



### MISSION STATEMENT

Felician College is an independent co-educational Catholic/Franciscan College founded and sponsored by the Felician Sisters to educate a diverse population of students within the framework of a liberal arts tradition. Its mission is to provide a full complement of learning experiences, reinforced with strong academic and student development programs designed to bring students to their highest potential and prepare them to meet the challenges of the new century with informed minds and understanding hearts. The enduring purpose of Felician College is to promote a love for learning, a desire for God, self knowledge, service to others, and respect for all creation.

### DIVISION OF ARTS AND SCIENCES MISSION STATEMENT

The mission of the Division of Arts and Sciences is to implement and manifest the Mission of Felician College in the Programs of the Division; the General Education Program, the Developmental Educational Program, and the Core by providing the highest quality of instruction at both the undergraduate and graduate level, encouraging students to develop to their fullest potential, to gain skills for life-long learning, and to produce graduates well-equipped to contribute to society. The division achieves the stated mission by using processes of continual improvement, based upon assessment of student learning at all levels, as well as the assessment of the administrative processes and mechanisms.

### DEPARTMENT OF MATHEMATICAL SCIENCES MISSION STATEMENT

The Department of Mathematical Sciences supports the mission of Felician College by providing the portion of students' educational experiences dealing with quantitative literacy. The Department supports the mission of Felician College to provide a strong academic program by providing rigorous mathematics courses to students in all majors at all levels. The Department supports the mission of the Division of Arts and Sciences by providing a high quality of instruction in mathematics at both the college level and the developmental level. The broad variety of courses offered by the Department of Mathematical Sciences helps bring students to their highest potential by providing theory and practice related to problem solving, logical reasoning, and analytical skills. This will help prepare Felician College students to meet future challenges with informed mathematical minds.

**Course Number:** Math 434

**Course Level:** Undergraduate

**Course Title:** Abstract Algebra

**Credits:** 4

**Prerequisite:** Math 433

**Corequisite:** None

**Location & Time:** Mondays 4:00 – 5:25, BH105; Wednesdays 9:45 – 11:05, BH207

**Instructor:** Dr. Elizabeth B. Uptegrove, associate professor

**Email:** [uptegrovec@felician.edu](mailto:uptegrovec@felician.edu)

**Phone:** 201 559-3195

**Office:** BH room 4 (basement)

**Office Hours:** Mondays 9:50 – 11:05 and 11:25 – 12:40; Fridays 9:50 – 11:05; other times by appointment

### COURSE DESCRIPTION

This course develops the introductory theory of groups, rings, and fields from an axiomatic point of view. Topics include the fundamental concepts of set and group theory, rings, fields and integral domains.

### COURSE CORE OBJECTIVES

Math students will demonstrate Critical Reasoning in Problem Solving and Effective Communication in oral presentation of solutions, and they will apply Quantitative and Analytical Skills to the subject matter.

### COURSE OBJECTIVES

The goal of this course is for you to learn to recognize and apply the powerful concepts of abstract algebra. Upon completion of this course, you will be able to:

- Use standard mathematical notation to define and make statements about sets, functions, groups, rings, and fields.
- Use number theory definitions and theorems to answer questions about properties of complex numbers, real numbers, rational numbers, integers, and natural numbers.
  - Understand the formal definition of division.
    - Apply the division algorithm and the Euclidean algorithm.
    - Understand the fundamental theorem of arithmetic.
      - Apply the fundamental theorem of arithmetic to mathematical questions.
- Define groups and describe properties of groups.
  - Describe specific groups, including Abelian groups and Boolean groups.
  - State and justify theorems about groups.
  - Analyze statements about groups.
  - Use properties of groups to answer questions about permutations and other counting problems.
- Define rings and fields, and describe their properties.

### TEXT

Instructor notes related to the topic under discussion will be handed out each week.

### COURSE CONTENT

**Please Note: This schedule is subject to change at the discretion of the instructor.**

Week	Dates	Topics	Notes
1	1/25, 1/27	Introduction: definitions, proof, and notations	
2	2/1, 2/3	The division algorithm, the Euclidean algorithm	
3	2/8, 2/10	Fundamental theorem of arithmetic	
4	2/17	Congruences and modular arithmetic	<b>Test 1</b>
5	2/22, 2/24	Introduction to groups and set theory	<i>College closed 2/15</i>
6	3/1, 3/3	Functions: composition, bijective	

		functions, and inverse functions	
		<i>Spring Break</i>	<i>College closed</i>
7	3/15, 3/17	Abelian groups, Boolean groups, and other groups	
8	3/22, 3/24	Symmetries	<b>Test 2</b>
9	3/29, 3/31	Subgroups and LaGrange's Theorem	
10	4/5, 4/7	Homomorphisms	
11	4/12, 4/14	Quotient groups	
12	4/19, 4/21	Groups: counting theorems	<b>Test 3</b>
13	4/26, 4/28	Rings and fields	
14	5/3, 5/5	Rings and fields (continued)	
15	5/10, 5/12	Final exam week	<b>Final exam</b>

### TEACHING/LEARNING STRATEGIES

- Class lectures, demonstrations, and discussions
- Small group work and discussions
- Study and homework groups
- Individual problem solving
- Individual proof writing

### GRADING POLICIES

- Homework will be assigned every day and discussed in class the following day. It is your responsibility to ask for help if you have difficulty with homework and it is your responsibility to arrange to make up any work that you miss if you are absent.
- Classwork and class discussions are an essential component of this class. You will find it very difficult to pass this class if you accrue too many absences.
- There are no extra credit assignments and no makeup tests except in case of extreme emergency.
- Please see me or send me an email if you are having difficulties or if you have questions about the work. Do not wait to ask for help!

### GRADING RUBRICS

- Tests, quizzes, and final exam: You will receive full credit for completely correct answers, with work shown. If you show your work, you will be eligible for partial credit.
- Problem solving homework: You will receive credit for attempted homework, even if the answer is not correct, if you show your work.
- Classwork: Your classwork grade depends on attendance and participation. You receive no classwork credit for unexcused absences. If you have an excused absence, you will receive credit after you have completed all classwork exercises on your own time, within two weeks after the absence. It is *your responsibility* to find out and complete the classwork you missed. If you are in attendance but do not participate in classwork and class discussions, you will receive half credit for the day's class.
- Proof homework: Proofs are graded on the following 5-point rubric:

## Statement of Proof – 2 points

## Points Description

- 0 Incorrect statement of problem.  
 1 Correct but incomplete statement of the problem – or correct but unreadable.  
 2 Correct and readable statement of the problem.

## Correctness of Proof – 3 points

## Points Description

- 0 Incorrect consequences improperly deduced from what is given.  
 1 Unconnected but mostly true statements properly deduced from what is given. No justification given for the conclusion.  
 2 Statements linked in a reasonable (not necessarily correct) attempt to prove the theorem. The proof may be incomplete, may depend upon an unjustified leap, or may be difficult to read.  
 3 A complete proof that is mostly correct, possibly with minor errors, and that is easy to read.

Your final grade will be based upon the following:

Homework and classwork, including proofs	40%
Tests and quizzes	30%
Final exam	30%

Your letter grade in this course is determined as follows:

Numerical Grade	Letter
95-100	A
90-94	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
70-76	C
65-69	D
64 or below	F

### COURSE POLICIES

- You should be engaged in mathematical thinking for the entire class period for every class. You should be courteous to your fellow students. Therefore:
  - Please do not carry on side conversations with other students. Inattentiveness and disruptiveness are grounds for dismissal from this class.
  - Please do not use cell phones or any other electronic devices (except calculators) during class; please silence cell phones before class begins. Use of a cell phone is grounds for dismissal from this class.
  - Regular *on-time* attendance is expected. Please notify me in advance of any excused absence or lateness.
- Honor Code procedures as outlined in the Felician College Catalog will be followed in this course. You are expected to do your own work unless I state that students may work

together. Representing the work of someone else as your own work (plagiarism) is a violation of the Honor Code. If I determine that you have violated the Honor Code, you will get no credit for the applicable work, and the violation will be reported to the honor council.

- Refer to the college catalog for college-wide policies.

**DISCLAIMER**

This syllabus is subject to change according to the needs of the class as deemed appropriate by the instructor. In case of minor changes, students will be notified in class; in case of major changes, a new syllabus will be distributed.