Data Structures

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.

Why Data structures?

- To store data on hard disks.

- For managing large datasets (e.g. databases or internet indexing services)

- For design of efficient algorithms.

    Program = Algorithm + Data structure

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

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 are widely applied in the following areas:

- Compiler design
- Operating System
- Statistical analysis package
- DBMS
- Numerical analysis
- Simulation
- Artificial intelligence
- Graphics

Data structures in real life?

- A Queue for bus
- Waiting in clinic or office
- Maps, geographical or railway maps etc
- Social networks
- Operating system processes
- Evaluate an equation
- Undo operation in any s/w or app
- 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	Module 1,2,3	After Test
2	Implementation of Data structure	Implementation of Data structure for problem definition. Students will choose a problem statement and suggest which one of the data structure might help in implementing the solution and how the solution will be implemented. Upon teacher's approval, students would work on the chosen problem and submit their work. It will be a group activity.	Mid November

Test

- Module 1,2 Module 1– Introduction , Types of Data Structures, ADT (Abstract data type)

- Module 2 – Linear data structure (linked list, stack and queue)

Data structures Implementation

Variables, arrays and Pointers

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

Memory

- Memory – Main memory, Secondary memory
- 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?

Queries???

Thank you!!