MATH 281 Modern Algebra II
Spring 2016 · Syllabus

Class Information

Instructor: Dr. Lauren Williams
Class Meeting: MWF 10:30 - 11:35, Hirt 209
Office: Old Main 404 (Tower)
Office Phone: (814) 824-2226
Office Hours: Mon 2:15 - 3:30, Tues 11:45 - 1, Wed 2:15 - 3:30, Thur 11:30 - 2
Email: lwilliams2@mercyhurst.edu
Website: `http://math.mercyhurst.edu/~lwilliams`

Course Description

This is the second semester of a year long sequence on the study of algebraic structures. Course topics include rings, fields, an introduction to Galois theory, symmetry, the Sylow theorems, and finite simple groups.

Course Objectives

On successful completion of the course, students should 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.

Textbook

Contemporary Abstract Algebra, by Joseph Gallian, 8th Edition (older editions are fine too). No other supplies are required for the course.

Homework

Homework assignments will be given regularly, and will include three types of problems.

1. Submit: Several problems will be marked with an 'S'. You will be required to submit your solution to all of these problems for grading. Work must be submitted within one week of the assignment date. Solutions to these problems will be posted after the due date.
2. Practice: Other problems will be marked with a 'P'. These are practice problems that you do not need to turn in, but please be aware that these problems could appear on a midterm or final exam, so be sure to give them a try. Solutions to these problems will generally not be posted, but I'm happy to check your work.
3. Challenge: Additional problems will be marked with a 'C'. You are *not* expected to work on all of these problems on your own. However, over the course of the semester, you will be required to choose two of these problems submit a neatly written solution that will be distributed to the class. After you submit your solution, you'll receive a grade and suggestions for improvement, if any. You'll have an opportunity to resubmit the problem for up to 50% of the lost points back (so if your first attempt earned 6/10, a corrected attempt would earn a final grade of 8/10). Only correct, legible solutions will be given to the rest of the class. You will receive 10% extra credit if you type your solution using LaTeX. Only one student can submit a solution for a particular problem. If one appeals to you, notify me by email, and I'll confirm if you've claimed it.

The First Biennial Math 281 Conference

The moderator of the Special Session on Modern Algebra would like to invite you to speak at the first biennial Math 281 Conference, scheduled for April 25 - May 6. The special session will be located in the scenic Hirt 209 conference room. Food, lodging, and travel expenses will not be provided. This session will be open to the public and advertised on the course website.

Call for Abstracts
Participation in the conference requires submission of an abstract. This is a one to two paragraph overview of your chosen topic, and must be approved by the moderator. Your abstract should also include a list of at least two peer-reviewed sources (textbooks and accepted journal articles - *not* websites). Abstracts must be submitted by Friday, April 8th. If you are required to revise and resubmit your abstract, the final version must be submitted by Friday, April 15th. A list of suggested topics will be provided, though you are free to choose any topic of interest to you that is related to modern algebra. Your abstract **must be typed and emailed to me** by the deadline, so they can be compiled into a conference program. Talks will be scheduled according to the topic chosen after all abstracts have been submitted and accepted. If there are any dates you would not be available, or you would strongly prefer to speak, please include these requests with your abstract submission.

Talks
You will have 20 minutes allotted for your talk. This time includes set up (getting slides ready on the projector, distributing handouts, etc) and time for questions from the conference attendees. Your actual talk should be about 15 minutes. Extra materials (such as slides, posters, and handouts) should be used when appropriate. Your talk should include a list of peer-reviewed sources used, and suggestions for further reading.

Feedback and Awards
All conference attendees will have an opportunity to provide feedback on your talk; a sample comment form is included in this syllabus. Attendees will also score your talk, though these scores will remain confidential and will not be revealed to the speaker. The speaker with the highest total score will receive a small algebra themed prize. The runner up will receive an even smaller topology themed prize. Comments and scores will not influence your conference grade.

Grading
Submission of the abstract, including any required revisions and sources, will be worth 10 points. The remaining 90 points of the conference grade will be tallied according to the rubric (included in this syllabus), but will be dependent on a "difficulty factor". This factor will be a value between 0 and 1 that reflects how challenging it will be to understand and present the topic you've chosen. Some example outcomes are shown below:

Student	A	B	C
Topic	A Proof of the Quadratic Formula	The Poincare Conjecture	The Four Color Theorem
Abstract	10	6	10
Difficulty Factor	0.2	1	0.9
Talk	80	50	90
Grade	$10 + 0.2 \times 80 = 26$	$6 + 1 \times 50 = 56$	$10 + 0.9 \times 90 = 91$

Your project will be assigned a difficulty factor after your abstract is submitted. You'll have an opportunity to alter your topic (and resubmit your abstract) if you'd like to increase this value.

Exams

We will have a midterm and a final exam. These will both be taken in class, and will be cumulative *and may include material from Math 280*.

Exam Dates:

Midterm Exam: Friday, March 18th
Final Exam: Wednesday, May 18th, 10:30-12:30

Final Grades

Grades will be calculated as follows:

30% - Average of graded homework problems
10% - Average of challenge problem grades
20% - Conference grade
20% - Midterm Exam
20% - Final Exam

Grading scale:

F	D	D+	C	C+	B	B+	A
0-59	60-64	65-69	70-77	78-83	84-89	90-93	94-100

Support of the Mercy Mission

This course supports the mission of Mercyhurst University by creating students who are intellectually creative. Students will foster this creativity by: applying critical thinking and qualitative reasoning techniques to new disciplines; developing, analyzing, and synthesizing scientific ideas; and engaging in innovative problem solving strategies.

Learning Differences

In keeping with college policy, any student with a disability who needs academic accommodations must call Learning Differences Program secretary at 824-3017, to arrange a confidential appointment with the director of the Learning Differences Program during the first week of classes.

Math 281 Modern Algebra Course Schedule - Spring 2016

Monday	Wednesday	Friday
Feb 1	*Feb 3*	*Feb 5*
No Class	Intro / Rings	Rings
Feb 8	*Feb 10*	*Feb 12*
Polynomial Rings	Divisibility	Divisibility
Feb 15	*Feb 17*	*Feb 19*
Factorization	Factorization	Factorization
Feb 22	*Feb 24*	*Feb 26*
Sylow Theorems	Sylow Theorems	Sylow Theorems
Feb 29	*Mar 2*	*Mar 4*
Finite Simple Groups	Finite Simple Groups	Finite Simple Groups
Mar 7	*Mar 9*	*Mar 11*
Extension Fields	Algebraic Extensions	Galois Theory
Mar 14	*Mar 16*	*Mar 18*
Galois Theory	Review	Midterm
Mar 21	*Mar 23*	*Mar 25*
No Class	No Class	No Class
Mar 28	*Mar 30*	*Apr 1*
No Class	Symmetry Groups	Symmetry Groups
Apr 4	*Apr 6*	*Apr 8*
Symmetry Groups	Symmetry Groups	Wallpaper Group Hunt
Apr 11	*Apr 13*	*Apr 15*
Symmetry	Symmetry	Duality
Apr 18	*Apr 20*	*Apr 22*
Knots and Braids	Knots and Braids	No Class
Apr 25	*Apr 27*	*Apr 29*
Rep Theory Overview	Representation Theory	Representation Theory
May 2	*May 4*	*May 6*
Representation Theory	Conference (3)	Conference (3)
May 9	*May 11*	*May 13*
Conference (3)	Conference (2) / Closing	Review
May 16	*May 18*	
No Class	*Final Exam 10:30-12:30*	

MATH 281 Special Session on Modern Algebra

Spring 2016 · Comment Form

Speaker:

Title of talk:

Were there any facts you were surprised to learn in this talk?

Has this talk inspired you to be further interested in the topic? What else would you like to know about this topic, if anything?

Do you have any additional comments for the speaker?

Please rate the speaker using an element of the group $U(5)$, where the identity is the lowest possible rating.

MATH 281 Special Session on Modern Algebra

Spring 2016 · Rubric for Conference Grade

Abstract: _____ / 10

The abstract must be typed and emailed by the due date, and include two peer reviewed sources that will be cited within the presentation. Full credit for the abstract will still be given if a revision is submitted by the revision deadline.

Topic Difficulty Factor: _____ / 1

The difficulty level of the presentation will be determined by the abstract. The presentation grade will be calculated by the rubric below, and multiplied by this difficulty factor to calculate the final conference grade.

Presentation Grade: _____ / 90

Organization and Explanation: _____ / 20

The focus of the presentation should be clearly explained to the audience. The presentation should be well organized and follow a logical sequence. Any required background (definitions, lemmas, etc) is presented before it is needed. The presentation should be appropriate for the intended audience. Any difficult material should be explained so that the audience is able to follow the overall theme of the presentation, and the material should be challenging enough to keep the audience interested.

Understanding of Topic: _____ / 30

The speaker should demonstrate a clear understanding of their chosen topic and its significance. The speaker should use mathematical terms and notation correctly, and skillfully handle questions from the audience (within reason).

Connection to Modern Algebra: _____ / 10

The presentation should include an explanation of how the topic relates to modern algebra, including the significance of the topic and its historical context. If applicable, the presentation should include some mention of how the topic involves other areas of mathematics.

Use of Time: _____ / 5

The presentation should last for approximately 20 minutes, leaving at least 5 minutes for audience questions. Time during the presentation should be utilized well.

Use of Board, Slides, Handouts, Props, etc: _____ / 15

Where appropriate, visual aids and handouts to help clarify the presentation should be available and easy to refer to during the presentation. The speaker should choose the best medium (board, slides, overheards, etc) to present their research.

Use of Sources / Mention of Sources for Further Research: _____ / 10

At least two peer reviewed sources were referenced in the presentation. Suggestions on how the audience can study the topic further should be included; this can simply be a list of additional sources provided at the end of the presentation.

Grade: $\underline{\text{Abstract Grade}} + (\underline{\text{Presentation Grade}} \times \underline{\text{Difficulty Factor}}) =$ _____ /100