MATH 6302 – Modern Algebra – Fall 2022
Syllabus

Instructor: Dr. Gordon Heier (Associate Professor)
Contact Information:
  Office: 666 PGH
  Office Hours: Tu 4pm-5pm, or by appointment
  Email: heier@math.uh.edu
  Web:  www.math.uh.edu/~heier and www.math.uh.edu/~heier/teaching.html
  and UH Blackboard

Lecture: TuTh 2:30pm - 4pm in CBB 214

Prerequisites: Graduate standing or consent of the instructor

Exams:
  Midterm Exam: Thursday, Oct. 27, during regular class
  Final Exam: Tuesday, Dec. 13, 2pm-5pm

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

Homework in the form of problem sets will be assigned on a regular basis and will be due as described on each set. Late homework will not be accepted.

Attendance: Attending classes and exams is mandatory for all students. Missing class makes a student liable to missing important information. Substantial documentation is necessary to receive any kind of excuse or make-up privilege.

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

Lecture notes: I will make typed lecture notes available on Blackboard for past lectures. These DO NOT replace the need to come to class.

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. (See below for the University's formal statement on Disabilities.)

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

1 Exam dates are subject to change. Please listen carefully to announcements made in class.
**Course Content:** This course covers the material relevant for our departmental Preliminary Examination in Algebra. For a list of sections from the textbook I expect to cover, see the end of this syllabus. The main mathematical topics 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).

**Math 6303 (Modern Algebra II):** In Spring 2023, I will teach part II of this course (which used to be relevant for our departmental Preliminary Examination in Algebra, but no longer is), covering more on rings and fields and applications to algebraic geometry. You are strongly encouraged to take this future course to further expand your knowledge of algebra.

**UH Email:** I may use ANY email address you have on file with UH to communicate important information. Please note that UH recently reorganized their email system and you may have several addresses on file with UH. It is your obligation to make sure you receive all email sent to any email address you have on file with UH.

**COVID-19 Information**
Students are encouraged to visit the University’s [COVID-19 website](https://www.uh.edu/covid19) for important information including diagnosis and symptom protocols, on-campus testing, and vaccine information. Please check the website throughout the semester for updates.

**Vaccinations**
Data suggests that vaccination remains the best intervention for reliable protection against COVID-19. Students are asked to familiarize themselves with pertinent vaccine information and to consult with their health care provider. The University strongly encourages all students, faculty and staff to be vaccinated.

**Reasonable Academic Adjustments/Auxiliary Aids**
The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact [the Justin Dart Jr. Student Accessibility Center](https://www.uh.edu/student_accessibility) (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

**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. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. 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 Justin Dart, Jr. Student Accessibility Center. 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).
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
1.7 Group actions
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)