Syllabus
Math 748 - Algebraic Number Theory
Fall 2006

Instructor: Rafe Jones
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Course Web Site: http://www.math.wisc.edu/~jones/Math748/

Text: J. S. Milne, *Algebraic Number Theory*, Available at http://www.jmilne.org/math/

Lecture: MWF 12:05–12:55PM (B223 Van Vleck)

Homework: There will be weekly homework assignments, due on Wednesday. The assignments will be in the range of 5-10 problems. Each week two to three problems will be graded, selected essentially at random. The assignments will be posted online at least a week before they're due. After the first one (which I'll hand out in class) the assignments will only be available on the website.

Grades: There will be two exams: an in-class exam on Wednesday, November 1 and a take-home final that will be handed out on Monday, December 11 in class and due at noon on Saturday, December 16. The final will be worth 50% of the course grade, the in-class exam 35%, and the homework 15%.

Course Outline:

1. Rings of integers (integral elements, integral closure, norm and trace of elements, discriminants of orders, computing some rings of integers)
2. Dedekind domains (definition, unique factorization of ideals, rings of integers are Dedekind domains, primes that ramify divide the discriminant)
3. Lattices and Minkowski theory (norms of Ideals, existence of an ideal with small norm in every ideal class)
4. Finiteness of the class number
5. Dirichlet's unit theorem
6. Cyclotomic extensions (computations of ring of integers, units, if time relation to Fermat's Last Theorem)
7. Ramification and the Tchebotarev density theorem [Ch. 8 in Milne] (decomposition and inertia groups, Artin symbol, applications to polynomial factorization and Galois groups)
8. Valuations and local fields, if time permits (completions, totally ramified and unramified extensions of local fields)