Math 2200-001 Discrete Mathematics

Fall Semester 2025

Course Description

This is a course on the fundamentals of discrete mathematics. It includes an introduction to proofs and rigorous analytic thinking; students will learn how to understand and write short proofs. We will introduce basic elements of mathematics such as fundamentals of logic, sets and relations, functions, number theory, modular arithmetic, combinatorics, and discrete probability. Math 2200 provides a foundation for higher mathematics or computer science courses.

- **Time:** Tuesday, Thursday 10:45AM – 12:05PM
- **Location:** JTB 120
- **Instructor:** Karl Schwede
- **Contact information:**
  - email: schwede@math.utah.edu
  - office: JWB 315
  - website: http://www.math.utah.edu/~schwede/math2200
- **Office hours:**
  - *TBD*
- **Textbooks:**
  - *A Concise Introduction to Pure Mathematics* by Martin Liebeck, 4th edition

Course Outcomes and Objectives

By the end of this course, you will be able to:

- Write and identify correct proofs on subjects within the topics of the course.
- Know and be able to work with and prove things about sets, functions, etc.
- Work with and prove things about division of integers, modular arithmetic, etc.
- Handle various combinatorics (counting) problems and related proofs.
- Read and implement mathematical induction proofs.

Course Requirements

Your grade will be determined by the following formula

- 35% - Homework, in-class worksheets, in-class quizzes. Each of these will occur every 1-2 weeks.
- 15% - Midterm #1, Tentatively Tuesday, September 25th
- 20% - Midterm #2, Tentatively Thursday November 6th
- 30% - Final Exam. Scheduled as University guidelines. https://registrar.utah.edu/academic-calendars/final-exams-fall.php
  Currently - Thursday, December 11, 2025. 10:30 am – 12:30 pm

Late and missed work

Note, I will generally not give extensions on homework sets, or let you take missed quizzes, unless you contact me ahead of time (unless it's impossible to do so). If you ask for repeated last-minute extensions/makeups (ie, more than a couple), I will ask that you work with the dean of students office before considering granting additional extensions. Accommodations through CDA supersedes this.

Grading Scale

A 93+ will be an *A*, 90-93 an *A*−, 87-90 a *B*+, 83-87 a *B*, 80-83 a *B*−, 77-80 a *C*+, 73-77 a *C*, 70-73 a *C*−, 67-70 a *D*+, 63-67 a *D*, and below will be an E.
The final grading scheme may be more generous than this one.

Preliminary Course Schedule

We will cover, in order:

- Chapter 1 (Introduction sets and proofs). We'll also cover truth tables which the book omits.
- Chapter 2 (Number systems). Real numbers, rational numbers, etc.
- Chapter 8 (Mathematical induction). A way to prove infinitely many things at once.
- Chapter 10 (Integers) Ie, whole numbers, division, etc.
- Chapter 11 (Prime factorization). Ie, precise theorems about factoring numbers.
- Chapter 12 (More on prime numbers). This is the start of *Number Theory*.
- Chapter 13 (Congruence of integers). An important topic in Math and CS.
- Chapter 14 (More on congruence).
- Chapter 15 (Secret codes). An application of Congruence to Cryptography. We are likely to do Diffie-Hellman key exchange and not RSA (so we'll do this very differently than the text).
- Chapter 16 (Counting and choosing). This is an introduction to *Combinatorics*.
- Chapter 17 (More on sets). We'll learn new set operations and connections with counting and choosing.
- Chapter 19 (Functions). A formal mathematical introduction to functions. We'll go more in depth than the text and learn the terms injective/surjective/bijective.
- Chapter 21 (Infinity). We'll learn which infinite sets are the same "size" as other infinite sets.

Most chapters will take 1 to 1.5 weeks to do in class.
Time permitting, we may also cover Chapter 18 (equivalence relations, between 17 and 19). We may also return to Chapter 9 at the end of the semester (it's a fun topic where you get to apply what you know).
The first midterm will cover 1,2,8, and 10, and possibly all or part of Chapter 11.
The second midterm will cover up to Chapter 16 and possibly all or part of Chapter 17.
The final will be cumulative.

Gradescope

All assignments will be turned in and graded on gradescope.

Group work

Students are allowed and even encouraged to work together when solving homework problems (although each student is responsible for their own write-up). Do not use artificial intelligence tools to solve homework problems without authorization. The point of doing the exercises is to come to your own understanding. Using AI (or getting the answers written up for you by a friend) will likely mean you won't learn the material well enough to succeed on quizzes, midterms, and final. This does mean that starting the assignments early is important. We will have some activities where we explore what artificial intelligence can do though.

University Policies

Updated mandatory syllabus policies regarding the ADA Act, Safety at the U, Addressing Sexual Misconduct, and Academic Misconduct can be viewed at:
https://cte.utah.edu/instructor-education/syllabus/institutional-policies.php

Americans With Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access (CDA). CDA will work with you and the instructor to make arrangements for accommodations. Prior notice is appreciated. To read the full accommodations policy for the University of Utah, please see Section Q of the Instruction & Evaluation regulations.
In compliance with ADA requirements, some students may need to record course content. Any recordings of course content are for personal use only, should not be shared, and should never be made publicly available. In addition, recordings must be destroyed at the conclusion of the course.
If you will need accommodations in this class, or for more information about what support they provide, contact:

Center for Disability & Access

801-581-5020
disability.utah.edu
Third Floor, Room 350
Student Services Building
201 S 1460 E
Salt Lake City, UT 84112

Safety at the U

The University of Utah values the safety of all campus community members. You will receive important emergency alerts and safety messages regarding campus safety via text message. For more safety information and to view available training resources, including helpful videos, visit safeu.utah.edu.
To report suspicious activity or to request a courtesy escort, contact:

Campus Police & Department of Public Safety

801-585-COPS (801-585-2677)
dps.utah.edu
1735 E. S. Campus Dr.
Salt Lake City, UT 84112

Addressing Sexual Misconduct

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status, or genetic information.
If you or someone you know has been harassed or assaulted, you are encouraged to report it to university officials:

Title IX Coordinator & Office of Equal Opportunity and Affirmative Action

801-581-8365
oeo.utah.edu
135 Park Building
201 Presidents' Cir.
Salt Lake City, UT 84112

Office of the Dean of Students

801-581-7066
deanofstudents.utah.edu
270 Union Building
200 S. Central Campus Dr.
Salt Lake City, UT 84112
To file a police report, contact:

Campus Police & Department of Public Safety

801-585-COPS (801-585-2677)
dps.utah.edu
1735 E. S. Campus Dr.
Salt Lake City, UT 84112

If you do not feel comfortable reporting to authorities, the U's Victim-Survivor Advocates provide free, confidential, and trauma-informed support services to students, faculty, and staff who have experienced interpersonal violence.
To privately explore options and resources available to you with an advocate, contact:

Center for Campus Wellness

801-581-7776
wellness.utah.edu
350 Student Services Building
201 S. 1460 E.
Salt Lake City, UT 84112

Academic Misconduct

It is expected that students comply with University of Utah policies regarding academic honesty, including but not limited to refraining from cheating, plagiarizing, misrepresenting one's work, and/or inappropriately collaborating. This includes the use of generative artificial intelligence (AI) tools without citation, documentation, or authorization. Students are expected to adhere to the prescribed professional and ethical standards of the profession/discipline for which they are preparing. Any student who engages in academic dishonesty or who violates the professional and ethical standards for their profession/discipline may be subject to academic sanctions as per the University of Utah's Student Code: Policy 6-410: Student Academic Performance, Academic Conduct, and Professional and Ethical Conduct.
Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code:
"...Includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information...It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct."
For details on plagiarism and other important course conduct issues, see the U's Code of Student Rights and Responsibilities.