

Math 422/501

Fields and Galois Theory

Fall 2013

Course Outline

Time: MWF 14:00-15:00

Place: Math 102

Instructor: Kai Behrend

Office hours: TBA
in Math Annex 1213.

Text Book: Dummit and Foote: **Abstract Algebra**. Wiley.

It is not necessary to purchase the text. You should have some reference book on algebra, but all basic algebra text books contain more or less the same material. Alternative suggestions include: Lang, Herstein, Artin. Any of these should get you through the course. The edition is irrelevant.

Prerequisites: Math 322 or equivalent. Math 323 would be desirable but not absolutely necessary. You have to have a good working knowledge of group theory, especially group actions, as covered in Chapters 1-4 of Dummit and Foote.

Course This is a standard course in Galois Theory.

Outline: Not only does Galois theory itself appear in many diverse

areas, but the principles of symmetry we cover appear in different guises throughout mathematics. This, or a course like it, is a must for anyone serious about our subject. Besides, Galois theory is beautiful and fun!

After briefly reviewing the basics of fields and polynomials, we move on to **Galois theory**. This is the study of the symmetries of algebraic equations. Highlights include Ruler and Compass constructions: the impossibility of doubling the cube or trisecting an angle. Impossibility of solving the quintic by radicals. **Cyclotomic fields**. **Kummer theory**.

If time permits, we will explain that the **Galois group** of a field is really the same thing as the **fundamental group** of a topological space. Or we will do a little algebraic number theory.

The minimum material covered consists of Chapters 13 and 14 of the text. This course covers the material in the field theory part of the algebra syllabus for the Qualifying Exam for the PhD programme at UBC.

Exams: There will be one midterm exam and one final exam.

Homework: Homework will be assigned on a **weekly** basis throughout the semester. Please do all homework assignments.

Marking: Your mark will be made up as follows:

Homework: 40%

Midterm: 20%

Final: 40%
