Missouri University of Science and Technology — Department of Computer Science
**Fall 2018** — **CS 2500: Algorithms (Sec: A & B)**

# SYLLABUS

**Instructor:** *Dr. Sid Nadendla* — **Email:** *nadendla@mst.edu*

## 1 Course Information

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|---|---|
| **Course Website:** | https://sites.google.com/a/mst.edu/nadendla//f18-cs2500 |
| **Lecture hours:** | Tuesdays & Thursdays; Section A: 9:30-10:45 AM, Section B: 3:30-4:45 PM |
| **Lecture Venue:** | Room 211, V. H. McNutt Hall |
| **Instructor:** | Dr. Sid Nadendla |
| **Office:** | 313 Computer Science Building |
| **Office hours:** | Wed 11AM - 12PM, Fri 4PM - 5PM, or by appointment. |
| **E-mail:** | nadendla@mst.edu |
| **Website:** | https://sites.google.com/a/mst.edu/nadendla |
| **Office Phone:** | (573) 341-4090 |

**Required Textbook:** Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein, *Introduction to Algorithms*, Third Edition, MIT Press, 2009. ISBN 978-0-262-03384-8.

## 2 Description

The goal of this course is to ensure that the students are exposed to several fundamental algorithms, while simultaneously developing abilities in both formal thinking (proof techniques and algorithm analysis) and problem solving skills (algorithm design and selection). A gamut of fundamental problems in computing will be introduced and algorithms are devised to solve them using techniques such as recurrence relations, dynamic programming, greedy, shortest-path, minimal spanning trees, and maximum flow algorithms. Furthermore, these algorithms shall also be analyzed for correctness and time/space complexity, and validated through programming. This is a writing intensive course and will include significant writing (like assignment reports) which will count towards their grade in this class.

## 3 Course Objectives

This course has the following objectives:

- Be thoroughly familiar with a collection of core algorithms.
- Be fluent in the following algorithm design paradigms: recursion, sorting, divide and conquer, greedy algorithms, dynamic programming and graph algorithms.

- Be proficient in analyzing the correctness and run-time performance of a given algorithm, and be familiar with the inherent complexity (lower bounds and intractability) of certain problems.
- Be able to apply these techniques to real-world problems.
- Improve technical writing skills in computer science through HW assignments and projects to enable them to fluently write algorithms using pseudocodes and flowcharts, articulate complexity analysis, and present design approaches in a clear and comprehensive manner.

# 4 Intended Audience & Prerequisites

This course is aimed at undergraduate students in any science or engineering degree program who are proficient in a procedural programming language, have a solid understanding of data structures, and have a basic proficiency in calculus. If in doubt, contact the instructor! Python is the programming language adopted for this course; under extraordinary circumstances, students may obtain instructor's approval to adopt other programming languages. The prerequisites for this course are (i) "C" or better grade in both Comp Sci 1200 and Comp Sci 1575; (ii) preceded by "C" or better grade in either Math 1208 or Math 1214, or accompanied by either Math 1208 or Math 1214.

# 5 Tentative Schedule

| **Topic** | **Subtopics** | **# Lectures** |
|---|---|---|
| Foundations | Complexity Analysis, Recursion, Randomization | 4 |
| Sorting | Insertion, Heapsort, Quicksort, Radixsort | 4 |
| **Midterm 1** | | **1** |
| Other Design Techniques | Dynamic Programming, Greedy Algorithms | 4 |
| Graph Algorithms | Searching, Shortest Path, Spanning Trees, Max. Flow | 4 |
| **Midterm 2** | | **1** |
| NP-Completeness | P vs. NP, Reducibility, Heuristics, Traveling Salesman | 4 |
| Special Topics | Linear Programming, String Matching | 4 |
| **Midterm 3** | | **1** |
| Project Presentations | | 2 |
| **Final** | | **1** |

# 6 Grading Information

## 6.1 Calculation of Final Grades

Students will be assigned a total of six homework assignments, three midterm examinations, a final comprehensive exam and a project. However, the best five homework grades and best two midterm grades shall only be considered for the sake of calculating the final grade, as shown below:

| | |
|---|---|
| **Assignments (5/6):** | 50% of total grade |
| **Midterm Exams (2/3):** | 20% of total grade |
| **Final Exam (1):** | 10% of total grade |
| **Project (1):** | 20% of total grade |
| **Final Grade:** | $[90-100]$: A, $[80-90)$: B, $[70-80)$: C, $[60-70)$: D, $<60$: F |

All the grades will be posted and maintained on Canvas.

## 6.2 Graders

Each section will be assigned about two graders, who will be introduced/announced in the first lecture. If a student has any question regarding the HW grades, they may contact their respective graders directly. After discussing with the grader, if the student feels that the issue remains unresolved, the student may reach out to the instructor.

# 7 Course Policies & Campus Resources

## 7.1 S&Tconnect

The purpose of the S&Tconnect Early Alert system (see the S&Tconnect tab in Canvas) is to improve the overall academic success of students by improving communication among students, instructors and advisors; reducing the time required for students to be informed of their academic status; and informing students of actions necessary by them in order to meet the academic requirements in their courses.

## 7.2 Disabilities

It is the universitys goal that learning experiences be as accessible as possible. If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with the instructor as early as possible in the semester. You will need to request that the Disability Support Services staff send a letter to the instructor verifying your disability and specifying the accommodation you will need before the instructor can arrange your accommodation. Disability Support Services is located in 203 Norwood Hall, their phone number is 573-341-6655, and their E-mail is sdsmst@mst.edu. Please visit http://dss.mst.edu/ for more information, or you can also initiate the accommodation process at https://mineraccess.mst.edu

### 7.3 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; phone: 573-341-7596; E-mail: success@mst.edu; facebook: https://www.facebook.com/SandTssc; web: https://studentsuccess.mst.edu/

### 7.4 Student Honor Code & Academic Integrity

Every student enrolled in this course is expected to be familiar with both the Student Honor Code (which can be found on http://stuco.mst.edu/honor-code/), and Missouri S&T's Student Academic Regulations (available on Page 30 of the Student Academic Regulations handbook), which 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. Incidences of Academic Dishonesty will typically receive no credit for the respective course components, in addition to sending a notification to the respective student's advisor, the student's department chair, and the campus undergraduate studies office. Further academic sanctions may be imposed as well in accordance with the regulations. Those who allow others to copy their work will also be treated in the same manner.

Please note that student submissions are checked against each other with software that is VERY good at detecting similarities and differences between any text files, including your source files. These methods are difficult, if not impossible to trick. Therefore, students should not try to copy-paste, share sources directly, or write code in a group or pair for individual assignments. However, if help is taken from any source, students should cite them.

### 7.5 Classroom Egress Map

Please familiarize yourself with the egress map for the classroom (Room 211, V. H. McNutt Hall) posted at: https://designconstruction.mst.edu/media/campussupport/designconstruction/secure/floorplan/R0135.pdf

### 7.6 Make-ups & Extensions

There will be no make-ups. However, with sufficient notice, the instructor may attempt to accommodate all reasonable (as per the instructor's discretion) requests for alternative dates.

### 7.7 Submission Guidelines

Unless specified otherwise, all assignments are due at 11:59pm of their respective due dates, and are to be submitted via GitLab. All code should be properly documented. Technical reports need to be electronically typeset and submitted in either PDF or MSWord file format. PDF file format is preferred and you are encouraged to typeset using LaTeX. Unless specified otherwise, the default penalty for late submission is a 5% point deduction for the first 24 hour period and a 10% point deduction for every additional 24 hour period. So 1 hour late and 23 hours late both result in a 5% point deduction, 25 hours late results in a 15% point deduction, and so on.

### 7.8 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&Ts Title IX Coordinator is interim chief diversity officer Neil Outar. You can reach him via email at naoutar@mst.edu; or via phone at (573) 341-6038; or find him at 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.