CS2001 Data Structures

Form number	COURSE OUTLINE / DOCUMENT	
COURSE INSTRUCTORS INFORMATION	Names	**Dr. Anwar Shah,** **Mr. Muhammad Usman Joyia,** **Mr. Muhammad Yousaf**
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	Program	Batch	# of Sections	Section(s)	Semester	FALL
DEGREE INFORMATION	BS CS/SE	19-20-21-22	06	BCS(3A, 3B,3C, 3D) MCS(1A)	Year	2022

	Course Category C- Core/ E-Elective		Code	Title	Credit hours
COURSE INFORMATION	C		CS2001	Data Structures	4
	Prerequisite(s)		CS1004	Object Oriented Programming	4
	TA Required (Yes/ No)	No. of TA(s)	Theory Ratio Lab (Hrs)		
	Yes	06	3:1		

TEXT BOOK(s) INFORMATION	Title of Book		**Data Structures Using C and C++**	Edition: 2nd
	Author(s)		Y. Langsam, M. J. Augenstein, A. M. Tenenbaum	
	Publisher		McGraw Hill Education	
	Title of Book		**Introduction to Algorithms**	
	Author(s)		Charles E. Leiserson, Clifford Stein, Ronald Rivest, and Thomas H. Cormen	
	Publisher		MIT Press	
Reference Book (s)	1.	Title of Book	**Data Structures,** Revised 1st Edition Seymour Lipschutz	
		Imprint details		
	2.	Title of Book	**Data Structures using C++** by D. S. Malik	
		Imprint details		
	Support Material(s)	a.	Teach Yourself Data Structures And Algorithms In 24 hours - Robert Lafore	
		b.	Problem Solving with Algorithms and Data Structures Release 3.0 - Brad Miller, David Ranum	
		c.	Programming Interviews Exposed 3rd Edition by John Mongan, Eric Giguère, and Noah Kindle	

Short Description of Course:	Data structures can be defined as a group of data element techniques that provide an efficient way for organization and storage of data in computer applications. The objective of this course to investigate different ways to reduce the time and space challenges by using data efficiently. General data structure types include the array, the file, the record, the table, the tree, and so on. Any data structure is designed to organize data to suit a specific purpose so that it can be accessed and worked with in appropriate ways.
Brief Description of Course: *(not more than 250 words)*	Data Structure is a systematic way to organize data to use it efficiently. Data Structures are core to any "Computer Science" degree and are related to efficient storage of information in memory. In this course we will cover elementary data structures and associated algorithms which manipulate them. The purpose of this course is to provide the students with solid foundations in the basic concepts of programming & data structures.

Course Objectives (CO): ***(Brief & unambiguous)… at least 5 Cos***

a. tend to describe specific, discrete units of knowledge and skill
b. can be accomplished within a short time frame - still may be relevant for a class period
*c. tend to be **STATEMENTS OF INTENT**; do not necessarily suggest that the behavior has been demonstrate*

1.	To provide students a solid foundation in the basic concepts of programming and data structures
2.	To familiar students with all elementary data structures, abstract data types and algorithms for operations associated with them.
3.	To make students able to evaluate data structures and associated algorithms based on their time and space complexities.
4.	Have ability to select the proper data structure and related algorithm for a given problem.
5.	Correctness of algorithms and studying their computational complexities

Learning Outcome (LO): ***(Brief & unambiguous-with reference to course objectives i.e. at least 5 Los***

a. describe broad aspects of behavior which incorporate a wide range of knowledge and skill
b. accomplished over time in several learning experiences
*c. refer to **DEMONSTRATIONS OF PERFORMANCE***

a.	Strategies and techniques to efficiently store data (Data Structures) and to perform processing on such data in efficient ways (Algorithms), as well as on the analysis and design of such techniques.
b.	Decide among different Data Structures according the problem
c.	
d.	

Courseware Structure: (Mark X where applies)

Lecture (Lect)	*Multimedia (MM)*	*Exercise (s) (Exer)*	*Labs (Lab)*	*Case Studies (CAS)*	*Assignment (s) (Assign)*	*Group Presentation (G-Pres)*	*Any other Medium*
X	X	X			X	X	

COURSE CONTENTS (Theory):

Weeks	Contents/Topics	**Courseware Events (MM/ IT Lab/Case Study/ Assignment/ Presentation etc.)	Comments (if any)
Week-01	Introduction to Data Structures and Applications		
Week-02	Abstract Datatypes and Arrays Introduction to dynamic sequential structures		
Week-03	Linked List (Singly, Doubly) Linked List Implementation	Assignment – I	Circular L.L can be included
Week-04	Elementary Data Structures: Stack Applications of Stack (Conversion to prefix, postfix, and infix notations)	Assignment – II	
		Quiz – I	
Week-05	Elementary Data Structures: Stack Applications of Stack (Conversion to prefix, postfix, and infix notations)		
Week-06	Elementary Data Structures: Queue Queue Applications and Implementation Priority Queues	Quiz – II	
		Assignment – III	
Week-07	**Sessional – I**		

Week-08	Trees: Introduction and basic terminologies Introduction to Binary Tree, Perfect, and complete binary tree Tree Traversal (Breadth first and depth first)		
Week-09	Binary Search Tree (Insertion, deletion, and traversal) Introduction to AVL Trees		
Week-10	AVL Tree operations and Implementation	Assignment – IV	
Week-11	Graph Data structure Adjacency matrix, Adjacency list	Quiz – III	
Week-12	**Sessional – II**		
Week-13	Graph Searching: DFS and BFS Introduction to Hashing	Assignment – V	
Week-14	Hash functions Hashing Techniques;	Quiz – IV	
Week-15	Introduction to probabilistic data structures Bloom filters and skip lists	Assignment – VI	
Week-16	Revision		
Week-17	**Final Exam**		

** **Courseware Events** *column is subject to variations / appropriations*

Oral & Written Communications/ Report Writing:

Grading Criteria			
			Absolute Grading

Marks Distribution:

Particulars	% Marks	*Weight Ranges
1. Assignments	10	
2. Quizzes	05	
3. Mid Term-I	15	
4. Mid Term-II	15	
5. Project(s) & Lab	05	
6. Final Exam	50	
7. Any other		
Total:-	**100**	**100**

**Weight Ranges as defined at FLEX*

Planned Courseware Events:

Particulars	Planned (Qz/As/Labs)	Remarks
1. Quizzes	**4**	Individual Activity
2. Assignments/	**6**	Individual Assignment
3. Presentations/ Project	**=>1**	Mostly group assignment
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Academic and Moral Integrity:	**All assignments should be your own work (or your group's when approved). PLAGIARISM will be awarded with "F" grade and/or reported to the University for academic and moral misconduct. To protect yourself, ALWAYS PROVIDE REFERENCES!**
S E P E C I A L I N S T R U C T I O NS (Specific to the subject being taught)	