

ALGEBRA I - MATH 5590H AND 5111

Instructor. Sachin Gautam. Office MW 640. gautam.42@osu.edu

COURSE INFORMATION

Homepage. <https://people.math.osu.edu/gautam.42/A22/algebra.html>

Class time and place. 11.30AM-12.25PM. MWF: Baker Systems 394. TR: Enarson Classroom Bldg 258.

Office hours. Thursdays 10-11.15AM. Fridays 3-4PM.

Textbook. D.S. Dummit and R.M. Foote, *Abstract Algebra*, 3rd edition.

Contents. This course will cover the basic theory of groups and rings: Chapters 1–9 and some material from Chapters 12, 15 and 16.

Grading. (see next page for precise dates of quizzes, exams and homeworks)

- *Homework* 15%. Homework will be assigned (almost) each week from the textbook. I will suggest a list of problems for practice and specify 4-6 problems from the list, whose solutions you will have to submit for grading.
- *Quizzes* 10%. There will be 6 short quizzes during the semester.
- *Midterms* 45%. We will have three in-class midterm exams, each worth 15% of your final grade.
- *Final exam* 30%.

GENERAL POLICIES

Academic Misconduct. It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Disability Services. Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>

COURSE SCHEDULE

The following schedule is tentative only. You will be notified of any changes by email, or in class. The most recent version of this syllabus will remain available at <https://people.math.osu.edu/gautam.42/A22/syllabus.pdf>

Week	Topics	Sections	HW/Quiz
1 8/23-26	Definition of a group. Examples. Subgroups, order, generators. Cyclic groups. Free groups.	1.1–1.5, 6.3 2.1,2,3,2.4	HW 1 due on 9/2
2 8/29-9/2	Cosets, index, normal subgroups, quotient groups. Group homs. Isomorphism thm. Presentation.	1.6, 3.1–3.3 2.5	HW2 due on 9/9 Q1 on 9/2
September 5 - Labor day, no class			
3 9/5-9	Group actions. Orbits and stabilizers. Counting lemmas. Examples and applications.	1.7, 2.2, 4.1–4.3	HW3 due on 9/16 Q2 on 9/9
4 9/12-16	Sylow theorems - applications. Simple groups.	3.5, 4.5, 5.3, 6.1	No homework No quiz
Mid term 1 on Tuesday 9/20			
5 9/19-23	Review. Structure theorem of finite abelian groups.	5.1, 5.2	HW4 due on 9/30
6 9/26-30	Semidirect products. Automorphisms of abelian groups	4.4 5.3–5.5	HW5 due on 10/7 Q3 on 9/30
7 10/3-7	Commutator subgroups. Solvable/nilpotent groups. Simple groups.	3.4, 4.6 6.1, 6.2	Q4 on 10/7
8 10/10-14	Problem session/review. Introduction to rings.	7.1	No homework No quiz
Mid term 2 on Tuesday 10/11			
Autumn break - Oct. 13, 14. No classes.			
9 10/17-21	Rings: definitions. Ideals and ring homomorphisms. Isomorphism theorems. Integral domains. Characteristic.	7.1–7.4	HW6 due on 10/28
10 10/24-28	Prime and maximal ideals. Chinese remainder thm. Rings of fractions. Local rings.	7.4–7.6 15.4	HW7 due on 11/4 Q5 on 10/28
11 10/31-11/4	Euclidean, Principal ideal and Unique factorization domains. Quadratic rings of integers	8.1–8.3	HW8 due on 11/10 Thursday
12 11/7-11	Gauss' lemma. Eisenstein criterion of irreducibility. Polynomial rings. Noetherian rings.	9.1–9.4 15.1, 15.2	HW9 due on 11/18 Q6 on 11/10
November 11 - Veteran's day, no class			
13 11/14-18	Hilbert basis theorem. Groebner basis. Primary decomposition theorem.	9.4-9.6	HW10 due on 12/2
14 11/21-25	Review.		
Mid term 3 on Tuesday November 22			
November 23-25, Thanksgiving break, no class			
15 11/28-12/2	Modules. Homomorphisms. Modules over PID.	10.1, 10.2 12.1	
16 12/5-7	Review		
Final exam: Thursday 12/15. 10-11.45AM.			