



## MATH 541: MODERN ALGEBRA, LECTURES 2 AND 3, FALL 2025

### COURSE DETAILS

**Official Course Description:** Groups, normal subgroups, Cayley's theorem, rings, ideals, homomorphisms, polynomial rings, abstract vector spaces.

**Instructional Modality:** Classroom Instruction.

**Meeting Time and Location:**

|           |                        |                     |
|-----------|------------------------|---------------------|
| Lecture 2 | MoWeFr: 9:55AM–10:45AM | Van Vleck Hall B119 |
| Lecture 3 | MoWeFr: 1:20PM–2:10PM  | Van Vleck Hall B139 |

**Instructor:** Mikhail Ivanov, Teaching Faculty, *Email:* [mivanov@wisc.edu](mailto:mivanov@wisc.edu), *Office:* Van Vleck Hall B127.

**Instructor Office hours:** W: 10:45AM–11:30AM in Van Vleck Hall, room B127 F: 12:00PM–1:00PM in Van Vleck Hall, room B127 (please check Canvas page for updates), or by Appointment.

**Grader and/or Course Assistant:** We will have a grader that has yet to be determined. We will have a course assistant that has yet to be determined. Canvas page will be updated once they are assigned.

**Credits hours:** 3.

**How Credit Hours are Met by the Course.** This course meets the Traditional Carnegie Definition for how credit hours are met by the course. Students in the course have 2.5 hours/week of direct faculty instruction during class time and are expected to work on course learning activities (reading, writing, problem sets, studying, etc) for a minimum of 2 hours outside of classroom per course credit (i.e. 6 hours/week). The syllabus includes more information about meeting times and expectations for student work.

**Course Designations and Attributes:**

Breadth – Natural Science

Level – Advanced

L&S Credit – Counts as Liberal Arts and Science credit in L&S

Grad 50% – Counts toward 50% graduate coursework requirement

Honors – Honors Optional (%)

**Requisites:** (MATH 234 or 375), (MATH 320, 340, 341, or 375), and (MATH 341, 375, 421, 467, or 521), or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program

### COURSE LEARNING OUTCOMES

By the conclusion of this course, students should have a thorough understanding of:

1. Recall and state the formal definitions of the mathematical objects and their properties used in modern abstract algebra (e.g., groups and their actions, rings, fields, homomorphisms, standard examples of these, etc.). Audience: Both Grad & Undergrad
2. Use such definitions to argue that a mathematical object does or does not have the condition of being a particular type or having a particular property (e.g., whether a group is abelian, whether a homomorphism is an isomorphism, etc.). Audience: Both Grad & Undergrad
3. Recall and state the standard theorems of abstract algebra. (e.g., the isomorphism theorems, the Sylow theorems, Lagrange's theorem, etc.), and recall the arguments for these theorems and the underlying logic of their proofs. Audience: Both Grad & Undergrad

4. Use such theorems in the context of longer arguments by examining their premises (e.g., to classify groups of a given order, prove that alternating groups are simple, etc.). Audience: Both Grad & Undergrad
5. Prove or disprove statements related to the above definitions, properties, and theorems using techniques of mathematical argument (direct methods, indirect methods, constructing examples and counterexamples, induction, etc.). Audience: Both Grad & Undergrad
6. Convey arguments using English and appropriate mathematical terminology, notation and grammar. Audience: Both Grad & Undergrad
7. Identify applications of course content in areas of modern research. Audience: Graduate

#### TEXTBOOK, COURSE WEBSITE, DIGITAL TOOLS AND OTHER COURSE MATERIALS

- Required textbook: David Dummit & Richard Foote. Abstract Algebra. Wiley. 3th Ed. The course will (tentatively) cover material in Sections 1.1-1.7, 2.1-2.4, 3.1-3.3, 3.5, 4.1-4.3, 5.1-5.2, 7.1-7.4, 7.6, and 8.1-8.3. The Preliminaries in Sections 0.1-0.3 will also be assumed, and will be reviewed in class if needed. You may investigate other resources, including other textbooks and online material, but it is your responsibility to verify and determine the accuracy of any resource.
- Canvas (<https://canvas.wisc.edu/courses/466956>) is our Learning Management System. All important course information will be relayed through Canvas. Make sure your Canvas notification setting for “Announcement” is “Notify immediately” so that you receive messages promptly. Notifications settings can be accessed here: <https://canvas.wisc.edu/profile/communication>.
- Zoom(<https://uwmadison.zoom.us>) will be used for remote office hours.
- Gradescope(<https://www.gradescope.com/>) will be used to grade homework and exams. Instructions will be shared later.
- Piazza (<https://piazza.com/wisc/fall2026/fa25math541002003>), the online discussion forum.

#### CLASS COMPONENTS

**Lectures.** Lectures will be delivered in-person and synchronously three times a week during regular class hours. Lectures will involve some active learning components (e.g., problems and small group work). Attendance and active engagement is expected.

**Piazza.** The online discussion forum, known as **Piazza**, will be used to discuss ideas or questions outside of class. Piazza can be used to get hints on homework problems, but no one is allowed to post entire solutions to homework assignments. However, feel free to post entire solutions to practice problems. Logistic questions are usually better posted on Piazza rather than emailed to the instructor, so all students can benefit from the answer. (e.g., exam dates and locations). Please do not use email for math questions.

You can use private question in Piazza to communicate with Instructor about personal circumstances.

Any posts containing comments (either positive or negative) about the instructors, the class, the students, or anything else, will be deleted. Unprofessional conduct may result in disciplinary action.

**Homework.** Assignments will be posted on Canvas, and they will have to be submitted in Gradescope as a single pdf file. Written assignments will be several questions long and will be assigned weekly usually due roughly every Friday. Please make sure all pages are in the right orientation when you convert them. Do not hand in your rough draft or first attempt. Papers that are unreadable or disorganized cannot be graded. It is a good habit to download your submission every time and check everything is fine.

Collaborating with other students on the homework is encouraged, but you must write up all reasoning and solutions on your own (in other words, no copying). Failure to abide by this guideline could be construed as a form of academic dishonesty.

Each problem should be completed with neat, understandable, detailed solutions and explanations. Your explanations and proofs must be sound and rigorous, paying attention to detail and clarity. Computations without appropriate explanation will not receive credit, even if the final numerical answer is correct.

Late homework will generally not be accepted. Since it is quite likely that during the semester you will either experience a technical difficulty (e.g., missed the deadline, your computer shut down as you were submitting it, internet outage, etc) or a personal emergency (being sick, attending a funeral, etc), the two lowest HW scores will be dropped. You do not need to contact your instructor if such a situation does come up.

**Usage of AI.** You are welcome to use artificial intelligence (AI) tools and applications (such as Copilot, DALL-E, etc.) in this class as they support the learning objectives of this course. Please be aware you are responsible for the information you submit based on an AI query (i.e. ensure your professor has allowed you to publicly post course content such as assignment or assessment prompts and that the AI generated results do not contain misinformation or unethical content). Your use of AI tools must be documented and cited to conform to this course's expectations.

**Mathematica.** Mathematica and Wolfram—Alpha Pro are available at no charge to UW Madison students. They are useful for: (a) solving problems, (b) obtaining step-by-step solutions, and (c) writing programs with the assistance of Artificial Intelligence. (AI chat is built in.) To get access, go to [www.wolfram.com/siteinfo](http://www.wolfram.com/siteinfo) and enter your University of Wisconsin email. (Here are click-by-click steps if you need them: [wolfr.am/UWMadison](http://wolfr.am/UWMadison)) Learn how to use Mathematica at [www.wolfram.com/wolfram-u/](http://www.wolfram.com/wolfram-u/)

**Exams.** The course will have three exams. We will have two evening Midterm Exams and a Final Exam, places to be scheduled by the University. Final Exam will be cumulative.

|                |                       |                 |
|----------------|-----------------------|-----------------|
| Midterm Exam 1 | Thursday, October 09  | 05:45PM–07:15PM |
| Midterm Exam 2 | Thursday, November 13 | 05:45PM–07:15PM |
| Final Exam     | Friday, December 12   | 07:45AM–07:45AM |

Students with academic or religious conflict with one of the exams should notify the instructor as soon as possible, and no later than the third week of the semester.

**Calculator Policy.** During an exam no books, notes, calculators, cell phones, pagers, or any electronic devices will be allowed.

## GRADING

In this course, you will be evaluated based on components described above with their corresponding percentages:

|                |     |
|----------------|-----|
| Homework       | 25% |
| Midterm Exam 1 | 25% |
| Midterm Exam 2 | 25% |
| Final Exam     | 25% |

**Grade Appeals.** All grade disputes must be dealt with within 1 week after receiving your grade on Gradescope. You will receive an email alert once your grade has been posted on Gradescope. Grade appeals can be done online through Gradescope, by the 'regrade request' option. Your regrade requests will be carefully reconsidered and may lead to raising, unchanging, or even possibly lowering the original score.

**Grading Scale.** The following grade lines are guaranteed in advance. A percentage score in the indicated range guarantees at least the letter grade next to it.

$$A \geq 92\% > AB \geq 88\% > B \geq 78\% > BC \geq 76\% > C \geq 66\% > D \geq 50\% > F$$

Final letter grades are not curved but the grade lines above may be lowered at the end. Class attendance is not part of the grading.

## GRADUATE LEVEL COURSE ATTRIBUTE

This course have the Graduate Level Course Attribute. According to University Policy, such courses must hold graduate students to higher standards of learning than undergraduates in the same course. If you are graduate student you will have additional assignment which weight 10% of the overall course load.

## HONORS

Students pursuing an Honors degree may take this course for Honors Optional credit. Students should add or drop the Honors Option by following the steps outlined on the Honors Program website as soon as possible. Students who wish to obtain Honors credit for the course should get in touch with the instructor by the end of the second week (Friday, September 19). To obtain Honors credit, students must pass the course with a grade of B or better and complete all additional assignments that are agreed on individually with the instructor. Please see the detailed honor information on Canvas page. Here are important policies for Honors Optional enrollment from the Registrar:

- The Honors project is not factored into your final letter grade. If you are enrolled for Honors and do not complete the Honors project in a satisfactory manner, however, your instructor will report a “Q” (Question) grade until the Honors designation is removed.
- Honors Optional is a way to earn general Honors credits and/or Honors breadth credits for Honors in the Liberal Arts. Honors Optional courses do not count toward Automatic Honors requirements.
- The deadline to add or drop Honors is the end of the twelfth week of the semester. Removing Honors after that deadline requires approval from the instructor and an L&S Academic Dean.
- You are responsible for removing the Honors Option from your enrollment if you decide to not complete the Honors Optional work.

## HOW TO SUCCEED IN THIS COURSE

Here are a couple of suggestions for being successful in this class:

- The best way to learn math is by doing it. Try to work through the examples in the textbook before reading them, and try to solve as many practice problems as you can (on top of the homework problems). Let me know if you run out of problems to solve!
- Attend the lectures, and try to be active in class. Ask questions if something is not clear.
- Read the textbook.
- In general, try to keep up with the material. We cover several topics in the class that build on each other, and it will be hard to catch up if you get behind in the material.
- Use Piazza to ask questions related to the course material, and try to answer questions of other students if you can.
- Take advantage of the office hours! I am happy to help you, but I cannot do that if you do not ask for it.
- The [Math Learning Center](#) (in particular the [Course Assistant](#) and the [Proof Table](#)) could be a useful resource.

Campus Resources for Academic Success

- [University Health Services](#)
- [Undergraduate Academic Advising and Career Services](#)
- [Office of the Registrar](#)
- [Office of Student Financial Aid](#)
- [Office of Student Assistance and Support](#)
- [Graduate Student Services](#)

## ACADEMIC POLICIES AND STATEMENTS

- [Academic Calendar and Religious Observances](#)
- [Academic Integrity Statement](#)
- [Accommodations for Students with Disabilities](#)
- [Course Evaluations](#)
- [Diversity and Inclusion Statement](#)
- [Mental Health and Well-Being Statement](#)
- [Privacy of Student Records and the Use of Audio Recorded Lectures Statement](#)
- [Students' Rules, Rights and Responsibilities](#)
- [Teaching and Learning Data Transparency Statement](#)