MA361 – Abstract Algebra II **Spring 2021**
MWF 11:00 a.m.–11:50 a.m. (via Zoom, meeting ID 920 1162 7592)

Instructor: Steven Jackson
Office hours: MWF 10:00 a.m.–10:50 a.m., (via Zoom, meeting ID 920 1162 7592)
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Course Description

Math 361 is a continuation of Math 360. We will study the basic structures of modern algebra (groups, rings, and fields) in greater depth, culminating with the systematic study of symmetry groups of extension fields and its implications for solvability of polynomial equations by radicals (Galois theory).

Prerequisites

Admission to the course is contingent upon successful completion of MA360.

Class meetings and office hours

Class meetings and office hours will be held virtually by Zoom at meeting ID 920 1162 7592; you may also access this meeting via

https://umassboston.zoom.us/j/92011627592

The passcode for this meeting has been e-mailed to all registered students at their UMB e-mail addresses. To ease review and study, our class meetings will be recorded, and the video posted on Blackboard, here:

https://umb.umassonline.net/webapps/blackboard/content/listContentEditable.jsp?content_id=_1326069_1&course_id=_22123_1&content_id=_1326409_1

These videos are accessible only to registered students, and only until the end of the semester. They are for your personal use only; circulating them in any other forum would be a violation of intellectual property law, and of your classmates' privacy.

It may also be necessary to post certain supplementary videos on the Blackboard page; these may contain examinable course content, and it is your responsibility to view them in a timely manner.

Course wiki

This course makes use of a wiki, similar to Wikipedia, to disseminate homework assignments and to ease communication among students. The course wiki page can be found here:

http://cartan.math.umb.edu/wiki/index.php/Math_361,_Spring_2021

Any registered student can edit this page or any of its sub-pages. You might find this useful for collaborative note-taking, or to ask one another questions about homework problems. The wiki supports LaTeX, so it is relatively painless to write mathematical symbols and formulas.

To edit, you will first need to sign in. Your username is your UMB e-mail address. On first login, use the password reset link, and a random password will be e-mailed to you. After using this, you may change the password to something of your own choosing.

Text

There is one required text for the course: *A First Course in Abstract Algebra*, Seventh Edition, by John Fraleigh.

Grading

Course grades are based on weekly quizzes (20%), two in-class tests (20% each), and a cumulative final exam (40%).

Reading and class preparation

There is a reading assignment associated with each class period. Although it is not generally possible to discuss every topic in class, students are responsible for the entire content of the reading assignment. *Test and exam questions may cover reading material not discussed explicitly in class.* Consequently it is very important to complete the reading assignments on time and to come to class prepared with questions.

Make-up tests

Tests may be rescheduled only in cases of serious illness, bereavement, or other circumstances of similar gravity. Whenever possible, arrangements for make-up tests must be made *in advance* of the regularly scheduled testing time.

Accomodations for students with disabilities

Section 504 of the Americans with Disabilities Act of 1990 offers guidelines for curriculum modifications and adaptations for students with documented disabilities. If applicable, students may obtain adaptation recommendations from

the Ross Center for Disability Services, CC-UL-211, (617-287-7430). The student must present these recommendations and discuss them with each professor within a reasonable period, preferably by the end of the Drop/Add period.

Student conduct

Students are required to adhere to the University Policy on Academic Standards and Cheating, to the University Statement on Plagiarism and the Documentation of Written Work, and to the Code of Student Conduct. The Code is available online at the following web site:

https://www.umb.edu/editor_uploads/images/life_on_campus/Code_of_Conduct_5-14-14.pdf

Please pay particular attention to Section XII, paragraphs 1 and 5. In this course, you will be permitted to use a short note sheet during exams, provided that you have prepared the sheet yourself. Your exam responses may quote your lecture notes or the course textbook without attribution, but material taken from any other source must be properly attributed to its author. In addition, the use of electronic devices during exams, except as described in the following section, is *expressly prohibited*. **Your exam responses must be your own work; you may not make use of any outside website, or accept assistance from any person, in connection with the exams.** Violation of these policies will result in disciplinary action.

Procedures and equipment required for remote examinations

Exams in this course will be administered using the Honorlock remote proctoring system. To take the exams, students must have access to a laptop or desktop computer capable of running the Chrome browser, which has a working camera and microphone. If you cannot easily access such a device, you may borrow a Chromebook from the University; see https://www.umb.edu/coronavirus/for_students for more information. **It is each student's responsibility to secure access to such a device in time for each exam. Do not wait until the week of the first exam to think about this.**

During the exams, you will be required to activate your webcam, and to position it so that your face is visible and the camera provides a good general view of your work area. You will also be required to present either your UMB photo ID, or a government-issued photo ID such as a driver's license or passport. The video feed from your exam session will be recorded, but will be used only to ensure the academic integrity of the exam, and will never be made public.

In addition, you must have access to a device capable of scanning or photographing work that you have handwritten on paper, saving it in a common image format (such as jpg or png), and uploading it to Blackboard or Gradescope. Many students use phones for this purpose, but please note that **during exams, phones may be used *only* to photograph and upload written**

work, and not for any other purpose, and phone use may be subject to additional restrictions as designated by the instructor.

To further ensure the academic integrity of the exams, your instructor reserves the right to require a brief "post-exam interview," during which you may be asked to explain the reasoning behind your exam responses. If you are unable to explain your responses, this may be regarded as evidence of academic dishonesty.

Appropriate attire

When joining any class-related event for which your camera will be switched on (such as an exam), please be sure to dress and present yourself as you would if the event were being held in person in a public area. Your instructor has both the right and the responsibility to exclude you from any such event if you do not present yourself appropriately.

Travel during the final exam period

This course has a final exam during the period **May 17–21, 2021.** The exact time of the final is determined by the Registrar's Office, and will be posted on WISER around the middle of the semester. Students must not make travel arrangements which might conflict with their responsibility to take the final exam at the appointed time. In particular, **a purchased airline ticket does not constitute a valid excuse to miss the final, and no makeup exam will be granted under these circumstances.**

Conflict finals

University policy specifies that any student who has two final exams scheduled at the same time, or who has three or more final exams scheduled on the same day, is eligible to reschedule one of the exams. Under these circumstances, students who wish to reschedule their final exam in this class must notify the instructor in writing **no later than May 12, 2021.** You must include your name and your student ID number in this notification. Department staff will then verify your eligibility to reschedule, and assign you to an alternate testing time if appropriate.

Web page

This syllabus and other course materials are available on-line at

http://cartan.math.umb.edu/wiki/index.php/Math_361,_Spring_2021

Schedule of topics

Week 1: Introduction. Group homomorphisms.

Week 2: The fundamental theorem of homomorphisms. Quotient group computations.

Week 3: Rings and fields. Integral domains.

Week 4: Direct products and the Chinese Remainder Theorem. Theorems of Fermat and Euler.

Week 5: RSA encryption. Ring homomorphisms and ideals.

Week 6: First midterm (Monday, March 1; covers assignments 1–4). Field of fractions of an integral domain.

Week 7: Rings of polynomials. Factorization of polynomials over a field.

Week 8: Prime ideals and maximal ideals. Extension fields.

Week 9: Vector spaces. Algebraic extensions.

Week 10: Unique factorization domains. Euclidean domains.

Week 11: Second midterm (Monday, April 12; covers assignments 5–9). Gaussian integers and multiplicative norms.

Week 12: Splitting field of a polynomial. Uniqueness of the splitting field.

Week 13: Finite fields. Irreducible polynomials and the Sieve of Eratosthenes.

Week 14: Euclidean construction.

Week 15: The Galois group and the Galois correspondence.