

MATH 6302 – Modern Algebra – Fall 2020 Syllabus

Instructor: Dr. Gordon Heier

Contact Information:

Office Hours: remotely, by appointment

Email: heier@math.uh.edu

Web: www.math.uh.edu/~heier and UH Blackboard

Prerequisites: Graduate standing or consent of the instructor

Lectures will be posted on Blackboard in an "asynchronous" way. Students will be notified by email once a new lecture has been posted. Lectures will be in a video file format.

Exams: Midterm Exam: Monday-Tuesday, Oct. 26-27, as a 4 hour take-home exam
Final Exam: Wednesday-Thursday, Dec. 9-10, as a 4 hour take-home exam

Text: *Abstract Algebra* by David Dummit and Richard Foote, 3rd Edition

Lecture notes: The typed lecture notes used in my lecture videos will be made available as a pdf file on Blackboard.

Homework in the form of problem sets will be assigned on Blackboard and will be collected and graded through Blackboard.

Grades: The homework and midterm exam will each account for 30 percent of your grade, the final exam for the remaining 40 percent.

File format for submissions: The ONLY acceptable file format for any submissions by students is PDF. Students should ensure that they have access to a scanner or scanner app on a mobile device at all times. In particular, files in JPG format are NOT acceptable.

Email is the primary means of communication in this course. It will be assumed that students will promptly read any emails sent to their email address(es) on file in the myUH system.

MS Teams: Occasionally, we may conduct an optional live video conference meeting in MS Teams to facilitate questions and social interaction. Such meetings will be announced by email and attendance is not required.

Disability: If you think or know that you have a disability that needs special accommodation, please see me at the beginning of the semester so that the proper steps can be taken.

Academic Dishonesty will not be tolerated and dealt with appropriately.

UH CAPS Statement: Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (www.uh.edu/caps) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the “Let's Talk” program, a drop-in consultation service at convenient locations and hours around campus.

http://www.uh.edu/caps/outreach/lets_talk.html

Religious Holy Days: Students whose religious beliefs prohibit class attendance or the completion of specific assignments on designated dates may obtain an excused absence. To do so, please make a written request for an excused absence and submit it to your instructor as soon as possible, to allow the instructor to make arrangements. For more information, see the Student Handbook. <http://catalog.uh.edu/index.php>

Excused Absence Policy: Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class: Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Center for Students with DisABILITIES. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Syllabus Changes: Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through (specify how students will be notified of changes).

Course Content: This course covers the material relevant for our departmental Preliminary Examination in Algebra. For further details about the content, see below.

Main topics likely to be discussed are:

- Group theory: introduction to group theory, subgroups, quotients and homomorphisms, group actions, semidirect products, Sylow theorem, finitely generated abelian groups.
- Ring theory: introduction to rings and ideals, integral domains, Euclidean domains, principal ideal domains (PIDs), unique factorization domains (UFDs)

Sections from the textbook likely to be discussed:

- 1.1 Intro to groups: basic axioms and examples
- 1.3 Symmetric groups
- 1.6 Homomorphisms and isomorphisms
- 2.1 Subgroups: definitions and examples
- 2.2 Centralizers and normalizers, stabilizers and kernels
- 2.3 Cyclic groups and cyclic subgroups
- 2.4 Subgroups generated by subsets of a group
- 3.1 Quotient groups and homomorphisms: quotient groups and examples
- 3.2 More on cosets and Lagrange's theorem
- 3.3 The isomorphism theorems
- 3.5 Transpositions and the alternating group
- 4.1 Group actions and permutation representations
- 4.2 Groups acting on themselves by left multiplication
- 4.3 Groups acting on themselves by conjugation
- 4.4 Automorphisms
- 4.5 Sylow's theorem
- 5.1 Direct products
- 5.2 The Fundamental Theorem of finitely generated abelian groups
- 5.5 Semidirect products
- 7.1 Introduction to rings
- 7.2 Polynomial rings, matrix rings, and group rings
- 7.3 Ring homomorphisms and quotient rings
- 7.4 Properties of ideals
- 7.5 Rings of fractions
- 7.6 The Chinese Remainder Theorem
- 8.1 Euclidean domains
- 8.2 Principal ideal domains (PIDs)
- 8.3 Unique factorization domains (UFDs)