DATA STRUCTURES & ALGORITHM DESIGN
21:198:335 (3 credits)

COURSE DESCRIPTION:
To explore Data Structures their needs and types, Algorithm Analysis, Lists, Stacks, Queues, Binary Trees, Non-Binary Trees, Sorting, Searching, Indexing, Graphs, Analyze the theory of Algorithms.

PREREQUISITE:
21:198:102 (Computers & Programming II)

TEXTBOOK:
“Data Structures & Algorithm Analysis in Java” (3rd edition) by Clifford A. Shaffer, published by Dover.

DEPARTMENT WEB SITE:  http://www.ncas.rutgers.edu/math

THIS COURSE COVERS THE FOLLOWING TOPICS:

Data Structures
- Philosophy, Need, Benefits of Data Structures.
- Abstract Data Types (ADT)

Recursion

Fundamental Data Structures
- Lists
- Stacks
- Queues
- Dictionaries

Binary Trees
- Definitions & Properties
- Binary Tree Traversals
- Binary Search Trees
- Heaps and Priority Queues
- Huffman coding Trees

Non-Binary Trees

Sorting and Searching Algorithms
• Sorting Algorithms
  • Insertion, Bubble, Selection, Shell, Merge, Quick sort
• Search Algorithms

Algorithm Analysis
• Best, Worst and Average Cases
• Asymptotic Analysis
• Calculating the Running Time for a Program
• Analyzing Problems

Indexing
• Linear Indexing
• Tree Based Indexing, 2-3 Trees, B-Trees

Algorithm Analysis Techniques

Dynamic Programming
• Knapsack Problem
• All-Pair Shortest Path

Lower Bounds on Sorting and Searching Lists

Graphs and Graph Algorithms