MTH 412.001, Introduction to Algebraic Systems
Department of Mathematics and Statistics
Class Policy Sheet and Syllabus—Fall 2018

Professor: Dr. Brittney Falahola
Office: 324 Mathematics Building
Email: falaholabl@sfasu.edu
Office Phone: 936.468.1722

Class Times & Place: 8:00 - 8:50 MWF, Room 205, Math Building

Office Hours: For the times in the table below, no appointment is needed; simply come by as your schedule allows. In addition, appointments may also be scheduled by emailing me in advance.

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<th>Monday</th>
<th>Tuesday</th>
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Course description: Introduction to the study of algebraic systems with particular emphasis on concrete examples of the basic algebraic structures, groups, rings, integral domains, and fields.


Course Calendar: 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 Friday, September 21
Exam 2 Friday, October 19
Exam 3 Friday, November 16
Final Wednesday, December 12, 8:00 – 10:00am

Course Requirements:

- Three in-class midterm exams—If a student must miss an exam due to an excused absence, special arrangements should be made at least one week in advance. No music (even through headphones) is allowed during exams.

- Homework—Exercises will be assigned from the text and collected. Completing the homework is crucial for success in the course. 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.

- A comprehensive final exam—The final exam is Wednesday, December 12, 8-10am in our usual classroom.

- Class attendance, participation, and presentations—Students are expected to attend all class meetings, arriving on time and actively participating in class discussions. You should also expect to give presentations in class on homework problems and/or textbook material. If you are absent, you are responsible for determining what you missed and for being prepared for class when you return. Bring your text daily. Missing 8 classes drops your course average by one letter grade. Missing 12 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. Material to be discussed in class should be read before coming to class. Check your university email regularly, as I may send reminders, assignments, or announcements.

Grading Policy: 50% Three Midterm Exams (highest 20%, others 15% each) 30% Homework 20% Final Exam

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

Anticipated Order of Topics

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<th>1.1 The Division Algorithm</th>
<th>6.2 Quotient Rings and Homomorphisms</th>
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<tr>
<td>1.2 Divisibility</td>
<td>First Isomorphism Theorem</td>
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<td>1.3 Primes and Unique Factorization</td>
<td>Exam 2</td>
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<td>2.1 Congruence and Congruence Classes</td>
<td>7.1 Definition and Examples of Groups</td>
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<td>2.2 Modular Arithmetic</td>
<td>7.2 Basic Properties of Groups</td>
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<td>2.3 The Structure of $\mathbb{Z}_n$</td>
<td>7.3 Subgroups</td>
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<tr>
<td>Exam 1</td>
<td>7.4 Isomorphisms and Homomorphisms</td>
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<tr>
<td>3.1 Definition and Examples of Rings</td>
<td>Exam 3</td>
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<tr>
<td>3.2 Basic Properties of Rings</td>
<td>8.1 Congruence and Lagrange’s Theorem</td>
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<tr>
<td>3.3 Isomorphisms and Homomorphisms</td>
<td>8.2 Normal Subgroups</td>
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<tr>
<td>4.1 Polynomial Arithmetic and the Division Algorithm</td>
<td>8.3 Quotient Groups</td>
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Academic Integrity (Policy A-9.1)
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.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/4.1-student-academic-dishonesty.pdf

Withdrawn Grades Semester Grades Policy (A-54)
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.

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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 D-34.1 http://www.sfasu.edu/policies/student-code-of-conduct-10.4.pdf). 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.

Student Learning Outcomes (SLO): At the end of MTH 412, a student who has studied and learned the material should be able to:
1. Recognize and prove theorems about equivalence relations, group structures, and basic ring structures. [PLO: 2,3]
2. Recognize cyclic groups and apply the fundamental theorem of cyclic groups. [PLO: 3]
3. Recognize subgroups and prove that a given subset of a group is a subgroup. [PLO: 2,3]
4. Construct and manipulate group homomorphisms and isomorphisms. [PLO: 2, 4]
5. Connect the definitions to their common applications in lower level mathematics. [PLO: 1,4]
6. Recognize and interpret theorems to prove properties about specific algebraic structure. [PLO: 1,3,4]
7. Use the skills of proof by contradiction, proof by contraposition, and proof of set equality. [PLO: 3]
8. Test a potential isomorphism for being well-defined, a homomorphism, one-to-one and onto. [PLO: 1,2]
9. Understand mappings and use definitions of one-to-one, onto, well-defined, homomorphism, isomorphism and others to characterize a given map. [PLO: 1,4]
10. Create factor groups and interpret elements of factor groups accurately. [PLO: 2,4]
11. Recognize and construct classic examples of rings, integral domains and fields. [PLO: 2,3]
12. Interpret permutations and symmetries in a group theoretic context. [PLO: 1,2,4]

Program Learning Outcomes (PLO): Students graduating from SFASU with a B.S. degree and a major in mathematics will:
1. Demonstrate comprehension of core mathematical concepts. [Concepts]
   (notion of theorem, mathematical proof, logical argument)
2. Execute mathematical procedures accurately, appropriately, and efficiently. [Skills]
   (calculation, algebra, routine, non-routine, applied)
3. Apply principles of logic to develop and analyze conjectures and proofs. [Logical Reasoning]
   (quantifiers, breaking down mathematical statements, counterexamples)
4. Demonstrate competence in using various mathematical tools, including technology, to formulate, represent, and solve problems. [Problem Solving] (calculus tools, algebra tools, applied tools, nonstandard problem solving)

Note on Credit Hours
Per SFA policy 5.4, this course provides an amount of student work per credit hour that reasonably approximates not less than one hour of class or direct faculty instruction and two hours of out-of-class student work per week for fifteen weeks over a long semester, or the equivalent amount of work over a different amount of time. For our class, this amounts to 3 hours of in-class time each week and at least 6 hours of out-of-class student work per week.

Disclaimer: I, Dr. Falahola, reserve the right to make changes to any part of this syllabus in the interest of the class. Students will be notified of any changes via email and in person.