

CS 4413 Algorithm Analysis SYLLABUS

Instructor: Qi Cheng (DEH254, qcheng@ou.edu)

Office Hours: TR 2-3:30

Class Meetings: TR 9 - 10:15 am Felgar Hall 0300

Course Website: Access through <https://canvas.ou.edu>

Prerequisite: CS 2413 and CS 2813; or MATH 2513; or CS 5005.

Required Text: Introduction to Algorithms, Fourth Edition By Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, MIT press.

Course Description and Goals: This course introduces various algorithm design strategies: divide and conquer, greedy principle and dynamic programming to solve a variety of problems such as sorting, computer algebra, numerical computing, graph algorithms and computational geometry etc. Before the midterm, we cover Chapter 1, 2, 3, 4, 6, 7, 9 and 8 in the textbook. After the midterm, we cover Section 14.2, 15.3, Chapter 20, 21, 22, 34, Section 35.2 and 24.

Learning Outcomes: Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify algorithmic solutions (From ABET).

Weekly schedule: Week 1: Introduction (Chapter 1)

Week 2: Insertion sort, worst case analysis and Pseudo-code. (Chapter 2)

Week 3: Merge sort, divide-and-conquer, Asymptomatic notation and big-O. (Chapter 3)

Week 4: Square matrix multiplication, Strassen algorithm and recursion tree (Chapter 4)

Week 5: Max/Min heap, heapify algorithm, and heap sort (Chapter 6)

Week 6: Partition algorithm, Quick sort with deterministic pivot, and randomized Quick sort. (Chapter 7)

Week 7: Linear time sorting, Selection in randomized linear time and deterministic linear time. (Chapter 8/9)

Week 8: Midterm

Week 9: Matrix chain multiplication and Dynamic programming. (Chapter 14)

Week 10: Prefix code, Huffman tree and greedy algorithm. (Chapter 15)

Week 11: Graph theory basics, graph representation, Depth First Search, and Breath First Search. (Chapter 20)

Week 12: Minimum Spanning Tree, Kruskal algorithm and Prim algorithm. (Chapter 21)

Week 13: The Shortest Path Problem, Dijkstra's algorithm and Bellman-Ford algorithm. (Chapter 22)

Week 14: The NP completeness, reduction, Circuit Satisfiability Problem, Boolean Formula Satisfiability Problem, Conjunctive Normal Form and Hamiltonian Path. (Chapter 34)

Week 15: Approximation Algorithm to solve the Traveling Salesman Problem. (Chapter 35)

Week 16: Review

Learning Activities, Assignments and Assessments Students are expected to study the chapter before a lecture. Homework and quizzes are assigned weekly. Please submit your homework at <https://canvas.ou.edu>. One homework of your choice can be turned in after its due time, for which you can earn up to 90% of credit. No other late homework will be accepted. Your lowest homework grade will be dropped, and your least two quiz scores will be dropped. These benefits are provided for you to take care of personal emergencies and other irregularities. No make-up quiz can be provided. In this course, all quizzes are open-book, open-notes, unless otherwise specified. We will post quiz solutions on the course website, which sometimes are scans/screenshots of student work with name and ID# removed. If you are against posting of your work, please let me know.

Assigning Grades The final grade consists of

Quiz	30%
Homeworks	20%
Midterm	20%
Final Examination	30%

The letter grade will be decided as following

A \geq 90% B \geq 80% C \geq 70% D \geq 60% F < 60%

AI policy You are allowed to use AI LLM as an study aid. Please be warned that while the current popular AI models can be helpful sometimes, they often give misleading information. You should not copy text from LLM and paste into your homework, even with some modification. You can not access AI models during online quizzes and exams.

Academic Integrity and Plagiarism

The overall goal of this course is your learning. In order to demonstrate that you have reached this goal, the work you turn in needs to be your own. This includes putting written work into your own words and citing your sources, as appropriate to avoid plagiarism. If you work in a group, seek assistance from a tutor, use a resource on campus, and/or use online resources (including AI software), the work you turn in must be your own, demonstrating your own understanding of the material that you have gained through the learning process. If you have questions about academic integrity or plagiarism, please ask: my aim is to foster an environment where you can learn and grow, while also maintaining academic honesty and a clear representation of your learning and ideas. Penalties for serious offenses include a zero on the assignment and egregious offenses can even result in expulsion from the university, so it is important to understand expectations. Plagiarism as defined by the OU Integrity Office includes:

- Copying words and presenting them as your own writing.
- Copying words, even if you give the source, unless you also indicate that the copied words are a direct quotation
- Copying words and then changing them a little, even if you give the source.
- Even if you express it in your own words, it is plagiarism to use someone else's idea as your own.

Visit the OU Integrity Office for more information on what constitutes plagiarism.

University Policies

Mental Health Support Services

Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either be seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through TimelyCare. To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit University Counseling Center. The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

Title IX Resources and Reporting Requirement

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from gender and sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex or gender-based discrimination or violence and wish to speak with someone confidentially, please contact OU Advocates (available 24/7 at 405-615-0013) or University Counseling Center (M-F 8 a.m. to 5 p.m. at 405-325-2911).

Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit Institutional Equity Office at 405-325-3546.

Adjustments for Pregnancy and Related Issues

Should you need modifications or adjustments to your course requirements because of pregnancy or a pregnancy-related condition, please request modifications via the Institutional Equity Office website or call the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office FAQ on Pregnant and Parenting Students' Rights for answers to commonly asked questions.

Reasonable Accommodation Policy

The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please submit your semester accommodation request through the ADRC as soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations.

If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete ADRC's pre-registration form to begin the registration

process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their Register with the ADRC web page. You may also contact them at (405)325-3852 or adrc@ou.edu, or visit www.ou.edu/adrc for more information.

Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [See Faculty Handbook 3.15.2]

Final Exam Preparation Period

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy.

Emergency Protocol

During an emergency, there are official university procedures that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.

Additional Weather Safety Information is available through the Department of Campus Safety.

The University of Oklahoma Active Threat Guidance

The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn off all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.

TULSA campus: For non-emergencies call (918) 660-3900. For emergencies call (918) 660-3333 or dial 911.

Fire Alarm/General Emergency

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. LEAVE the building. Do not use the elevators.
2. KNOW at least two building exits
3. ASSIST those that may need help
4. PROCEED to the emergency assembly area
5. ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues.
6. WAIT for official notice before attempting to re-enter the building.

Video: OU Fire Safety on Campus