

## MATH 330 ABSTRACT ALGEBRA

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Welcome to Math 330! This course is an introduction to Abstract Algebra. Abstract Algebra is one of the main pillars of modern mathematics. In this course we will explore the basic objects of algebra such as groups, rings and fields.

**Course webpage:** <http://www.math.uic.edu/~coskun/math330.html>

**Venue:** AH 307

**Office hours:** M 12-1, W 9-11 and by appointment.

**Text:** J. Gillian, Contemporary Abstract Algebra, Sixth Edition Houghton Mifflin Company, Boston 2006.

**Prerequisites:** A grade of C or better in Math 215. I will assume that you are comfortable with writing rigorous proofs.

**Requirements:** There will be weekly homework, two mid-terms and a final. The midterms and the homework will count for 20 % of your grade each. The final exam will account for 40 % of your grade. The homeworks will be due Wednesdays in the beginning of class. No late homework will be accepted. You may collaborate on the homework problems, but you must write your own solutions and properly acknowledge any help you receive from others.

**Topics:** The following is a tentative list of topics that will be covered in the course. Please read the suggested pages in the text book before class.

Aug 27	Integers	p. 3-14
Aug 29	Equivalence relations	p. 14-27
Aug 31	Symmetries	p. 31-39
Sep 3	No class: Labor Day	
Sep 5	Groups	p. 42-50
Sep 7	Elementary properties of groups	p. 50-55
Sep 10	Subgroups	p. 59-63
Sep 12	Center and Centralizer	p. 63-70
Sep 14	Cyclic groups	p. 73-78
Sep 17	Fundamental theorem of cyclic groups	p. 78-85
Sep 19	Permutation groups	p. 94-99
Sep 21	Properties of permutations	p. 99-105
Sep 24	Alternating group	p. 105-116

Sep 26	Isomorphisms	p. 120-126
Sep 28	Properties of isomorphisms	p. 126-128
Oct 1	Automorphisms	p. 128-134
Oct 3	Cosets	p. 137-140
Oct 5	Mid-term 1	
Oct 8	Lagrange's theorem	p. 140-143
Oct 10	Applications	p. 143-149
Oct 12	External direct products	p. 153-157
Oct 15	Applications	p. 157-165
Oct 17	Normal subgroups	p. 177-184
Oct 19	Internal direct product	p. 184-190
Oct 22	Group homomorphisms	p. 199-205
Oct 24	Isomorphism theorems	p. 205-213
Oct 26	Abelian groups	p. 217-227
Oct 29	Rings	p. 235-243
Oct 31	Integral domains	p. 248-252
Nov 2	Midterm 2	
Nov 5	Characteristic of a ring	p. 252-257
Nov 7	Ideals	p. 261-265
Nov 9	Factor rings	p. 265-271
Nov 12	Ring homomorphisms	p. 278-284
Nov 14	Field of quotients	p. 284-290
Nov 16	Polynomial rings	p. 291-296
Nov 19	PIDs	p. 297- 301
Nov 21	Factorization of polynomials	p. 303-313
Nov 23	Happy Thanksgiving	
Nov 26	UFDs	p. 320-333
Nov 28	Fields	p. 343-348
Nov 30	Field extensions	p. 352-365
Dec 3	Finite fields	p. 369-377
Dec 5	Finite fields	p. 381-388
Dec 7	Review	