MATH 223B (GALOIS COHOMOLOGY AND CLASS FIELD THEORY)

LINUS HAMANN

1. Overview

This course will cover:
(1) The statements of local and global class field theory.
(2) The proof of local class field theory and portions of the proof of global class field theory.
(3) Group Cohomology of finite and pro-finite groups.
(4) Galois Cohomology of Local Fields and Number Fields.

2. Background Material

A good understanding of a first course in algebraic number theory such as Math 223A. A solid background in point set topology and abstract algebra. Familiarity with homological algebra and complex analysis would also be very useful, but is not required.

3. References

The course will primarily follow the books:
(1) Galois Cohomology by J.P-Serre [Ser94], especially Chapters 1 through 6.
(2) Local Fields by J.P-Serre [Ser79], especially Chapters 8 through 15.
(3) Algebraic Number Theory, proceedings edited by J.W.S. Cassels and A. Fröhlich [CF10], especially Chapters 6 and 7.

4. Logistics

4.1. **Meeting Time.** The course will be held Tuesdays and Thursdays from 10:30 AM to 11:45 AM in SC 310.

4.2. **Course Notes and Homework.** There will be course notes available for the week at the course webpage: *https://people.math.harvard.edu/∼hamann/CFT.html* posted on Tuesday before the first lecture along with the weekly homework. The homework is due the proceeding week on the proceeding Thursday and is required if you are taking this course for a grade.

4.3. **Office Hours.** Office hours will be held on Friday 2:00 - 3:00 PM in my office (SC 239). If you have questions regarding the material you may also email me at: *hamann@math.harvard.edu.*

5. Homework and Grading

If you are interested in taking this course for a grade (if you are a graduate student) or if you are an undergraduate then the grading for the course is as follows:
(1) Weekly Homework (50 %)
(2) Take Home Final (50 %).

The homework for the week along with the course notes will be posted on the first Tuesday of each week. The homework for the previous week is due in class on the proceeding Thursday. The lowest homework will be dropped.

References

[CF10]   J. W. S. Cassels and A. Fröhlich, eds. *Algebraic number theory*. Papers from the conference held at the University of Sussex, Brighton, September 1–17, 1965, Including a list of errata. London Mathematical Society, London, 2010, pp. xxiv + 366. ISBN: 978-0-95027-342-6.

[Ser79] Jean-Pierre Serre. *Local fields*. Vol. 67. Graduate Texts in Mathematics. Translated from the French by Marvin Jay Greenberg. Springer-Verlag, New York-Berlin, 1979, pp. viii+241. ISBN: 0-387-90424-7.

[Ser94] Jean-Pierre Serre. *Cohomologie galoisienne*. Fifth. Vol. 5. Lecture Notes in Mathematics. Springer-Verlag, Berlin, 1994, pp. x+181. ISBN: 3-540-58002-6. DOI: 10.1007/BFb0108758. URL: https://doi.org/10.1007/BFb0108758.