CSC 5402
Advanced Data Structures

Dr. Melissa Wiggins
MCC 306
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COURSE CREDIT: 3 hrs. credit **PREREQUISITES:** CSC 216 Data Structures

OFFICE HOURS: MWF 9-10, TR 8-9, TW 1-3, F 11-12, other hours by appointment

TEXT: *Algorithm Design: Foundations, Analysis, and Internet Examples*
Michael Goodrich & Roberto Tamassia

OTHER MATERIALS: Access to a computer with Java 2 SDK ver 1.3 or 1.4 and the Internet.

DESCRIPTION: A study of data structures and algorithms designed for their implementation. Lists, arrays, stacks, queues, deques, queues, graphs, trees and tree structures, and various search and sorting techniques will be covered.

RATIONALE: This course is required of all majors in Computer Science and is an elective course for majors in Computing and Information Systems.

LEARNING OBJECTIVES: After successfully passing this course, the student will be able to

- Identify the data structure that is best suited for solving a particular problem
- Understand the time complexity of various data structures
- Use various data structures to solve problems.
- Demonstrate understanding of advanced data structures by self-research.

EVALUATION: ***The instructor reserves the right to make changes as necessary.***

Exams: There will be two exams worth 200 points each.

Assignments: There will be 4-5 programming/problem solving assignments worth a total of 400 points.

Research Project: As a graduate student will be required to write a research paper on a particular uncovered data structure or to write a major program using this data structure in a real-life situation. This will be worth 200 points.

Final Exam: There will be a comprehensive final examination given at the time specified by the college. This examination will be worth 200 points. **Saturday, December 8, 2007, 8:00a.m. - 10:00 a.m.**

Grading Scale:

1080 - 1200 points	**A**	840-899 points	**C**
1056-1079 points	**B+**	720-839 points	**D**
960-1055 points	**B**	0-719 points	**F**
900-959 points	**C+**		

CLASS ATTENDANCE: The student is expected to attend classes. Regulations for class attendance are given in the Class Schedule. Remember in a MWF class **12** absences is an automatic **F**. **Three tardies count as one absence in this class. (See the Mississippi College catalog).**

MAKE-UP WORK & TESTS: Students are expected to take tests on the day they are assigned. However, it is the student's responsibility to contact the instructor in case of an emergency illness or death in the family **before** the test. At that time the student and instructor will agree on a time for the make-up exam. This time should be within 2 days of the missed test. Assignments are to be turned in on the day they are due!! All work is due at the beginning of the class period. Any work not turned in will lose 10% credit for each school day ***until the third day***. The due date at the beginning of class is day 1. No work will be accepted after the third day. Under no circumstances will work be accepted after the assignment has been graded and handed back in class. Laboratory work will be due at the end of each week's lab at which time a lab quiz will be administered. Exceptions to this may be made at the instructor's discretion.

ACADEMIC INTEGRITY: This statement on academic honesty in computer science courses is an addendum to the Mississippi College policy 2.19 found at **http://www.mc.edu/publications/policies/academic/219.wpd**. In a computer science class individual effort is expected. Student misconduct not only includes cheating on tests, but also extends to copying or collaborating on programming assignments, projects, lab work or research unless otherwise specified by the instructor. Using other people's accounts to do your work or having others do your work is prohibited. Close proximity in lab does not mean collaboration is permitted. NOTE: Discussing logical solutions to problems is acceptable, exchange of code, pseudocode, designs, or procuring solutions from the Web, other texts, the Internet or other resources on or off campus is not acceptable.

First offense: grade of 0 for all parties involved unless the "guilty" party can be determined
Second offense: grade of F in the course

SPECIAL ACCOMMODATIONS: If you need special accommodations due to learning, physical, psychological, or other disabilities, please contact Dr. Buddy Wagner in the Counseling and Career Development Center. He may be reached by phone at (601) 925-3354 or by mail at P. O. Box 4016, Clinton, MS 39058.

DROPPING A COURSE: **LAST DROP DATE - October 26**

Students cannot withdraw after this date with a W (passing) unless the three following criteria are met:

- Extenuating circumstances (clearly outside the student's control)
- Passing the course at the time of withdrawal
- Does not have excessive absences at the time of withdrawal

NOTE: Dropping after the THIRD (3rd) WEEK will result in a grade of W appearing on your permanent record (transcripts). See http://www.mc.edu/publications/policies/academic/213.wpd**.**

TENTATIVE COURSE OUTLINE

Chapter 1 - Algorithm Analysis
Methodologies for Analysis
Asymptotic Notation
Math Review
Case Studies in Algorithm Analysis
Amortization
Experimentation

Chapter 2 - Basic Data Structures**
Stacks & Queues
Vectors, Lists, and Sequences
Trees
Priority Queues and Heaps
Dictionaries and Hash Tables
Example

Chapter 3 - Search Trees & Skip Lists**
Ordered Dictionaries & Binary Search Trees
AVL Trees
Bounded-Depth Search Trees
Splay Trees
Skip Lists

Chapter 4 - Sorting, Sets and Selection
The Set ADT
Selection

Chapter 5 -Fundamental Techniques**
The Greedy Method
Divide & Conquer
Dynamic Programming

Exam 1 - Chapters 1-5

Chapter 6 - Graphs
The Graph ADT
Data Structures for Graphs
Graph Traversal
Directed Graphs
Java: Depth-First Search

Chapter 7 - Weighted Graphs**
Single-Source Shortest Path
All-Pairs Shortest Paths
Minimum Spanning Tree
Java: Dijkstra's Algorithm

Chapter 8 - Network Flow & Matching
Flows & Cuts
Maximum Flow
Minimum-Cost Flow
Java: Minimum-Cost Flow

Exam 2 - Chapter 6-8

Chapter 9 - Text Processing**
Strings & Pattern Matching Algorithms
Tries
Text Compression
Text Similarity Testing

Chapter 14 - Algorithmic Frameworks
External-Memory Algorithms

Other parts of other chapters as time permits

****Programming Assignment Given**

Program Submission Guidelines

All programs should be submitted by e-mail as an attachment. Source code must be submitted as well as **all** files necessary for the programs execution. The e-mail message should contain the following information:

- Author's name
- Date completed
- Brief problem description
- Statement regarding whether the program works or not.
- If the program does not work, a brief but concise description of what is wrong and what it will take to "fix" it.