3202 (Galois Theory)

Year:	2013–2014
Code:	MATH3202
Level:	Advanced
Value:	Half unit (= 7.5 ECTS credits)
Term:	2
Structure:	3 hour lectures per week. Assessed coursework and mini-project
Assessment:	80% examination, 10% coursework, 10% project
Normal Pre-requisites:	7202 (the course is independent of 3201)
Lecturer:	Dr ML Roberts

Course Description and Objectives

Galois theory is a very elegant piece of mathematics, bringing together ideas from group theory, ring theory and linear algebra. It can be used to solve classical problems such as: is there a construction for trisecting angles, using ruler and compasses? More importantly, the theory analyses the question of the solubility of equations, and gives an answer to the question of whether there are formulae (like the quadratic formula) for the solution of equations of higher degree than 2.

The course is based around the set book (see below). Considerable participation is expected from students, who will prepare and present small sections of the book. There will also be collaborative work and discussions in class. 10% of the mark is assigned to a mini-project towards the end of the course. This is assessed by means of a short presentation: training in presentation skills will be provided.

Recommended Texts

The set book for the course is *Galois Theory* (3rd ed) by Ian Stewart (Chapman and Hall): it will be necessary to have a copy of this.

Detailed Syllabus

- Revision of ring theory: polynomials, Euclidean algorithm, unique factorization, etc.
- Prime subfield, characteristic, symmetric polynomials.
- Field extensions: degree, simple extensions, algebraic and finitely generate extensions.
- Splitting fields, normal extensions, normal closure.
- Galois group, Dedekind's Lemma.
- The fundamental Theorem of Galois theory.
- Soluble groups and their theory.
- Solution of equations by radicals.

Selected other topics may be covered, for example ruler and compass constructions, separability, finite fields.