CSCI 244 – Fall 2009
Data Structures and Analysis of Algorithms

Ben Coleman
coleman@cs.moravian.edu
PPHAC 214
Office Phone: 610-625-7781

Office Hours: MWF 9:00 - 10:00
R 3:00 - 4:00
or by appointment

Course Description

An examination of issues dealing with static and dynamic aggregates of data. Topics covered include logical characteristics of various data organizations, storage structures implementing structured data, design and implementation of algorithms to manipulate such storage structures, and classical applications of data structures. Representative data structures include stacks, queues, ordered trees, binary trees, and graphs. Both contiguous and linked storage implementations are considered and performance issues discussed.

Course Goals

Upon completion of this course, a successful student will be able to:

- Describe the strengths and limitations of linear data structures, trees, graphs, and hash tables.
- Select appropriate data structures for a specified problem.
- Describe classic sorting techniques.
- Analyze algorithms using appropriate mathematical notation.

Required Texts

In addition to the following text, supplementary readings will be given periodically during the semester.

- *Data Structures & Problem Solving Using Java* by Mark Allen Weiss

You should expect to spend about an hour before each class session working through the readings. This means reading the text for detail, studying the syntax for new language features, and working to learn vocabulary – not just skimming through the material before class.

Graded Material

- **Homework** – The goal of homework problems is for you to practice using the current course content and to explore the topics in more detail. Problems will be assigned nearly every class session and will be due the next class.
- **Tests** – Two tests will be given during the semester on Friday, October 9 and Monday November 30. You may only re-schedule a test for college-approved absences or documented illness. In either case, you must contact me *before* the beginning of the test.
- **Projects** – Two multi-part projects will be assigned during the semester. These projects will have intermediate due dates where you will receive grades for correctness and testing for the current portion. Your final grade will be based on overall correctness, quality of testing, and program style.
- **Final** – The final will be cumulative and will be given in-class on Monday, December 14 at 1:30 p.m. Any change to the final exam schedule must be approved by both me and the dean of students.

Grade Determination

- (40%) Homework
- (25%) Tests
- (20%) Projects
- (15%) Final

All grades will be calculated on the standard scale using pluses and minuses.

Responsibilities

Your attendance is expected at each class meeting. You are also responsible for the contents of reading assignments, handouts, class activities, and class email.

If you have a disability that may affect your participation in this course, please contact me immediately to discuss academic accommodations.

Academic Honesty

Except on tests, you are *encouraged* to discuss the material and work with other students in the course. Specifically, on homework and labs you may discuss any portion of the assignment with your fellow students. This policy does not allow you to copy another student's work verbatim – you must produce your own code or write-up of the material. Work together to learn the concepts, but keep in mind that you are ultimately responsible for the material on the tests.

Course Outline

Date	Reading	Topic
M Aug 31		• Day 1 Activities
W Sept 2	• Ch 5 pp. 163 - 192	• Big-Oh and Analysis
F Sept 4	• Ch 6 pp. 201 - 214	• Iterators and Collections
M Sept 7		• Labor Day
W Sept 9	• Ch 6 pp. 214 - 228	• Linear Data Structures
F Sept 11	• Ch 6 pp. 229 - 245	• Trees and Hashes
M Sept 14	• Ch 7 pp. 252 - 277	• Recursion
W Sept 16	• Ch 7 pp. 277 - 287	• Divide and Conquer
F Sept 18	• Ch 7 pp. 287 - 291	• Dynamic Programming
M Sept 21	• Ch 7 pp. 291 - 297	• Backtracking
W Sept 23		• Recursion Wrap-Up
F Sept 25	• Ch 8 pp. 303 - 313	• Basic Sorts and Shell Sort
M Sept 28	• Ch 8 pp. 313 - 316	• Merge Sort
W Sept 30	• Ch 8 pp. 316 - 331	• Quick Sort
F Oct 2	• Ch 8 pp. 316 - 331	• Pivot Selection
M Oct 5	• Ch 8 pp. 332 - 336	• Sorting Lower Bounds
W Oct 7		• Sorting Wrap-Up
F Oct 9		• Test #1
M Oct 12		• Fall Break
W Oct 14	• Ch 15 pp. 517 - 535	• Inner Classes and ArrayList
F Oct 16	• Ch 16 pp. 539 - 560	• Stacks and Queues
M Oct 19	• Ch 18 pp. 595 - 608	• Trees
W Oct 21	• Ch 18 pp. 609 - 625	• Tree Traversals
F Oct 23		• Tree Wrap-Up
M Oct 26	• Ch 19 pp. 627 - 639	• Binary Search Trees
W Oct 28	• Ch 19 pp. 639 - 648	• Binary Search Tree Analysis
F Oct 30		• CCSC Conference - No Class
M Nov 2	• Ch 19 pp. 648 - 656	• AVL Trees
W Nov 4	• Ch 19 pp. 657 - 670	• Red-Black Trees
F Nov 6	• Ch 19 pp. 680 - 697	• Tree Implementations

Date	Reading	Topic
M Nov 9		• Binary Search Tree Wrap-Up
W Nov 11	• Ch 14 pp. 471 - 483	• Graphs
F Nov 13	• Ch 14 pp. 483 - 489	• Unweighted Shortest Path
M Nov 16	• Ch 14 pp. 489 - 496	• Positive-Weight Paths
W Nov 18	• Ch 14 pp. 496 - 498	• Negative Weights
F Nov 20	• Ch 14 pp. 499 - 508	• Directed Acyclic Graphs
M Nov 23		• Graph Wrap-Up
W Nov 25 & F Nov 27		• Thanksgiving Break
M Nov 30		• Test #2
W Dec 2	• Ch 20 pp. 713 - 723	• Hash Tables
F Dec 4	• Ch 20 pp. 723 - 739	• Quadratic Probing
M Dec 7		• Hash Wrap-Up
W Dec 9		• Review

The details of this syllabus and schedule are subject to change based on our progress through the material.