

CSCE 350: DATA STRUCTURES AND ALGORITHMS

Catalog Description:

350—Data Structures and Algorithms. (3) (Prereq: CSCE 245, MATH 374) Techniques for representing and processing information, including the use of lists, trees, and graphs; analysis of algorithms; sorting, searching, and hashing techniques.

Prerequisite(s) By Topic:

Introductory programming and data structures
Discrete mathematics
Use of simple data structures (queues, stacks, lists, trees)

Textbook(s) and Other Required Material:

Anany V. Levitin, *Introduction to the Design and Analysis of Algorithms*, Addison-Wesley, Boston, MA, 2003.

Computing Platform: UNIX/Windows XP

Course Objectives: {Assessment Methods Shown in Braces}

1. Describe formal analysis measures. {assignments, tests}
2. Describe the relevance of abstraction to problem solving. {tests}
3. Analyze and use lists, trees, and graphs. {assignments, tests}
4. Apply common algorithm design techniques: brute force, divide-and-conquer, decrease-and-conquer, transform-and-conquer, dynamic programming, and the greedy technique {assignments, tests}
5. Analyze algorithms. {assignments, tests}
6. Use appropriate data structures {programming assignments}

Topics Covered:

1. Structured programming, stacks, queues, lists (5 hours)
2. Determining the Running Time of Programs, Order of Magnitude Analysis (6 hours)
3. Brute force (3 hours)
4. Divide-and-Conquer (3 hours)
5. Dynamic Programming (6 hours)
6. Transform-and-Conquer (3 hours)
7. The Greedy Technique (3 hours)
8. Decrease-and-Conquer (3 hours)
9. Graphs (3 hours)
10. Reviews and exams (4 hours)

Laboratory Projects: None

Syllabus Flexibility: Low. The Undergraduate Committee approves the choice of textbook and syllabus.

Relationship of Course to Program Outcomes:

The contribution of each course objective to meeting the program outcomes is indicated with the scale:

3 = major contributor, 2 = moderate contributor, 1 = minor contributor. Blank if not related.

| Course Objectives | Program Outcomes | | | | | | | | | | |
|-------------------------------------------------------------|------------------|---------------------------|-------------------------------|------------------|----------------------------|---------------------------------|-------------------------------------|--------------------------------|-----------------------------|----------------------|----------------------------------------|
| | 1. Logic & Math | 2. Computing Fundamentals | 3. Apply Computing Principles | 4. Work on teams | 5. Communicate Effectively | 6. Liberal arts & Soc. Sciences | 7. Basic Science and Lab Procedures | 8. Learn New Tools & Processes | 9. Employed upon Graduation | 10. Application Area | 11. Electronics and Digital Sys Design |
| 1. Describe formal analysis measures | 3 | 3 | | | 1 | | | | | | |
| 2. Describe the relevance of abstraction to problem solving | | 3 | 3 | | 1 | | | 2 | | | |
| 3. Analyze and use lists, trees, and graphs | 3 | 3 | 3 | | 1 | | | 2 | 3 | | |
| 4 Apply Algorithm Design Techniques | 3 | 3 | 3 | | 1 | | 1 | 2 | 1 | | |
| 5. Analyze algorithms | 3 | 3 | | | 1 | | | 1 | 2 | | |
| 6. Use appropriate data structures | | 3 | 3 | | 1 | | | 2 | 3 | | |

Estimated Computing Category Content (Semester hours):

| Area | Core | Advanced | Area | Core | Advanced |
|-----------------------|------|----------|-----------------------|------|----------|
| Algorithms | | 2 | Data Structures | | 1 |
| Software Design | | | Programming Languages | | |
| Computer Architecture | | | | | |

Estimated Information Systems Category Content (Semester hours):

| Area | Core | Advanced | Area | Core | Advanced |
|-----------------------------|------|----------|-----------------------------------|------|----------|
| Hardware and Software | | | Networking and Telecommunications | | |
| Modern Programming Language | | | Analysis and Design | 1 | |
| Data Management | | 1 | Role of IS in an Organization | | |
| Quantitative Analysis | | 1 | Information Systems Environment | | |

Oral and Written Communication:

An oral communication component involving the analysis, design, implementation, or use of selected algorithms is required of all students.

Social and Ethical Issues: None

Theoretical Content:

Analysis of algorithms

Analysis and Design:

Substantive algorithm analysis and some programming

Class/Laboratory Schedule:

Lecture: 3 periods of 50 minutes or 2 periods of 75 minutes per week

Course Coordinator: Marco Valtorta

Modification and Approval History:

Initial description, September 1998

Revised, April 2001

Revised February 2002 to include an oral and written communication component

Revised June 2005 by Caroline Eastman to update textbook and coordinator

Revised June 2005 by Marco Valtorta to update objectives and topics consistent with earlier discussions of the Undergraduate Committee