial 8**

Arrays – Syntax, reading and writing of one dimensional array.

### **Practical 8**

14. Write a program to input 10 numbers to an array and display the greatest number.

### **Tutorial 9**

Strings - Initializing String, Manipulating strings of characters

### **Program 15, 16**

15. Accept any electrical quantity as a string in lower case. Convert and display it in upper case.

16. Accept any 10 words and display the same.

## **Resources**

1. Programming with C – Byron S Gottfried
2. Programming in ANSI C – Balaguruswamy
3. Programming in C Language \_ M A Jayaram. Sapna Publications.
4. Let us C – Yaswanth Kanetkar
5. Programming in C – V.Rajaraman

## **Web Resources**

1. <http://fresh2refresh.com/cprogramming>
2. <http://www.learn-c.org>
3. <http://www.learnonline.com/>

## Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering	30
2	Understanding	30
3	Application/ Analysis	40
<b>Total</b>		<b>100</b>

## Mapping Course Outcomes with Program Outcomes: (Course Outcome linkage to Cognitive Level)

Course Outcome		Experiment linked	PO Mapped	Cognitive Level	Lab Sessions
CO1	Learn the basic concepts of C programming.	Tutorials 1 to 9 Expt. 1 to 4	2, 3, 8, 9, 10	R/U/A	17
CO2	Distinguish different programming approaches.	5 to 16	2, 3, 8, 9, 10	U/A	36
CO3	Write C programs and execute.	1 to 16	2, 3, 8, 9, 10	R/U/A	32
CO4	Debug different types of errors.	1 to 16	2, 3, 8, 9, 10	U/A	32

**R-Remember, U-Understanding; A-Application/ Analysis;**

## Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
C Programming Lab	-	3	3	-	-	-	-	3	3	3

**LEVEL 3- HIGHLY ADDRESSED, LEVEL 2-MODERATELY ADDRESSED, LEVEL 1-LOW ADDRESSED.**

METHOD IS TO RELATE THE LEVEL OF PO WITH THE NUMBER OF HOURS DEVOTED TO THE COS WHICH ADDRESS THE GIVEN PO.

IF  $\geq 40\%$  OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 3

IF 25 TO 40% OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 2

IF 5 TO 25% OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 1

If  $< 5\%$  of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

### Course Delivery:

The Course will be delivered through Tutorials, Demonstration, Exercises and Assignments.

### Tutorial - 1Hr:

Staff-in-charge will;

1. Explain the concepts and Programming skills of C language.
2. Impart/ discuss required selection of commands for the program to be executed.
3. Ask students to write and execute the program.
4. Explain how to debug the errors.

### Conduction/ Execution- 2 Hr:

Student will enter and execute the C program individually under the supervision of the staff-in-charge.

## Course Assessment and Evaluation:

	What		To Whom	Frequency	Marks	Evidence Collected	Course Outcomes
<b>Direct Assessment</b>	<b>CIE (Continuous Internal Evaluation)</b>	<b>I A Tests</b>	<b>Students</b>	<b>Two IA tests (Average of two IA test marks will be computed)</b>	<b>10</b>	<b>Blue Books</b>	<b>1 to 4</b>
		<b>Class room Assignments</b>		<b>Assignments or Mini Program Project</b>	<b>5</b>	<b>Assignment papers or Program hardcopy</b>	<b>1 to 4</b>
		<b>Record Writing</b>		<b>Record Writing (Average of marks allotted for each expt.)</b>	<b>10</b>	<b>Record</b>	<b>1 to 4</b>
				<b>TOTAL</b>	<b>25</b>		
	<b>SEE (Semester End Examination)</b>	<b>End Exam</b>	<b>Students</b>	<b>End Of the Course</b>	<b>50</b>	<b>Answer Scripts at BTE</b>	<b>ALL COs</b>
<b>Indirect Assessment</b>	<b>Student Feedback on course</b>		<b>Students</b>	<b>Middle Of The Course</b>			<b>Feed Back Forms</b>
	<b>End Of Course Survey</b>			<b>End Of The Course</b>			<b>Questionnaire</b>

\*CIE – Continuous Internal Evaluation

\*SEE – Semester End Examination

**Note:**

1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

## Suggested Student Activity (any one to be submitted with 3 pages report):

1. Develop flow chart for a given Process industry/ office automation/ salary slip, etc.
2. Mini project on Applications of C language in Engineering field.
3. Mini project on C language.
4. Report on C programs to solve an electrical circuit for currents (using KVL).
5. Report on C programs to solve an electrical circuit for voltages (using KCL).
6. Mini project on C language commands, keywords, arrays, etc.

### MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY ( Course Coordinator)

Dimension	Scale					Students score (Group of five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	3				
2	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2				
3	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	5				
4	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	4				
<b>Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks</b> <b>One activity on any one CO (course outcome) may be given to a group of FIVE students</b> <b>Grand Average/Total</b>						14/4 =3.5 ≈4				

### Example only: MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY- Task given- Industrial visit and report writing

Dimension	Scale					Students score (Five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1.Organisation	Has not included relevant info	Has included few relevant info	Has included some relevant info	Has included many relevant info	Has included all relevant info needed	3				
2. Fulfill team's roles & duties	Does not perform any duties assigned	Performs very little duties	Performs partial duties	Performs nearly all duties	Performs all duties of assigned team roles	2				
3.Conclusion	Poor	Less Effective	Partially effective	Summarises but not exact.	Most Effective	5				
4.Conventions	Frequent Error	More Error	Some Error	Occasional Error	No Error	4				
Total marks						14/4=3.5 ≈4				



### Scheme of Valuation

Sl.No.	Particulars	Marks
1.	Write one program for the assigned question	10
2.	Enter, execute and obtain output for the assigned question	25
3.	Obtain the printout of the assigned program	05
4.	Viva-voce	10
<b>Total</b>		<b>50</b>

### MODEL QUESTION BANK

#### C PROGRAMMING LAB

Code:15EE23P

1. Write a program to find the sum and average of three integers.  
[sum = a+b+c , average = sum/3]
2. Write a program to find the area and perimeter of a rectangle when length and breadth are given. [ hint: area = length x breadth, perimeter = 2(length + breadth) ]
3. Write a program to find the area of a triangle when base and altitude are given  
[hint: area =  $\frac{1}{2} * base * altitude$ ]
4. Write a program to find equivalent resistance of 3 resistors when connected in series, and when connected in parallel.
5. Write a program to find equivalent capacitance of 3 capacitors when connected in series, and when connected in parallel.
6. Write a program to find simple interest [SI] when Principal [P], Term [T] and Rate of Interest[R] are given.

Simple interest  $SI = \frac{PTR}{100}$

7. A computer manufacturing company announces a special offer to their customers on purchasing laptops and printers accordingly:  
On laptop the discount is 15%  
On printers the discount is 10%  
Write a program to calculate the discount if a customer purchases a laptop and a printer.
8. Write a program to calculate the value of the following expression.  
 $P = VI \cos \phi$

9. Write a program to calculate the value of following expression.  
 $I = I_m \sin \omega t$
10. Write a program to calculate the value of following expression.  
 $P = \sqrt{3} VI \cos \phi$
11. Write a program to find inductive reactance and capacitive reactance.  
 (Hint:  $X_L = 2\pi f L$   $X_C = \frac{1}{2\pi f C}$ )
12. Write a program to find impedance of a series RLC circuit.  
 (Hint:  $Z = \sqrt{R^2 + (X_L - X_C)^2}$   $X_L = 2\pi f L$   $X_C = \frac{1}{2\pi f C}$ )
13. Write a program to calculate real power, apparent power, reactive power and power factor in a single phase AC system (Hint: Apparent power  $S = EI$ , real power  $P = EI \cos \phi$ , Reactive power  $Q = EI \sin \phi$ )
14. Write a program to find the maximum of two resistor values using ternary operator.
15. Write a program using **switch – case** statement to find and display
1. Area of a circle. (hint:  $A = \pi r^2$ )
  2. Area of a square. ( $A = S * S$ )
  3. Area of a triangle. ( $A = \frac{1}{2} * B * H$ )
16. Write a program using **switch – case** statement to find and display:
1. Sum of two numbers
  2. Difference of two numbers
  3. Product of two numbers
  4. Division of two numbers
17. Write a program using **switch – case** statement to calculate
1. Power dissipated in resistance. (hint:  $P = VI$ )
  2. Energy stored in capacitor. ( $E = \frac{1}{2} CV^2$ )
  3. Energy stored in inductor. ( $E = \frac{1}{2} LI^2$ )
18. Write a program to generate the electricity bill according to the units consumed as per the given tariff:

Units consumed	Charge
Up to 100 units	` 2.70 paisa/unit
More than 100 and up to 200 units	` 3.50/unit
More than 200 units	` 6/unit

In addition to the above every consumer has to pay service charge of ` 50.

19. Accept a string in lower case. Convert and display it in upper case.

20. Write a program to display the electrical units in the following format:

Electrical quantity	Unit
current	Ampere
voltage	volts
power	watts
energy	KWH

21. Write a program to assign 10 numbers to an array and calculate the sum of even numbers and display them
22. Write a program to accept ten numbers and calculate the sum of odd numbers and display them.
23. Write a program to assign 10 numbers to an array and display the greatest number.
24. Write a program to assign 10 numbers to an array and display the smallest number.
25. Program to enter your name (first line), address1 (second line), address2 (third line) and address3 (fourth line) and display them. Use gets( ) and puts( ) string functions.