

SYLLABUS – MATH 6310 – FALL 2024

MODERN ALGEBRA

Description: This course focuses on the basics of commutative and homological algebra. Topics include:

- Commutative rings: ideals, quotient rings, units, localization, PIDs, UFDs.
- Modules: Submodules, quotient modules, modules over a PID.
- Linear Algebra: rational and Jordan form, minimal and characteristic polynomials, Cayley-Hamilton
- Homological Algebra: Abelian categories, complexes, homology, diagram chasing, derived functors.
- Topics: Ext and Tor, (graded) polynomial rings, Gauss' Lemma, Hilbert's three big theorems.

Time: Monday, Wednesday, Friday 12:55–1:45pm.

Location: LCB 215

Instructor: Aaron Bertram

Contact information:

- email: bertram@math.utah.edu
- office: JWB 302
- website: <http://www.math.utah.edu/~bertram/math6310>

Office hours: TBD. Most likely MWF afternoons.

References. I will follow my lecture notes. There are other good references, including:

- “Algebra: Chapter 0”, *Paolo Aluffi*
- “Abstract Algebra”, *Davis S. Dummit and Richard M. Foote*
- “Algebra”, *Serge Lang*

Grade: Your grade will be apportioned as 1/4 homework (weekly), 1/4 midterm in mid-October, 1/2 final.

Pass/Highpass: For the Ph.D. students in the course, the final exam will also be a qualifying exam.

Assignments: Turn in your homework on time (it will be assigned on Mondays, due on Mondays). We have a grader who will not grade unexcused late assignments. Within reason, I will grade late assignments, but your feedback won't be as detailed as the graders'.

You are allowed, and even encouraged to work together when solving homework problems, BUT you need to write up the assignments on your own. If you are tempted to look elsewhere for answers to homework problems, don't. Come to me instead for help.

Prerequisites: You should be familiar with groups, rings and fields at the undergraduate level.

Academic Integrity: All University of Utah policies regarding ethics and honorable behavior apply.

Official matters

The following have been provided by the Department and University.

The Americans with Disabilities Act: The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veterans status or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, including sexual orientation or gender identity/expression, you are encouraged to report it to the University's Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or to the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to police, contact the Department of Public Safety, 801-585-2677(COPS).

Campus safety: The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu

Office of the Dean of Students: The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. To contact the Office of the Dean of Students, please email deanofstudents@utah.edu or call 801-581-7066. There is more information at <https://deanofstudents.utah.edu/>

Note: If you are unable to attend class in person due to a positive COVID test, quarantine, etc., I will ensure that you are not penalized from the grade perspective and will do my best to make sure you don't fall behind. I will not, however, be recording any of the lectures.