MATH 2200-001: Discrete Math

Time: MWF 8:45-9:45 am Room: LCB 225

Instructor: Jenny Kenkel
Office: JWB 115
Email: `kenkel@math.utah.edu` (preferred method of contact)

Office Hours: (tentative)
Mondays, 3:30pm - 4:30pm
Tuesdays, 3:30pm - 4:30 pm
Thursdays, 10:00-11:00am or e-mail me and I'd be happy to meet with you another time!

Textbook: *Discrete Mathematics and its Applications* by K. H. Rosen, 7th Edition, ISBN 9780073383095.

Course Web Page:
All course information and announcements will be posted on the Canvas page, which can be accessed through your CIS. It also contains material that may help you succeed in this course. I will assume that you are keeping up to date with its contents.
I will try to keep your grades as accurate as possible on Canvas, but use common sense.

Prerequisites: C or better in one of Math 1220, 1250, 1260, 1270, 1311, 1320, 1321, 2210, or AP Calc BC score of 5

Course Description:
Fundamentals of logic, set theory, order, relations, functions. Elementary number theory, modular arithmetic. Combinatorics; counting permutations, generating functions, matrix operations. Introduction to graph theory.

Course Outcomes: At the end of the course, students will be able to:

- create rigorous, valid mathematical proofs.
  - Students will be able to evaluate the truth of a logical sentence expressed in terms of quantifiers, predicates, logical operations and propositional variables.
  - Students will be able to construct and distinguish between exhuastive proofs, direct proofs, proofs by contradiction, proofs by contrapositive, and proofs by induction.
  - Students will be able to locate logical mistakes in proofs.
  - Students will be able to distinguish between necessary and unnecessary hypotheses.
- Analyze the basic principles of sets and operations in sets.
  - Students will understand the mathematical notation used in describing sets.
  - Students will be able to prove set identities, formally, and with drawings.
  - Students will be able to analyze properties of functions, such as injectivity, surjectivity, and bijectivity, as well as being able to identify images, preimages, graphs, and compositions of functions.

- Apply counting principles
  - Students will be able to apply the pigeonhole principle to counting arguments.
  - Students will be able count permutations and combinations of objects and distinguish between the two.
  - Students will understand the connection between Pascal's triangle and binomial coefficients.

Teaching and Learning Methods

This class will not be purely lecture based. This course has been constructed around research-based practices to best help you learn and grow in your mathematical thinking. I would like to be transparent with you about my teaching methods in order to make this course as productive for you as possible.

Growth Mindset, Making Mistakes, and Failure: Mathematics is not an innate ability; it is a skill we learn and refine through hard work and persistence. I strive to challenge you to engage with difficult problems in this class. Some times you will solve them, and some times you will not. It may be uncomfortable to encounter problems you cannot (yet) solve, but failed attempts in math are very informative and an important part of the mathematical process. Studies show synapses in the brain fire when a person makes a mistake, even if the person does not yet realize they've made a mistake (https://www.youcubed.org/evidence/mistakes-grow-brain/)! I encourage you to ask yourself the following questions:
What is the value of making mistakes in Math?
What can I do to support my classmates if they make a mistake?
What can my classmates do to support me if I make a mistake?

Learning Groups: Communication and collaboration is an important part of being a professional mathematician, computer scientist, physicist, or professional *anything*. This class will be organized into learning groups so that you have a group of your peers with whom you can ask questions, get feedback, and build connections. The learning group structure is also intended to foster a welcoming and safe learning environment in the classroom.
If you are having any difficulty with your group members or the group learning situation, for any reason, please don't hesitate to let me know.

Active Learning: Research shows that we retain only around 5% of what we hear in a lecture, compared to 70% of what we practice by doing and over 90% of what we teach others. In this class we will use a combination of learning strategies, including lecture, discussion, and group problem sessions. The more actively engaged you are in your own learning process, the more information you are likely to retain. I encourage you to help others understand the material. This process benefits everyone, but it's especially helpful when you're the one who is teaching.

Course Work and Evaluation

Grading: The grades of homework, exams, and finals will weight as follows in your overall average.

Homework	20%
Group Quizzes	15%
Journal Entries	5%
Midterm Exams	30%
Takehome Final Exam	30%

Grading Scale: The grade scale will be the usual:
A (93-100), A- (90-92), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D+ (67-69), D (63-66), D- (60-62), E (0-59).
I reserve the right to curve grades at the end of the semester, but it will only be in your favor (that is, if you recieve an 85 percent, you will get a B *or better*).

Homework: Homework will be assigned weekly from the textbook. Homeworks will be assigned on Wednesdays and collected the following Wednesday. All homework assignments and due dates will be posted on the course webpage. Homeworks will be completed outside of class and all students must turn in their own homework assignments. The lowest two homework scores will be dropped. No late homeworks will be accepted.

Group Quizzes: There will be quizzes during the last ten minutes of class on Fridays. You can work in groups of 1, 2, or 3 students. Please write on your quiz the names of your group members, if you worked in a group. Each student must turn in their own quiz. Quizzes will be on the material that was on the most recent homework, that is, the homework you turned in the Wednesday before. Since you will not have yet gotten back your homework, homework solutions will be posted Wednesday after class for you to go over before the quiz. The lowest two quiz scores will be dropped. There will be no makeup quizzes.

Journal Assignment: Every other week, there will be a reading assigned on metacognition (thinking about thinking) or about being a good citizen in the mathematical community. After doing the reading, you will be asked to write a brief journal entry about the reading. As inspiration, consider the following prompts;

1. Does anything in the article resonate with you? Is there anything in the article you disagree with? Is there anything important you think the author missed?
2. What is one practical suggestion that you can put into practice that will help you learn more effectively?
3. Does this article effect the way you think about mathematics, mathematicians in general, or yourself as a mathematician?

I will not read your journal entries. Journal entries will be due on Sunday evening (Sunday at midnight), and submitted through Canvas. No late journal entries will be accepted.

Exams: There will be two midterm exams and one final take-home exam. Exam dates and times are listed on the course schedule. There will be no makeup exams. However, if the percentage earned on your Final

exam is higher than either of your Midterm exams, I will replace one Midterm score with the Final. The final will be cumulative.

Exam Corrections Policy: Math learning is about process, not performance. For this reason, you may perform exam corrections for **one** of your midterm exams. Exam corrections for the final will not be accepted. Exam corrections will be due the week after the exam at the beginning of class. Late corrections will not be accepted. Since I want to analyze what you have learned, you will be required to write a thoughtful description of why you made each error you made and how you can improve for next time. Writing that something was a 'simple mistake' is not sufficient for credit. While collaboration on corrections is accepted, you must write up your own work. If I have any indication that you do not understand your correction, I will not give you credit for the correction.

Other Policies

Cheating: If you cheat on any assignment, I will give you a zero on that assignment. Depending on the severity of the cheating, I may decide to fail you from the class. In all cases of academic dishonesty, I reserve the right to report the incident to the Dean of Students.

Disclaimer: I reserve the right to change any information in this syllabus throughout the semester. If I make a change to the course policies, I will inform you in class, and post an updated version of the syllabus to canvas. I will hold you accountible for information that is stated in class or posted on canvas.

Important Dates:

Drop Deadline ..... Wednesday, May 23
Memorial day (NO CLASS) ..... Monday, May 28
First Midterm ..... June 4
Withdraw Deadline ..... Friday, June 22
Second Midterm ..... July 2
Independence Day (NO CLASS) ..... Wednesday, July 4
Final Takehome Exam Due .... Thursday, August 2, 9:30 am

Resources

Math Tutoring Center: Do not hesitate to come to my office during office hours or by appointment to discuss a homework problem or any aspect of the course. Additionally, the T. Benny Rushing Mathematics Tutoring Center offers free tutoring. Beginning Thursday, May 18th, tutoring will be available from 8am to 8pm Monday through Thursday and 8am to 4pm on Friday. Their website can be found here:
https://www.math.utah.edu/ugrad/tutoring.html
If you want to hire an outsider tutor (for a fee), you can find a list of such people through the math department.

Veteran's Center: If you are a student veteran, the University of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class.

LGBT Resource Center: If you are a member of the LGBTQIA* community, I want you to know that my classroom is a safe zone. Additionally, the University of Utah has an LGBT Resource Center on campus. They are located in Room 409 in the Olpin Union Building. Hours: M-F 8-5pm. You can visit their website to find more information about the support they can offer, a list of events through the center and links to additional resources: http://lgbt.utah.edu/. Please also let me know if there is any additional support you need in this class.

The Americans with Disabilities Act: The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

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, veterans status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801- 581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585- 2677(COPS).

Women's Enrollment Initiative: The Women's Enrollment Initiative is designed to recruit, retain, and graduate women through a network of support that provides opportunities and creates innovative partnerships that positively impact the full range of experiences for women as they pursue their educational and professional goals. Their website can be found here:
https://women.utah.edu/need-advice/

Inspiring Websites Inspiring websites highlighting mathematical contributions from underrepresented groups in mathematics :
http://mathematicallygiftedandblack.com/
http://lathisms.org/
http://www.womendomath.org/