Math 361: Abstract Algebra

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Office Hours Mon. noon – 1:30 pm, Tues. 11:30 am - 1 pm, Wed. noon - 1:30 pm, or by appointment. (A good time to ask for an appointment is Thurs. noon - 1 pm.) You can come to office hours on Zoom (use my ID above) or come by my office in person. If you come in person you must wear a mask over your nose and mouth!

Course Description This course is an introduction to modern abstract algebra which focuses primarily on groups, rings, and fields. We will see many examples of these both familiar and unfamiliar, and learn how to generalize our ideas of addition, multiplication, and division to new settings. Along the way, students will practice creating, analyzing, and communicating logically reasoned arguments.

Learning Outcomes By the end of this course, successful students will be able to:

- Construct a valid proof that proceeds efficiently from hypotheses to conclusion
- Use basic definitions and properties of groups and rings
- Investigate basic properties in a wide range of algebraic examples
- Effectively communicate mathematical results both in writing and in presentations

Course Materials *Contemporary Abstract Algebra*, Joseph Gallian, 9th Edition

Important Dates We will have three take-home tests, the third of which replaces a final exam. Their due dates are listed below.

Test 1	**Tuesday 10/4, by 1:10 pm**
Test 2	**Tuesday 11/8, by 1:10 pm**
Test 3	**Monday 12/12, by 5 pm**

Course Grades The final course grade is determined in the following way:

Vocabulary/Co-Curricular Activities	**10%**
Written Homework	**35%**
Presentations/Participation	**22%**
Tests (11% each)	**33%**

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below.

		B+	87-89	C+	77-79	D+	67-69			
A	93-100	B	83-86	C	73-76	D	63-66	F	0-59	
A-	90-92	B-	80-82	C-	70-72	D-	60-62			

Course Format This class will be split between short intro lectures, in class work time, and student presentations. Each section of the course will follow the same week-long cycle. On Tuesday, we will start class with student presentations over the previous week's chapter(s) and then spend the rest of the class on an intro to that week's chapter(s). On Thursday, we will spend class working on the material from that week's chapter(s). Homework will be due at the start of the next Tuesday's class.

Vocabulary We will have a short weekly vocabulary quiz at the start of class Thursday where you will be asked to complete basic definitions and theorems. These quizzes are to help you stay caught up on new vocabulary and important ideas, since it is impossible to understand what is happening in class or write good proofs if you are not clear on the definitions of the words being used or the theorems being cited. I will post new vocabulary words from each week's material on Inquire. No make up quizzes will be given, but at the end of the semester I will drop your lowest quiz score.

Co-Curricular Activities The MCSP department and Roanoke College offer many opportunities to engage with mathematical ideas outside of classes. Members of this class are encouraged to attend many of these activities, however attending at least three is mandatory. Examples include MCSP Conversation Series talks and student research showcases - if you're unsure if a given activity makes sense for this purpose, please email me to ask. Within one week of attendance you must submit a brief response to the activity. Each response will count as one vocabulary quiz grade.

Written Homework There will be a written homework set due at the end of every weekly cycle, aka at the start of class Tuesday. Submit your homework as a PDF or Word file using the links on our Inquire page or hand it in on paper at the start of class. **No late homework will be accepted.** I encourage you to work with your classmates on the mathematics of these assignments, but you must write up your solution independently. (This means you should not look at anyone else's write-up or let anyone else but me see yours.) You may not work on homework with anyone besides me and your classmates. These assignments are open book and open notes, but you must get permission from me before you use any other outside resources to work on homework problems.

Presentations On Tuesdays, students will present solutions to problems from the previous week's chapter(s). I will assign groups and problems as part of the intro to each week's material. These presentations are graded on participation, and my expectations are: that you go to the board having thought seriously about the problem beforehand, be able to talk clearly about the ideas being discussed, and either solve the problem yourself or facilitate a class discussion to solve it. This means even if you are not at the board you can participate by helping your classmates if they get stuck. I expect that each of you will present roughly 6 times throughout the semester.

Participation

As we work through the course material, I expect you to come to class prepared and willing to contribute to our progress. There will be many ways to do this, including: working on problems during class time, supporting your peers during their presentations, joining class discussions, and asking good questions.

Attendance Policy

Class attendance is expected. However, if you have a temperature of 100.4 or higher or other coronavirus symptoms, don't come to class. Call Health Services IMMEDIATELY. Do not come to class or go to any public area on campus. In order for your absence to be excused, you must give Health Services permission to notify me that you have consulted them about coronavirus symptoms. All absences caused by consultation with Health Services about coronavirus symptoms will be excused. **If your absence is not coronavirus related and you have not discussed it with me beforehand, you will be unable to make up any work missed and it will negatively impact your participation score. Whatever the reason, if you have to miss class, you are responsible for learning all material covered that day.** If Health Services informs you that you should isolate and not attend class for multiple days or weeks, inform me so that we can make a plan to keep you current in the course. All absences caused by isolation ordered by Health Services will be excused.

Mask Policy

Unless the college changes its policy, face coverings/masks are no longer required. However, anyone is welcome to wear a mask for some or all of the semester, and anyone who feels sick is highly encouraged to wear a mask.

Special Needs

If you have a disability that may require an accommodation in this course, please provide me with your documentation within the first 2 weeks of the semester. I must have your documentation at least 48 hours prior to any accommodation made. (Check with the Center for Teaching and Learning for their scheduling guidelines.)

Expected Work Policy This course expects you to spend at least 12 hours of work each week inside and outside of class.

Academic Integrity I expect all of you to follow the Academic Integrity policies of Roanoke College. All graded work should be your own work! If you ever have questions about how these policies apply to our class please contact me. Any violations of these policies will automatically be turned over to the Academic Integrity Council.

Pandemic Planning If college policies change due to the pandemic, I will distribute an updated syllabus. I will email you our new plan and post details on Inquire. You should email me with any questions or challenges that arise.

Course Schedule The following schedule is approximate and subject to change, but it should give you some idea of the timing of the topics covered and assignments.

Dates	Topic	Notes
9/1 - 9/6	Chapter 0: Preliminaries	
9/6 - 9/13	Chapter 1 / Chapter 2: Groups	
9/13 - 9/20	Chapter 3: Finite Groups	
9/20 - 9/27	Chapter 4: Cyclic Groups	
9/27 - 10/4	Chapter 5: Permutation Groups	**Test 1 assigned 9/27**
10/4 - 10/11	Chapter 6: Isomorphisms	**Test 1 due 10/4**
10/11 - 10/13, 10/25	Chapter 7: Cosets, Lagrange's Theorem	
	Fall Break	
10/25 - 11/1	Chapter 8: External Direct Products	
11/1 - 11/8	Chapter 9: Normal Subgroups, Factor Groups	**Test 2 assigned 11/1**
11/8 - 11/15	Chapter 10: Group Homomorphisms	**Test 2 due 11/8**
11/15 - 11/22	Chapter 12: Rings / Chapter 13: Integral Domains	
	Thanksgiving Break	
11/29 - 12/6	Chapter 14: Ideals, Factor Rings	
12/6 - 12/12	Chapter 15: Ring Homomorphisms	**Test 3 assigned 12/6**
Mon 12/12	**2 pm: Chapter 15 Presentations**	**Test 3 due by 5 pm**