

CS 2500 – Algorithms - Course Syllabus

Instructor: TBD

Course Objectives

The purposes of this course are fivefold:

1. Analyze a complex computing problem and apply advanced algorithmic design and analysis techniques to identify and implement solutions
2. Build on the basic skills of analysis and programming developed in CS 1575 and 1200
3. Apply algorithm complexity and correctness analysis techniques
4. Develop Written Communication Skills within the Context of Computer Science
5. Develop Lifelong Learning Skills

Intended Course Audience/Prerequisites

The intended audience for this course is Computer Science Sophomores/Juniors who have completed each of the following courses:

- Discrete Mathematics and boolean algebra (CS 1200)
- Data Structures I CS 1575

Course Materials

Text: Introduction to Algorithms, 3rd Edition, Cormen et. al., McGraw Hill

Handouts: As required

Grading

15% Test I -

15% Test II -

15% Test III -

Final - During Prescribed Final Time (replaces a test grade)

45% Program Assignments (4-6 assignments)

10% Checks for Understanding, Quizzes, Board Work, Worksheets (in class at random)

The exams, programs, and quizzes receive grades based on the following scale:

89-100 A

77-88 B

65-76 C

53-64 D

The final course grade is then a weighted average (according to the above table) of these individual grades.

Topic Schedule	Weeks
Ch. 1: Algorithms: Algorithms, Complexity, Efficiency	½ week
Ch. 2: Basic Algorithm Design and Analysis : 2.1. Simple Algorithm & Invariants, 2.2. Run-time analysis, 2.3. Some algorithm design basics: the Divide and Conquer Approach Outcome: Students will be able to interpret a short program, write the inductive proof associated with it, and implement the program.	2 weeks
Ch. 3: Asymptotic Analysis: 3.1 Theta, big-Oh, Omega, 3.2. Common Functions and tricks, Appendix A. Math Techniques Outcome: Students will be able to perform the run-time asymptotic analysis given a program that is not recursive	1 week
Ch. 4: Recurrences: Outcome: Students will be able to perform the run-time asymptotic analysis given a program that is recursive	1½ weeks
Ch. 6: Heapsort revisited: 6.1-6.4 - Design Correctness and Complexity Outcome: Students will perform asymptotic analysis and correctness analysis to heapsort.	1½ weeks
CH. 15: Dynamic Programming: Outcome: Students will develop a dynamic program and implement it validating the asymptotic run time and correctness. Student will determine the tradeoffs among different dynamic program implementations.	2 ½ weeks
Ch. 16: Greedy Algorithms: Outcome: Students will develop a program using the greedy method and implement it validating the asymptotic run time and correctness. Student will determine the tradeoffs among greedy vs dynamic program implementations.	1 week
Ch. 22: Graph Algorithms: 22.1, Appendix B: Graph Theory for Computer Scientists, 22.2 Breadth First Search Revisited, correctness and complexity, 22.4 Topological Sort, 22.5 Strongly Connected Components Outcome: Students will have the ability to describe implementation structures for graph structures.	1½ weeks
Ch. 23,24,25: Spanning Tree and Shortest Path Algorithms Outcome: Students will develop a program using graph algorithms and implement it validating the asymptotic run time and correctness. Student will determine the tradeoffs among different dynamic program implementations.	1 ½ weeks
Ch. 26: Maximum Flow: Outcome: Students will apply max flow to a problem and implement it validating the asymptotic run time and correctness.	1 ½ weeks
Ch. 34: Brief Introduction to NP Completeness and Undecidability	½ week

Program Assignments

Program assignments are **due 1 week after being assigned** unless otherwise stated in class. Some work may be in small groups (up to 3) and some work will be individual effort on the programming assignments. For group assignments, though, you must change group membership with each assignment. Written reports will be required for each programming assignment. **Late program assignments** will be assessed a 10 point deduction per day and will not be accepted beyond one week of the assigned deadline. A program is considered late if it is not turned in when collected at the start of class. Revisions of assignments will be accepted on the writing portion only and will also be subject to a 10 point deduction per day with a minimum of one day's penalty.

Homework Assignments

Homework assignments will be given regularly and corrected, but not graded. It is up to you to do the homework. However, in borderline grade situations, if you've completed all the homework, you may receive the next higher grade for the course.

Quizzes

Quizzes are over material we will cover that day, so it is in your best interest to read ahead.

Course Requirements/Policies

Attendance

Regular attendance is required; if you miss more than 2 classes in a row, I will file a report through S&T Connect indicating you are not meeting the requirements for the course. If you miss over 7 classes during the semester and have less than an "A" average, you will be administratively dropped. If an examination is missed for unavoidable absence due to a university-sponsored commitment, a makeup examination will be given. For planned absences, programs should be turned in before the absence, rather than after.

Personal Electronics

Personal electronic devices such as cell phones, etc., are not to be used during class for voice calls, texting, etc. The one exception is emergency calls. If you receive an emergency call, please exit the room quickly.

Title IX

Missouri University of Science and Technology is committed to the safety and well-being of all members of its community. US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Furthermore, in accordance with Title IX guidelines from the US Office of Civil Rights, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Title IX Coordinator, any notice of sexual harassment, abuse, and/or violence (including personal relational abuse, relational/domestic violence, and stalking) disclosed through communication including but not

limited to direct conversation, email, social media, classroom papers and homework exercises.

Missouri S&T's Title IX Coordinator is interim chief diversity officer Neil Outar. Contact him (naoutar@mst.edu; (573) 341-6038; Temporary Facility A-1200 N. Pine Street) to report Title IX violations. To learn more about Title IX resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit <http://titleix.mst.edu>.

Student Honor Code and Academic Integrity:

The Honor Code is developed and endorsed by the Missouri S&T Student Council: the Honor Code can be found at this link: <http://stuco.mst.edu/honor-code/>. Please read and reflect upon the Honor code and its emphasis on HONESTY and RESPECT.

Page 30 of the Student Academic Regulations handbook describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism or sabotage (<http://registrar.mst.edu/academicregs/index.html>). Additional guidance for faculty, including the University's Academic Dishonesty Procedures, is available on-line at <http://academicsupport.mst.edu>. Other informational resources for students regarding ethics and integrity can be found online at <http://academicsupport.mst.edu/academicintegrity/studentresources-ai>.

S&Tconnect: <https://canvas.mst.edu/> (S&Tconnect icon on left toolbar)

S&Tconnect provides an enhanced system that allows students to request appointments with their instructors and advisors via the S&Tconnect calendar, which syncs with the faculty or staff member's Outlook Exchange calendar. S&Tconnect will also facilitate better communication overall to help build student academic success and increase student retention.

Classroom Egress Maps:

Please familiarize yourself with the classroom egress maps posted on-line at: <http://designconstruction.mst.edu/floorplan/>. This is G-31 EECH.

Accessibility and Accommodations:

It is the university's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please contact Student Disability Services at (573) 341- 6655, sdsmst@mst.edu, visit <http://dss.mst.edu/> for information, or go to mineraccess.mst.edu to initiate the accommodation process.

The Student Success Center

The Student Success Center is a centralized location designed for students to visit and feel comfortable about utilizing the campus resources available. The Student Success Center was developed as a campus wide initiative to foster a sense of responsibility and self-directedness to all S&T students by providing peer mentors, caring staff, and approachable faculty and administrators who are student centered and supportive of student success. Visit the SSC at 198

Toomey Hall; 573-341-7596; success@mst.edu; facebook: www.facebook.com/SandTssc; web: <http://studentsuccess.mst.edu/>

If you have any questions about the information listed above, please contact the Office of Academic Support at 573-341-7276.