MATH 335 Modern Algebra Spring 2006

Meeting times: MWF 9:10–10:00

Prerequisites: MATH 301 (Exploration & Proof) and MATH 325 (Linear Algebra) with grade C or better, or consent of the instructor

Instructor: Matthias Beck (TH 933, (415) 405-3473, `beck@math.sfsu.edu`)

Course Objectives: Algebra studies the structure of sets with operations, such as integers with addition and multiplication, or vector spaces with linear maps. The abstract point of view, based on an axiomatic approach, reveals many deep ideas behind seemingly innocent structures—such as the arithmetic of counting numbers—and serves as an elegant organizing tool for the vast universe of modern algebra. Generations of brilliant minds have crystallized these ideas in the ideas in the concept of groups, rings, fields, modules, and their quotient structures and homomorphisms—the topics of MATH 335 & 435. Our main goal in MATH 335 is the study of groups and rings. We will not strive for the maximal possible generality but rather work out as many concrete examples/incarnations of theoretical concepts as possible. Another goal of this course is to make the students immerse in communicating mathematical thoughts (proofs, examples, counterexamples) in a written form.

Syllabus: We will cover *groups* for about 2/3 of the semester (definition and basic properties, examples, symmetric groups, subgroups, cyclic groups, homomorphisms, isomorphisms, normal subgroups, left and right cosets, Lagrange's theorem, factor/quotient groups, isomorphism theorems, fundamental theorem of finitely generated abelian groups) and *rings* for about 1/3 of the semester (definition of rings, unit, zero-divisor, division ring, integral domain, and field, basic properties, examples, ring homomophisms and isomorphisms, subrings, images and kernels, definition of ideals and quotient rings, one- and two-sided ideals, isomorphism theorems, properties of ideals, PIDs, greatest common divisor, UFDs, division algorithm, irreducibility of polynomials).

Evaluation of Students: Grades will be based on weekly homework assignments (60%), quizzes (20%), and a final exam (20%).

Textbook: J. Gallian, *Contemporary Abstract Algebra*, Houghton Mifflin.