MATH 245: Discrete Mathematics
Fall 2024 Section 1: MWF 10-10:50am
in-person lecture modality Meeting room: HH-130

Overview:
This course is a rigorous introduction to many of the tools useful in higher mathematics and computer science. The major topics to be covered will be logic and proof techniques. Also included will be a brief introduction to set theory, number theory, relations, functions, recurrences, and complexity.

This course is required for all students pursuing majors in computer science, computer engineering, mathematics, and statistics.

Prerequisites:
Students must meet *all* of these requirements to take the course. Students should read this list carefully, and if they do not or cannot meet a requirement they should strongly consider taking the course later[1]. Failure to meet even one of these requirements will likely lead to failure in the course.

1. Attitude Prerequisite: This course is difficult, with an unfortunately high fail rate. Students must take the course seriously. Taking a break, even for a few days, will make it almost impossible to recover. Don't be a statistic, keep up with the course. In case of problems, seek help immediately – do not wait until the course is almost over, it will be too late.

2. Time Prerequisite: Students must spend 15-20 hours per week on this course, every single week from the first to the last. This includes 3 hours of lecture, 1 hour of group meetings, 1 hour of office hours, and 10-15 hours of solving and writing up homework exercises. Most of your learning will happen through solving exercises.

3. Technology Prerequisite: Students must have suitable technology for taking brief quizzes, in Canvas, at the conclusion of every class meeting. This can be a suitable cell phone, or a laptop connected to the campus wifi.

4. Attendance Prerequisite: This course meets in person[2] during its regularly scheduled times. Attendance is mandatory, and students must give their full attention to the course meetings for the duration.

5. Subject Prerequisite: This course has as prerequisite a grade of C or better in Math 124 or 150 or 151; or a 4 or better on the Calculus AB exam; or a 3 or better on the Calculus BC exam. Students barely meeting the prerequisite (i.e. a grade of C/C+/B-) are at substantial risk of failing this course, and will likely need additional study time.

6. Homework Prerequisite: Students are expected to solve every exercise in the supplement "Big Book O' Exercises." This will take substantial time and effort. Students who do not (or cannot) spend the time and effort, will generally not succeed in the course. Solutions are not provided – check your answers with your study group, and in office hours.

7. Textbook Prerequisite: Students *must* have a copy of *Mathematical Maturity via Discrete Mathematics*, ISBN 0-486-83857-9, for the duration of the course[3]. It is inexpensive and can be bought at the SDSU bookstore, on Amazon, or various other booksellers. Students *must* also have the "Big Book O' Exercises" supplement, either in printed form (available at the SDSU bookstore) or in digital form (available free from the course Canvas page).

8. Office Hours Prerequisite: Students must attend office hours at least once per week. These visits are used to check homework solutions, and to get help on difficult problems.

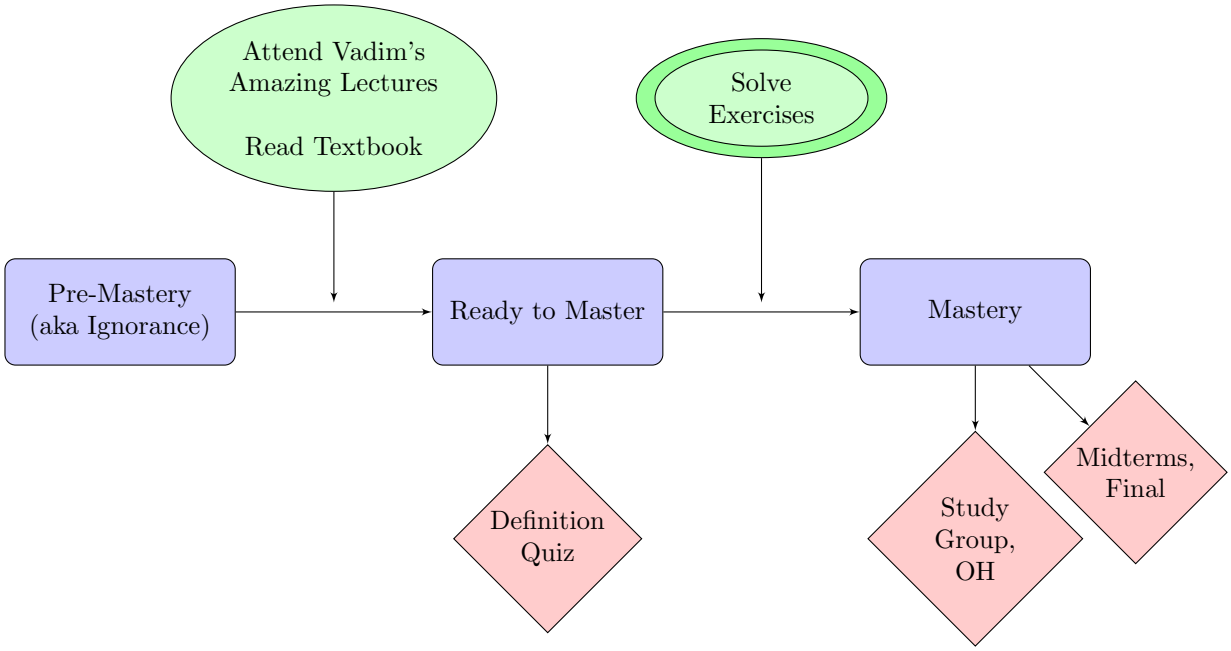
9. Integrity Prerequisite: Students must understand and comply with the academic integrity standards in this course, and ask questions about any unclear issues. Unfamiliarity with the rules does not constitute a valid excuse for violating them.

10. Literacy Prerequisite: Students are expected to read the syllabus in full, be familiar with its contents, and check in the syllabus first when faced with administrative questions.

[1] All variances must be requested before the schedule adjustment deadline (Sep 9).
[2] No portion of the lectures will be offered online, sorry. If you miss class you will need to get the notes from a friend.
[3] The printed softcover Dover edition is strongly recommended, over any electronic editions, which are mostly poopoo garbage.

Course Structure:
This course has in-person meetings three times per week, all of which students must attend. There are also many office hours, held by the ISAs, which students must attend at least once per week. Class meetings will include a definition quiz, on Canvas. Students will need to take these quizzes on their phones or laptops. Students are expected to produce solutions to all homework exercises, and to bring these solutions to office hours. Students will also take three midterm exams (during classtime) and a final exam (during finals week).

Students are strongly encouraged to form study groups, ideally of size 4, and to meet with their groups at least weekly to discuss homework solutions. Office hours are a good place to get to know people for a study group.



Grading:
Midterm and final grades are all normalized to lie between 50% (blank but present) and 100% (perfect score). Missing grades are still worth 0%. Quiz grades are the usual 0% to 100% (random guessing gives 50% already, on average). The cutoffs for each letter grade are as below. No other grades are awarded. The passing grade for math/cs/ce majors is C, 700 points.

What?	When?	Why?
Definition Quizzes	every lecture (39x5, drop 3)	180
Office Hours	every week (13x10, drop 1)	120
Labor Day (no class or OH)	Mon. Sep. 2	
Midterm 1 (Ch. 1-4)	Wed. Sep. 25	120
Midterm 2 (Ch. 5-7)	Fri. Oct. 18	120
Veteran's Day (no class or OH)	Mon. Nov. 11	
Midterm 3 (Ch. 8-10)	Wed. Nov. 13	120
Thanksgiving Break (no class or OH)	week of Nov.25-29	
Last class day	Wed. Dec. 11	
[Midterm 4 (Ch. 11-13) + Final]	Fri. Dec. 13 10:30-12:30	120+220=340
Total		1000

A: 900 B+: 880 B: 800 C+: 780 C: 700 D+: 680 D: 600 F: 0

Alternative Grading Policy:
Students' course grades are meant to be primarily determined by exams (three midterms and final), with a minor adjustment from quizzes and office hours (and extra credit, when available). In rare cases when the exam scores are consistently different from the overall score, the course grade will be adjusted to be no lower than the lowest exam grade, or no higher than the highest exam grade. Here are some examples. A student who gets at least a C on *all four exams* will pass the course (even if the overall total is below 700). A student who fails *all four exams* will fail the course (even if the overall total is above 700).

Textbook:
Students are required to own and read the textbook, *Mathematical Maturity via Discrete Mathematics*, ISBN 0-486-83857-9 – it is inexpensive, very helpful, and brief. Students are expected to solve *all* of the problems in the supplement "Big Book O' Exercises". Hints can be found in the back of the supplement; solutions are not available, by design (see p. xxi of the textbook for an explanation).

Definition Quizzes:
On all class days except exam days, students take a 2 minute[4] quiz, typically on recent material. These quizzes are true-false, giving either 5 points (for a correct answer) or 0 points (for an incorrect answer), or multiple choice. Students may use their textbook and notes if they wish, but may not ask for help from other people. Makeup quizzes are not given under any circumstances. Quizzes must be completed before 11:10am, at which time solutions will be released in Canvas for 24 hours. We will take 39 quizzes, and keep the 36 highest scores.

Homework:
Students are expected to solve every exercise in the "Big Book O' Exercises" supplement. They are encouraged to seek help from their study group, office hours, and Discord chat. The math department also keeps a list of paid tutors. Students are strongly *dis*couraged from seeking help from other online sources. Finding a friendly video or website that shows you an "easier way", you might not know whom to trust. In this situation, there are two simple questions you can ask, that will help: (a) Who's got better credentials?; and (b) Who's grading my exams?

Office Hours:
Students are required to sign up for one of the ISA office hours, and attend them every week. The primary purpose is to check homework solutions; it is also possible to ask about practice exam questions. Weeks end at the end of the day on Fridays – the first week ends on Friday Sep. 6, and the last week ends on Friday Dec. 6. For full credit, students are expected to come prepared (with solved homework exercises) and stay for the entire one-hour period. Students may attend additional office hour sessions if they wish (with no additional credit) on a drop-in basis. It may be possible to change the designated office hour, temporarily or permanently, but only if you first notify the ISAs. It is your responsibility to arrange alternate office hours if a holiday or other event cancels your usual meeting – this includes Monday Sep.2. If you miss your appointment in a given week without rescheduling first, there is no way to get those missing points – office hours are meant to be a regular habit. There are 13 grades, and we will keep the 12 highest.

Exams:
The three midterm exams and final will all be closed book, closed notes[5], with no calculators, smartwatches, or other technology permitted. The final exam will be roughly 120/340 on the last three chapters of material (like a fourth midterm) and roughly 220/340 cumulative (equally on all 13 chapters). All exam questions will be graded on a 50%-100% scale. No makeup exams will be offered under any circumstances. In case of a documented medical emergency, please contact the professor via email to discuss other options.

Attendance:
Students are expected to attend every class, paying attention and taking notes the entire time. Students who miss class, even occasionally, are at substantial risk of failing the course. Makeup quizzes and exams are not given under any circumstances. Students who will miss class due to an official university event or activity (such as athletics), must notify the instructor during the first two weeks of classes. Absences for official university events must be documented with a memorandum from the event's sponsor with that same deadline. Students missing class due to a medical emergency must provide a signed medical excuse justifying the absence. Student Health Services does not provide these.

Online Materials:
The professor maintains a comprehensive website (URL below). It contains old exams, solutions (most of which are correct), syllabi, course evaluations, grade distributions. Keep in mind that courses prior to 2019 were from an evolving coursepack – their material may differ in places. The instructor is very diligent and prompt about responding to emails and Discord DMs. You may expect a response within 24 hours, often much sooner. The course is also active on Canvas.

FERPA:
Student information in this course is confidential as required by law and by SDSU policy[6].

[4] occasionally 3 minute
[5] one $3'' \times 5''$ index card of notes will be permitted for each midterm, and one $8.5'' \times 11''$ page of notes for the final

Collaboration and Academic Integrity:
Students are strongly encouraged to study together, and to work together on exercises. They are strongly encouraged to form study groups for this purpose. Best practice for group size is 4 human people. Use of AI to help with homework is discouraged but not forbidden – genAI is like a well-spoken but dumb friend, not a math expert.

Collaboration on quizzes/exams is forbidden. Sharing of quiz questions or quiz access codes is forbidden, including after the quiz has concluded. Impersonation of a student for quiz/exam purposes is forbidden. Use of paper or online resources during quizzes and exams is forbidden, except where otherwise stated[7]. All violations will be reported to the Center for Student Rights and Responsibilities and will also result in grade reductions or worse. Courses failed due to integrity violations are ineligible for course forgiveness. See SDSU's full policy[8] on academic honesty, or ask the instructor, if you have any doubts or questions.

It is not permitted to create and/or compile and/or share any unofficial solution manual to the textbook and/or coursepack and/or quizzes. It is permitted to save solutions for your own personal private use, so long as they are not shared with others as a collection (sharing occasional solutions is okay). Violations of academic integrity are very serious. Don't jeopardize your entire college career, and possibly your future job prospects, for a tiny benefit (whether for yourself or for a friend).

SASC:
If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact the Student Ability Success Center at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact SASC as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from SASC.

Additional Help:
The math department[9] maintains a list of paid tutors. Academic advising is available at the Student Success Center[10]. Counseling and Psychological Services[11] helps students with mental health concerns. The SDSU Economic Crisis Response Team[12] helps students with food/housing/financial concerns.

Learning Objectives:
Students will carefully state all definitions relevant to the course, apply these definitions to objects, and determine whether or not the definition applies. This determination will often involve a calculation. Students will have a ready supply of examples and non-examples to these definitions, and will be able to justify why these are examples or non-examples. Students will prove and disprove statements using the methods of discrete mathematics. They will construct rigorous proofs following the rules of logic. Students will carefully state and apply many mathematical theorems. Students will recognize and give examples of contributions to mathematics that have been made by members of diverse cultural and gender groups; they will also articulate ideas and exhibit behaviors that cultivate teamwork, critical thought, and communication skills needed to function in a diverse workforce and global community.

Professor:
Vadim Ponomarenko `vponomarenko@sdsu.edu`
Office hours: Mon/Wed/Fri 9-9:50am (drop in anytime), and also at other times by appointment, in: GMCS 511
Website: `http://vadim.sdsu.edu/` (all old materials may be found here, under "teaching")

Discord:
Please join the course Discord, you will likely find it quite helpful: `https://discord.gg/uabbdJYebQ`

Contact:
Please contact the professor via email (`vponomarenko@sdsu.edu`) for important matters like absences or regrade requests, and via Discord for unimportant matters. Please do *not* contact the professor via Canvas or Gradescope – it makes him cranky and needing a nap.

[6] `https://bfa.sdsu.edu/oerc/students/ferpa.aspx`
[7] For quizzes, the book, coursepack, and all notes are permitted, as well as Canvas (but no genAI or indeed any other websites). For exams, only paper notes in specified, limited, quantities are permitted.
[8] `http://go.sdsu.edu/student_affairs/srr/cheating-plagiarism.aspx`
[9] `https://math.sdsu.edu/`
[10] `https://cossuccess.sdsu.edu/academic-advising/`
[11] `http://go.sdsu.edu/student_affairs/cps/therapist-consultation.aspx`
[12] `http://sdsu.edu/ecrt`