

MATH 4301 – 010 – Abstract Algebra – Spring 2022

Contact Information:

- Instructor: Jesse Taylor
- Office: MCS 219E
- Email: jesse.taylor@angelo.edu
- Our Classroom: Online
- Meeting Times: Online
- Office Hours:
 - Monday: 10:00-11:00am
 - Tuesday: 12:00-1:00pm, 2:00-2:30pm
 - Wednesday: 1:00-4:00pm
 - Thursday: 2:00-2:30pm
 - Friday: 10:00-11:00am, 12:00-1:00pm
 - If the above times do not work please email me to set up another time to meet; virtual office hours are available by request.

Required Textbook

Abstract Algebra, 3rd edition, by Dummit and Foote.

Course Content

Selected sections from chapters 0-4 and 7 will be covered, as well as additional topics as time permits.

Tests

We will have three tests. Below is a table containing a schedule for the tests, which is subject to change. If you have a conflict with one of the tests you must let me know at least one week before the test is taken to ensure that you receive a make-up exam. The earlier you let me know, the better.

Test	Material Covered	Date
Test 1	Chapters 0, 1, and 2	Week of Feb 14-18
Test 2	Chapters 2, 3, and 4	Week of Mar 21-25
Test 3	Chapters 4, and 7	Week of Apr 18-22

It is expected that you will take your tests in person.

Grading

Your grade in this class will be determined based on the following grading rubric.

- Exam 1: 33.33%
- Exam 2: 33.33%
- Exam 3: 33.33%

Your final letter grade in this class will be determined based on a ten-point grading scale.

Zero Tolerance for Cheating

This is a hard class, so it will be tempting to cheat. Please, PLEASE, do not cheat. It is emotionally taxing and short-circuits your learning process. You are welcome to talk with other students in our class, but you should NEVER just copy an argument down that you do not understand. Further, if someone helps you on your homework, both students should document that fact on their homework papers so I know they might have similar answers. Anyone caught cheating (finding solutions online or using another student's work without permission, for example) will automatically fail the class. No exceptions.

Technology

Unless you have special accommodations documented with the Student Life office, no cell phones, tablets, laptops, games, or other electronic devices may be used at any time during in-person class.

If ASU has to move to all online delivery due to a COVID-19 outbreak

In the event that ASU is forced to move online due to a COVID-19 outbreak, all lectures will be given as video recordings posted to our Blackboard course. Homework will be submitted via Blackboard, and all tests will be taken through Respondus. More information will be given about this if it occurs.

Study Aids

This is a hard class. Many students struggle with proof-writing. I am, **by far**, your best resource in this class. Feel free to talk to me for help. I have office hours regularly and am also available for one-on-one meetings and virtual meetings if you have questions or want to discuss anything.

Notes

- All electronic correspondence will be sent to your ASU email account unless other arrangements are made. **Check your email regularly!**
- If you do not receive a graded homework assignment, quiz, or test on the day they are returned, please contact me to pick the assignment up.
- Good luck. I want you to succeed in this course. If at any point during the semester you feel as if you do not understand the material, please come talk with me as soon as possible. An ounce of prevention is worth a pound of cure.
- All items and dates in this syllabus are subject to change as the semester progresses. Students will be notified in class of any changes, and the changes will not be updated within this syllabus.

Math 4301 Student Learning Outcomes

- 1. The students will demonstrate factual knowledge including the mathematical notation and terminology used in this course.** Students will read, interpret, and use the vocabulary, symbolism, and basic definitions used in abstract algebra, including binary operations, relations, groups, subgroups, homomorphisms, rings, and ideals.
- 2. The students will describe the fundamental principles including the laws and theorems arising from the concepts covered in this course.** Students will develop and apply the fundamental properties of abstract algebraic structures, their substructures, their quotient structure, and their mappings. Students will also prove basic theorems such as Lagrange's theorem, Cayley's theorem, and the fundamental theorems for groups and rings.
- 3. The students will apply course material along with techniques and procedures covered in this course to solve problems.** Students will use the facts, formulas, and techniques learned in this course to prove theorems about the structure, size, and nature of groups, subgroups, quotient groups, rings, subrings, ideals, quotient rings, and the associated mappings. Students will also solve problems about the size and composition of subgroups and quotient groups; the orders of elements; isomorphic groups and rings; and the composition of ideals.
- 4. The students will apply course material along with techniques and procedures covered in this course to solve problems.** Students will use the facts, formulas, and techniques learned in this course to prove theorems about the structure, size, and nature of groups, subgroups, quotient groups, rings, subrings, ideals, quotient rings, and the associated mappings. Students will also solve problems about the size and composition of subgroups and quotient groups; the orders of elements; isomorphic groups and rings; and the composition of ideals.

Textbook

Abstract Algebra, 3rd edition, by Dummit and Foote.

Course Content

The following chapters including the particular sections listed are covered.

- 0. Preliminaries:** basics, properties of the integers, the integers modulo n .
- 1. Introduction to Groups:** basic axioms and examples, dihedral groups, symmetric groups, matrix groups, the quaternion group, homomorphisms and isomorphisms, group actions.
- 2. Subgroups:** definition and examples, centralizers and normalizers, stabilizers and kernels, cyclic groups and cyclic subgroups, subgroups generated by subsets of a group, the lattice of subgroups of a group.
- 3. Quotient Groups and Homomorphisms:** definitions and examples, more on cosets and Lagrange's Theorem, the isomorphism theorems, composition series and the Hölder program, transpositions and the alternating group.
- 4. Group Actions:** group actions and permutation representations, groups acting on themselves by left multiplication – Cayley's Theorem, groups acting on themselves by conjugation – The Class Equation, automorphisms, the Sylow Theorems, the simplicity of A_n .

- 7. Introduction to Rings:** basic definition and examples, examples: polynomial rings, matrix rings, and group rings, ring homomorphisms and quotient rings, properties of ideals, rings of fractions, the Chinese Remainder Theorem.

Additional topics as time permits.

Anticipated Schedule

Below is a table containing an approximate guide to what we will cover during each week of the semester. These topics are subject to change.

Course Week	Topics
1	Introduction and Chapter 0
2	Chapter 1
3	Chapter 1
4	Chapter 1
5	Chapter 2
6	Chapter 2 and Test 1
7	Chapters 2 and 3
8	Chapter 3
9	Chapters 3
10	Chapter 4
11	Chapter 4 and Test 2
12	Chapters 4 and 7
13	Chapter 7
14	Chapter 7
15	Chapter 7 and Review
16	Test 3/Final Exam, Wednesday December 8, 1:00pm-3:00pm,

General Policies Related to This Course

All students are required to follow the policies and procedures presented in these documents:

- [Angelo State University Student Handbook](#)ⁱ
- [Angelo State University Catalog](#)ⁱⁱ

Academic Integrity

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

The College of Science and Engineering adheres to the university's [Statement of Academic Integrity](#).ⁱⁱⁱ

Accommodations for Students with Disabilities

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu. For more information about the application process and requirements, visit the [Student Disability Services website](#).^{iv} The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dr. Dallas Swafford
Director of Student Disability Services

Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu
Houston Harte University Center, Room 112

Incomplete Grade Policy

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 [Grading Procedures](#)^v for more information.

Student Absence for Observance of Religious Holy Days

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 [Student Absence for Observance of Religious Holy Day](#)^{vi} for more information.

Title IX at Angelo State University

Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based on sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of a sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence (domestic violence or dating violence), sexual violence, and any other misconduct based on sex.

You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Miller, J.D. You may submit reports in the following manner:

Online: [Incident Reporting Form](#)^{vii}

Face to Face: Mayer Administration Building, Room 210

Phone: 325-942-2022

Email: michelle.miller@angelo.edu

Note, as a faculty member at Angelo State, I am a mandatory reporter and must report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325-942-2371), the 24-Hour Crisis Helpline (325-486-6345), or the University Health Clinic (325-942-2171).

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit the [Title IX website](#).^{viii}

Information About COVID-19

Please refer to ASU's [COVID-19 \(Coronavirus\) Updates](#)^{ix} web page for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

Modifications to the Syllabus

This syllabus, including grade evaluation and course schedule, is subject to modification on potentially short notice based on developing circumstances.

ⁱ <https://www.angelo.edu/current-students/student-handbook/>

ⁱⁱ <https://www.angelo.edu/academics/catalog/>

ⁱⁱⁱ <https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=96>

^{iv} <https://www.angelo.edu/current-students/disability-services/>

^v <https://www.angelo.edu/content/files/14197-op-1011-grading-procedures>

^{vi} <https://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of>

^{vii} <https://www.angelo.edu/incident-form>

^{viii} <https://www.angelo.edu/title-ix>

^{ix} <https://www.angelo.edu/covid-19/>