

CS 477/677: Analysis of Algorithms

Fall 2009

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Office hours: Wednesday 9:00am-11:00am

Class webpage: <http://www.cse.unr.edu/~monica/Courses/CS477-677/index.html>

Lectures

Tuesday, Thursday: 4:00pm-5:15pm, SEM 347.

Required Textbook

Introduction to Algorithms, 3rd Edition, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, 2009.

Course Description

The design and analysis of algorithms is the core subject matter of Computer Science. Given a problem, we want to (a) find an algorithm to solve the problem, (b) prove that the algorithm solves the problem correctly, and (c) prove that we cannot solve the problem any faster. Designing an algorithm for a computational problem involves knowledge of the problem domain, a thorough knowledge of the data structures that are available and suitable, and no small measure of creativity. This course concentrates on the above problems, studying useful algorithmic design techniques, and methods for analyzing algorithms.

Prerequisites

CS 365. Good knowledge of data structures (such as linked lists and trees) and a good mathematical background are required.

Course Outcomes

ABET Criterion 3 Outcomes	Course Outcomes	Assessment Methods/Metrics	CS Program Objectives Impacted	CIE Program Objectives Impacted
1	Students will possess the mathematical knowledge and skills necessary to the analysis of algorithms.	Reinforce mathematical fundamentals including techniques for solving summations and recurrences, the asymptotic growth rate of functions, and basic probability.	1, 2	2
3	Students will gain insight into algorithmic design and how it is affected by and/or affects algorithmic logic, structure, and performance.	Apply proof techniques and mathematical concepts to demonstrate the correctness and assess the performance of standard algorithms	3	3
5	Students will demonstrate their ability to carry out a complete algorithmic design process (design, analysis, implementation, results).	Address problems involving algorithmic design, analysis, and implementation.	2, 3	3
11	Students will gain an understanding of certain classes of algorithms, along with models for future algorithmic work.	Introduce a number of standard algorithms, both classical and modern, as objects for algorithmic analysis.	2, 3	2, 3

ABET Criterion 3 Outcomes:

Our graduates will have achieved:

1. an ability to apply knowledge of computing, mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints specific to the field.
4. an ability to function effectively on multi-disciplinary teams.
5. an ability to analyze a problem, and identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution.
6. an understanding of professional, ethical, legal, security and social issues and responsibilities.
7. an ability to communicate effectively with a range of audiences.

8. the broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society.
9. a recognition of the need for, and an ability to engage in continuing professional development and life-long learning.
10. a knowledge of contemporary issues.
11. an ability to use current techniques, skills, and tools necessary for computing and engineering practice.
12. an ability to apply mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
13. an ability to apply design and development principles in the construction of software systems or computer systems of varying complexity.

Computer Science Program Objectives:

Within 3 to 5 years of graduation our graduates will:

1. be employed as computer science professionals beyond entry level positions or be making satisfactory progress in graduate programs.
2. have peer-recognized expertise together with the ability to articulate that expertise as computer science professionals.
3. apply good analytic, design, and implementation skills required to formulate and solve computer science problems.
4. demonstrate that they can function, communicate, collaborate and continue to learn effectively as ethically and socially responsible computer science professionals.

Computer and Information Engineering Program Objectives:

Within 3 to 5 years of graduation our graduates will:

1. be employed as computer engineering professionals beyond entry level positions or be making satisfactory progress in graduate programs.
2. have peer-recognized expertise together with the ability to articulate that expertise as computer engineering professionals.
3. apply good analytic, design, and implementation skills required to formulate and solve computer engineering problems.
4. demonstrate that they can function, communicate, collaborate and continue to learn effectively as ethically and socially responsible computer engineering professionals.

Topics

- Introduction/Mathematical Foundations (Chapters 1, 3, Appendix A)
- Recurrences (Chapter 4)
- Sorting Algorithms (Chapters 2, 8)
- Randomized Algorithms (Chapters 5, 7, 9)
- Data Structures (Chapters 6, 11, 12, 13, 14)
- Greedy Algorithms (Chapter 16)
- Dynamic Programming (Chapter 15)
- Graph Algorithms (Appendix B4, Chapters 22, 23, 24, 25)
- Selected Topics (Chapters 28, 30, 31, 34, 35)

Assignments, Examinations and Grading

Homework assignments: There will be a number of homework assignments, some of which will include programming. The homeworks and their due dates will be posted on the course web page. Homeworks are due on the specified date at the beginning of the class.

Late submission policy: each late homework will incur a 10% penalty for each day of delay, but no homeworks may be submitted later than 3 days after the deadline.

Exams: There will be one midterm exam and one final exam. Both exams will be closed books, closed notes. Permissions to take exams on other dates than scheduled will not be given, except for extreme medical emergencies.

Grading structure: The final score will be computed as follows:

Homeworks:	40%
Midterm exam:	25%
Final exam:	30%
Attendance and class participation:	5%

Letter grades: The letter grade will be computed according to the following table. Some upward adjustment *may* occur, but do not count on it.

88-100:	A-, A
75-87:	B-, B, B+
62-74:	C-, C, C+
50-61:	D-, D, D+
< 50:	F

Academic integrity: Students are encouraged to study together, however each student must individually prepare his/her solutions. Cheating or plagiarism are not permitted and will be sanctioned according with the UNR policy on Academic Standards. You should carefully read the section on Academic Dishonesty found in the UNR Student Handbook (copies of this section are on-line). Your continued enrollment in this course implies that you have read it, and that you subscribe to the principles stated therein.