

Master Course Syllabus
School of Engineering and Computer Science
Washington State University Vancouver

CS 223

Advanced Data Structures

3 Semester Hours

(3 lecture hours)

Catalog Description

Advanced data structures, object oriented programming concepts, and program design principles.

Prerequisite Courses

- CS 122 with a C or better

Prerequisite Topics

- Some programming experiences
- Fundamental data structures
- Basic sorting and searching algorithms
- Tree traversal methods

Measured Course Outcomes

Students taking this course will:

1. Demonstrate understanding of advanced data structures, such as balanced or multiway trees, heaps or priority queues. (Contributes to performance criterion 6.c.)
2. Compare the time and space tradeoffs of different advanced data structures (Contributes to performance criterion 6-a.)
3. Implement simple programs in an object-oriented language, demonstrating the use of encapsulation and Abstract Data Type techniques (Contributes to performance criterion 2.b.)

Covered Course Outcomes

Students taking this course will also:

1. Select appropriate data structures for computational problems. (Relevant to performance criterion 1-c.)

Required Textbooks

One of the following:

- *Introduction to Algorithms*, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, MIT Press.
- *Data Structures and Algorithms in Java*, Robert Lafore, Sams.
- *Algorithms in Java*, Robert Sedgewick, Addison-Wesley.

Reference Material

None specified.

Major Topics Covered in the Course

1. Abstract data types
2. Object oriented design and programming concepts including inheritance, polymorphism, modularity, encapsulation, and overloading
3. Advanced data structures including balanced binary search trees, B-trees, multi-way trees, and hash tables
4. Associative arrays, graphs, graph traversal algorithms, sets and relations

Projects

Programming Project Area	Weeks
(Small Assignments, See Below)	

Design, Implementation, and Analysis

This course requires the student to correctly implement a variety of data structures. At the minimum, the student will implement a self-balancing search tree, a hash table or associative array, and a priority queue.

CS2013

This course provides coverage of CS2013 knowledge areas. Values listed are minimum course hours dedicated to the topic, percentages indicate the fraction of CS2013 knowledge area topics covered (acceptable values are: <25%, 25-75%, >75%, or 100%).

Area	Tier 1	Tier 2	Elective
AL/Algorithmic Strategies	1 (25-75%)		
AL/Advanced Data Structures and Algorithms			6 (<25%)
AL/Fundamental Data Structures and Algorithms	3 (25-75%)	3 (25-75%)	
DS/Graphs and Trees	2 (100%)	1 (25-75%)	
PL/Object-Oriented Programming		2 (25-75%)	
SDF/Algorithms and Design	2 (25-75%)		
SDF/Fundamental Data Structures	2 (25-75%)		

Course Coordinator:	Paul Bonamy
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