MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

COURSE PLAN

Department	:	Data Science and Computer Applications
Course Name & code	:	Data Structures & DSE-2155
Semester & branch	:	III & DSE
Name of the faculty	:	Linda Varghese, Dr. Savitha G

No of contact hours/week:

L	T	P	C
3	1	0	4

Course Outcomes (COs)

	At the end of this course, the student should be able to:	**No. of Contact Hours**	**Marks**
CO1:	Identify appropriate data structure	Hrs.	Marks
CO2:	Interpret the working of searching and sorting techniques	Hrs.	Marks
CO3:	Demonstrate the working of linear and non-linear data structure	Hrs.	Marks
CO4:	Make use of preliminary structures to implement various applications	Hrs.	Marks
CO5:	Click or tap here to enter text.	Hrs.	Marks
	Total		

Assessment Plan

1. Continuous Evaluation	60%
Total of 3 regular evaluations which will be carried out in every week. Each evaluation is for 20 marks of which will have the following split up: Record: 4 Marks; Viva/test/quiz: 12 Marks; Execution: 4 Marks; Total = 20 Marks Total Internal Marks: 3 * 20 =60 Marks	
2. Lab Examination	40%
• Examination of 2 hours duration (Max. Marks: 40). Program Write up: 15 Marks; Program Execution: 25; MarksTotal: 15+25 =40 Marks	

Lesson Plan

L. No.	Topics	Course Outcome Addressed
L1	**1. Define a class EMPLOYEE contains following members.** **Data members: Employee_Number, Employee_Name, Basic, DA, IT, Net_Sal, Gross_salary.** **Member functions: To read the data, calculate net salary, gross salary and display both salary.** **Write a C++ program to read the data of N employees and compute Net salary and Gross salary of each employee. (DA= 12% of Basic and Income Tax (IT) = 18% of the gross salary).** **2. Create a flight class that has private data members: flight number (integer), destination(characters), distance (float), fuel (float).** **a) Initialize fuel to 13.2 liters** **b) Provide a parameterized function that accepts fuel details** **c) Private Member functions: calculate_fuel() to calculate the value of Fuel as per the following criteria:** **Distance (in kilometers) Fuel (in liters)** **<=1000 500** **>1000 and <=2000 1100** **>2000 2200** **d) Member functions: information_entry() to allow user to enter values for flight number, destination, distance which calls function calculate_fuel() to calculate the quantity of fuel and display_info() to allow user to view flight details.** **Additional questions:-** **1). Check if a given number is prime or not** **2). Factorial of given 10 numbers (do not use arrays)** **3). Print all odd numbers between m and n** **4). Menu driven program to sum all elements entered upto -1**	CO1

	5). Print triangle in the following form using loops until n. **Ex. If n=6** **1** **2 3** **4 5 6**	
L2	**1. Mapping of 2-D arrays to 1-D arrays:** **Map the following 2-D arrays (matrices) to 1-D arrays (lists).** **a) Upper triangular matrix** **b) Lower triangular matrix** **c) Diagonal matrix** **d) Tri-diagonal matrix** **e) Row-major** **f) Column-major** **Display the element at any specified position (row, column).** **2. Representation of a Sparse Matrix:-** **Represent a sparse matrix using 1-D array. Use this 1-D array to reconstruct the original matrix.** **Additional Questions:** **1) Define a class time with data members hour, min, sec .Write the user defined functions to (i) Add (ii) To find difference between two objects of class time. Functions take two time objects as argument and return time object. Also write the display and read function**	CO1
L3	**1. Representation of a Polynomial:-** **Represent a polynomial using 1-D array and perform addition operation on two polynomials.** **2. Write a program to perform following string operations without using string handling functions:** **a) length of the string** **b) string concatenation** **c) string comparison** **d) to insert a sub string** **e) to delete a substring** **Additional Questions:** **1). Write a program to subtract two polynomials.** **2). Write a program to find the transpose of a sparse matrix represented using array of objects.**	CO3
L4	**1. Solving problems using Recursion:** **a) Factorial of a given number** **b) GCD of 2 numbers** **c) Fibonacci series upto nth term** **d) Tower of Hanoi for n disks**	CO3

	Additional questions: **1) Write a program to find the length of a string using recursion** **Display the element at any specified position (row, column).**	
L5	**1. Implementation of Stack using arrays** **2. To check if the given parenthesized expression has properly matching open and closing parenthesis** **3. To check a given string is palindrome or not using stack** **Additional Questions:** **1). Write a program to Check whether a given String is Palindrome or not using Recursion** **2). Write a program to copy one string to another using Recursion**	CO3
L6	**1. Conversion of infix expression to postfix and prefix forms;** **2. Evaluation of postfix and prefix expressions**	CO4
L7	**1. Implementation of Queue using arrays** **2. Implement a circular queue of Strings with functions insert, delete and display.** **3. Write a program to implement the circular queue using arrays**	CO3
L8	**1. Write a menu driven program to perform the following operations on linked list.** **a) Insert an element in the beginning of the list** **b) Insert an element at the end of the list** **c) Insert an element before another element in the existing list** **d) Insert an element after another element in the existing list** **e) Delete a given element from the list** **f) Print the list** **2. Implement Stack and Queue using linked lists** **Additional Questions:** **1).Write the program which performs the following functions:** **a) Reverse the list** **b) Sort the list** **c) Delete every alternate node in the list** **d) Insert an element in a sorted list such that the order is maintained**	CO4
L9	**1. Write a menu driven program to perform the following on a doubly linked list** **a) Insert an element at the rear end of the list** **b) Delete an element from the rear end of the list** **c) Insert an element at a given position of the list** **d) Delete an element from a given position of the list** **e) Insert an element after another element** **f) Insert an element before another element**	CO4

	g) Print the list **2. Write a program to add two polynomials using doubly linked list.** **Additional Questions** **1). Write a program to perform insertion and deletion operation in circular doubly linked list.**	
L10	**1. Write user defined functions to perform the following operations on binary trees:** **a) create a binary tree** **b) In order traversal (recursive)** **c) Post order traversal (recursive)** **d) Preorder traversal (recursive)** **e) Count the number of leaf nodes in a binary tree** **2. Write a program to perform the following:** **a) Print the parent of the given element** **b) Print the depth of a tree** **c) Print the ancestors of a given node** **3. Write a program to construct and search for a given element in a binary search tree.** **Additional Questions:** **1). Write a program to implement level order traversal on binary search tree** **2). Write a program to insert and delete an element in a binary search tree.** **3). Write a program to search for a given element using Depth first search traversal.**	CO3
L11	**1. Linear Search and Binary searching** **2. Sorting: Bubble, Quick, Selection & Insertion** **3. Represent the graph using adjacency list and adjacency matrix** **4. Heapsort and mergesort** **Additional Questions:** **1). Write a program to perform BFS and DFS in a given Graph** **2). Write a program to construct expression tree from the given expression. (infix, prefix, postfix)**	CO2
L12	**End Semester Examination**	CO
L13	Click or tap here to enter text.	CO
L14	Click or tap here to enter text.	CO

References:

1.	Ellis Horowitz, SartajSahni, Dinesh Mehta, Fundamentals of Data Structures in C++, 2nd Edition, GalgotiaPublications, Reprint 2013
2.	Behrouz A Foruzan, Richard F Gilberg, A Structured Programming Approach using C, 3E, Cengage, Learning India Pvt Ltd. India 2007
3.	Behrouz A. Forouzan, Richard F. Gilberg, Data Structures, A Pseudocode approach Using C, 2e, Cengage, learning India Pvt.Ltd, India, 2009.
4.	Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Fundamentals of Data Structures in C, 2nd Edition Univertsities Press (India) Private Limited, Reprint, 2013
5.	Debasis Samanta, Classic Data structures- 2nd edition, PHI Learning Private Limited , 2010
6.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson Education, 2005.
7.	Michael T, Goodrich, Roberto Tamassia, David Mount, Data Structures and Algorithms in C++, 2nd Edition, John Wiley & Sons, 2011

Submitted by: Mrs. Linda Varghese & Dr. Savitha G

(Signature of the faculty)

Date: 15-09-2021

Approved by: Dr. Radhika M Pai

(Signature of HOD)

Date: 15-09-2021

FACULTY MEMBERS TEACHING THE COURSE (IF MULTIPLE SECTIONS EXIST):

FACULTY	SECTION	FACULTY	SECTION
Linda Varghese	A		
Dr. Savitha G	B		

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