

COURSE DESCRIPTION

Department and Course Number: CSCI 433

Course Title: Algorithm and Data Structure Analysis

Current Catalog Description: Study of the design and analysis of algorithms and data structures. The topics include analysis techniques, sorting, searching, advanced data structures, graphs, string matching, and NP-completeness.

Total Credits: 3 hours.

Coordinator: Dawn Wilkins, Associate Professor of Computer and Information Science. Described version was developed by Daniel Dooly, Visiting Assistant Professor of Computer and Information Science.

Textbook: Sara Baase and Allen Van Gelder. *Computer Algorithms*, Third Ed. Addison-Wesley, 2000.

Other required materials: None

References: <http://www.cs.olemiss.edu/~drd/csci433/spring02/>

Course Goals: To apply analysis and design techniques to non-numeric algorithms which act on data structures; to provide students with an understanding of the effectiveness of algorithms and their relationship to the data structures which they manipulate. This course is designed to give computer science seniors an ability to develop and measure the effectiveness of algorithms, implemented in a variety of data structures, to solve a diversity of application problems.

Prerequisites by Topic:

1. Differential Calculus and L'Hopitals Rule
2. Summations and recurrence relations
3. Data Structures
4. A high level language

Major Topics Covered in the Course:

1. Analyzing algorithms (5 hours)
2. Data abstraction (2 hours)
3. Recursion and induction (3 hours)
4. Sorting (8 hours)
5. Selection and adversary arguments (3 hours)
6. Hashing (2 hours)
7. Graphs and graph traversals (8 hours)
8. More graphs (3 hours)
9. String matching (3 hours)
10. NP-completeness (8 hours)

Laboratory projects: Each student must complete two projects, chosen from six possible. The student must choose appropriate data structures, design an algorithm using those structures, implement the algorithm in a high-level language, and analyze the effectiveness of the algorithm. (3 weeks each)

Estimate of ABET/CAC Category Content:

	CORE	ADVANCED		CORE	ADVANCED
Data Structures	_____	_____ 1 _____	Computer Organization and Architecture	_____	_____
Algorithms	_____	_____ 2 _____	Concepts of Programming Languages	_____	_____
Software Design	_____	_____		_____	_____

Oral and Written Communications:

Not a significant focus of this course.

Social and Ethical Issues:

Not a significant focus of this course.

Theoretical Content (Foundations):

1. Data structures (10 hours)
2. Asymptotic analysis of algorithms (15 hours)
3. Proving algorithms correct (5 hours)
4. NP-complete problems (8 hours)

Problem Analysis:

Each project requires analysis of the problem. Several homework problems require analysis of a problem in order to design a solution for it.

Solution Design:

Each project requires design of a solution to the given problem. Several homework problems ask for design, but not implementation, of a solution to a problem.