

Fayetteville State University  
College of Arts and Sciences  
Department of Mathematics and Computer Science  
MATH361 Introduction to Modern Algebra I  
Fall 2010

**I. Locator Information**

Instructor: Dr. Valentin Milanov

Course Number and Name: MATH361-01, Introduction to Modern Algebra I

Semester Credit Hours: 3

Day, Time and Place Class Meets: MWF 10:00 -10:50 a.m., SBE 210

Total Contact Hours for Class: 45

Email address: [vmilanov@uncfsu.edu](mailto:vmilanov@uncfsu.edu)

Office Location: LS 119

Office hours: MWF 11:00 am – 12:00 pm TR 3:30 pm – 6:00 pm

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**FSU Policy on Electronic Mail:** Fayetteville State University provides to each student, free of charge, an electronic mail account ([username@uncfsu.edu](mailto:username@uncfsu.edu)) that is easily accessible via the Internet. The university has established FSU email as the primary mode of correspondence between university officials and enrolled students. Inquiries and requests from students pertaining to academic records, grades, bills, financial aid, and other matters of a confidential nature must be submitted via FSU email. Inquiries or requests from personal email accounts are not assured a response. The university maintains open-use computer laboratories throughout the campus that can be used to access electronic mail.

Rules and regulations governing the use of FSU email may be found at <http://www.uncfsu.edu/PDFs/EmailPolicyFinal.pdf>

**Important: In case FSU must close for an emergency during the semester, instruction will continue using Blackboard.**

**II. Course Description**

This is the first course of a two-semester sequence introducing fundamental concepts and proof techniques used in abstract algebra and including studies of groups, normal subgroups, quotient groups, homomorphisms, rings, ideals, quotient rings, integral domains, fields, and related topics.

**Prerequisite:** MATH 251 and MATH 260.

**III. Disabled Student Services**

In accordance with Section 504 of the 1973 Rehabilitation Act and the Americans with Disabilities Act (ACA) of 1990, if you have a disability or think you have a disability to please contact the Center for Personal Development in the Spaulding Building, Room 155 (1<sup>st</sup> Floor); 910-672-1203.

**IV. Textbook**

Contemporary Abstract Algebra (Sixth Edition), Joseph A. Gallian, Houghton Mifflin Company, 2006.

**V. Student Learning Outcomes**

Upon the completion of this course, the student shall:

- Give examples of groups, subgroups, external direct products, cosets, normal subgroups, and factor groups.
- Prove the basic properties of groups and find the order of an element of a group.
- Utilize the definitions of the center, generator, and commuter of a group in solving problems.
- Utilize the properties of cyclic groups, permutation groups, and state the Cayley's Theorem.
- Prove the Lagrange's Theorem and its consequences.
- State the G/Z Theorem, the First Isomorphism Theorem, and the Fundamental Theorem of Finite Abelian Groups.

- Give examples of isomorphism classes of finite Abelian groups.
- Give examples of rings, fields, and integral domains.

## VI. Course Requirements and Evaluation Criteria

The emphasis in this course will be more on proofs and less on computation. Proofs could be as short as a line and as long as several pages. The “one-liners” may be ingenious and the longer ones may be straightforward. So do not judge the difficulty of the proofs by their length. Always have a paper and pencil ready as you read the text. You will often need time as you “plow through” your reading. One learns to do proofs by doing them than reading them. This may be a little frustrating to begin with, so do not despair!

Write your proofs with a reader in mind. The proof should not only convince you, but it must convince others. Write your proofs in complete English sentences and provide clear transitions.

You are not banned from collaborating with other members of the class on homework problems but do not write down something that you do not understand!

Students are encouraged to ask questions of the instructor in class and to respond to those posed by the instructor. They should not discourage others from raising or answering questions. Often, other students have the same question which they wish to ask, but are hesitant to do so.

Students are expected to attend classes regularly and do all of the assignments.

<b>FN</b>	Hours attempted – Not earned	0 per credit hour	Failing due to non-attendance. (Student registered, but <u>never</u> attended.)
<b>W</b>	Hours attempted – Not earned	No impact on GPA	Class withdrawal prior to deadline (see Academic Calendar)
<b>P</b>	Hours attempted and earned	No impact on GPA	Satisfactory - Assigned only in classes specified as Pass/Fail
<b>WU</b>	Hours attempted – Not earned	No impact on GPA	<b>Withdrawal from all classes for semester or term</b>
<b>AU</b>	Hours attempted – Not earned	No impact on GPA	Auditing

- Attendance Requirements – The FSU Attendance Policy stated on page 73 of the 2008-2009 University Catalogue will be strictly enforced. **Three (3) late arrivals** and/or **early departures** will count as one absence. Exceeding the limit of **four (4) unexcused absences** will result in an interim grade **EA = EXCESSIVE ABSENCES**. When a student enters the classroom after the roll call, it is the responsibility of the student to inform the instructor after class that (s)he was in attendance. You must notify the instructor when it is necessary for you to leave early.
 

Notice that:

  - **Students receive no refund for withdrawing from individual classes and they slow their progress toward degree completion.**
  - **Students who withdraw from or fail more than one-third of their classes will no longer be eligible for financial aid.**
  - **STUDENTS MUST STRIVE TO EARN CREDIT FOR ALL THE CLASSES IN WHICH THEY ENROLL. STUDENTS SHOULD WITHDRAW FROM CLASSES ONLY WHEN IT IS ABSOLUTELY NECESSARY.**
- Graded Assignments – There will be three homeworks, three tests - weighted the same and the lowest test score will be dropped, and a comprehensive final exam (see the schedule). The weight given to various activities for evaluation is as follows: tests-60%, final exam-20%, and homeworks-20%. There will be some extra credit from unannounced quizzes.

Grading Scale:

<b>A:</b> 90-100	<b>B:</b> 80-90	<b>C:</b> 70-80	<b>D:</b> 60-70	<b>F:</b> below 60
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- c. Policy on **Missed or Late Assignments** - Late homework will no longer be accepted after it has been graded and returned to class. If homework is given to me the day after it is due, it will lose 20% of its total value. For two days delay it will lose 40% of its total value and so on. . **No make up tests for unexcused absences! For excused absences student should contact the instructor prior to the test!**
- d. Other - Dishonesty on graded assignments will not be tolerated. Students must neither give nor receive help on any work to be graded. The University policy on cheating will be applied to any violations. The minimum penalty will be a grade of zero on the assignment (including tests).

**Please note: If these evaluation criteria must be revised because of extraordinary circumstances, the instructor will distribute a written amendment to the syllabus.**

**Student Behavior Expectations:** -The instructor will respect all students and will make every effort to maintain a classroom climate that promotes learning for all students. Students must accept their responsibility for maintaining a positive classroom environment by abiding by the following rules:

1. Students are expected to arrive to class on time, remain in class until dismissed by the instructor, and refrain from preparing to leave class until it is dismissed.
2. Student/teacher relationships, as well as relationships among peers, must be respectful at all times.
- 3 Students are not permitted to wear headphones or other paraphernalia that may be distracting to the classroom environment.
4. Students must refrain from any activity that will disrupt the class; this includes turning off cell phones and pagers.
5. Students are not permitted to use profanity in the classroom.
6. Students will not pass notes or carry on private conversations while class is being conducted.

**Consequences for Failing to Meet Behavioral Expectations:** The first time a student violates one of these rules, the instructor will warn him or her privately, either after class or before the next class. (Faculty members reserve the right to warn students publicly if needed.) The second time a student violates the guidelines, the instructor may deduct as many as twenty points from the student's next exam grade. If a student violates the guidelines three times, the instructor will report the student to the Dean of Students for disciplinary action according to the FSU Code of Student Conduct.

## **VII. Academic Support Resources**

Students are encouraged to use the Blackboard Learning System where lecture notes, solutions to problems, and other materials will be posted.

## **VIII. Course Outline and Assignment Schedule**

### Topics

*Chapter 0:* Preliminaries Properties of Integers, Modular Arithmetic, GCD, Euclid's Lemma, Euclidean Algorithm

Mathematical Induction, Equivalence Relations

*Chapter 1:* Symmetries of a Square, Dihedral Groups

*Chapter 2:* Definitions and Examples of Groups.

Elementary Properties of Groups

*Chapter 3:* Finite Groups, Subgroups,  
Subgroup Tests, Examples of Subgroups

*Chapter 4:* Properties of Cyclic Groups  
Classification of Subgroups of Cyclic Groups  
Review, **Homework #1 Due.**

**Test 1**

*Chapter 5:* Permutation Groups, Cycle Notation  
Properties of Permutations

*Chapter 6:* Isomorphisms, Definitions and Examples, Cayley's Theorem.  
Properties of Isomorphisms, Automorphisms  
Problems

*Chapter 7:* Cosets and Lagrange's Theorem Corollaries  
Application of Cosets to Permutation Groups

*Chapter 8:* External Direct Products - Definitions, Examples, and Properties  
The group of Units Modulo  $n$  as an External Direct Product  
Problems

Review, **Homework #2 Due.**

**Test 2**

*Chapter 9:* Normal Subgroups, Factor Groups  
Applications and Internal Direct Product  
Problems

*Chapter 10:* Group Homomorphisms – Definitions and Examples  
The First Isomorphism Theorem, Examples  
Problems

*Chapter 11:* Fundamental Theorem of Finite Abelian Groups.  
The isomorphism Classes of Abelian Groups.  
Problems

*Chapter 12:* Introduction to Rings, Definition and Examples  
Properties of Rings, Subring Test  
Problems

Review, **Homework #3 Due.**

**Test 3**

*Chapter 13* Integral Domains: Definitions and Examples  
Fields, Characteristic of a ring  
Problems

Review

**Comprehensive Final Exam TBA**

**IX. Teaching Strategies**

The teaching strategies for this course will be: Lectures and Group Discussions

**X. Bibliography**

Jimmie Gilbert, Linda Gilbert, Elements of Modern Algebra, Brooks/Cole, Sixth Edition, 2005

Aigli Papanonopoulou, Algebra: Pure and Applied, Prentice Hall, First Edition, 2002.

Joseph J. Rotman, A First Course in Abstract Algebra, Prentice Hall, Third Edit