Computer Algorithms

CS 470-002 | Fall 2020 | 3 Credit Hours

Lecture

Brandon Dixon

Contact Information

UA Campus Directory:

- Brandon Dixon (https://www.ua.edu/directory/?i=bdixon#listing)

Instructor

Name: Dr. Brandon Dixon

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Prerequisites

UA Course Catalog Prerequisites:
CS 300, CS 301 and ECE 383

- Ability to use fundamental data structures and algorithms for sets, trees, and graphs.
- Understanding of algorithms using divide-and-conquer, dynamic programming, and greedy.
- Ability to read and write mathematical arguments using contradiction, deduction, induction.

Course Description

Course Description and Credit Hours
Construction of efficient algorithms for computer implementation.

Required Texts

Required Texts from UA Supply Store:

- CORMEN(VP) / INTRO TO ALGORITHMS **(Required)**
- CORMEN(VP) (RENTAL) / (RENTAL) INTRO TO ALGORITHMS **(RENTAL)**

Course Objectives

At the completion of this course, students should be able to:

- Know standard algorithms and be able to analyze their efficiency.
- Recognize standard problems embedded in real-world applications.
- Analyze and compare the performance of competing algorithms for the same problem.
- Modify known algorithms to solve new variations of familiar problems.
- Design and analyze new algorithms using divide-and-conquer, dynamic programming, greedy method, multithreading, and/or approximation techniques.
- Decide which design technique is most useful for solving a given problem.
- Prove that a problem is NP-complete, and understand implications of NP-completeness.
- Develop improved abilities to think abstractly, critically, and rigorously, and to solve problems that require analysis, synthesis, and evaluation.

Student Learning Outcomes

At the completion of this course, students should be able to:

- Know standard algorithms and be able to analyze their efficiency.
- Recognize standard problems embedded in real-world applications.
- Analyze and compare the performance of competing algorithms for the same problem.
- Modify known algorithms to solve new variations of familiar problems.
- Design and analyze new algorithms using divide-and-conquer, dynamic programming, greedy method, multithreading, and/or approximation techniques.
- Decide which design technique is most useful for solving a given problem.
- Prove that a problem is NP-complete, and understand implications of NP-completeness.

- Develop improved abilities to think abstractly, critically, and rigorously, and to solve problems that require analysis, synthesis, and evaluation.

Other Course Materials

Additional course materials will be posted to Blackboard during the semester.

Outline of Topics

- Divide-and-conquer (chapters 4, 9)
- Dynamic programming (chapters 15, 25)
- Greedy method (chapters 16, 23-24)
- Amortized Analysis (chapter 17)
- Max flow and matchings (chapter 26)
- Parallel algorithms (chapter 27)
- String matching (chapter 32)
- Computational geometry (chapter 33)
- NP-completeness (chapter 34)

Exams and Assignments

Weekly in class quizzes (available on Blackboard as well)

We will have 3 exams during the semester.

Grading Policy

25%	Weekly Quizzes (2 drops)
25%	Exam 1
25%	Exam 2
25%	Exam 3

Policy on Missed Exams and Coursework

The lowest 2 weekly quiz scores will be dropped, if more quizzes are missed than 2, an appropriate plan can be decided.

A missed exam for an appropriate reason will be determined on a case by case basis.

Attendance Policy

Students may attend the in person sessions or remain on-line/virtual.
The weekly quizzes will only be available online during the classtime.

Notification of Changes

The instructor will make every effort to follow the guidelines of this syllabus as listed; however, the instructor reserves the right to amend this document as the need arises. In such instances, the instructor will notify students in class and/or via email and will endeavor to provide reasonable time for students to adjust to any changes.

Statement on Academic Misconduct

Students are expected to be familiar with and adhere to the official Academic Misconduct Policy (https://catalog.ua.edu/undergraduate/about/academic-regulations/student-expectations/academic-misconduct-policy/) provided in the Online Catalog.

Statement On Disability Accommodations

Contact the Office of Disability Services (ODS) (https://catalog.ua.edu/undergraduate/about/support-programs/disability-services/) as detailed in the Online Catalog.

Severe Weather Protocol

Please see the latest Severe Weather Guidelines (https://ready.ua.edu/severe-weather-guidelines/) in the Online Catalog.

Pregnant Student Accommodations

Title IX protects against discrimination related to pregnancy or parental status. If you are pregnant and will need accommodations for this class, please review the University's FAQs on the UAct website (https://www.ua.edu/campuslife/uact/information/pregnancy) .

Religious Observances

Under the Guidelines for Religious Holiday Observances, students should notify the instructor in writing or via email during the first two weeks of the semester of their intention to be absent from class for religious observance. The instructor will work to provide reasonable opportunity to complete academic responsibilities as long as that does not interfere with the academic integrity of the course. See full guidelines at Religious Holiday Observances Guidelines (https://provost.ua.edu/oaa-guidelines-for-religious-holidays-observance) .

UAct Statement

The University of Alabama is committed to an ethical, inclusive community defined by respect and civility. The UAct website (www.ua.edu/uact (https://www.ua.edu/uact)) provides extensive information on how to report or obtain assistance with a variety of issues, including issues related to dating violence, domestic violence, stalking, sexual assault, sexual violence or other Title IX violations, illegal discrimination, harassment, hate or bias incidents, child abuse or neglect, hazing, threat assessment, retaliation, and ethical violations or fraud.

Statement on COVID-19

All University faculty, staff, and students are expected to maintain a commitment to the health and safety of our campus community. Due to the current COVID-19 pandemic, specific health and safety standards are in place to minimize exposure and community spread on campus. In the interest of your health and safety and that of all UA students, faculty and staff, the University reserves the right to change the mode of instruction or schedule of instruction at any time, based upon prevailing public health and other guidance. While the method of delivery may change, educational instruction and opportunities will continue. As such, the University will not provide a refund of tuition, in whole or in-part, based on any such changes. Detailed information on changes in format or schedule can be found at studentaccounts.ua.edu (https://studentaccounts.ua.edu) and financialaid.ua.edu (https://financialaid.ua.edu/) .

All students must be familiar with and abide by the requirements outlined in the UA Return Plan | UA System Comprehensive Health and Safety Plan. Students must (1) wear a mask or face covering at all times while participating in face-to-face class; (2) adhere to social distancing standards; and (3) comply with all other health and safety restrictions. If a student refuses to comply with the requirements, the student will be asked to leave the class and reported for a conduct violation. Unless a student has an exemption from the requirement to wear a face covering, (more information can be found at ods.ua.edu/covid-19-disability/ (http://ods.ua.edu/covid-19-disability)), the student will be reported to Student Life for further disciplinary action. More information on these requirements and UA Healthcheck system and screening can be found at healthinfo.ua.edu/returnplan (https://healthinfo.ua.edu/returnplan) . You are expected to visit the site and comply with all noted requirements related to in-person class attendance.