

IT327

Data Structures

[Onsite]

Course Description:

Through exploring fundamental data structures, data manipulation techniques and algorithms necessary for good program development, students will be exposed to methods of selecting appropriate data structures to represent data with a given set of operations on that data. Topics include abstract data types, trees and graphs and their traversal, priority queues, searching and sorting, algorithm design techniques, external sorting techniques, hashing, etc.

Prerequisite(s) and/or Corequisite(s):

Prerequisite: IT217 Programming in C++ II

Credit hours: 4

Contact hours: 50 (30 Theory Hours, 20 Lab Hours)

Syllabus: Data Structures

Instructor: _____

Office hours: _____

Class hours: _____

Major Instructional Areas

1. Templates, iterators, and the STL
2. Linked lists
3. Stacks
4. Queues
5. Recursion
6. Trees
7. Searching algorithms
8. Sorting algorithms
9. Graphs

Course Objectives

1. Describe generic programming using templates.
2. Use standard template classes and their iterators for building code.
3. Define the need and functionality of linked list data structures.
4. Define the need and functionality of stack data structures.
5. Define the need and functionality of queue data structures.
6. Define the need and use of recursive programming.
7. Define the need and functionality of tree data structure.

8. Traverse a binary search tree.
9. Identify the importance and usage of common searching algorithms in data structures.
10. Identify the importance of hashing and its use in searching data structures.
11. Sort data structures using various sorting algorithms.
12. Identify the need and functionality of graph data structure.

SCANS Objectives

SCANS is an acronym for Secretary's Commission on Achieving Necessary Skills. The committee, created by the National Secretary of Labor in the early 1990s, created a list of skills and competencies that the committee feels are necessary for employees to function in a high-tech job market.

1. Acquire and evaluate information.
2. Use computers to process information.
3. Apply and adapt new knowledge and skills in both familiar and changing situations.
4. Demonstrate the ability to effectively and efficiently utilize the ITT Tech Virtual Library.
5. Assess self accurately, set personal goals, monitor progress, and exhibit self-control.

Course Outline

Note: All graded activities, except the final exam, are listed below in the pattern of <Unit Number>.<Assignment Number>. For example, Labs: 3.1 refers to the first lab activity in Unit 3.

Unit	Activities
1– Templates, Iterators, and the STL	<ul style="list-style-type: none"> • Content Covered: <ul style="list-style-type: none"> <i>Data Structures and Other Objects Using C++:</i> <ul style="list-style-type: none"> ○ Chapter 6, Sections 6.1-6.3, pp. 291-317 • Labs: 1.1

Unit	Activities
	<ul style="list-style-type: none"> • Writing Assignments: 1.1
2–Linked Lists	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 5, Sections 5.1 and 5.2, pp. 221-258 • Labs: 2.1 • Writing Assignments: 2.1
3–Stacks	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 7, Sections 7.1-7.3, pp. 353-377 • Labs: 3.1 • Writing Assignments: 3.1
4–Queues	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 8, Sections 8.1-8.4, pp.394-430 • Labs: 4.1 • Quizzes: 4.1 • Writing Assignments: 4.1
5–Recursion	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 9, Sections 9.1 and 9.2, pp. 437-461 • Labs: 5.1 • Writing Assignments: 5.1
6–Trees- Part 1	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 10, Sections 10.1-10.3, pp. 474-517 • Labs: 6.1 • Writing Assignments: 6.1
7–Trees- Part 2	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 10, Sections 10.4 and 10.5, pp. 500-531 • Labs: 7.1 • Quizzes: 7.1

Unit	Activities
	<ul style="list-style-type: none"> • Writing Assignments: 7.1
8–Searching Algorithms	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 12, Sections 12.1 and 12.2, pp. 584-615 • Labs: 8.1 • Writing Assignments: 8.1
9–Sorting Algorithms	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 13, Sections 13.1 and 13.2, pp. 630-662 • Labs: 9.1 • Writing Assignments: 9.1
10–Graphs	<ul style="list-style-type: none"> • Read from <i>Data Structures and Other Objects Using C++</i>: <ul style="list-style-type: none"> ○ Chapter 15, Sections 15.1-15.3, pp. 733-763 • Labs: 10.1 • Writing Assignments: 10.1
11–Course Review and Final Exam	<ul style="list-style-type: none"> • Final Exam

Instructional Methods

The curriculum is designed to promote a variety of teaching strategies that support the outcomes described in the course objectives and that foster higher cognitive skills. Delivery makes use of various media and delivery tools in the classroom.

Instructional Materials and References

Student Textbook Package

- Main, M., and W. Savitch. *Data Structures and Other Objects Using C++*. Fourth edition. USA: Pearson Education, 2011.

References

Log on to the ITT Tech Virtual Library at <http://library.itt-tech.edu/> to access online books, journals, and other reference resources selected to support ITT Tech curricula.

General References

- School of Study> School of Information Technology> Professional Organizations
 - Association for Computing Machinery
 - Association of C & C++ Users
 - Association of Information Technology Professionals
 - Software & Information Industry Association
- Recommended Links
 - C Programming: C++ Resources
 - CPlusPlus
 - Free Programming Resources

Books

You may click “Books” from the Main Menu or use the “Library Catalog” function on the home page to find the following books.

- Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L., Stein, Clifford, *Introduction to Algorithms, 2nd edition. Cambridge, MA: The MIT Press, 2001.*
- Schildt, Herbert. *C++: The Complete Reference, 4th edition. New York: McGraw-Hill/Osborne, 2003.*

Other Resources

- Interactive Data Structure Visualizations (accessed 03/14/12)
<http://www.student.seas.gwu.edu/~idsv/idsv.html>
- Additional labs for Units 7-10 are available in the Course Support folder.

All links to web references are always subject to change without prior notice.

Course Evaluation and Grading

Evaluation Criteria Table

The final grades will be based on the following categories:

CATEGORY	WEIGHT
Writing Assignment	10%
Quiz	20%
Lab	35%
Final Exam	35%
Total	100%

Note: Students are responsible for abiding by the Plagiarism Policy.

Grade Conversion Table

The final grades will be calculated from the percentages earned in the course, as follows:

A	90 - 100%	4.0
B+	85 - 89%	3.5
B	80 - 84%	3.0
C+	75 - 79%	2.5
C	70 - 74%	2.0
D+	65 - 69%	1.5
D	60 - 64%	1.0
F	<60%	0.0

(End of Syllabus)