

APT 2060: DATA STRUCTURES & ALGORITHMS

Pre-requisites:

APT 1030: Fundamentals of programming Languages

MTH 2215: Discrete mathematics

3 Credit Units

Course Rationale

This course leads to the understanding of the Stacking, Queuing to go for Arrays and linked lists. It leads to learn relevant applications of data structure, algorithms, and evaluations of data structure against criteria and gives proper approach to learn dynamical algorithms, minimum spanning tree and overview of Huffman encoding.

Course Description

This is the introductory course on data structures and algorithms as used in problem solving. The course introduces the basic data structures arrays, records, strings, linked lists, stacks, and queues BTrees, graphs, Searching & Sort techniques and the algorithms for manipulating the data structures including analysis of BIG O notations. Hash technique. While data structures are seen as a method of collecting and organizing large amounts of data, algorithms are the means by which the computer efficiently manipulates the data structures. Since some implementation and testing of programs are important part of algorithms, computer code has to be exhibited. Therefore, some amounts of programming will be necessary, especially in C/C++/Java

Learning outcomes

At the end of the course, the student should be able to:

1. Discuss the use of primitive data types and built-in data structures.
2. Describe common applications for each data structure in the topic list.
3. Write programs that use each of the following data structures: arrays, records, strings, linked lists, stacks, and queues.
4. Choose the appropriate data structure for modeling a given problem.
5. Describe a simple hash function

Course Content

Basic concepts of data structures. Data abstraction.. Arrays and their implementation. Computer presentation of characteristic strings. Application and implementation of some Abstract Data Types: Stacks, queues, linked lists, trees, graphs and B-trees; multiple linked lists. Algorithms:

Introduction. Basic steps in development of an algorithm Storage algorithm: Storage management and garbage collection. Operations of Algorithms on data structures: Searching and sorting algorithms; sorting: quick sort, bubble sort, binary sort, merge sort, heap sort and insertion sort. File handling. Recursion

Teaching and Learning Methodologies

A combination of Lectures and Laboratory work. The students will run demonstration programs and workshops and develop computer programs for using data structures and algorithms. Projects/Teamwork: Students, either individually or in a team of 2, will submit term assignments, modeling data structures and their usage, coded in C/C++ or Java

Instructional materials and Equipment

Computer Usage: The students will install and setup C Software Development Environment to compile and run programs that will be provided to them as support material.

Method of Evaluation

Laboratory Work	20%
Project	20%
Assignments	10%
Mid-semester	20%
Final semester exams	30%
Total	<u>100%</u>

Course Text

Data structures and algorithms in Java by Michael T. Goodrich, Roberto Tamassia – 2010

Recommended Reading

Data structures and algorithms using Visual Basic.NET by Michael McMillan – 2005

Data structures and algorithms: concepts, techniques and applications by Pai, Coimbatore - 2008

Data Structures and Algorithms in Java, 2nd Ed., Robert Lafore, SAMS, 2003.

Data Structures and Algorithms in Java, 2nd Ed., Micheal T. Goodrich and Roberto Tamassia, Wiley, 2001.

Introduction to Algorithms, 2nd Ed., Thomas H. Cormen, et al, The MIT Press, 2001.

An Introduction to Data Structures and Algorithms; Storer, J.A. (2002), Springer ISBN: 978-0-8176-4253-2

Data Structures and algorithms in C++, Michael T. Goodrich, Roberto Tamassia, David M Mount,
ISBN: 0-471-20208-8

Weiss, M. A., Algorithms, Data Structures, and Problem Solving with C, Addison-Wesley, 1996.