Data Structures

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Data structures: What and Why?

- **Data structure is a way of storing and organizing data in a computer so that it can be retrieved and used most productively.**

- Different kinds of data structures are meant for different kinds of applications, and some are highly specialized to specific tasks.

- Where might we need data structures?

Why Data structures?

- They help to manage ,organize data and process data in volatile/temporary memory
- Essential ingredient in creating fast and powerful algorithms

Program = Algorithm + Data structure

- They make the code cleaner and easier to understand

Data structures Vs Database Vs knowledgebase!!

Which Data structures?

- Stack - LIFO
- Queue- FIFO, Queue, Circular queue, Dequeue, Priority queue
- Linked lists- singly linked list, doubly linked list, circular linked list
- Graph
- Trees – General trees, binary trees, binary search trees, B tree, B+ tree, heaps, AVL trees
- Set, map, dictionary

Data structures in real life?

- A Queue for bus
- Waiting in clinic or office
- Maps, geographical or railway maps etc
- Social networks
- Undo operation in any s/w or app
- Operating system processes
- Evaluate an equation
- Games like chess, tic-tac-toe
- Family history

Books

Sr. No	Name/s of Author/s	Title of Book	Publisher	Edition/ Year
1	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed	*Fundamentals Of Data Structures In C*	University Press	Second Edition 2008
2	Michael T Goodrich Roberto Tamassia David Mount	*Data Structure and Algorithm in C++*	Wiley	Second Edition 2011
3	Richard F. Gilberg & Behrouz A. Forouzan	*Data Structures A Pseudocode Approach with C*	CENGAGE Learning	Second Edition 2005
4	Aaron M Tanenbaum Yedidyah Langsam Moshe J Augentstein	*Data structure Using C*	Pearson	Twelfth Impression 2013
5	Jean Paul Tremblay, Paul G. Sorenson	*An introduction to data structures with applications*	Tata McGraw-Hill Education	Second Edition 1984
6	Reema Thareja	*Data structures using C*	Oxford Higher Education	Second edition, 2014

Lab Work

Sr. No	Topic	CO Mapping	Week No
1	Implementation of ADT without using any standard library function	CO1	1
2	Static Implementation of Stack- Basic operations (Creation, Insertion, Deletion, Peek)	CO2	2
3	Introduction to Dynamic Memory Allocation. DMA functions malloc(), calloc(), free() etc. Implementation of Basic Linked List -Creation, Insertion, Deletion, Traversal, Searching an element. Vlab: https://ds1-iiith.vlabs.ac.in/exp/poly-arithmetic/index.html	CO1	3,4
4	Implementation of Dynamic implementation of Stack- Creation, Insertion, Deletion, Peek)	CO2	5
5	Implementation of Queue operations (Static and Dynamic implementation)	CO2	6
6	Implementation of various types of LL- doubly LL, circular LL, circular doubly LL etc	CO2	7
7	Implementation of Binary Search Tree- insertion, search and traversal Vlab : https://ds1-iiith.vlabs.ac.in/exp/binary-search-trees/index.html Vlab: https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html	CO2	8.9
8	Study of Graph traversal methods Vlab: https://ds1-iiith.vlabs.ac.in/exp/depth-first-search/index.html Vlab: https://ds1-iiith.vlabs.ac.in/exp/breadth-first-search/index.html	CO2	10
9	Implement a dictionary for some real world application. Perform operations like union, intersection, and difference. Use C/C++ or python.	CO3	111
10	Hashing - Linear and quadratic hashing Vlab: https://ds1-iiith.vlabs.ac.in/exp/hash-tables/index.html	CO4	12
11	Implementation of sorting Algorithms.	CO4	13
	Onscreen test		

Lab assessment Rubrics

Attendance	Timely execution of code and submission of write-up	Quality of the code (Correct program with comments and output)	Originality of code	Understanding of concepts	Quality and originality of write-up, including the post lab questions	**LAB Total**	**On-screen test**	**Total**
5	**5**	**5**	**5**	**5**	**5**	**30**	**20**	**50**

Programming language

- C language

- Why???
- Low-level memory access, Performance, pointer-arithmetic, simplicity, widely supported etc.

Internal Assessments

Sr. No.	Task	Description of task	Schedule
1	Rapid Fire activity with flash cards	Every student has to prepare 10 flash cards on data structures in module 1, 2 and 3.1	After Test
2	Peer grading Programming assignment using a data structure to develop solution for a small application	This can be done in a group of 2-3 students. 1.Small programming programs will be assigned to each group. 2.The presentation **screencast** video should- explain the problem statement, logic, code and output. 3.The video duration will be max 10mins 4.All students must participate in presentation 5.Students would choose a problem statement and suggest one of the data structure for developing the solution, and how the solution will be implemented. Upon teacher's approval, students would work on the chosen problem and submit their work. 6.Code submission will be on Turnitin platform to check plagiarism and originality.	First Week of Oct

Test

- Module 1- Introduction , Types of Data Structures, ADT (Abstract data type)
- Module 2 - Linear data structure (linked list, stack and queue)
- Module 3.1 – Nonlinear data structure (Tree)

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Evaluation Scheme Theory

Course Code	Name of the Course			
216U01C302	Data Structures			
Teaching Scheme (Hrs./Week)	TH	P	TUT	Total
	03	-	-	03
Credits Assigned	03	-	-	03
Evaluation Scheme	Marks			
	LAB/TUT CA	CA (TH)		ESE	Total
		IA	ISE		
	-	20	30	50	100

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Evaluation Scheme Lab

Course Code	Name of the Course			
216U01L302	Data Structures Laboratory			
Teaching Scheme (Hrs./Week)	TH	P	TUT	Total
	--	02	--	02
Credits Assigned	--	01	--	01
Evaluation Scheme	Marks			
	LAB/TUT CA	CA (TH)		ESE	Total
		IA	ISE		
	50	--	--	--	50

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Modes of Content Delivery

- Blackboard Teaching
- Visual Aids
- Seminar
- NPTEL Video Lectures
- Quiz
- Guest Lecture
- Test
- Assignments/Activities

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Queries???

Thank you!!