

COSC-5313
Analysis of Algorithms
Fall Semester, 2017
9:35pm-10:55pm, Tuesday-Hybrid

Instructor: Dr. Jing Zhang,
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Office hours: anytime by email and in person from 2:30am to 4:30 on TR

CATALOG COURSE DESCRIPTION

- The course is intended as a course to the design and analysis of algorithms for some of the most frequently encountered combinatorial problems. The course aims to provide familiarity with general algorithmic techniques, performance measures, analysis tools, and problem areas. In this course, we will focus on developing an understanding of the algorithmic design process: how to identify the algorithmic needs of an application and apply algorithmic design techniques to solve those problems. The students will also learn how to identify problems for which no exact, efficient algorithm is known.
- More specifically, topics include: Fundamentals (Basic Programming Model, Growth of functions, Standard Annotations, Data Abstraction, Bags, Queues, and Stacks, Analysis of Algorithms), Sorting (Elementary Sorts, Heapsort, Mergesort, Quicksort, applications), Searching (Symbol Tables, Binary Search Trees, Balanced Search Trees, Hash Tables, applications), Advanced Design (Dynamic Programming, Greedy Algorithm), Strings (String Sorts, Tries, Substring Search, Regular Expressions, Data Compression), Graphs (Undirected Graphs, Directed Graphs, Minimum Spanning Trees, Shortest Paths),

COURSE OBJECTIVES

1. Introduce students to the analysis and design of algorithms.
2. Developing an understanding of the algorithmic design process.
3. How to identify the algorithmic needs of an application and apply algorithmic design techniques to solve those problems.

LEARNING OUTCOMES: Upon completion of the course with a “B” or better, the student should be able to:

1. Design efficient algorithms and compare competing designs based on their complexities.
2. Understand mathematical and scientific principles relevant to computer science.
3. Explain the mathematical concepts used in describing the complexity of an algorithm.
4. Select and apply algorithms appropriate to a particular situation.
5. Demonstrate basic understanding of some design approaches such as backtracking, greedy algorithms, dynamic programming and divide-and-conquer.
6. Employ one from a range of strategies leading to the design of algorithms to serve a particular purpose.
7. Explain the trade-offs that exist between a range of algorithms that possess the same functionality.
8. Know advanced and modern topics in computer science.
9. Debug implemented software in a proficient manner.

Course materials (required textbook):

[Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein; 2009]: Introduction to Algorithms, 3rd edition, ISBN: 978-0-262-03384-8

Grading criteria (Tentative and Subject to Change):

The grade for the course will be based on several homework assignments, midterm and final written exam, paper or project presentation with percentages assessed as follows:

1. Quizzes (Active Participation): 10%
2. Assignments: 20%
3. Midterm exam: 35%
4. Final exam: 35%

Grading:

90-100%	A
80-89%	B
70-79%	C
60-69%	D
Below 60%	F

Course Outline (Tentative and Subject to Change):

	Chapters – Topics
Foundations	Chapter 1: The Role of Algorithms in Computing Chapter 2: Getting Started Chapter 3: Growth of Functions Chapter 4: Divide-and-Conquer
Sorting and Order Statistics	Chapter 6: Heapsort Chapter 7: Quicksort Chapter 8: Sorting in Linear Time Chapter 9: Medians and Order Statistics
Data Structures	Chapter 10: Elementary Data Structures Chapter 11: Hash Tables Chapter 12: Binary Search Trees Chapter 13: Red-Black Trees
Advanced Design and Analysis Techniques	Chapter 15: Dynamic Programming Chapter 16: Greedy Algorithms
Graph Algorithms	Chapter 22: Elementary Graph Algorithms Chapter 23: Minimum Spanning Trees Chapter 24: Single-Source Shortest Paths Chapter 25: All-Pairs Shortest Paths
Final Exam	TBD

Policies:

1. Assignments that are turned in late will be assessed with the following late penalty applied to the score received:
 - 1 day late (Immediately after the deadline up to 24 hours later): -10%
 - 2 days late: -25%
 - 3 days late: -30%
 - > 3 days late: -100% (we will not accept it)
2. In-class quizzes may not be announced ahead of time. It is important to attend class regularly so no quizzes are missed. Missed quizzes cannot be made up unless the student has an official university excuse for missing class.

3. There is no make-up final exam unless you have a DOCUMENTED medical or personal EMERGENCY.
4. All work in this course is to be your own. Anyone caught copying, plagiarizing, or otherwise cheating on a homework assignment will get a 0 on that assignment. Anyone caught copying, plagiarizing, or otherwise cheating on the final exam will get an F in the course. The same applies to those who allow their materials to be copied.
5. Attendance Policy: If the course is online, then students are required to log on regularly and submit all the assignments in time. If the course is not online, students are expected to attend every class and are solely responsible for anything missed in the class. Poor attendance will ultimately be reflected in the course grade. Therefore, an 'A' student must attend all classes and actively provide thoughtful, relevant comments to class discussions.
6. The Campus Closure Policy: In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University website's homepage (www.lamar.edu) for instructions about continuing courses remotely.

Students with disabilities:

The Professor will make reasonable accommodations for students with documented disabilities. Students needing accommodations must first have them approved through the **Office of Services for Students with Disabilities, Communication Building, room 105, phone number 409-880-8347**. Please notify the Professor during the first week of class regarding accommodations needed for the course.

Emergency Procedures

Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at:

<http://www.lamar.edu/about-lu/administration/risk-management/index.html>. Following are procedures for the first two:

Severe Weather:

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

Violence/Active Shooter (CADD):

- **CALL** - 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.
- **AVOID**- If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY**- Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.
- **DEFEND**- Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.