Math 1530 Abstract Algebra, Spring 2013: Syllabus

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Course website: http://www.math.brown.edu/~ckottke/1530/

Office hours: Wed. 11:15-12:00 (shared with Math 540), Fri. 3:00-3:45, or by appointment.

Text: *Abstract Algebra*, by Dummit & Foote. 3rd Ed (ISBN 978-0-471-43334-7).

Exams:

- Midterm 1: Friday Mar. 1, in class.
- Midterm 2: Friday Apr. 12, in class.
- Final: TBA

Description:

This class will introduce you to abstract algebra — one of the three pillars of modern mathematics along with analysis and geometry/topology. Historically, this subject grew out of the observation that many structures which arise over and over again in the study of classical mathematics and algebra can be abstracted and studied using just a handful of their properties, taken as axioms. Thus, once one has a proof about, say, groups as abstract objects, that proof applies to all concrete groups which arise in applications no matter how different they appear, from the permutations of the roots of a polynomial, to the invertible matrices under matrix multiplication, to the symmetries of a geometric object. We will focus mostly on the theory of groups and rings, with some time spent towards the end of the course on polynomials and fields.

The class will be entirely rigorous and proof based, and will require quite a bit of time and effort. You will be expected to spend time studying the text and solving difficult homework problems, many of which you will not be able to solve right away. Working on such problems is an integral part of learning a subject such as this. As with speaking a new language or playing a musical instrument, learning to do modern mathematics is not something which can be done passively, but rather requires active practice, perseverance, and patience.

Approximate lecture schedule:

Lectures	**Topic**
1-5	Ch. 1: Introduction to groups.
4-8	Ch. 2: Subgroups.
9-13	Ch. 3: Quotient groups and homomorphisms. Midterm 1.
14-18	Ch. 4: Group actions.
19-21	Ch. 5: Direct and semidirect products and abelian groups.
22-27	Ch. 7: Introduction to rings. Midterm 2.
28-30	Ch. 8: Euclidean domains, PIDs and UFDs.
31-36	Selected topics from Ch. 9, 13.

Course Policies:

- **Grading:** Your final grade will depend on weekly homework assignments and three exams (2 midterms and a cumulative final). Your lowest 2 homework scores will be dropped. Letter grades will be awarded on a curve based on your total numerical score computed using the percentages below.

Homework	30%
Midterm 1	20%
Midterm 2	20%
Final Exam	30%

- **Homework:** Homework problems will be assigned with every lecture and collected weekly. You are encouraged to attempt the problems as soon as possible, to solidify the material covered in lecture. Homework may be handed in during class, or turned in to the appropriate box in the math department mailroom, by 4pm on the due date. Collaboration on homework assignments is allowed, and indeed encouraged. This means discussing problems, solution techniques, and comparing individual answers, not copying answers. Each student must write up their own homework individually. **Please cite your collaborators and references used (apart from the textbook) on your homework assignments.** The grader may choose a random subset of problems to grade on each assignment.

- **Missed/Late assignments and exams:** Late homework will not be permitted, except in cases of emergency accompanied by a note from the Dean's office. If you have a conflict, please arrange to turn in your assignment early, or use it as your lowest homework score to be dropped. A missed exam may be made up only in the case of an emergency; the make up will be an oral exam and may be more difficult than the original.

- **Grade disputes:** Please check over your exams and assignments when they are returned to you for any grading mistakes (they happen!) and I will be glad to correct them. **Grade disputes will be considered for one week following the return of an assignment.** After one week, the grade is set.

Tips for success:

- **Read the relevant material before class.** I will post a reading assignment on the website corresponding to each lecture. which should be completed *before* coming to class. You don't need to fully understand everything, but you'll find that having some familiarity with the subject before hearing the lecture is extremely helpful, and you are guaranteed to get more out of each class this way.

- **Start homework problems early.** Again, learning abstract mathematics takes time and above all, practice. The homework assignments are your chance to practice the material and develop your skills and intuition. Make an attempt at the homework problems as soon as possible after each lecture, then let them roll around in your head for a while if you don't get them right away. Sometimes the best mathematical insights come while you're walking down the street (or in the shower!) after you've put a problem in the back of your mind. If you wait until the last minute to start the homework assignments, you will set yourself up to do poorly.

- **Be your own teacher.** You are the person in the best position to identify which things you understand well and which things you feel a little hazy about. Try taking the role of instructor and see if you can explain the material to someone else (or yourself) and you'll quickly find out which things you are confused about. While confusion is a (the?) natural state of learning mathematics (if you're not confused about something you probably aren't trying hard enough), don't let it persist — work to become 'unconfused'! (That way you can move on to be confused about something new...)

- **Come to office hours.** This is an invaluable time to get unconfused. Identify those things you don't understand very well, and ask me about them — professors like to explain things! I'm also happy to discuss mathematics in general or anything else.