

**MATH 5310-001 – Introduction to Modern Algebra I  
Fall 2021**

**Instructor** Prof. Tommaso de Fernex  
Department of Mathematics, JWB 322  
defernex@math.utah.edu

**Class Meeting** UNION 323, MWF 12:55–1:45 pm

**Office Hours** Office Hours will be held on Zoom. The Zoom link is available on Canvas. Times will be determined at the beginning of the semester based on polling.

**Course Description**

**Textbook** Michael Artin, *Algebra*, Second Edition, Prentice Hall, ISBN-10: 0-13-241377-9, ISBN-13: 978-0-13-241377-0

**Prerequisites** C or better in MATH 3210 AND (MATH 2250 OR MATH 4400 OR MATH 4510).

**Goals & Objectives** This is the second course in the MATH 5310–5320 Introduction to Modern Algebra sequence, and focuses on groups and linear algebra, with matrix operations leading to many concrete examples of groups (rings, modules, and fields will be the topic of Math 5320). The course is designed to introduce students to the abstract aspect of the theory while learning about some of its applications. Proofs of the fundamental properties will be covered in a rigorous manner, with the goal to further improve the student’s ability to assimilate abstract concepts and understand their interrelationships.

We will cover material from Chapters 2-7 of the book, including the following list of topics:

- Groups, subgroups, homomorphisms
- Equivalence relations, cosets and conjugacy classes, theorem of Lagrange
- Modular arithmetic, fields and finite fields
- Normal subgroups, quotient groups, and the first isomorphism theorem
- Vector spaces over a field
- The meaning of row column operations, dimension of vector spaces
- Quotient spaces, their dimension
- Linear transformations, a brief discussion of Jordan normal form
- Orthogonal transformations, theorem of Euler for dimension 3
- Group actions, application to classification of finite subgroups in  $SO(3)$
- The class equation and simplicity of icosahedral group
- The first Sylow theorem

**Canvas** The course webpage is hosted on Canvas: [utah.instructure.com/courses/709531](http://utah.instructure.com/courses/709531). The university suggests that you use Firefox, Chrome, or Safari to login to Canvas, but not Internet Explorer. For any technical help with Canvas, you should contact the UOnline Helpdesk at (801) 581-6112.

Official announcements, this syllabus, homework assignments, and any other information regarding the course can be found on the Canvas page.

Canvas will also be used for communications to the class, and it is expected that students will receive Canvas messages and notifications to their email. In Canvas, go to Account > Notifications to make sure you receive Canvas messages and notifications in your email.

## Course Policies

**Homework** Homework will be assigned weekly and is worth 30% of the total course grade. Because solutions may be discussed in class, late homework is not accepted. Instead, the two lowest scores will be dropped.

Homework will be assigned on Canvas, and will be submitted, graded, and returned via Canvas. Each student will be responsible for creating a readable PDF file and submitting it electronically on Canvas before the deadline. Only upload one file per assignment.

Some options for creating a PDF file: Scan handwritten work (e.g., using a scan app on the phone or tablet), write the homework directly on a tablet, or type it up in LaTeX or other editors.

**Exams** There will be two midterm exams and one comprehensive final exam, cumulatively worth 70% of the total course grade. All exams will be in-class.

Exam dates are:

**First Midterm:** Friday, September 24

**Second Midterm:** Friday, November 5

**Final Exam:** Monday, December 13, 1–3 pm

Exams will be closed-book and closed-notes, with no calculators or other devices allowed.

**Grading** The following are the grade components and the percentage each contributes to a student's final grade:

- Weekly homework (two lowest scores dropped): 30%
- Midterm exams: 40%
- Final exam: 30%

**Accommodations** Accommodations will be considered on an individual basis and may require documentation. Please contact your instructor as soon as possible (preferably shortly before the semester begins) to request accommodations of any kind.

Please contact your instructor as soon as possible if an extreme personal circumstance (hospitalization, death of a close relative, natural disaster, etc) is interfering with your ability to complete your work.

To request an accommodation for religious practices, contact your instructor at the beginning of the semester.

If you are a student on active duty with the military and experience issues that prevent you from participating in the course because of deployment or service responsibilities, contact your instructor as soon as possible to discuss appropriate accommodations.

All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services (CDS). CDS will work with you and the instructor to make arrangements for accommodations. Prior notice is appreciated. To read the full accommodations policy for the University of Utah, please see Section Q of the Instruction & Evaluation regulations ([regulations.utah.edu/academics/6-100.php](https://regulations.utah.edu/academics/6-100.php)). If you will need accommodations in this class, contact: Center for Disability Services, 801-581-5020 ([disability.utah.edu](https://disability.utah.edu)), 162 Union Building, 200 S. Central Campus Dr., Salt Lake City, UT 84112.

## University Policies

**COVID-19 Campus Guidelines** University leadership urges all faculty, students, and staff to model the vaccination, testing, and masking behaviors we want to see in our campus community. These include:  
Vaccination:

- Get a COVID-19 vaccination if you have not already done so. Vaccination is proving highly effective in preventing severe COVID-19 symptoms, hospitalization and death from coronavirus. Vaccination is the single best way to stop this COVID resurgence in its tracks. Visit [mychart.med.utah.edu/](https://mychart.med.utah.edu/), [alert.utah.edu/covid/vaccine/](https://alert.utah.edu/covid/vaccine/), or [vaccines.gov](https://vaccines.gov) to schedule your vaccination.

Masking:

- While masks are no longer required outside of Health Sciences facilities, UTA buses and campus shuttles, CDC guidelines now call for everyone to wear face masks indoors.

Testing:

- If you are not yet vaccinated, get weekly asymptomatic coronavirus tests. This is a helpful way to protect yourself and those around you because asymptomatic individuals can unknowingly spread the coronavirus to others. Saliva based testing is available at [alert.utah.edu/covid/testing/](https://alert.utah.edu/covid/testing/).

Student Mental Health Resources:

- Rates of burnout, anxiety, depression, isolation, and loneliness have noticeably increased during the pandemic. If you need help, reach out for campus mental health resources, including counseling, training, and other support.
- A Mental Health First Aid ([studentaffairs.utah.edu/mental-health-first-aid.php](https://studentaffairs.utah.edu/mental-health-first-aid.php)) or other wellness-themed training ([wellness.utah.edu/workshops-training](https://wellness.utah.edu/workshops-training)) are provided by our Center for Student Wellness. Consider participating in them and sharing these opportunities with your peers, teaching assistants, and department colleagues.

Self-Reporting:

- All of us, including faculty, students, and staff, must self-report if we test positive for COVID-19. To report, please contact:

COVID-19 Central @ The U  
801-213-2874  
[coronavirus.utah.edu](https://coronavirus.utah.edu)

**Drop/Withdraw Policies** Students may drop a course within the first two weeks of a given semester without any penalties.

Students may officially withdraw (W) from a class or all classes after the drop deadline through the midpoint of a course. A “W” grade is recorded on the transcript and appropriate tuition/fees are assessed. The grade “W” is not used in calculating the students GPA.

For deadlines to withdraw from full-term, first, and second session classes, see the U’s Academic Calendar ([registrar.utah.edu/academic-calendars/index.php](http://registrar.utah.edu/academic-calendars/index.php)).

**Plagiarism & Cheating** It is assumed that all work submitted to your instructor is your own work. When you have used the ideas of others, you must properly indicate that you have done so.

Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code,

*“...Includes, but is not limited to, cheating, misrepresenting ones work, inappropriately collaborating, plagiarism, and fabrication or falsification of information... It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct.”*

For details on plagiarism and other important course conduct issues, see the U’s Code of Student Rights and Responsibilities ([regulations.utah.edu/academics/6-400.php](http://regulations.utah.edu/academics/6-400.php)).

**Course Materials Copyright** The Content is made available only for your personal, noncommercial educational, and scholarly use. You may not use the Content for any other purpose, or distribute, post or make the Content available to others unless you obtain any required permission from the copyright holder. Some Content may be provided via streaming or other means that restrict copying; you may not circumvent those restrictions. You may not alter or remove any copyright or other proprietary notices included in the Content. Please see the Code of Student Rights and Responsibilities ([regulations.utah.edu/academics/6-400.php](http://regulations.utah.edu/academics/6-400.php)), Section III.A.5 regarding the use and distribution of class Content ([regulations.utah.edu/academics/6-400.php](http://regulations.utah.edu/academics/6-400.php)) and materials. Section III.A.5. prohibits the following: Sale or distribution of information representing the work product of a faculty member to a commercial entity for financial gain without the express written permission of the faculty member responsible for the course. (“Work product” means original works of authorship that have been fixed in a tangible medium and any works based upon and derived from the original work of authorship.)

**Safety at the U** The University of Utah values the safety of all campus community members. 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](http://safeu.utah.edu).

To report suspicious activity or to request a courtesy escort, contact:

- Campus Police & Department of Public Safety, 801-585-COPS (801-585-2677) ([dps.utah.edu](http://dps.utah.edu)), 1735 E. S. Campus Dr., Salt Lake City, UT 84112.

**Wellness at the U** Your personal health and wellness are essential to your success as a student. Personal concerns like stress, anxiety, relationship difficulties, depression, or cross-cultural differences can interfere with a student’s ability to succeed and thrive in this course and at the University of Utah. Please feel welcome to reach out to your instructor to handle issues regarding your coursework.

For helpful resources to manage your personal wellness and counseling options, contact:

- Center for Student Wellness, 801-581-7776 ([wellness.utah.edu](http://wellness.utah.edu)), 2100 Eccles Student Life Center, 1836 Student Life Way, Salt Lake City, UT 84112.
- Women’s Resource Center, 801-581-8030 ([womenscenter.utah.edu](http://womenscenter.utah.edu)), 411 Union Building, 200 S. Central Campus Dr., Salt Lake City, UT 84112.
- University Counseling Center, 801-581-6826 ([counselingcenter.utah.edu](http://counselingcenter.utah.edu)), Student Services Building, Room 426, 201 South 1460 East, Salt Lake City, UT 84112.
- Student Success Advocates, 801-587-8556 ([ssa.utah.edu](http://ssa.utah.edu)), Sterling Sill Center, 195 South Central Campus Dr., Salt Lake City, UT 84112.

Visit [studentaffairs.utah.edu/mental-health-resources/index.php](http://studentaffairs.utah.edu/mental-health-resources/index.php) for additional resources.

### **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, you are encouraged to report it to university officials:

- Title IX Coordinator & Office of Equal Opportunity and Affirmative Action, 801-581-8365 ([oeo.utah.edu](http://oeo.utah.edu)), 135 Park Building, 201 Presidents’ Cir., Salt Lake City, UT 84112.
- Office of the Dean of Students, 801-581-7066 ([deanofstudents.utah.edu](http://deanofstudents.utah.edu)), 270 Union Building, 200 S. Central Campus Dr., Salt Lake City, UT 84112.

To file a police report, contact:

- Campus Police & Department of Public Safety, 801-585-COPS (801-585-2677) ([dps.utah.edu](http://dps.utah.edu)), 1735 E. S. Campus Dr., Salt Lake City, UT 84112.

If you do not feel comfortable reporting to authorities, the U’s Victim-Survivor Advocates provide free, confidential, and trauma-informed support services to students, faculty, and staff who have experienced interpersonal violence.

To privately explore options and resources available to you with an advocate, contact:

- Center for Student Wellness, 801-581-7776 ([wellness.utah.edu](http://wellness.utah.edu)), 328 Student Services Building, 201 S. 1460 E. Salt Lake City, UT 84112.

### **Americans with Disabilities Act (ADA)**

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities.

All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access (CDA). CDA will work with you and the instructor to make arrangements for accommodations. Prior notice is appreciated. To read the full accommodations policy for the University of Utah, please see Section Q of the Instruction & Evaluation regulations ([regulations.utah.edu/academics/6-100.php](http://regulations.utah.edu/academics/6-100.php)).

If you will need accommodations in this class, or for more information about what support they provide, contact:

- Center for Disability & Access 801-581-5020 ([disability.utah.edu](http://disability.utah.edu)), 162 Union Building, 200 S. Central Campus Dr., Salt Lake City, UT 84112.

**Diverse Student Support**

Your success at the University of Utah is important to all of us here! If you feel like you need extra support in academics, overcoming personal difficulties, or finding community, the U is here for you. Please refer to the course's Canvas page for a list of support services, including: Student Support Services, American Indian Students, Black Students, Students with Children, Students with Disabilities, Students of Ethnic Descent, English as a Second Language (ESL) Students, Undocumented Students, LGBTQ+ Students, Veterans and Military Students, Women, and Inclusivity at the U.