

NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Semester – VI
Department Elective-III

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Course Code	2CSDE75
Course Title	Advanced Data Structures

Course Outcomes:

At the end of the course, students will be able to –

1. describe the importance of various data structures from application perspective
2. apply the knowledge of data structures for real time applications
3. solve the algorithmic problems optimally.

Syllabus:

**Teaching
Hours; 30**
06

Unit I

Search Trees: Models of Search Trees, Properties and transformations, height of search tree, basic find, insert and delete, returning from leaf to root, dealing with non-unique keys, queries for keys in an interval, building optimal search trees, converting trees to lists, removing a tree.

Unit II

Balanced Search Trees: Height balanced and weight balanced trees, B-trees, Red Black Trees and Trees of almost optimal height, Finger trees and level linking, trees with partial rebuilding, Splay Trees, Skip Trees, Joining and Splitting Balanced Search Trees

06

Unit III

Tree Search for Set of Intervals: Interval Trees, Trees for union of intervals, trees for sums of weighted intervals, trees for interval-restricted maximum sum queries, orthogonal range trees, higher dimensional segment trees, other systems of building blocks, range counting and semi group model, Quad-tree, kd-trees and related structures

06

Unit IV

Heaps: Array based heaps, heap ordered trees and half ordered trees, Leftist Heaps, Skew heaps, Binomial heaps, changing keys in heaps, Fibonacci heaps, heaps of optimal complexity, Double ended heap structures and multidimensional heaps, heap related structures with constant time updates

06

Unit V

Union – Find and related structures: Union – Find, Union Find with copies and dynamic segment trees, list splitting, Problems on root directed trees, maintaining a linear order

06



Data Structure Transformations: Making structures dynamic and persistent

Hashing and dictionary operations: Static & Dynamic Hashing techniques, Tries and compressed tries, Dictionaries allowing errors in queries, Suffix Trees, Suffix arrays

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on the above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings[^]:

1. Peter Brass, Advanced Data Structures, Cambridge University Press
2. Suman Saha, S.Shukla, Advanced Data Structures: Theory and application, CRC press
3. A.A. Puntambekar, Advanced Data Structures, TPP

L=Lecture, T=Tutorial, P=Practical, C=Credit

[^]this is not an exhaustive list.