



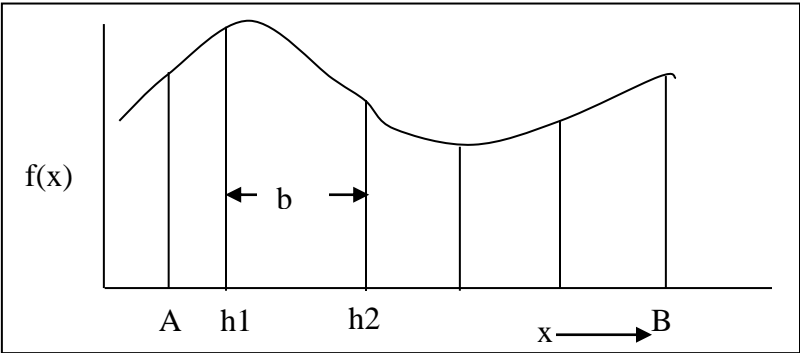
**B. P. Poddar Institute of Management & Technology**  
**Department of Electronics & Communication Engineering**  
**Academic Year: 2018-19 Semester: Even**  
**Laboratory Name: Ramanujan Laboratory Room No.: B604**  
**1 ECE 2<sup>nd</sup> Semester**



**Course Name: Programming for Problem Solving (ES-CS 291)**  
**List of Programs to be Performed**

Sl. No.	Topics	Name of Programs	CO	PO	PSO
1	Familiarization with Programming Environment	<ol style="list-style-type: none"><li>1. Go to your home directory and create there a subdirectory called 'src'.</li><li>2. Now change to the 'src' directory, create a directory called 'hello', and then enter into that directory.</li><li>3. Open here the file hw1.c with vi.</li><li>4. Write in it the codes in C to display "Hello World!"</li><li>5. Compile the codes in the file hw1.c</li><li>6. Run the file to display its content on screen.</li><li>7. Now copy its content to any other file of your choice first by creating it in the same directory.</li><li>8. Write command to list all the links from a directory?</li><li>9. Create a read-only file in your home directory?</li><li>10. Find which operating system version your system is running on in LINUX?</li><li>11. Now view the command line history in LINUX.</li><li>12. Now display how much space left in current drive.</li></ol>	1	1,2,12	1, 2
2	Simple Computational Problems using Arithmetic Expressions	<ol style="list-style-type: none"><li>1. WACP to read two numbers and perform various arithmetic operations on them like Addition, Subtraction, Multiplication, Division &amp; Modulo Division.</li><li>2. WACP to swap two integer numbers: (a) without using 3<sup>rd</sup> variable (b) using 3<sup>rd</sup> variable (b) using bitwise operators.</li></ol>	1, 2	1,2,12	1, 2
3	Problems involving if-then-else Structures	<ol style="list-style-type: none"><li>1. WACP to find the nature of roots of a quadratic equation: <math>ax^2 + bx + c = 0</math> ; <math>a \neq 0, a, b, c \in R</math> Also compute the roots of the equation.</li><li>2. WACP to check whether a number is: (a) Prime (b) Armstrong. Use of 'switch-case' for these cases is preferable.</li></ol>	1, 2	1,2,12	1, 2

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4	Iterative Problems e.g., Sum of Series	<p>1. Consider the following series expansion of <math>\exp(x)</math>:</p> $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots \infty$ <p>Write a C function to add N terms of the series (<math>S_N</math>). Use a recursive C function to calculate factorial of an integer. After completion of addition, calculate the absolute error, <math> error </math> for a given value of x, where <math> error  =  e^x - \text{Sum of } N \text{ terms}(S_N) </math>. Hence obtain the value of N after which <math> error  \leq 0.01</math></p> <p>2. WACP to calculate the sum of following progressions: (Use of 'switch-case' is preferable)</p> <p>i) Arithmetic Progression (E.g. – Sum of first N odd natural numbers)</p> <p>ii) Geometric Progression (E.g. <math>-S_N = a + ax + ax^2 + ax^3 + \dots + ax^N</math>)</p> <p>3. Write C Programs to generate the following patterns:</p> <p>a) <pre> 1 1 1 1 2 1 1 3 3 1 1 4 6 4 1 </pre> </p> <p>b) <pre> * * * * * * * * * * </pre> </p> <p>c) <pre> * * * * * * * * * * * </pre> </p>	3, 4	1-5, 11, 12	1, 2
5	1D Array Manipulation	<p>1. Consider a set of N integers. Write a C function to find the maximum and minimum integer among them along with their positions.</p> <p>2. Write a C program to calculate the weighted average of a list of 'n' numbers, using the formula:</p> $x_{avg} = f_1x_1 + f_2x_2 + \dots + f_nx_n$ <p>where the f's are fractional weights, i.e.</p> $0 \leq f_i \leq 1 \quad \text{and} \quad f_1 + f_2 + \dots + f_n = 1$ <p>3. WACP to find the cross-correlation between two 1-D discrete signals with various shifting parameter values.</p>	3, 4, 5	1-6, 11, 12	1, 2
6	Matrix Problems, String Operations	<p>1. WACP to multiply two matrices and then find the transpose of the resultant matrix: (a) without pointer (b) integer pointer (c) array pointer (d) array of pointers</p> <p>2. WACP to find the inverse of a matrix.</p> <p>3. WACP to store names of some authorized persons of an organization. Develop a feature to control access of unauthorized person with their name.</p>	3, 4, 5	1-6, 11, 12	1, 2

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7	Simple Functions	<p>1. Write a C function to calculate the power of a number <math>n^r</math>, where <math>n \in R, r \in \{0, N\}</math>.  Note: Is it possible to make this program general for any <math>r \in R</math>.</p> <p>2. Write a C function to calculate the binary equivalent of a decimal number.  Note: Validate your program for (a) <math>53_{10}</math> (b) <math>(53.625)_{10}</math>.</p> <p>3. Write a C program to implement the following functions:  a) <math>[.]</math> : Greatest Integer Function  b) <math>\{.\}</math> : Fractional Function  Here, domains of the function have to be given by the user according to the following choices:  1) Domain <math>\in R</math> (Infinite Set). Calculate the allowable R for your compiler using range concept.  2) Domain <math>\in [-I_D, +I_D]</math> (Finite Set) where <math>I_D \in I^+</math>. <math>I_D</math> must be given by user.</p> <p>4. Write your own strcpy() and strcat() functions in C.</p>	3, 4	1-5, 11, 12	1, 2
8	Programming for Solving Numerical Methods Problems	<p>1. Numerical Integration: One of the applications of computers in numerical analysis is computing the area under of a curve.</p>  <p>WACP to calculate the area for a curve of the function <math>f(x) = x^2 + 1</math> between any two given limits say A and B as shown in figure above.  Note: Inputs to the program are lower limit(A), upper limit(B) and the number of trapezoids.</p> <p>2. Root Finding: Consider an algebraic equation: <math>x^5 + 3x^2 - 10 = 0</math>. An iterative method can be used to solve the equation with a suitable initial guess for the solution and a threshold error. WACP to compute the root(s) of the equation after N iterations. Hence find the value of N for which the solution is convergent. (Take threshold error = 0.01).</p>	3, 4	1-5, 11, 12	1, 2

Sl. No.	Topics	Name of Programs	CO	PO	PSO
9	Programming for solving Numerical methods problems	<p>1. Root Finding: Consider an equation: <math>xe^x = \sin x</math>. The equation can be solved with an iterative method using two properly chosen initial guesses for the solution and a threshold error. WACP to compute the root(s) of the equation after N iterations. Hence find the value of N for which the solution is convergent. (Take threshold error = 0.01).</p> <p>2. Numerical Differentiation: WACP to compute the derivative of a given differentiable function. (e.g. <math>f(x) = ax^2 + b</math>) within a given interval.</p>	3, 4	1-5, 11, 12	1, 2
10	Recursive functions	<p>1. Write a recursive C function to print the fibonacci series.</p> <p>2. Write a recursive C function to calculate factorial of an integer.</p> <p>3. Write a recursive C function to calculate the sum of all digits of a given integer.</p>	3, 4	1-5, 11, 12	1, 2
11	Pointers and Structures	<p>1. WACP that can maintain the name, roll, number and marks of a class of students. The size of the class is variable. Include function to compute the average marks of the class.</p> <p>2. WACP to study different features of structure: (i) array of structure (ii) nested structure (iii) structure pointer (iv) passing structure to a function.</p> <p>3. WACP to create a linked list and perform various operations: (i) Add node (ii) Delete node (iii) Count list (iv) Search list</p>	3, 4, 5	1-6, 11, 12	1, 2
12	File Operations	<p>1. WACP that will receive a file name and a line of text as command line arguments and write the text to the file.</p> <p>2. WACP to remove all blank from a C file.</p> <p>3. WACP to copy the contents of one file into another.</p>	4, 5, 6	1-6, 9-12	1, 2
13	Additional Assignments	<p>1. "2D Pattern Object Transformation": Generate a 2D pattern object. Hence develop a generalized program for transformation model of the object. Transformation means translation or rotation or combination of both.</p> <p>2. "2D Graphics Drawing": WACP to draw the following templates: (a) Straight Line (b) Circle (c) Parabola (d) Ellipse</p>	4, 5, 6	1-6, 9-12	1, 2