CS302
Data Structures with Java
[Onsite]

Course Description:

This course covers the theory of data structures and their implementation using Java. Topics include lists, queues, stacks, trees, and maps. The course covers various algorithms for searching and sorting data. Methods of evaluating algorithm efficiency are covered.

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

Prerequisite: CS300 Application Design or equivalent

Credit hours: 4

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

Syllabus: Data Structures with Java

Instructor:	_____
Office hours:	_____
Class hours:	_____

Major Instructional Areas

1. Recursion

2. Generics

3. Java Collections Framework

4. Data structures

5. Algorithm efficiency

6. Sort and search algorithms

Course Objectives

1. Use recursion in program construction.

2. Implement generics to improve software reliability and readability.

3. Use the Java Collections Framework to efficiently store and process objects.

4. Write programs that use lists, stacks, and queues.

5. Write programs that use trees, heaps, and priority queues.

6. Estimate the efficiency of common algorithms by comparing different sorting and searching methods.

7. Write programs that use different sorting methods.

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 information.

2. Know how technological systems work and operate effectively.

3. Demonstrate competence in understanding systems.

4. Know how a system's structures relate to its goals.

5. Demonstrate competence in selecting technology, which includes determining desired outcomes and applicable constraints.

6. Demonstrate competence in applying technology to a task.

7. Design and implement an application to solve a business problem.

8. Identify appropriate technology to solve business problems.

Course Outline

Note: All graded activities, except the Project, are listed below in the pattern of <Unit Number>.<Assignment Number>. For example, Lab 3.2 refers to the 2nd lab activity in Unit 3.

Unit	Activities
1–Recursion	• Content Covered: *Introduction to Java Programming, Comprehensive Version:* o Chapter 20, "Recursion" • Assignments: 1.1 • Labs: 1.1-1.2

Unit	Activities
2–Generics	- Read from *Introduction to Java Programming, Comprehensive Version:* - Chapter 21, "Generics" - Assignments: 2.1 - Labs: 2.1-2.2 - Project 1
3–Java Collections Framework–Part I	- Read from *Introduction to Java Programming, Comprehensive Version:* - Chapter 22, "Java Collections Framework," pp. 706-723 - Assignments: 3.1 - Labs: 3.1-3.3
4–Java Collections Framework–Part II	- Read from *Introduction to Java Programming, Comprehensive Version:* - Chapter 22, "Java Collections Framework," pp. 723-734 - Assignments: 4.1 - Labs: 4.1-4.2 - Project 2
5–Lists, Stacks, and Queues–Part I	- Read from *Introduction to Java Programming, Comprehensive Version:* - Chapter 24, "Lists, Stacks, and Queues," pp. 768-788 - Assignments: 5.1 - Labs: 5.1-5.2

Unit	Activities
6–Lists, Stacks, and Queues–Part II	• Read from *Introduction to Java Programming, Comprehensive Version:* o Chapter 24, "Lists, Stacks, and Queues," pp. 788-795 • Assignments: 6.1 • Labs: 6.1-6.2 • Project 3
7–Trees, Iterators, Heaps, and Priority Queues–Part I	• Read from *Introduction to Java Programming, Comprehensive Version:* o Chapter 25, "Trees, Iterators, Heaps, and Priority Queues," pp. 800-820 • Assignments: 7.1 • Labs: 7.1-7.2
8–Trees, Iterators, Heaps, and Priority Queues–Part II	• Read from *Introduction to Java Programming, Comprehensive Version:* o Chapter 25, "Trees, Iterators, Heaps, and Priority Queues," pp. 820-829 • Assignments: 8.1 • Labs: 8.1-8.2 • Project 4
9–Algorithm Efficiency	• Read from *Introduction to Java Programming, Comprehensive Version:* o Chapter 23, "Algorithm Efficiency" • Assignments: 9.1 • Labs: 9.1-9.2

Unit	Activities
10–Sorting	• Read from *Introduction to Java Programming, Comprehensive Version:* o Chapter 26, "Sorting" • Assignments: 10.1 • Labs: 10.1-10.3 • Project 5
11–Review and Final Exam	• Final Exam

Instructional Methods

In this course, you will be introduced to data structures and will be given opportunities to write Java programs to create simple applications. This course employs learning and evaluating strategies such as assignments, labs, projects, and a final exam to help you comprehend the aspects of data structures. The assignments require you to submit answers to chapter-end questions.

Labs and projects offer significant hands-on practice. Each unit, from Unit 1 to Unit 10, includes at least one lab exercise that reinforces the content specific to that unit. Programming assignments require you to apply concepts that were presented earlier in the course to later units.

Unit 11 includes the final exam that evaluates your understanding of all the concepts covered in this course.

Instructional Materials and References

Student Textbook Package

Liang, Y. Daniel. *Introduction to Java Programming, Comprehensive Version.* 7th ed. Upper Saddle River, NJ: Pearson Prentice Hall, 2009.

References

ITT Tech Virtual Library

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

Books

You may click "Books" or use the "Search" function on the home page to find the following books.

Books 24x7

- Horton, Ivor. *Ivor Horton's Beginning Java 2, JDK. 5th ed. Indianapolis, IN:* Wiley Publishing, Inc., 2005.

- Jarc, Duane. *Learning Java Through Applications: A Graphical Approach.* Hingham, MA: Cengage Charles River Media, 2005.

- Kurniawan, Budi. *Java 5: A Beginner's Tutorial. Vancouver, BC, Canada:* Brainy Software Corp., 2006.

- Lafore, Robert. *Data Structures and Algorithms in Java. Corte Madera, CA:* Waite Group Press, 1998.

- Levenick, James. *Simply Java: An Introduction to Java Programming.* Hingham, MA: Cengage Charles River Media, 2006.

- Schildt, Herbert. *Java: The Complete Reference, J2SE. 5th ed. Emeryville,* CA: McGraw-Hill/Osborne, 2005.

- Sestoft, Peter. *Java Precisely. 2nd ed. Cambridge, MA: The MIT Press, 2005.*

Learning Guides

You may click "Learning Guides" or use the "Search" function on the home page to find the following learning guides.

- Online Tutorials> Java Programming Tutorials

- Online Tutorials> Programming Tutorials> Java> Introduction to Programming Using Java

- Online Tutorials> Tutorialized> Java> Miscellaneous

Other References

The following resources may be found **outside** of the ITT Tech Virtual Library, whether online or in hard copy.

Web sites

- Collections Data Structure « Java
  This Web page provides a collection of Java code for data structures.
  http://www.java2s.com/Code/Java/Collections-Data-
  Structure/CatalogCollections-Data-Structure.htm (accessed October 22, 2008).

- Java Programming Notes
  This Web page provides a collection of Java lessons categorized by topic.
  http://www.leepoint.net/notes-java/index.html (accessed October 22, 2008).

- Java Tutorial
  This tutorial is available on the official Java Web site maintained by Sun Microsystems.
  http://java.sun.com/docs/books/tutorial/collections/intro/index.html (accessed October 22, 2008).

- RoseIndia Java Tutorial
  This Web site provides a comprehensive collection of Java tutorials from beginning to advanced levels. http://www.roseindia.net/java/jdk6/index.shtml (accessed October 22, 2008).

All links to Web references outside of the ITT Tech Virtual Library 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
Labs	35%
Projects	35%
Assignments	10%
Final Exam	20%
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