

Math 410

Fundamental Concepts of Modern Algebra

4.0 Units
Spring 2016
MWF 1:00-1:50pm

Location: KAP 167

Instructor: Sami Assaf

Office: KAP 438-C

Office Hrs: M 11am-12pm and W 10am-11am

Contact: shassaf@usc.edu

Teaching Assistant: tbd

Office: tbd

Office Hours: tbd

Contact: tbd

Course Description

This course covers the fundamental concepts of algebraic structures, including groups, rings and fields. We will use abstract and axiomatic methods to generalize the concept of numbers and arithmetic operations on numbers such as addition and multiplication.

Learning Objectives

Modern algebra employs many techniques in its derivations and proofs. Students will learn a vast collection of tools that can be applied to many areas of mathematics and will develop intuition to help them determine which tool is most fitting for the problem at hand.

Prerequisite(s): Math 225

Recommended Preparation: One 400-level mathematics course

Course Notes

Homework assignments will be posted weekly to Blackboard.

Required Readings and Supplementary Materials

Required: *Algebra*, Third Edition by Saunders MacLane and Garrett Birkhoff (ISBN: 9780821816462)

Description and Assessment of Assignments

Students are expected to complete weekly problem sets containing a combination of computational and theoretical problems. There will be two in-class midterm exams, on February 24 and April 6, and a final exam on May 4 from 2pm-4pm.

Grading Breakdown

Assignment	Points	% of Grade
Problem Sets	120	50%
Midterm I	30	12.5%
Midterm II	30	12.5%
Final Exam	60	25%
TOTAL	240	100%

Assignment Submission Policy

Problem sets will be posted on Blackboard by noon on Monday and are due in class the following Friday. Late homework will not be accepted without prior permission from the instructor.

Course Schedule: A Weekly Breakdown

	Topics	Readings	Deliverable (Due Date)
Week 1	Sets and relations	I.1–I.3	Problem Set 1 (1/15)
Week 2	Addition and multiplication	I.4–I.7	Problem Set 2 (1/22)
Week 3	Equivalence relations	I.8–I.10	Problem Set 3 (1/29)
Week 4	Group and subgroups	II.1–II.4	Problem Set 4 (2/05)
Week 5	Symmetric groups	II.5–II.7	Problem Set 5 (2/12)
Week 6	Cosets and quotients	II.8–II.10	Problem Set 6 (2/19)
Week 7	Rings	III.1	Midterm Exam I (2/24)
Week 8	Quotient rings and fields	III.2–III.4	Problem Set 7 (3/04)
Week 9	Polynomials	III.5–III.8	Problem Set 8 (3/11)
Week 10	Unique factorization	III.9–III.12	Problem Set 9 (3/25)
Week 11	Finite abelian groups	XI.1–XI.3	Problem Set 10 (4/01)
Week 12	Isomorphism theorems	XII.1	Midterm Exam II (4/06)
Week 13	Conjugacy classes	XII.2–XII.5	Problem Set 11 (4/15)
Week 14	Solvable groups	XII.6–XII.9	Problem Set 12 (4/22)
Week 15	Review		
Final			Final Exam (5/04)

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism presenting someone else's ideas as your own, either verbatim or recast in your own words is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* [https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-](https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate) Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This is important for the safety of the whole USC community. Another member of the university community such as a friend, classmate, advisor, or faculty member can help initiate the report, or can initiate the report on behalf of another person. The *Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The *Office of Disability Services and Programs* http://sait.usc.edu/academic-support/center-programs/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.