Data Structures

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What do I teach?

- Data structures
- Analysis of Algorithms
- System Security
- Artificial Intelligence
- Operating systems
- Computer Networks
- Social, mobile, analytics and Cloud

Data structures: What and Why?

- Data structure is a particular way of storing and organizing information 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?

- To process data in volatile/temporary memory
- For design of efficient algorithms.

Program = Algorithm + Data structure

- Data use and easier data processing on a software system.

Data structures, Database and 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

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

Course outcomes

CO1	Explain the different data structures used in problem solving
CO2	Apply linear and non-linear data structure in application development.
CO3	Describe concepts of advance data structures like set, map & dictionary
CO4	Demonstrate sorting and searching methods.

Course outline

1	Introduction to Data Structures- Types ADT
2	Linear data structure – linked list, stack and queue
3	Non-Linear data structures: Trees, Graph
4	Non-Linear data structures: Set, Map, Dictionary
5	Searching and Sorting

Books

1	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed	*Fundamentals Of Data Structures In C*
2	Richard F. Gilberg & Behrouz A. Forouzan	*Data Structures :A Pseudocode Approach with C*
3	Jean Paul Tremblay, Paul G. Sorenson	*An introduction to data structures with Applications*
4	Aaron M Tanenbaum ,Yedidyah Langsam, Moshe J Augentstein	*Data structure Using C*
5	Michael T Goodrich Roberto Tamassia, David Mount	*Data Structure and Algorithm in C++*

Lab Work

Lab assessment Rubrics

Timely Execution (05)

Timely Writeup Submission (10)

Individual Performance (10)

Programming language

- C language

Internal Assessments

1	One Quiz (No re-exam will be conducted.)	Module 1,2,3	After Test (September)
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 applications 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.	Oct First week

Test

- Module 1.2 and 3.1
- 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)

Evaluation Scheme

- Number of credits – 04 (TH – 03 , PR – 01)
- Term Test/ISE – 30 marks
- Internal Assessment – 20 marks
- End Sem. Exam – 100 converted to 50 marks
- Term work – 25 marks
- Prac/Oral – 25 marks

Course Code	Course Title			
116U04C302	Data Structures			
	TH	P	TUT	Total
Teaching Scheme(Hrs.)	03	–	–	03
Credits Assigned	03	–	–	03

Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	30	20	50	--	--	---	100

Modes of Content Delivery

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

Data structures Implementation

Variables, arrays and Pointers

- Variable
- Pointer variable
- Memory allocation
- Array allocations
- Dynamic memory allocation

Memory

- Memory – Main memory, Secondary memory
- How do you differentiate : RAM, main memory, Primary memory, secondary memory, HDD???
- Main memory and program execution
- Can a user have access to entire main memory space?
- Can a program be larger than main memory?