Lovely Professional University, Punjab

Course Code	Course Title	Lectures	Tutorials	Practicals	Credits	
CSE231	COMPETITIVE PROGRAMMING	0	0	2	1	
Course Weightage	ATT: 5 CAP: 45 ETP: 50					

Course Outcomes :Through this course students should be able to

CO1 :: relate the theoretical knowledge and insights gained to formulate working code

CO2 :: devise time and space efficient algorithms to solve abundant ubiquitous problems

CO3 :: identify the intricacies present in the design of a solution to devise an optimal solution

CO4 :: deduce the appropriate and efficient algorithms and data structures for optimal solution to the problems at hand

CO5 :: extend and utilize the knowledge base of various algorithmic paradigms to build optimized solutions to real world problems

CO6 :: validate the logic building and code formulation by designing optimal code capable of passing various test cases

	Reference Books (R)		
Sr No	**Title**	**Author**	**Publisher Name**
R-1	DATA STRUCTURES AND ALGORITHMS : CONCEPTS, TECHNIQUES AND APPLICATIONS	G. A. V. PAI	Mc Graw Hill Education
R-2	CRACKING THE CODING INTERVIEW	GAYLE LAAKMANN MCDOWELL	CAREERCUP

Relevant Websites (RW)		
Sr No	**(Web address) (only if relevant to the course)**	**Salient Features**
RW-1	https://www.codechef.com/	Programming, Data Structures and Algorithms
RW-2	https://www.hackerrank.com/	Programming, Data Structures and Algorithms
RW-3	https://www.hackerearth.com/	Programming, Data Structures and Algorithms
RW-4	https://tutorialhorizon.com/algorithms/	Programming, Data Structures and Algorithms
RW-5	https://www.geeksforgeeks.org/	Programming, Data Structures and Algorithms

Software/Equipments/Databases		
Sr No	**(S/E/D) (only if relevant to the course)**	**Salient Features**
SW-1	https://www.codeblocks.org/downloads/	Code Blocks
SW-2	https://www.bloodshed.net/	Dev C plus plus

Scheme for CA:

CA Category of this Course Code is:A0203 (2 best out of 3)

Component	Weightage (%)	Mapped CO(s)
Test- Situation based problem solving 1	50	CO1, CO2, CO3
Test- Situation based problem solving 2	50	CO1, CO2, CO3, CO4
Test- Situation based problem solving 3	50	CO1, CO2, CO3, CO4, CO5, CO6

Details of Academic Task(s)

Academic Task	Objective	Detail of Academic Task	Nature of Academic Task (group/individuals)	Academic Task Mode	Marks	Allottment / submission Week
Test- Situation based problem solving 1	To build the problem solving skills of the students and to evaluate competency in the same	The student will be given some problems for which he/she is expected to provide an optimal solution. The academic task is aimed at checking the knowledge gained till week 5.	Individual	Online	30	5 / 6
Test- Situation based problem solving 2	To build the problem solving skills of the students and to evaluate competency in the same	The student will be given some problems for which he/she is expected to provide an optimal solution. The academic task is aimed at checking the knowledge gained till week 10.	Individual	Online	30	9 / 10

Test- Situation based problem solving 3	To build the problem solving skills of the students and to evaluate competency in the same	The student will be given some problems for which he/she is expected to provide an optimal solution. The academic task is aimed at checking the knowledge gained till week 12.	Individual	Online	30	12 / 13

Detailed Plan For Practicals

Practical No	Broad topic	Subtopic	Other Readings	Learning Outcomes
Practical 1	Strings and Linear Data Structures	Longest substring problem	RW-1 RW-4 SW-1	The students will become accomplished learners and will exhibit more confidence while dealing with problems related to strings
	Strings and Linear Data Structures	Reverse the individual words of the string	RW-1 RW-4 SW-1	The students will become accomplished learners and will exhibit more confidence while dealing with problems related to strings
	Strings and Linear Data Structures	Decimal number to Roman Numeral	RW-1 RW-4 SW-1	The students will become accomplished learners and will exhibit more confidence while dealing with problems related to strings
Practical 2	Strings and Linear Data Structures	Longest Palindromic substring	RW-1 RW-4 RW-5 SW-1	The students will get exposure to more string problems and will also get exposure to problems involving linear data structures
	Strings and Linear Data Structures	Implement a stack using one queue	RW-1 RW-4 RW-5 SW-1	The students will get exposure to more string problems and will also get exposure to problems involving linear data structures
	Strings and Linear Data Structures	Find kth largest element	RW-1 RW-4 RW-5 SW-1	The students will get exposure to more string problems and will also get exposure to problems involving linear data structures
Practical 3	Strings and Linear Data Structures	Detect duplicate parenthesis	RW-1 RW-2 RW-3 RW-4 RW-5 SW-2	The students will be exposed to problems involving the stack data structure

Practical 3	Strings and Linear Data Structures	Reverse a stack problem	RW-1 RW-2 RW-3 RW-4 RW-5 SW-2	The students will be exposed to problems involving the stack data structure
Practical 4	Strings and Linear Data Structures	Print minimum element of the array using recursion	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion
	Strings and Linear Data Structures	Last non zero digit of the factorial	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion
Practical 5	Strings and Linear Data Structures	Find symmetric pairs problem	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion
	Strings and Linear Data Structures	Pascal triangle problem	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion
	Strings and Linear Data Structures	Two people meet each other	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion
	Strings and Linear Data Structures	Next Largest Number problem	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion

Practical 5	Strings and Linear Data Structures	Minimum swaps to get the Sorted Array	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion
	Strings and Linear Data Structures	Print smallest k elements in same order in an array	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will become accomplished learners in recursion
Practical 6	Hashing and Hashtables	Four elements such that a+b=c+d using sets and hashtables	RW-1 RW-3 RW-4 RW-5 SW-1 SW-2	The students will get further understanding of hashing and hashtables
	Hashing and Hashtables	Print K most frequent numbers using hashing	RW-1 RW-3 RW-4 RW-5 SW-1 SW-2	The students will get further understanding of hashing and hashtables
Practical 7	Hashing and Hashtables	Shortest substring of all distinct characters	RW-2 RW-3 RW-5 SW-1 SW-2	The students will get further understanding of hashing and hashtables
Practical 8	Binary Trees and Binary Search Trees	Left view of a binary tree	RW-1 RW-2 RW-3 SW-1 SW-2	The students will get exposure to problems related to binary trees thereby increasing their understanding about this non linear data structure
	Binary Trees and Binary Search Trees	Flatten a binary tree	RW-1 RW-2 RW-3 SW-1 SW-2	The students will get exposure to problems related to binary trees thereby increasing their understanding about this non linear data structure

Practical 8	Binary Trees and Binary Search Trees	Lowest common ancestor in a BST	RW-1 RW-2 RW-3 SW-1 SW-2	The students will get exposure to problems related to binary trees thereby increasing their understanding about this non linear data structure
Practical 9	Binary Trees and Binary Search Trees	Spiral order traversal in a binary tree	RW-1 RW-3 RW-4 RW-5 SW-1 SW-2	The students will gain more understanding about traversing a binary tree and heap data structure
	Binary Trees and Binary Search Trees	Merge K sorted lists using heaps	RW-1 RW-3 RW-4 RW-5 SW-1 SW-2	The students will gain more understanding about traversing a binary tree and heap data structure
Practical 10	Binary Trees and Binary Search Trees	Maximum sum pairs problem using heaps	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will gain more understanding about heap data structure
Practical 11	Graphs and Shortest Distance between every pair of vertices	Check whether the graph is Bipartite	RW-2 RW-3 RW-4 RW-5 SW-1 SW-2	The students will gain more understanding about the graph data structure
	Graphs and Shortest Distance between every pair of vertices	Shortest distance between every pair problem	RW-2 RW-3 RW-4 RW-5 SW-1 SW-2	The students will gain more understanding about the graph data structure
Practical 12	Two dimensional arrays and Linked Lists	Implement own arraylist using arrays	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will build on their understanding of linear data structures

Practical 12	Two dimensional arrays and Linked Lists	Print the matrix in spiral form	RW-1 RW-2 RW-4 RW-5 SW-1 SW-2	The students will build on their understanding of linear data structures
Practical 13	Two dimensional arrays and Linked Lists	Last nth node of a linked List	RW-1 RW-3 RW-4 RW-5 SW-1 SW-2	The students will build on their understanding of linear data structures
	Two dimensional arrays and Linked Lists	Remove a loop in singly linked list	RW-1 RW-3 RW-4 RW-5 SW-1 SW-2	The students will build on their understanding of linear data structures
Practical 14	Two dimensional arrays and Linked Lists	Subtract two numbers	RW-2 RW-3 RW-4 RW-5 SW-1 SW-2	The students will build on their understanding of linear data structures
	Two dimensional arrays and Linked Lists	Flatten the given linked list	RW-2 RW-3 RW-4 RW-5 SW-1 SW-2	The students will build on their understanding of linear data structures
	SPILL OVER			
Practical 15	Spill Over			