CSCI 244 – Fall 2010
Data Structures and Analysis of Algorithms

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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, fourth edition

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 5 and Monday, November 22. 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.
- **Programming Assignments** – Various programming assignments will be assigned during the semester. In some instances, you will simply implement a small stand-alone program. At other times, a sequence of assignments will build upon each other to produce a final program. All programming assignments will be graded based on correctness and the quality of testing.
- **Final** – The final will be cumulative and will be given in-class on Thursday, December 16 at 8:30 a.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%) Programming Assignments
- (15%) Final

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

Course Policies

- **Late Policy** – I understand that life sometimes gets in the way of getting work done. Consequently, late assignments will be accepted without penalty in the class after the assignment was due. However, this policy should not be used as a crutch, and if you frequently use it I will deduct from your grade. After the next class session, late work will not be accepted unless there are exceptional circumstances.
- **Extensions** – In a similar vein, I am generous with extensions on work if you approach me *before* the day the assignment is due.
- **Absences** – Your attendance is expected at each class meeting, but I understand that students occasionally get sick, have obligations outside Moravian, and even over sleep. If you do miss class, please send me an email explaining your absence – preferably before the class session. Regardless of your reason for missing class, you are responsible for the contents of reading assignments, handouts, class activities, and class email.

- **Academic Honesty** – Except on tests, you are *encouraged* to discuss the material and work with other students in the course. Specifically, on homework and programming assignments 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.
- **Disabilities** – If you have a disability that may affect your performance in this course, please contact me immediately to discuss academic accommodations.

Course Outline

Date	Reading	Topic
M Aug 30		• Day 1 Activities
W Sept 1	• Ch. 1-4	• Java Review
F Sept 3	• Ch. 1-4	• Exceptions, Packages, etc.
M Sept 6		• Labor Day
W Sept 8	• Ch. 1-4	• Unit Testing, Netbeans, the Debugger
F Sept 10	• Ch. 5 pp. 187-193, 201-216	• Algorithm Analysis
M Sept 13	• Ch. 5 pp. 193-200	• Maximum Contiguous Subset Sums
W Sept 15	• Ch. 7 pp. 293-319	• Recursion
F Sept 17	• Ch. 7 pp. 295-297	• Induction
M Sept 20	• Ch. 7 pp. 319-329	• Divide and Conquer Algorithms
W Sept 22	• Ch. 7 pp. 329-333	• Dynamic Programming
F Sept 24	• Ch 7. 333-336	• Backtracking
M Sept 27	• Ch. 8 pp. 351-357	• Basic Sorting Algorithms
W Sept 29	• Ch. 8 pp. 357-361	• Shell Sort
F Oct 1	• Ch. 8 pp. 361-364	• Merge Sort
M Oct 4	• Ch. 8 pp. 364-372	• Quicksort
W Oct 6	• Ch. 8 pp. 372-380	• Pivots and Partitions
F Oct 8	• Handout	• Linear-Time Sorting
M Oct 11		• Fall Break
W Oct 13		• Sorting Wrap-up
F Oct 15		• Test #1
M Oct 18	• Ch. 6 pp. 229-261	• Linear Data Structures
W Oct 20	• Ch. 6 pp. 261-279	• Non-Linear Data Structures

Date	Reading	Topic
F Oct 22	• Ch. 15 pp. 573-590	• Iterators and Arraylists
M Oct 25	• Ch. 18 pp. 651-667	• Trees
W Oct 27	• Ch. 18 pp. 667-680	• Tree Traversals
F Oct 29	• Handout	• Tree from Traversals
M Nov 1	• Ch. 19 pp. 687-702	• Binary Search Trees
W Nov 3	• Ch. 19 pp. 702-706	• Binary Search Tree Analysis
F Nov 5	• Ch. 19 pp. 706-714	• AVL Trees
M Nov 8	• Ch. 19 pp. 715-728	• Red-Black Trees
W Nov 10	• Ch. 14 pp. 527-539	• Graphs
F Nov 12	• Ch. 14 pp. 539-545	• Unweighted Shortest Paths
M Nov 15	• Ch. 14 pp. 545-552	• Positive Weighted Paths
W Nov 17	• Ch. 14 pp. 552-554	• Negative Weights
F Nov 29	• Ch. 14 pp. 555-563	• Directed Acyclic Graphs
M Nov 22		• Test #2
W Nov 24 & F Nov 26		• Thanksgiving Break
M Nov 29	• Ch. 20 pp. 773-784	• Hash Tables
W Dec 1	• Ch. 20 pp. 784-797	• Quadratic Probing
F Dec 3	• Ch. 21 pp. 807-822	• Priority Queues
M Dec 6	• Ch. 21 pp. 823-826	• Heapsort
W Dec 8		• Review

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