

Algebraic Number Theory MATH 512

Term: Winter 2012
Instructor: Paul Buckingham
Core course: No
Textbooks (suggested only): Lang or Neukirch, for example
Prerequisites: MATH 424
Grading: 100% assignments

1 Global theory

- Review of basic field theory and Galois theory
- Number fields
- Integral closure, rings of integers
- Discriminants, integral bases
- Units, Dirichlet's Unit Theorem
- Class-groups, including finiteness
- Uniqueness of factorization and failure thereof
- Prime ideals, ideal factorization
- Residue fields, decomposition groups, ramification degree, residue degree
- Quadratic reciprocity

2 Applications

- Approaches to solving diophantine equations
- Explicit computations in cyclotomic fields
- The first case of Fermat's Last Theorem for regular primes
- The Kronecker–Weber Theorem

3 Local theory

- Valuations
- Completions
- Local fields, valuation rings, uniformizers
- Hensel's Lemma
- Multiplicative structure of local fields
- Counting and constructing abelian extensions of local fields

4 Local-global connections

- Ideles and the idele class-group
- Formulation of local and global class field theory
- The relationship between local and global class field theory

Grade evaluation:

There will be six assignments, all worth the same number of marks. The overall percentage obtained from assignments will be converted into a letter grade using the table opposite. Some curving may be applied. There will be no exams. A grade of C+ will be sufficient to pass the course.

95 – 100	A+
90 – 94	A
85 – 89	A–
80 – 84	B+
75 – 79	B
70 – 74	B–
65 – 69	C+
60 – 64	C
55 – 59	C–
52 – 54	D+
50 – 51	D
< 50	F

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