

Computer Science 2305 – Data Structures

Student Learning Outcomes

1. Students will have a better understanding of the C++ class concept.
2. Students will learn techniques of algorithm analysis.
3. Students will learn about recursion.
4. Students will know how to use the C++ Standard Template Library (STL) `vector` container.
5. Students will learn programming techniques for sorting.
6. Students will learn programming techniques for searching.
7. Students will know how to use the STL `stack` adaptor.
8. Students will know how to use the STL `queue` adaptor.
9. Students will know how to use the STL `deque` container.
10. Students will know how to use the STL `priority_queue` adaptor.
11. Students will know how to use the STL `list` container.

Course Content

Textbook: *Data Structures with C++ Using STL*, Second Edition, by William Ford / William Topp
The following chapters including the particular sections listed are covered. (See textbook “Contents”)

1. Introduction to Data Structures

- Abstract View of Data Structures
- An ADT as a Class
- Implementing C++ Classes
- Declaring and Using Objects
- Implementing a Class with Inline Code

2. Object Design Techniques

- Object Composition
- Operator Overloading

3. Introduction to Algorithms

- Selection Sort
- Simple Search Algorithms
- Analysis of Algorithms
- Making Algorithms Generic
- The Concept of Recursion

4. The Vector Container

- Overview of STL Container Classes
- Template Classes
- The `vector` Class

5. Pointers and Dynamic Memory

- C++ Pointers
- Dynamic Memory
- Classes Using Dynamic Memory
- Assignment and Initialization
- The `miniVector` Class
- The `matrix` Class

6. The List Container and Iterators

- The `list` Container
- Iterators
- General List Insert and Erase Operators

7. Stacks

- The `stack` ADT
- Stack Implementation
- Postfix Expressions

8. Queues and Priority Queues

- The `queue` ADT
- The Radix Sort
- Implementing the `miniQueue` Class
- Priority Queues

9. Linked Lists

- Linked List Nodes
- Building Linked Lists
- Handling the Back of the List
- Doubly Linked Lists
- Updating a Doubly Linked List
- The `miniList` Class

Additional Content

Any section or chapter not listed previously.