

Mathematics 431

Algebra II

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

*Syllabus*

<u>Topics</u>	<u>Number of hours</u>
Group actions; conjugacy and the class equation; semidirect products	3
The Sylow theorems; classification 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)	
Vector spaces over an arbitrary field; basis and dimension	3
Algebraic and transcendental field extensions; adjoining the root of a polynomial	6
Degrees of finite extensions; multiplicativity of the degree in towers	4
Existence and uniqueness of the splitting field of a polynomial; finite fields	4
Galois groups of polynomials; normal and separable extensions	4
The fundamental theorem of Galois theory	3
Solutions of equations by radicals; applications to geometric constructions (time permitting)	3
<b>TOTAL HOURS</b>	<b>36</b>

*Course Outcomes*

The main objective of this course is to provide students with an intermediate undergraduate treatment of groups, fields and the profound connections between the two. The primary means of assessment in this course will be through extensive and challenging take-home written assignments. Students are expected to enter the course with reasonable comfort in proof-writing, as well as a working knowledge of the basic theory of groups and rings. At the end of this course, students will be able to:

1. State, prove and apply the basic results surrounding  $p$ -groups, nilpotent groups and solvable groups.
2. State, prove and apply the theory of finite and algebraic field extensions.
3. Have an appreciation of some of the open questions in these subjects and the role of such questions in the development of the theory.
4. Have an appreciation of the beauty of these structures and their historical significance.
5. Complete challenging take-home written assignments to a mathematically rigorous standard.

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