

**MA401**

**Abstract Algebra I**

**Instructor:**  
Lee Redmond

**Class Meetings Location/Time:**  
TR 1:00 - 2:15

**Office Location:**  
136

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254-3399

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**Fall 2018**

### **COURSE DESCRIPTION**

Binary Operations, groups, subgroups, permutations, cyclic groups, finitely generated and abelian groups, rings, integral domains.

### **PREREQUISITES**

MA 300 and preferable a course in linear algebra.

### **COURSE OVERVIEW**

This course is designed to meet the needs of students majoring in mathematics who are in pursuit of a B.S. degree, those who plan to attend graduate school and those who plan to become teachers of mathematics. Because many students will not have much experience with abstract thinking, a number of familiar concrete examples involving logic, set and number theory, induction and binary operations are introduced at the beginning of the course. Most of the semester will be used to provide students with detailed presentation of one of the simplest structures of abstract algebra called groups. Students are expected to learn to read and understand formal proofs on groups and then be able to construct proofs on their own. This course requires students to think reflectively about the well-known methods used in previous courses to solve problems of different types in a concrete setting and use this information to successfully make the transition to writing proofs and producing concrete examples involving more abstract objects and concepts. Such transformation of knowledge indicated mathematical maturity that is exemplary of a potential holistic transformer. It typifies scholarship and reflective thinking and equips students for a lifetime enjoyment and appreciation for higher mathematics. If time permits, the course will conclude with a discussion of the more complex structures rings and fields.

### **COURSE CONTENT**

#### **Text**

Saracino, Dan. 2<sup>nd</sup> ed. **Abstract Algebra: A First Course**. Brooks/Cole, Cengage Learning.

## **GENERAL COURSE GOALS**

1. Provide students with adequate knowledge of the preliminaries that they can build on to develop their ability to prove results in algebra.
2. Present the subject of Abstract Algebra in a clear manner so that students of different levels of achievements will understand and learn to appreciate and apply the major concepts to real- life situations.
3. Prepare students to communicate mathematical ideas using everyday and mathematical language orally and in writing.
4. Provide student with an instrument for investigating everyday phenomena of the real world.
5. Teach students to investigate and understand the content of the course through solving problems.

## **Major areas of study**

- I. Preliminaries  
Mathematical logic, sets, fundamental results in number theory, mathematical induction, and methods of proofs.
- II. Mappings and Operations  
Mappings, one-to-one functions, onto functions, inverse functions, composite functions, matrices, n-tuples, binary operations, cayley tables, integer modulo, division algorithm, and Euclidean algorithm.
- III. Groups  
Definition, basic properties and examples.
- IV. Fundamental Theorem about Groups
- V. Powers of an Element; Cyclic Groups.
- VI. Subgroups  
Definitions, properties of subgroup, Klein-4 group, proper and improper subgroups, lemmas, corollaries, and theorems.
- VII. Direct Products
- VIII. Introduction to Rings  
Definitions and examples.

## **COURSE OBJECTIVES**

Upon completion of MA 401, students should be able to:

1. Use familiar concepts of the preliminaries including such topics as sets, number theory, and number systems that they can build on to help prove results in algebra.
2. Construct Proofs using different methods.
3. Utilize concepts of calculus and linear algebra to describe, model, and solve problems.
4. Relate operations, sets, lemmas, axioms, corollaries, theorems, and proofs to

higher mathematics.

5. Communicate abstracts ideas using everyday and mathematical language both orally and in writing using symbols.

### MAJOR STUDENT ACTIVITIES

- (1) Students are expected to have a comprehensive understanding of the content areas of study as a result of the materials being covered. Therefore, they are expected to read intensively from the textbook and spend a considerable amount of time solving problems to help understand the concepts. **Every student must have the textbook and must bring it to class daily.**
- (2) Students are expected to pass examinations based on classroom lectures, and homework assignments. For any student who could not take the test, a **make-up test must** be taken at the time designated by the instructor. Notification must come on or before the day of the test. Failure to makeup a test results in a grade of **zero**.
- (3) Random quizzes will be given. **Quizzes cannot be made up.**
- (4) Students are strongly encouraged to participate in all class activities and assignments with both the instructor and other students. Students may earn extra points toward their daily average through class participation (solving , presenting, and discussing problems in class ).
- (5) All homework assignments must be completed and submitted on time. **Incomplete or late** work will not be accepted unless prior preparations have been made with the instructor. Assignments are to be submitted at the beginning of class.
- (6) A notebook should be maintained which contains lecture notes and all homework and practice exercises properly labeled. There may be random notebook checks.

### EVALUATION AND GRADING PROCEDURES

The followings will be used to determine the final grade.

Content Examinations and Special Assignments. . . . .	60%
Final Exam. . . . .	20%
Quizzes, Lab and Homework. . . . .	20%

Grading Scales:	<u>SCORE</u>	<u>GRADE</u>
	90-100	A
	80-89	B
	70-79	C
	60-69	D
	BELOW 60	F

## **ATTENDANCE POLICY**

It is necessary for students to attend every class meeting. Any student who misses more than the allowed number of absences will be subject to a decrease in their final grade.

## **TECHNOLOGY**

Students often use the assistance of technology for the numerical and other presentations encountered in this course which allows students to spend less time with time - consuming calculations and diagrams and more time with analyzing, reasoning, and proving results. However, developing these skills effectively requires students to gather materials through the use of various resources in the library and the computer laboratory.

## **SPECIAL NEEDS STATEMENTS**

Mississippi Valley State University is committed to providing reasonable accommodations for students with a documented disability. If you feel you are eligible to receive accommodations for a covered disability (medical, physical, psychiatric, learning, vision, hearing, etc.) and would like to request it for this course, you must be registered with the Services for Students with Disabilities (SSD) program administered by University College. It is recommended that you visit the Disabilities Office located inside the EMAP Computer Lab in the Technical Education (IT) Building to register for the program at the beginning of each semester. If you are determined to be eligible after our confidential consultation, you will be provided with a Memo of Accommodations that must be submitted to each of your instructors.

## **INCOMPLETE**

Only students with acceptable excuses who could not complete the course requirements within the semester will be considered for a grade of incomplete. The student must have a passing grade ( **C or better**) up to the withdrawal date. Otherwise, students should drop or withdraw from the class.

**Note:** Cell phones should not be used at any time during the class period. It is preferred that cell phones not be visible.

**Office Hours:** Posted on office **136**.

***This document does not constitute a contract with the university. It contains guidelines and I reserve the right to make changes on this syllabus as needed.***