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Fall 9-1-2000

### MATH 521.01: Advanced Algebra

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# Math 521 — Advanced Algebra — Fall 2000

## Syllabus

- Instructor: Nikolaus Vonessen  
Time: MWF 1:10-2:00 in room Math 211  
Textbook: *Abstract Algebra, Second Edition*, by D. S. Dummit and R. M. Foote, Prentice Hall, 1999  
Prerequisite: An undergraduate abstract algebra course comparable to our Math 422, or consent of instructor

Math 521 and its sequel Math 522 (which might be offered next semester) give an introduction to the core topics of modern advanced algebra. The first semester is mostly devoted to studying group theory, field theory, and Galois theory. We should be able to cover most of the topics listed below.

A few words on grading: The grade is to a large extent based on the weekly homework assignments, worth 60% (the two lowest homework scores will not count). In addition, there will be a midterm and a final exam, each worth 20%. The date of the midterm will be announced about two weeks in advance.

**GROUP THEORY:** Review of the basic concepts of elementary group theory (subgroups, normal subgroups, homomorphisms, isomorphisms, Lagrange's theorem, quotient groups, and direct products). Group actions, the class equation, automorphisms, the Sylow theorems, direct and semidirect products, finitely generated abelian groups. Time permitting: nilpotent and solvable groups.

**FIELD THEORY:** Review of polynomial rings and basic theory of vector spaces. Field extensions, algebraic extensions, splitting fields, and algebraic closures. Further topics (time permitting) include separable and inseparable extensions, cyclotomic polynomials and extensions, transcendence degree, transcendence basis, transcendental extensions.

**GALOIS THEORY:** Basic definitions, the Fundamental Theorem of Galois Theory, finite fields. Time permitting: further topics, e.g., composite, simple, cyclotomic and abelian extensions.