MATH 416: SYLLABUS

Instructor. Dr. David Stapleton   email: dajost@umich.edu

Office hours. Tuesdays 9am–11:30am. (Some will be held over Zoom.)

Meeting times. MonWed 11:30am–1:00pm in Mason Hall 1437.

Textbook. There is no required course textbook, but you might find the following resources useful:
- *Algorithms* by Jeff Erickson. Freely available online here.
- *Introduction to Algorithms* by Cormen–Leiserson–Rivest–Stein. A standard tome, covering much more than we will cover in this class. The U–M library provides access to an electronic version.

There are many, *many* resources about algorithms available on the web, some better than others.

Course webpage. Everything related to the course will be posted on the course website located at

  http://www-personal.umich.edu/ dajost/ToAW23/w2023theoryofalgos.html.

Certain links will also be available on our Canvas Site.

Course description and topics. Math 416 will focus on the design and analysis of algorithms from a mathematical perspective. We will begin with the basics of algorithm analysis, including proofs of correctness and running time, and some basic graph theory. We will discuss in depth three strategies for algorithm design: greedy algorithms, divide and conquer, and dynamic programming. The topics in the second half of the course may include network flow, NP-completeness and complexity, randomized algorithms, strategies for dealing with NP-hard problems, or other topics.

Prerequisites. As indicated on the Math Department's webpage, the official prerequisites for this course are either Math 312 + 412 or EECS 280 + Math 465. Unofficially, what is important is that you have some experience (e.g. in a discrete math or CS course) working with the basic objects of discrete math and that you have some experience with proof-based math courses (preferably at least two completed before this one). Experience with probability will also be beneficial, especially if we have time to study randomized

Date: Winter 2023.

algorithms later in the course. If you are unsure whether you have suitable preparation to succeed in this course, **please talk to me as soon as possible.**

Quizzes and exams. There **We will have several quizzes and a final exam.** The quizzes will be given (in person) during the scheduled class time.

Exams. There will be three exams, two during the term and the final exam.

Exam 1: Wednesday, February 15
Exam 2: Wednesday, March 22

The format of the final exam will be decided and announced later in the term, but please be prepared to take it in person during the time scheduled by the Registrar:

Final Exam: Thursday, April 27: 1:30–3:30pm.

If there you have any issues with any of these exam times you MUST let the instructor know within the first two weeks of class.

Homework. Homework will be assigned approximately weekly, with a few exceptions, and will be made available electronically on Canvas and on the course website. Homework will be handed in on our gradescope page.

You are encouraged to collaborate on homework, but **solutions must be written independently**: you must write your solutions in your own words. Homework solutions should also be clear, organized, and legible, especially if they are handwritten. You should list your collaborators at the top of your completed homework.

Homework that is turned in between 1 second and 24 hours late will be deducted by 50%. No other homework will be accepted, but your lowest homework score will be dropped.

Engagement. *Actively* developing your understanding by doing problems and collaborating with others is critical to learning math. Accordingly, a portion of your final grade will be determined by a measure of your engagement with the course. This includes attending class, contributing positively to in-class group activities, and collaborating with your peers outside of class.

Grading. At the end of the course, you will be assigned a numerical score according to the following scheme.

10% Engagement
10% Quizzes
20% Homework
15% Exam 1
15% Exam 2
30% Final exam

Then your numerical score will be converted to a final letter grade according to a scale that will be *at least as generous* as the following: $[90, 100]$ earns A— or better, $[80, 89)$ earns B— or better, $[70, 79)$ earns C— or better.

Accommodations. The University of Michigan is committed to providing equal opportunity for participation in all classes, programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Services for Students with Disabilities (SSD) Office located at G664 Haven Hall. The SSD phone number is 734–763–3000 and their website is ssd.umich.edu. Once your eligibility for an accommodation has been determined, this information will be reflected in SSD's Accommodate system. Please use Accommodate to request that this information be shared with me at the beginning of the term, or at least two weeks before you need the accommodation for an exam, project, etc.

Illness. If you are feeling unwell, please stay home and let me know. I will work with you to figure out the best way to make up such absenses.

Other help. Algorithms are important, but your mental health is much more important. Please know that all students can seek help from the Counseling and Psychological Services office (CAPS, caps.umich.edu) and the University Health Service (UHS, uhs.umich.edu). If you are having difficulties that are affecting your coursework, please let me know if you are comfortable doing so. While I am not equipped to do any counseling, we can discuss options regarding your coursework.