Math 7262 Algebraic Theory II Spring 2019

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Class: MWF 10:20am–11:15pm, Dunn Hall 231

Office Hours: MWF 9:40am–10:10am, Dunn Hall 331, or by appointment

Textbook: There are many suitable books on graduate Abstract Algebra. A free online textbook can be found at
http://www-users.math.umn.edu/~garrett/m/algebra/notes/Whole.pdf
Notes will also be provided by the instructor:
Galois Theory.
Modules.

Description: This is a graduate course in Abstract Algebra which splits into 2 parts.

1. The first part of the course covers fields and field extensions; the tower law; algebraic and transcendental elements and extensions; splitting field extensions; algebraic closure; normal and separable extensions; the fundamental theorem of Galois theory; finite fields; cyclotomic extensions; solvability by radicals.
2. The second part of the course covers modules; direct sums; free modules and bases; torsion and torsion-free modules; finitely generated modules over a PID; tensor products (over commutative rings with 1); vector spaces; linear maps; dimension; matrices; minimal and characteristic polynomials; the Cayley-Hamilton theorem; Smith Normal Form; Rational Canonical Form; Jordan Normal Form.

Prerequisites: Math 7261 or permission of instructor.

Goals: In addition to learning about fields, modules, etc., key goals include being able to communicate effectively about abstract mathematical concepts, construct and recognize rigorous proofs, and to pass the PhD algebra qualifying exam.

Grades: A-F with +/- grades will be used. Grades will be based on:

1. Weekly homework assignments (40%)
2. Class participation (10%)
3. Two (mid-term and late-term) take-home exams (20%)
4. A final, in-class exam (30%)

Homework will be set on Mondays and will be due the following Monday.

Class participation will involve active discussion of problems in class, and presenting solutions at the board.

The format of the take-home exams and the final will be modeled on the PhD qualifying exam, so as to provide students with practice for this exam.

Collaboration: Students are allowed, and even encouraged, to discuss homework and other problems with other students. However, the write up of the homework must be the work of the student alone (i.e., no word-for-word copying). Also, if you know how to do a problem, please don't just immediately tell other students the complete solution! Give hints and advice on how to approach the problem instead.

Final exam: **Monday, April 29, at 8:00am**.