GUJARAT TECHNOLOGICAL UNIVERSITY

Subject Code: 3110003

PROGRAMMING FOR PROBLEM SOLVING
1ST YEAR

Type of course: Engineering Science

Prerequisite: Zeal to learn the subject

Rationale: Understanding of basic principles of Mechanical Engineering is required in various field of engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Topics	Teaching Hours	Module Weightage
1	**Introduction to computer and programming:** Introduction, Basic block diagram and functions of various components of computer, Concepts of Hardware and software, Types of software, Compiler and interpreter, Concepts of Machine level, Assembly level and high level programming, Flowcharts and Algorithms	5	11
2	**Fundamentals of C:** Features of C language, structure of C Program, comments, header files, data types, constants and variables, operators, expressions, evaluation of expressions, type conversion, precedence and associativity, I/O functions	4	9
3	**Control structure in C:** Simple statements, Decision making statements, Looping statements, Nesting of control structures, break and continue, goto statement	5	11
4	**Array & String:** Concepts of array, one and two dimensional arrays, declaration and initialization of arrays, string, string storage, Built-in-string functions	6	13
5	**Functions:** Concepts of user defined functions, prototypes, definition of function, parameters, parameter passing, calling a function, recursive function, Macros, Pre-processing	5	11
6	**Recursion:** Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	4	9
7	**Pointers:** Basics of pointers, pointer to pointer, pointer and array, pointer to array, array to pointer, function returning pointer	4	9
8	**Structure:** Basics of structure, structure members, accessing structure members, nested structures, array of structures, structure and functions, structures and pointers	4	9
9	**Dynamic memory allocation:** Introduction to Dynamic memory allocation, malloc, calloc	4	9

10	**File management:** Introduction to file management and its functions	4	9

Reference Books:

1. Programming in ANCI C, Seventh edition, by Balagarusamy E, Tata McGraw-Hill Publishing Company Limited
2. Programming with C, Second edition, by Gottfried, Tata McGraw-Hill Publishing Company Limited
3. Star C Programming, Pub: STAR Certification
4. C Programming language, Second edition, by Kernighan B W and Ritchie D M Prentice Hall,
5. Let us C, Fifth edition, by Kanetkar Y. P., BPB Publication
6. Fundamentals of Computing and Programming in C, First Edition, Oxford University Press, 2009 by Pradip Dey, Manas Ghosh,
7. "Computer programming", Pearson Education, 2007 by Ashok N. Kamthane.
8. "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007 by R.G. Dromey.
9. Programming in C, Reema Theraja, Oxford.

Course Outcomes:

1. Students will **learn** about fundamentals of computer and programming language, draw flow chart to solve given problem logically and **develop** algorithm to solve given program.
2. Students will be able to **comprehend** the general structure of C program, concepts of variable, datatype, operator and be able to **create** a C program to **demonstrates** these concepts.
3. Students will be able to **use** the concept of branching and looping to design efficient C program and be able to **apply** the concepts of user defined function and recursion to support reusability.
4. Students will be able to **design** an application using the concepts of array, pointer, structure and file management to solve real world problem.

List of Experiments:

1. Write a program to that performs as calculator (addition, multiplication, division, subtraction).
2. Write a program to find area of triangle(a=h*b*.5)
   a = area
   h = height
   b = base
3. Write a program to calculate simple interest (i = (p*r*n)/100)
   i = Simple interest
   p = Principal amount
   r = Rate of interest
   n = Number of years
4. Write a C program to interchange two numbers.
5. Write a C program to enter a distance in to kilometre and convert it in to meter, feet, inches and centimetre
6. Write a program to compute Fahrenheit from centigrade (f=1.8*c +32)
7. Write a C program to find out distance travelled by the equation d = ut + at^2
8. Write a C program to find that the accepted number is Negative, or Positive or Zero.
9. Write a program to read marks of a student from keyboard whether the student is pass or fail(using if else)
10. Write a program to read three numbers from keyboard and find out maximum out of these three. (nested if else)

11. Write a C program to check whether the entered character is capital, small letter, digit or any special character.
12. Write a program to read marks from keyboard and your program should display equivalent grade according to following table(if else ladder)

Marks	Grade
100 - 80	Distinction
79 - 60	First Class
59 - 40	Second Class
< 40	Fail

13. Write a c program to prepare pay slip using following data.
    Da = 10% of basic, Hra = 7.50% of basic, Ma = 300,
    Pf = 12.50% of basic, Gross = basic + Da + Hra + Ma, Nt = Gross – Pf.
14. Write a C program to read no 1 to 7 and print relatively day Sunday to Saturday.
15. Write a C program to find out the Maximum and Minimum number from given 10 numbers
16. Write a C program to input an integer number and check the last digit of number is even or odd.
17. Write a C program to find factorial of a given number.
18. Write a program to reverse a number.
19. Write a program to generate first *n* number of Fibonacci series
20. Write a program to find out sum of first and last digit of a given number.
21. Write a C program to find the sum and average of different numbers which are accepted by user as many as user wants
22. Write a program to calculate average and total of 5 students for 3 subjects (use nested *for* loops)
23. Read five persons height and weight and count the number of person having height greater than 170 and weight less than 50,
24. Write a program to check whether the given number is prime or not.
25. Write a program to evaluate the series 1^2+2^2+3^2+……+n^2
26. Write a C program to find 1+1/2+1/3+1/4+....+1/n.
27. Write a C program to find 1+1/2!+1/3!+1/4!+.....+1/n!.
28. Write a program to evaluate the series sum=1-x+x^2/2!-x^3/3!+x^4/4!......-x^9/9!
29. Write a program to print following patterns :

```
i   *               ii       *            iii   *****
    * *                     *  *                ****
    * * *          *  *  *                ***
    * * * *             *  *   *  *       **
    * * * * *         *  *  *   *  *            *
```

30. Write a program to print following patterns :

```
i   1          ii   12345      iii  55555      iv   1
    12         1234           4444            22
    123             123             333             333
    1234            12              22              4444
    12345           1               1               55555
```

31. Write a program to print following patterns:

```
i    AAAAA      ii     ABCDE
```

BBBB	ABCD
CCC	ABC
DD	AB
E	A

32. Write a C program to read and store the roll no and marks of 20 students using array.
33. Write a program to find out which number is even or odd from list of 10 numbers using array
34. Write a program to find maximum element from 1-Dimensional array.
35. Write a C program to calculate the average, geometric and harmonic mean of *n* elements in an array.
36. Write a program to sort given array in ascending order (Use Insertion sort, Bubble sort, Selection sort, Mergesort, Quicksort, Heapsort).
37. Write a program to find a character from given string.
38. Write a program to replace a character in given string.
39. Write a program to delete a character in given string.
40. Write a program to reverse string.
41. Write a program to convert string into upper case
42. Write a program that defines a function to add first *n* numbers.
43. Write a function in the program to return 1 if number is prime otherwise return 0
44. Write a function Exchange to interchange the values of two variables, say x and y. illustrate the use of this function in a calling function.
45. Write a C program to use recursive calls to evaluate $F(x) = x - x^3 / 3! + x^5 / 5 ! - x^7 / 7! + \ldots x^n / n!$.
46. Write a program to find factorial of a number using recursion.
47. Write a C program using global variable, static variable.
48. Write a function that will scan a character string passed as an argument and convert all lowercase character into their uppercase equivalents
49. Write a program to read structure elements from keyboard.
50. Define a structure type *struct* personal that would contain person name, date of joining and salary using this structure to read this information of 5 people and print the same on screen.
51. Define structure data type called time_struct containing three member's integer hour, integer minute and integer second. Develop a program that would assign values to the individual number and display the time in the following format: 16: 40:51
52. Define a structure called cricket that will describe the following information:
    Player name
    Team name
    Batting average
    Using cricket, declare an array player with 50 elements and write a C program to read the information about all the 50 players and print team wise list containing names of players with their batting average.
53. Design a structure student_record to contain name, branch and total marks obtained. Develop a program to read data for 10 students in a class and print them.
54. Write a program to print address of variable using pointer.
55. Write a C program to swap the two values using pointers.
56. Write a C program to print the address of character and the character of string using pointer.
57. Write a program to access elements using pointer.
58. Write a program for sorting using pointer.
59. Write a program to write a string in file

60. A file named data contains series of integer numbers. Write a c program to read all numbers from file and then write all odd numbers into file named "odd" and write all even numbers into file named "even". Display all the contents of these file on screen

List of Open Source Software/learning website : Students must refer to following sites to enhance their learning ability.

1) Vlabs.iitb.ac.in
2) NPTEL tutorials
3) www.coursera.org
4) www.udacity.com