MATH 5360—Abstract Algebra
Department of Mathematics and Statistics
Class Policy Sheet and Syllabus—Fall 2021

Professor: Dr. Brittney Falahola
Office: 324 Mathematics building
Email: falaholabl@sfasu.edu
Office Phone: 936.468.1772
Office Hours:

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<tr>
<th>Monday</th>
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<td>10-11am</td>
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Class Times & Place: 9:30-10:45 TR, Room 209, Math Building

Course description: Groups, subgroups, homomorphisms, isomorphisms, cosets, factor groups, the Fundamental Theorem of Group Homomorphisms, the Fundamental Theorem of Finite Abelian Groups.


Tentative Exam Schedule: Please note that the dates for our in-class exams below are subject to change. The final is university scheduled and cannot be taken at a different time without permission of the Dean of the College of Sciences and Mathematics.

- Exam 1 Thursday, September 16
- Exam 2 Thursday, October 14
- Exam 3 Thursday, November 11
- Final Thursday, December 9, 8-10am in our regular classroom

Grading Policy: 55% Three Midterm Exams (top score 20%, others 15% each) 15% Homework/Presentations 5% Weekly Quizzes 25% Comprehensive Final Exam

Grading Scale: 90% - 100%: A 80% - 90%: B 70% - 80%: C 60% - 70%: D Below 60%: F

Course Requirements:

- **Three in-class exams**—If a student must miss an exam due to an excused absence, special arrangements should be made in advance. **Cell phones and graphing calculators are not allowed out during exams, even if that is all you brought.** No music (even through headphones) is allowed during exams.

- **Homework**—Homework will be assigned and collected. Completing homework and checking your answers to problems with solutions is your source for daily feedback. Completing homework is also how you become responsible for identifying which topics on which you need to spend more time. Homework will be assigned well in advance of the due date so that you will have adequate time to complete the exercises and to typeset it in LaTeX. If you wait to begin the day before, you will not have enough time.

- **Accountability and content delivery (Presentations)**—Students are expected to know and be able to recall definitions and theorems to contribute to class discussions. To encourage ownership in preparation, students will present class content during the semester.

- **Weekly quizzes**—Short weekly quizzes will be given on Thursdays to assess your knowledge of definitions and theorem statements.

- **A comprehensive final exam**—The final exam is Thursday, December 9, 8-10am in our regular classroom.

- **Class attendance and participation**—Students are expected to attend all class meetings, arriving on time. **Bring your text daily.** If you are absent, you are responsible for determining what you missed and for being prepared for class when you return. Missing 5 classes drops your course average by one letter grade. Missing 8 classes drops your course average by two letter grades.
• **Preparing for class**—Students should be prepared to invest several hours per day outside of class reading the text, practicing examples, and working homework exercises.

• **Email**—Check your university email regularly, as I may send reminders, assignments, or announcements via your @jacks account.

• There is no extra credit or alternative credit. Do well enough on the graded items to earn the grade you seek.

Disclaimer: I, Dr. Falahola, reserve the right to make changes to this syllabus in the best interest of the class. If changes are made, students will be notified in class and on D2L.

COMPLETE COURSE POLICY SHEET ACCESSIBLE ONLINE AT
http://www3.sfasu.edu/math/docs/syllabi/MATH5360Syllabus.pdf

**MATH 5360 Course Outline**: The following is a list of topics we'll discuss this semester.

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<th>Required Reading</th>
<th>Exercises to Practice</th>
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<td>0: Preliminaries</td>
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<td>1: Introduction to Groups</td>
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<td>2: Groups</td>
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<td>3: Finite Groups, Subgroups</td>
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<td>4: Cyclic Groups</td>
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<td>5: Permutation Groups</td>
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<td>6: Isomorphisms</td>
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<td>7: Cosets and LaGrange’s Theorem</td>
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<td>8: External Direct Products</td>
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<td>9: Normal Subgroups and Factor Groups</td>
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<td>10: Group Homomorphisms</td>
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<td>11: Fund. Thm. of Finite Abelian Groups</td>
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<td>24: Sylow Theorems</td>
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<td>25: Finite Simple Groups</td>
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Math 5360 – Abstract Algebra I
Course Syllabus

**Course description:** Groups, subgroups, homomorphisms, isomorphisms, cosets, factor groups, the Fundamental Theorem of Group Homomorphisms, the Fundamental Theorem of Finite Abelian Groups.

**Credit hours:** 3

The following is an excerpt from SFA Policy 5.4:

*The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:*

1. **Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;**

2. **At least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.**

To this end, all students in courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend a minimum of two hours outside of class for every credit hour associated with this course. Expected activities to be completed in the time outside of class include reviewing notes from previous class meetings, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation.

**Course Prerequisites and Corequisites:** MATH 4320 or equivalent

**Course outline:**

- **Sets & binary operations**
  - Basic set theory
  - Equivalence relations
  - Binary operations
  - Isomorphic structures
  Approximate time spent 5%

- **Introductory Group Theory**
  - Definitions of group and subgroups
    - Canonical examples
    - Subgroup tests
    - Abelian groups
  - Notions of homomorphism and isomorphism
    - Basic definitions
    - Properties
    - Tests for proving homomorphism
    - Tests for proving isomorphism
  - Cyclic groups
    - Fundamental Theorem of Cyclic Groups
  - Generating Sets and Cayley diagrams
  25%

- **Permutations, Cosets and Direct Products**
  - Permutation groups
  - Orbits and cycles
  - Alternating groups
  - Cosets
  25%
Theorem of Lagrange
  - External/ Internal Direct products
  - Finitely generated abelian groups
    - Fundamental Theorem of Finite Abelian Groups

- Homomorphisms 15%
  - Definition and intuition of homomorphism
  - Basic properties
  - Tests for proving homomorphism
  - Tests for proving isomorphism

- Normal Subgroups and Factor Groups 15%
  - Kernels
  - The First Isomorphism Theorem

- Sylow Theorems 10%
  - Cauchy's Theorem

- [Finite Simple Groups] 5%

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**Student Learning Outcomes (SLO):** At the end of MATH 5360, a student who has studied and learned the material should be able to:

1. Incorporate equivalence relations into group theoretic structures, particularly factor groups. [PLO 1,2,3]
2. Determine subgroups and determine whether given subsets of a group are subgroups. [PLO 1,2,3]
3. Use the Fundamental Theorem of Cyclic Groups to classify and determine subgroup structure of non-cyclic groups. [PLO 1,2,3]
4. Construct and manipulate group homomorphisms and isomorphisms. [PLO 1,2,3]
5. Recognize and interpret theorems to prove properties about specific algebraic structure. [PLO: 1,2,3]
6. Use the skills of proof by contradiction, proof by contraposition, proof of set equality, and proof using both forms of mathematical induction. [PLO: 1,2,3]
7. Define and test a potential isomorphism for being well-defined, a homomorphism, one-to-one and onto. [PLO: 1,2,3]
8. Use definitions of one-to-one, onto, well-defined, homomorphism, isomorphism and others to characterize a given map. [PLO: 1,2,3]
9. Create factor groups using normal subgroups or the First Isomorphism Theorem and interpret elements of factor groups accurately. [PLO: 1,2,3]
10. Demonstrate understanding of permutations and symmetries in a group theoretic context – particularly the significance of Cayley’s Theorem. [PLO: 1,2,3]
11. Recognize and use the Sylow Theorems to characterize certain finite groups. [PLO: 1,2,3]

**Program Learning Outcomes (PLO):** Students graduating from SFA with a M.S. Mathematical Sciences Degree will:

1. Written Communication - SFA Mathematics majors communicate mathematical ideas effectively in written form, integrating mathematical notation correctly and consistently.
2. Verbal Communication - SFA Mathematics majors communicate mathematics effectively to diverse audiences.
3. Mathematical Maturation - SFA Mathematics majors grow from a computational understanding of mathematics to an integrated approach which includes critical thinking proficiency, computational facility, conceptual understanding, and problem-solving persistence.

**Academic Integrity**
Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

The penalty for a student found cheating on any part of an assignment, quiz, or exam in this class will range from a grade of zero on the work to a grade of F in the course, and may result in additional, more severe disciplinary measures. A student who allows another to copy his work and the student copying the work are both guilty of cheating. Do your own work. Do not show your completed work to others. Do not allow others to copy your work.

www.sfasu.edu
Definition of Academic Dishonesty (SFA policy 4.1):
Academic dishonesty includes both cheating and plagiarism. Cheating includes, but is not limited to:
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- falsifying or inventing of any information, including citations, on an assignment;
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Plagiarism is presenting the words or ideas of another person as if they were one’s own. Examples of plagiarism include, but are not limited to:
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- submitting a work that has been purchased or otherwise obtained from the Internet or another source;
- incorporating the words or ideas of an author into one’s paper or presentation without giving the author credit.

Withheld Grades Semester Grades (SFA Policy 5.5)
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average. The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices.

SFASU Mental Health Statement: SFASU values students’ mental health and the role it plays in academic and overall student success. SFA provides a variety of resources to support students mental health and wellness. Many of these resources are free, and all of them are confidential.

On-campus Resources:
SFASU Counseling Services
www.sfasu.edu/counselingservices
3rd Floor Rusk Building
936-468-2401

SFASU Human Services Counseling Clinic
www.sfasu.edu/humanservices/139.asp
Human Services Room 202
936-468-1041

Crisis Resources:
Burke 24-hour crisis line 1(800) 392-8343
Suicide Prevention Lifeline 1(800) 273-TALK (8255)
Crisis Text Line: Text HELLO to 741-741

Acceptable Student Behavior
Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy 10.4). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be
referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

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  - Basic set theory
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  - Isomorphic structures
  5%

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Human Services Room 202
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