UNIVERSITY OF CALGARY

FACULTY OF SCIENCE
Department of Mathematics and Statistics

Pure Mathematics 431 Algebra II

(see Course Descriptions under the year applicable: http://www.ucalgary.ca/pubs/calendar/)

Syllabus

Topics	**Number of hours**
Review of basic concepts of group theory; isomorphism theorems	3
Group actions; conjugacy and the class equation; semidirect products	3
The Sylow theorems; classifiication of groups of small order	3
Nilpotent and solvable groups; the Jordan-Holder theorem	3
Simplicity of alternating groups and of PSL(2,q) (time permitting)	
Review of polynomial rings over fields	3
Vector spaces over an arbitrary field; basis and dimension	3
Algebraic and transcendental field extensions; adjoining the root of a polynomial	3
Degrees of finite extensions; multiplicativity of the degree in towers	3
Existence and uniqueness of the splitting field of a polynomial; finite fields	3
Galois groups of polynomials; normal and separable extensions	3
The fundamental theorem of Galois theory	3
Solutions of equations by radicals; applications to geometric constructions (time permitting)	
TOTAL HOURS	**33**

The main objective of this course is to provide students with a solid under- standing of the most important algebraic systems: groups and commutative rings. They should understand, and be able to use the Sylow theorems, the fundamental theorem of finite abelian groups, the factorization theory of in- tegral domains including principal ideal domains and unique factgorization domains, and the structure of finite fields. Time permitting they should have some idea about nilpotent groups and Galois theory. A student who successfully completes this course will:

1. Be able to manipulate these systems and prove basic facts about them
2. Have the skill to use the basic theorems about these systems to solve theoretical exercises and to construct examples and counter-examples
3. Understand the basic proof techniques of these subjects and be able to apply them
4. Have an appreciation of some of the open questions in these subjects and the role of such questions in the development of the theory
5. Have an appreciation of the beauty of these structures and their historical significance

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