

CPE 593 Applied Data Structures & Algorithms

Course Syllabus

Course Objective: This course intends to teach data structures and algorithms for solving real problems that arise frequently in computer applications, and to teach principles and techniques of computational complexity.

Prerequisite: Knowledge of C++ programming and CPE 360, or an equivalent undergraduate-level course of data structures and algorithms

Textbook:

Data Structures, Algorithms, and Applications in C++, Second Edition, Sartaj Sahni, Silicon Press.

Reference Books:

- Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Third edition, Published by Addison-Wesley.
- Introduction to Algorithms, Second Edition. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, MIT Press.

Main Topics:

- Methods for expressing and comparing complexity of algorithms: worst and average cases, lower bounds on algorithm classes, verification of correctness
- Application of such analysis to sorting: heap sort, merge sort, bubble sort, quick sort, shell sort, insertion sort, radix sorting
- Elementary data structures: arrays, stacks, queues, linked lists, heaps, trees, hashing
- Advanced data structures: binary search trees, B-trees, AVL trees, binomial heaps, Fibonacci heaps
- Graph algorithms: breadth-first search, depth-first search, minimum spanning trees, single-source shortest paths
- NP-complete and NP-hard problems
- Advanced algorithm design: divide and conquer, dynamic programming
- Recent research papers in algorithm design and analysis

Grading: The grade for the class will be based upon homework and exams.

- Homework: (30%) There will be regular homework assignments including theory problems and programming assignments.
- Midterm: (30%) There will be one midterm exam.
- Final Exam: (40%) There will be a final exam. The final exam is comprehensive.