Modern Algebra

Fall 2021 | Syllabus | Math 280

Class Information

Professor
Lauren Williams, PhD

Meeting Times
MWF 9:00 - 9:50

Meeting Location
Zurn 63

Office Hours

Monday 12 - 12:50 pm
Monday 4 - 5 pm
Tuesday 9 - 10 am
Tuesday 1 - 1:50 pm
Wednesday 12 - 12:50 pm
Friday 8 - 8:50 am

Contact

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Course Description

This is the first semester of a year long sequence on the study of algebraic structures. Course topics include the properties of numbers, equivalence relations, groups, rings, fields, direct products, homomorphisms and isomorphisms, and the natural development of various number systems.

Course Objectives

On successful completion of the course, students will be able to:

· provide the definitions of algebraic objects, and know some examples of each.

· develop abstract and critical reasoning by studying and writing mathematical proofs.

· understand the connection between modern algebra and other branches of mathematics.

· relate the material learned in this course to prerequisite courses.

· recognize algebraic structures and objects in everyday situations.

· learn about the historical development of modern algebra.

Required Material

We will be using **Contemporary Abstract Algebra**, by Joseph A. Gallian. I'll be following the 8th edition, but any edition of the text would be fine. No other texts or materials are required. You will not be required to bring the text to class, so feel free to use an electronic version.

The book may be available as an inexpensive rental. If you plan to take Modern Algebra II (Math 281), it is highly recommended that you purchase the text, as you will need it for both semesters.

Homework

You will have several assignment due throughout the semester. You should expect to spend a fair amount of time on each assignment - don't wait until the night before it's due to get started! You are free to work together on your assignments, but everyone must submit their own work, in their own words. If you need an extension on an assignment, please let me know ahead of the due date so the same extension can be offered to the rest of the class.

Some assignments may include problems that you will not be required to turn in. Make sure to work on these problems anyway, as they could always appear on an exam.

Exams

We will have three midterm exams, with the last exam given during final exam week. Exams will be based on homework problems, class examples, and any suggested problems that were not required as homework.

Exam Dates:
Midterm Exam I: Friday, October 8
Midterm Exam II: Friday, November 12
Midterm Exam III: Wednesday, December 15

Grading

Your final grade in the course will be calculated as follows:

| 60% | **Midterm Exam Average** |
| 40% | **Homework Average** |

and converted to a letter grade using the scale below:

A	B+	B	C+	C	D+	D
90	87	80	77	70	67	60

Program Outcomes

This course will be used to assess our department's goal of meeting the following Mathematics Program Objective:

> #4: Prove and disprove mathematical statements using an appropriate technique to create a formal, coherent, and well structured argument supported by logic and the correct application of known theorems and definitions.

This assessment does not impact your grade, nor is it based on your grade. A specialized rubric, available on request, will be used to score selected homework problems *independent* of the methods used to grade your work for course purposes.

Math 280 Modern Algebra - Fall 2021 Semester Schedule

Week	Topic
1 Aug 25 - 27	**Course Introduction and Review** Syllabus overview and a review of sets.
2 Aug 30 - Sept 3	**Properties of Numbers and Functions** A review of types of numbers and related definitions, as well as important theorems that will be useful throughout the course. A review of the definitions of relations and functions.
3 Sept 6 - 10	**Functions and Equivalence Relations** No Class Monday Some specific properties of functions, and a review of equivalence relations and classes.
4 Sept 13 - 17	**Modular Arithmetic and a Linear Algebra Review** An overview of modular arithmetic, and the "best of" linear algebra to warm up for what's next.
5 Sept 20 - 24	**Introduction to Groups** The definition of a group, basic properties, and some examples.
6 Sept 27 - Oct 1	**More Group Properties** The cyclic and dihedral groups, order, and Cayley tables.
7 Oct 4 - 8	**Group Property Wrap Up and Review** MIDTERM EXAM I A few more group properties and the first midterm exam.
8 Oct 11 - 15	**Subgroups** No Class Friday Definition of a subgroup and some important examples.
9 Oct 18 - 22	**Centers and Cyclic Groups** Centers, centralizers, generators, and abstract cyclic groups.
10 Oct 25 - 29	**The Symmetric Group** Representing permutations, composition, and properties of the symmetric and alternating groups.
11 Nov 1 - 5	**Maps Between Groups** Group homomorphisms and isomorphisms and their properties.
12 Nov 8 - 12	**Cosets and Products** Group cosets, Lagrange's theorem, direct products, and normal subgroups.
13 Nov 15 - 19	**Finite Group Theory** MIDTERM EXAM II Some important theorems on finite groups and a review for the second midterm exam.
14 Nov 22 - 26	**Introduction to Rings** No Class Wednesday or Friday The definition of a ring and their properties.
15 Nov 29 - Dec 3	**More on Rings** More ring properties, integral domains, ideals, and factor rings.
16 Dec 6 - 10	**Ring Homomorphisms** No Class Friday Ring homomorphisms and a review for midterm III.
✱✱✱ Dec 6 - 10	**Final Exam Week** MIDTERM EXAM III The final midterm exam will be given during the final exam time: Wednesday, December 15, 8-10 am

University Resources and Policies

ADA and Learning Differences

Mercyhurst University is committed to making reasonable accommodations for qualified students, and employees with disabilities as required by law. Please refer to the HUB

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Services tab, then ADA Accommodations from the dropdown for instructions to request an accommodation. You may also contact Susan Reddinger, ADA Coordinator, ADA@mercyhurst.edu, 814-824-2362, Egan Hall 200. For students with questions about Academic Support, please refer to the HUB

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Academic Resources tab, then Academic Support for more information.

Title IX Information

Mercyhurst is committed to providing an environment free from sex discrimination, including sexual harassment and sexual violence. Please refer to the HUB:

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Resources tab, then Title IX – Sexual Respect from the dropdown for more information. If you would like to file a sexual misconduct complaint, please contact Ann Miller, Title IX Coordinator and Compliance Officer, titleix@mercyhurst.edu, 814-824-2363. Please be aware that in compliance with Title IX, educators must report incidents of sexual assault/harassment, stalking, and domestic/dating violence. If you disclose any of these situations in class, in papers, or to me personally, I am required to report it to the Title IX Coordinator (or any of the Deputy Title IX Coordinators).

Course Evaluations

Near the end of the semester, you will be asked to complete an online course evaluation. The evaluation will be completed in class during the last two weeks of the semester using any laptop, tablet, or mobile device. The response tool allows you to note aspects of the course that helped you learn, as well as aspects that might be modified to help future students learn more effectively. You will receive an email letting you know when the evaluation window for our class is open. Please note that these course evaluations are anonymous and instructors do not see the results until after the grades for the course are submitted.

Covid

Masks
University policy requires all individuals to wear face coverings while indoors on campus. Masks are not required while sitting alone at your office desk or while eating.

Food and Drink in the Classroom
In light of the COVID-19 situation, eating is not permitted in classrooms, labs, or other academic spaces. A water bottle or cup with a lid (and preferably a straw) is permitted to be used in classrooms and labs to help prevent a student from becoming dehydrated. Masks should be pulled only slightly away from the bottom of the face to take a quick drink and immediately replaced to cover the mouth and nose.