18.786. Algebraic Number Theory (Fall 2011)

- Instructor: Sug Woo Shin (swshin@mit.edu)
- Class hours: Tue/Thu 11-12:30
- Classroom: 2-135
- Office: 2-167
- Office hours: Mon 10-11, Thu 2-3, or by appointment
- Homework: assigned weekly and due every Tuesday (the 1st HW will be due Sep 20)
- Exams: one in-class exam (Tue Oct 25) + one take-home final (deadline: TBA)
- Grade formula: 100 = Homework (50)+ midterm (20) + final (30)

Main Textbooks

My lectures will be based on the following two sources:

- Jürgen Neukirch, Algebraic Number Theory, Grundlehren der Mathematischen Wissenschaften 322, Springer-Verlag, 1999 [Chapters I and II]
- H.P.F. Swinnerton-Dyer, A Brief Guide to Algebraic Number Theory, London Math Society Student Texts 50, Cambridge, 2001

Supplementary Texts

There will be no need to refer to Milne's CFT, Serre or (most of) Cassels-Fröhlich until the very end when we try to summarize the main results of class field theory.

- Serge Lang, Algebraic Number Theory, 2nd Ed., GTM 110, Springer, 1994
- James Milne, Algebraic Number Theory / Class Field Theory, available at http://www.jmilne.org/math/CourseNotes/index.html
- Jean-Pierre Serre, Local Fields, GTM 67, Springer, 1979
- J.W.S. Cassels and A. Fröhlich (editors), Algebraic Number Theory, Academic press, 1967

Prerequisite

- abstract algebra and Galois theory (undergraduate level)
- basic commutative algebra (it would be helpful if you have read at least the first few chapters of Atiyah-MacDonad's "Introduction to commutative algebra" or something equivalent).
- curiosity

Homework policy

- You are encouraged to work on homework in groups and share ideas. However write up your own solutions or you will not be given credit.
- Late homework will not be accepted. It is better to hand in incomplete solutions on time than submit perfect solutions after due time.
- Among your scores on n problem sets, only the best $n-1$ scores will be counted toward your grade. (Corollary: If you miss one problem set, you are going to be excused for the zero point on that.)

Other remarks

- This course is designed as a graduate course. An undergraduate with proper background knowledge is welcomed to attend my class but keep in mind that you may be required to invest a lot to follow the course.

Reading assignment by Sep 13 (there's no need to turn in anything)

- Read Ch.1 and 2 of Atiyah-MacDonald. Do exercises as needed. If you are already familiar or if you can go further, then also read Ch.5, pp.59-61, Ch.7, pp.80-82 and Ch.9.
- If you can't access Atiyah-MacDonald, then the next best thing would be to read Ch.1 of Milne's ANT. Milne does not seem to define the notion of modules among other things, so you may need to refer to some standard algebra textbook for basic definitions.
- Read Introduction in Milne's ANT.