Algebra I – Fall Semester 2017
CRN 68714 Syllabus

MWF 1:30 – 2:20 MSCS 509

Instructor	Dr. Anthony Kable
Office	MSCS 521
Office Hours	M 4:30 – 5:30, W 2:30 – 3:30, R 12:30 – 1:30 in MSCS 521
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Course Overview

The subject of this course and its successor, Algebra II, is basic abstract algebra; more specifically groups, rings, modules, and fields. The topics to be covered are, in large part, dictated by the syllabus for the comprehensive exam in algebra. The entire syllabus of Modern Algebra I and II is included, but some new topics also appear. These include, for example, solvable groups, presentations, chain conditions for rings and modules, tensor products, and positive-characteristic phenomena in field theory. This is too much to cover thoroughly in two semesters and so compromises have to be made in the presentation. In addition, linear algebra is assumed background for the course, but may sometimes have to be moved to the foreground. Algebra I will start with group theory, but I am not sure what will happen after that. The course, as it is currently conceived, lacks coherence in its subject matter. Such coherence as there is may be found instead in certain recurring themes and concepts. As far as possible, the exposition will highlight these.

Books

The textbook for the course is *Algebra: A Graduate Course* by I. Martin Isaacs. It contains almost everything on the required list of topics, has good problems, and avoids the major pitfalls that afflict some of its competitors. There is no perfect general algebra textbook. Taken on their own terms, *Basic Algebra I* and *Basic Algebra II* by Nathan Jacobson are probably the closest thing to the ideal that actually exists. Unfortunately, some of the choices made by Jacobson, particularly concerning Galois theory, make these texts unsuitable for the present course, but they are excellent references for most of the topics to be covered.

There is a lot to be said for textbooks that tackle specific subjects rather than attempting to survey basic algebra. For group theory, *A Course in Group Theory* by John S. Rose is a good choice. It includes everything needed for the current course except for presentations. For field theory and Galois theory, *A Course in Galois Theory* by D.J.H. Garling is the best of the modern books, and includes quite a bit more than we need. It is harder to make recommendations for ring theory and module theory. *Module Theory: An approach to linear algebra* by T.S. Blyth is out of print and marred by ugly typography, but treats the basics of module theory well. For general ring theory, *A First Course in Noncommutative Rings* by T.Y. Lam is excellent, but covers way too much and can be somewhat overwhelming (rather

like ring theory itself). For the unifying perspective afforded by category theory, I like *Category Theory in Context* by Emily Riehl. If this is all one wants from category theory then the first two chapters hit the main points and the next two include additional useful material for later reading; monads and Kan extensions are more specialized.

Grades

There will be two preliminary exams and a final exam. It is my intention to hold the preliminary exams in the evening and to allow two hours for their completion. The final exam will be held in MSCS 509 on Wednesday, December 13, from 2:00 – 3:50. There will also be regular homework assignments and occasional in-class quizzes. The preliminary exams will be worth 17% each, the final exam 25%, and the homework and quizzes 41% in total. I will base the homework-and-quiz score on the best 80% of your work in each of these categories, so it will be possible to drop one or two low quiz scores and one or two low homework scores (depending on how many quizzes and how many homework assignments there end up being).

A total score of at least 90% will ensure an A, a score of at least 80% will ensure at least a B, a score of at least 70% will ensure at least a C, and a score of at least 60% will ensure at least a D. I reserve the right to use my discretion in close cases.

Other Information

In an exam, everyone is alone. This should be borne in mind when deciding how much to collaborate when studying and completing homework. The only restriction I impose on collaboration and reference to outside sources is that you must understand the work you turn in. This means that if you submit a solution to a homework problem and I ask you to explain the solution to me without referring to your written work then you can do so. Even if you work entirely alone and without reference to outside sources this requirement still applies.

You should be familiar with the University's policies on academic integrity. You should also locate and read the Fall 2017 Syllabus Attachment.

I will follow the Department's model policy on missed work. In situations where this policy doesn't apply, I will be prepared to accept late work occasionally, but not as the default state of affairs. If you find yourself unable to keep up with the work in this class along with your other responsibilities then let me know so that we may seek a solution.