MATH 4108: ABSTRACT ALGEBRA II
SPRING 2015 SYLLABUS

Instructor:	Joe Rabinoff
Time:	Tuesdays and Thursdays, 3:05–4:25pm
Location:	Skiles 246
Course Website:	http://people.math.gatech.edu/~jrabinoff/1415S-4108/
Prerequisite:	Math 4107 (this course is the continuation)
Text:	M. Artin, *Algebra*, second edition
Email:	rabinoff@math.gatech.edu
Office:	Skiles 221
Office hours:	Mondays, 9:30–11:30am; Thurdsays, 4:30–5:30pm; and by appointment

Objectives.   This course is a continuation of Math 4107, which introduced the basic notions in abstract algebra, namely groups, rings, and fields. In math 4108 we will delve into more advanced topics in those areas, in the opposite order: fields, rings, and back to groups. Important topics include Galois theory, which motivated much of the development of modern algebra; unique factorization of ideals in quadratic integer rings, which is a glimpse into algebraic number theory; and the representation theory of finite groups, which is a way of applying linear algebra to group theory.

These topics are beautiful and deep. They are also more abstract, and hence more removed from immediate application in other fields (although there are plenty of applications). In other words, this is a course in pure mathematics. After taking this course, students should be competitive in the first-year algebra sequence at a good math graduate program, at Georgia Tech or elsewhere.

I would like to be explicit about the following points:

- This course is intended for students with a fair amount of experience with abstract math. All of the work on which you will be evaluated will be some form of written proof, and we will not spend any time on proof writing, basic set theory, etc.
- The only way to learn abstract math involves investing a lot of time outside of class, every single week. In other words, you need to think hard and you need a long attention span. If you are taking six other classes, this is probably not the class for you.

Homework.

- The weekly homework is the *most important component* of the course; as such, it will be heavily emphasized.
- There will usually be a homework assignment due every Tuesday. **This includes the Tuesday during the week before finals period.**
- Late homework will generally not be accepted.
- All solutions must be neatly written in grammatically correct mathematical English.
- Collaboration on solving homework problems is **encouraged**; however, **you must write up your work separately**, so your proofs will not be identical word-for-word.
- Please list your collaborators and any outside sources you consulted on all graded work. This is matter of academic honesty: you cannot tacitly take credit for other peoples' ideas.
- I'd like to discourage you from searching the Internet for help. The problems are assigned so that you spend the necessary time thinking about the material: you learn when you get stuck and think hard for a long time. Circumventing this process is shooting yourself in the foot.
- I expect that the homework assignments will take **about 5 hours** to complete each week (although any given student may require more or less time than that). I do not expect you to

be able to complete them in a satisfactory way the night before they are due. I hope that you will start them early enough to be able to discuss the more difficult problems with each other and with me during office hours.

- If you start the homework early, collaborate with your classmates, talk to me in office hours, and commit the necessary time, there is no reason you should do poorly on the homework.

Exams.

- There will be two in-class midterm examinations.
- There will be no aids (textbook, calculator, etc.) allowed on the midterms or the final.
- Absences from midterms are generally excused only for Georgia Tech official business, religious holidays, serious illness, and the like. This does not include internships and interviews. I reserve the right to ask for a letter from the Dean of Students to justify an absence.
- In the event that you miss a midterm or exam for an acceptable reason, you will be excused from that exam; the other midterm and the final will count more towards your grade.
- The final exam will be held at the place and time scheduled by the Institute for that purpose, namely, Tuesday, April 28, 11:30am–2:20pm.

Lectures.   The course is organized under the assumption that students will attend all of the lectures. If you are obliged to miss a lecture, please let me know so that I can catch you up on anything you may have missed, such as announcements or material not contained in the book.

Honor code.   Students are expected to fully adhere to the honor code, which can be found at

http://www.honor.gatech.edu/

Note that writing up your homework separately and listing your collaborators are matters of academic honesty.

Important dates.   The midterm dates are *tentative*; they will be confirmed at least a week in advance.

February 17	Midterm exam 1
February 27	Last day to withdraw from course
March 17, 19	Spring break
March 31	Midterm exam 2
April 28	Final exam

Grading.   The grade breakdown for the course is as follows:

40%	Homework assignments
15%	Midterm exam 1
15%	Midterm exam 2
30%	Final exam

The final letter grade cutoffs will be determined *after* all number grades have been determined. However, if you score at least 90% in the class you will be guaranteed an A, 80% for a B, and 70% for a C.

Outline.   Below is the course schedule with corresponding sections of the text. Each midterm focuses on the unit preceding it, whereas the final exam is comprehensive.

January 6 – February 12: Field theory and Galois theory: parts of chapter 15 and chapter 16. There is some overlap between chapter 15 and the material in Math 4107; however, Artin goes more in depth, we will move quickly, and it makes good review.

February 19 – March 26: Quadratic integer rings and unique factorization of ideals: parts of chapters 11 and 12, and chapter 13.

April 2 – April 23: Group representations: selections of chapters 6 through 9. *Alternative:* depending on time and interest, we may instead cover chapter 14, Modules, which includes the classification theorem for finitely generated abelian groups.