MATH 320: Abstract Algebra

Fall 2025 Section 1: TuTh 4-5:15pm
in-person lecture modality   Meeting room: GMCS-422

Overview:

This course is a rigorous introduction to ring theory. It is an abstract course, with many definitions, theorems, and proofs, but also with motivating examples.

Prerequisites:

Students are expected to be comfortable with proofs, the language of mathematics. These skills are normally taught in Math 254 and especially Math 245. Students who experienced watered-down versions of these courses will have to work harder to keep up.

Course Materials:

None are required. Hungerford's *Abstract Algebra, 3rd ed.*, ISBN: 978-1111569624, may be helpful for additional reading material, as well as Ponomarenko's *Mathematical Maturity via Discrete Mathematics*, ISBN 0-486-83857-9, for background on proof techniques as needed.

Course Structure:

This course has in-person meetings twice weekly, all of which students must attend. These meetings will be split into a first half (approx. 30 mins), followed by a 5 minute break, followed by the remaining time (approx. 40 mins). The first half will usually consist of student presentations, but six times will instead be a unit exam. The second half will consist of students working in groups on the unit exercises, with the instructor offering help and guidance as needed.

Grading:

Unit exams, presentations, and the final exam, are all normalized to lie between 50% (blank but present) and 100% (perfect score). Missing grades are still worth 0%. The cutoffs for each letter grade are as below.

What?	When?	Why?
Student Presentations	three times, as scheduled (15 pts each)	45
Attendance	throughout	55
Unit 0 Exam	Tue. Sep. 2	40
Unit 1 Exam	Thu. Sep. 18	40
Unit 2 Exam	Tue. Oct. 7	40
Unit 3 Exam	Tue. Oct. 21	40
Unit 4 Exam	Tue. Nov. 4	40
Veteran's Day	Tue. Nov. 11	no class
Thanksgiving	Week of Nov. 25&27	no class
Unit 5 Exam	Tue. Dec. 2	40
Final Exam	Tue. Dec. 16 3:30-5:30	200
Drop Lowest Unit Exam		-40
Total		500

A: 460   A-: 450   B+: 440   B: 410   B-: 400   C+: 390
C: 360   C-: 350   D+: 340   D: 310   F: 0

Student Presentations:

Most class days, the first half will be filled with student presentations, typically four. All presenters will write their solution on the board simultaneously (before class if possible), and will take turns discussing their solution and answering questions. Students will present typically twice during the semester. They will sign up on the signup sheet provided (link in Canvas and in the Discord). Do not sign up for a second presentation until everyone has completed their first presentation; do not sign up for a third presentation until after everyone has completed their second. After everyone has completed three presentations, you may sign up for a fourth presentation – if you do, you will keep the three highest presentation grades. Presentations are graded based on proof correctness as well as discussion accuracy.

Attendance:

Student attendance scores begin at 55/55 and can only decrease. Students may miss one class without penalty. After that, each unexcused absence incurs a 5 point penalty to participation. Coming late, leaving early, or being disengaged (e.g. on your phone) will also lead to penalties.

Exams:

Unit exams are taken with no access to notes, calculators, phones, smartwatches, or other aids. Unlimited paper will be provided, as well as key definitions and theorems from the unit exercises. They will consist of four problems, at least three of which will be very similar to the unit exercises. Each problem will be graded on a scale of 5 to 10. The lowest unit exam score is dropped. The final exam will be similar to the unit exams in structure, except four times as long, and there will be extra emphasis on Unit 6 (which does not have its own unit exam). Students will get one $8.5'' \times 11''$ page of handwritten notes for the final.

Attendance:

Students are expected to attend every class, paying attention, participating, and taking notes as appropriate. Makeup 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.

FERPA:

Student information in this course is confidential as required by law and by SDSU policy[1].

SDS:

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services 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.

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[1]https://registrar.sdsu.edu/students/additional_resources_students/student_privacy_ferpa

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 3 or 4 human[2] people. A study group works best when everybody contributes roughly equally. If you take and don't give, not only will you exhaust and annoy your groupmates, but you will not master the material. Passive learning is the weakest form of learning.

On the flip side, spoonfeeding people answers does not do them any favors. It may seem like you're helping, but in fact you are only helping them to avoid learning, enabling and encouraging bad habits. In this course, it's not about the answers, it's about how to get the answers on your own. To this end, please do not distribute collections of solutions to people outside your study group (hints, parts of problems, or even entire single problems from time to time, are all fine).

Collaboration on exams is forbidden. Use of written, digital, or online resources during exams is forbidden, except on the final exam (as described above). 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[3] on academic honesty, or ask the instructor, if you have any doubts or questions.

Additional Help:

The math department[4] maintains a list of paid tutors. Academic advising is available at the Student Success Center[5]. Counseling and Psychological Services[6] helps students with mental health concerns. The SDSU Economic Crisis Response Team[7] helps students with food/housing/financial concerns.

Learning Objectives:

Students will apply definitions relevant to the course (such as divisibility, primality, irreducibility, homomorphism), use those definitions to prove theorems, and apply those theorems to solve concrete problems. Students will articulate ideas and exhibit behaviors that cultivate teamwork, critical thought, and communication skills needed to function in a diverse workforce and global community.

Discord:

Please join the course Discord, you will likely find it quite helpful: `https://discord.gg/ZMHqhDE9KF`

Professor:

Vadim Ponomarenko   `vponomarenko@sdsu.edu`
Office hours: Some Tuesdays and all Thursdays 3-3:50pm (before class), all Tuesdays and Thursdays 5:15-5:30 (after class), and also at other times by appointment, in: GMCS 511
Website: `http://vadim.sdsu.edu/`

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[2]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. Trusting an AI solution without understanding is just as foolish as trusting a friend's solution without understanding.

[3]`https://sacd.sdsu.edu/student-rights/academic-dishonesty/cheating-and-plagiarism`

[4]`https://math.sdsu.edu/`

[5]`https://cossuccess.sdsu.edu/academic-advising/`

[6]`https://sacd.sdsu.edu/cps`

[7]`http://sdsu.edu/ecrt`