VAAGDEVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year I Sem.   L T P C
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Course Objectives:
- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

UNIT - I: Introduction to Programming
Compilers, compiling and executing a program.
Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode withexamples, Program design and structured programming
Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators
Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops
I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:
Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings
Structures: Defining structures, initializing structures, unions, Array of structures
Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self referential structures in linked list (no implementation) Enumerationdata type

UNIT - III: Preprocessor and File handling in C:
Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data toexisting files, Writing and reading structures using binary files, Random access using fseek, ftell andrewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:
Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard

functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursivefunctions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays ofdifferent data types

UNIT - V: Searching and Sorting:
Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexitythrough the example programs

Course Outcomes: The student will learn
  CO-1: To write algorithms and to draw flowcharts for solving problems. To convert the
         algorithms/flowcharts to C programs.
  CO-2: To use arrays, pointers, strings and structures to write C programs.
  CO-3: Ability to design and implement different types of file structures using standard methodology.
  CO-4: To decompose a problem into functions and to develop modular reusable code.
  CO-5: Searching and sorting problems.

TEXT BOOKS:
1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition,Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCE BOOKS:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

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[Note:The programs may be executed using any available Open Source/ Freely available
IDESome of the Tools available are:
CodeLite: https://codelite.org/
Code:Blocks:
http://www.codeblocks.org/
DevCpp :
http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:
- ➢ To work with an IDE to create, edit, compile, run and debug programs
- ➢ To analyze the various steps in program development.
- ➢ To develop programs to solve basic problems by understanding basic concepts in C likeoperators, control statements etc.
- ➢ To develop modular, reusable and readable C Programs using the concepts like functions,arrays etc.
- ➢ To Write programs using the Dynamic Memory Allocation concept.
- ➢ To create, read from and write to text and binary files

Practice sessions:
- a. Write a simple program that prints the results of all the operators available in C (including pre/post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
- b. Write a simple program that converts one given data type to another using auto conversion andcasting. Take the values from standard input.

Simple numeric problems:
- a. Write a program for finding the max and min from the three numbers.
- b. Write the program for the simple, compound interest.
- c. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.
- d. Write a program that prints a multiplication table for a given number and the number of rows inthe table. For example, for a number 5 and rows = 3, the output should be:
  5 x 1 = 5
  5 x 2 = 10
  5 x 3 = 15
- e. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).

b. Write a C program, which takes two integer operands and one operator from the user, performsthe operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

c. Write a program that finds if a given number is a prime number

d. Write a C program to find the sum of individual digits of a positive integer and test given numberis palindrome.

e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Writea C program to generate the first n terms of the sequence.

f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

g. Write a C program to find the roots of a Quadratic equation.

h. Write a C program to calculate the following, where x is a fractional value.
      1-x/2+x^2/4-x^3/6

j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometricprogression: 1+x+x^2+x^3+...... +x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Arrays, Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in asingle dimension array.

c. Write a program to count the occurrence of an element in an array.

d. Write a C program that uses functions to perform the following:

e. Addition of Two Matrices

f. Multiplication of Two Matrices

g. Transpose of a matrix with memory dynamically allocated for the new matrix as row and columncounts may not be the same.

h. Write C programs that use both recursive and non-recursive functions

i. To find the factorial of a given integer.

j. To find the GCD (greatest common divisor) of two given integers.

k. To find x^n

l. Write C program to demonstrate call by value and call by reference.

m. Write a program to pass a single dimensional array as a parameter to a function.

n. Write a program for reading elements using a pointer into an array and display the values usingthe array.

o. Write a program for display values reverse order from an array using a pointer.

p. Write a program through a pointer variable to sum of n elements from an array.

Files:

a. Write a C program to display the contents of a file to standard output device.

b. Write a C program which copies one file to another, replacing all lowercase

characters withtheir uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file nameand the character are supplied as command line arguments.

d. Write a C program that does the following:
    It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index shouldbe changed to the new value in the file. (hint: use fseek function) The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the first file followedby those of the second are put in the third file).

Strings:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.

b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent

c. Write a C program that uses functions to perform the following operations:

d. To insert a sub-string into a given main string from a given position.

e. To delete n Characters from a given position in a given string.

f. Write a C program to determine if the given string is a palindrome or not (Spelled same in bothdirections with or without a meaning like madam, civic, noon, abcba, etc.)

g. Write a C program that displays the position of a character ch in the string S or − 1 if S doesn't contain ch.

h. Write a C program to count the lines, words and characters in a given text.

i. Write a program to read 'n' strings and search the given substring.

j. Write a program to sort the strings in logical order.

Miscellaneous:

a. Write a menu driven C program that allows a user to enter n numbers and then choose betweenfinding the smallest, largest, sum, or average. The menu and all the choices are to be functions.Use a switch statement to determine what action to take. Display an error message if an invalidchoice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1            *            1         1            *
1 2          * *          2 3       2 2          * *
1 2 3        * * *        4 5 6     3 3 3        * *
                                                 *
                                    4 4 4 4      * *
                                                 *
```

Sorting and Searching:

a. Write a C program that uses non recursive function to search for a Key value in a given

b. list of integers using linear search method.

c. Write a C program that uses non recursive function to search for a Key value in a given

d. sorted list of integers using binary search method.

e. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

f. Write a C program that sorts the given array of integers using selection sort in descending order

g. Write a C program that sorts the given array of integers using insertion sort in ascending order

h. Write a C program that sorts a given array of names

Course Outcomes: The candidate is expected to be able to:

CO-1: Understand basic structure of the C Programming, data types, declaration and usage of variables,control structures and all related concepts.

CO-2: Ability to understand any algorithm and Write the C programming code in executable form.

CO-3: Implement Programs using functions, pointers and arrays, and use the pre-processors to solve realtime problems.

CO-4: Ability to use file structures and implement programs on files and Implement programs on sortingand searching techniques.

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson

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