DATA STRUCTURES & ALGORITHMS

COURSE OVERVIEW

The study of data structures is an essential part of virtually every computer course, as data structures show how data is actually organized and used by the computer. This unit provides the student with a range of experiences in using the algorithms and data structures that underpin much of today's computing. The various techniques presented should be seen in the context of solving problems using computers.

This subject is too big to be covered in its entirety in the time available, so the aim must be to provide a range of experiences, which can be applied to problems, and the performance and resource issues which ensue.

This should allow students to develop solutions using data structures for a range of commercial needs.

SYLLABUS
DATA STRUCTURES AND ALGORITHMS

Content

Abstract Data Types

ADTs: introduction to ADTs using simple examples, eg Stacks, queues

Implementation: description of how different data structures can implement the same ADT, eg Arrays and single linked lists

Data Structures

Context: a survey of the more common complex data structures and typical applications

Arrays: tables (hashed, lookup), matrices, dynamic memory, linked lists (single, double), tree (binary search trees, expression trees, quad, Red-Black trees, AVL trees), graphs

Algorithms for data structures: appropriate algorithms include 'insert', 'delete', 'search' and 'sort' (with many forms being naturally recursive)

Code implementation: documented computer code which covers the range of data structures

Data Structure/ Algorithm

Applications: relevant application areas, research and review current uses of data structures within applications

Evaluation: criteria for the use of data structure/ algorithms for chosen applications (eg simple 'Big Oh' calculations), evaluation of data structures/ algorithms against these criteria, selection of the most suitable data structure.

Suggested Readings

1. **Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullma,** Data Structures and Algorithm, Addison-Wesley, 1983

2. **G. H. Gonnet**, Handbook of Algorithms and Data Structures, Addison-Wesley, 1984

3. **Aho, Alfred V.,** Data structures and algorithms, Delhi: Pearson Education Asia, 1983.

4. **Dale, Mell,** Pascal plus data structures, algorithms, and advanced programming, New Delhi: Tata McGraw- Hill Publishing, 1985.

5. **Horowitz, Ellis,** Fundamentals of data structures in c++, New Delhi: Galgotia Publications, 1999.

6. **Kakde, O.G., Despande, U.A. ; Sen, Sandeep,** Data structures and algorithms, New Delhi : Indian Society for Technical Education, 2001

7. **Kruse, Robert L.,** Data structures and program design, 3rd ed. New Delhi: Prentice Hall of India, 2001.

8. **Kutti, N.S.,** Data structures in c++, New Delhi: Prentice Hall of India, 2000.