Course Description: This is the first semester of a two-semester sequence covering the fundamental structures of abstract algebra (groups, rings, fields, associative algebras, vector spaces, modules) with many important concrete examples (e.g., polynomial rings, matrix rings, symmetry groups, and fields of real and complex numbers).

The fall semester introduces group theory, based heavily on examples from linear algebra (matrix groups), but also investigating the concept of symmetry more generally. This approach requires a thorough review of topics from linear algebra, and the syllabus devotes time to review as well as new material. Although the topics may look similar to ones you have already studied, this ”second pass” will emphasize algebraic features, and your mastery of linear algebra will be deepened.

The spring semester (Math 334b) introduces rings, fields, and modules. It covers topics in number theory and Galois Theory, and other advanced topics depending on the interests of the instructor and the class.

Math 333a-334b pays close attention to the language and formal structure of mathematical arguments. This means that precise definitions, theorems, and proofs will be the primary mode of discourse. You should have been exposed to this approach already in Linear Algebra and perhaps other courses; beginning in Math 333a, it will be elevated to paramount importance. Early homework assignments and discussion sections will address skills necessary for dealing with definitions and formulating proofs. You will all become adept at this important mode of mathematical communication.

Prerequisite: Math 215 and either Math 121 or 216. If you have not taken 216, you should also register for 299d (Bridge to Advanced Mathematics), a half-course taught during the first half of the fall semester.


Course Schedule: Three lectures per week (MWF 2:30-3:30), and one hour of discussion at times to be arranged.

Homework, Tests, Grades: Weekly homework, two midterm tests, and a final. These will be weighted as follows in determining the final course grade:

| Homework: 15% | Tests: 25% each | Final: 25% | Free Points: 10% |

The two midterm tests will have in-class and take-home components. The final will be self-scheduled. The weekly homework will contain a mixture of basic and challenging problems, the latter indicated by a star (*). All of these problems should be handed in for grading. Basic problems are designed to help you learn the essential concepts and practice new techniques; satisfactory performance on these problems will guarantee at least a 3.0 in the course.

Math Question Center: I encourage collaboration on the homework, and many students find it useful to work together in the Math Question Center (Sunday through Thursday 7-9PM, Hilles 011/012).
Office Hours: You can find me in my office after class on Wednesday and Friday 3:30-4:00. Monday 3:30-4:00 is the regularly scheduled Math Tea, and you are welcome to follow me there and chat about the course. I will announce other office hours after the discussion section times have been settled, and am happy to arrange other consultation times by appointment.

Electronic Resources: Moodle will be the primary source for course materials. You are responsible for getting the weekly homework assignments from Moodle. I will also post solutions to homework and tests, handouts, links to course-related websites, and other materials that might be quite important (e.g. corrections to and hints to homework assignments, reminders of test dates, etc.).

Mathematica will be used occasionally in Math 333a, but perhaps not as extensively or centrally as in other courses. You are probably already familiar with Mathematica. If not, this would be a good time to make your acquaintance with it. Please ask me if you have questions about using or obtaining access to Mathematica.

In Math 333a you might find some of the following Mathematica commands useful: Factor, Mod, PolynomialMod, GCD, ExtendedGCD, PowerMod, EulerPhi, PrimitiveRoot, as well as all of the basic commands for manipulating polynomials and matrices. Mathematica V.8 has a command called FiniteGroupData which involves some of the material we will be studying this fall in Math 333a.

Collaboration: I encourage collaboration on the homework, both standard and special problems. Indeed, I expect you will learn a great deal about this course from each other. It will be to your advantage to form study groups, and many students facilitate this by working together in the Math Question Center.

Collaboration on homework naturally raises the question, "how much is OK?" I expect that you will share ideas, and perhaps work together at a blackboard, but eventually each student must write up his/her work independently, without reference to another students work or to written work that has been produced jointly. Verbatim copying from another person’s paper or blackboard work is definitely "not OK". The safest approach is to write up your final solutions in a different place, and on a fresh sheet of paper.

It’s important not to misunderstand these guidelines, so please ask me if you have any questions. You might also want to refer to the department’s published guidelines on homework collaboration, which are available on the department website.

It goes without saying that collaboration on tests is never permitted. All inquiries about problems on the tests should be directed to me.

Honor Code Principle: You must never present others’ work as your own. If you have used other students’ work in the preparation of homework you must acknowledge it. If you obtain solutions to assigned problems (on homework or take-home tests) from sources other than the textbook or class notes, you must acknowledge such sources. This especially applies to material obtained electronically, e.g., on the web.

If there are questions about honor code issues, you should seek clarification and guidance from me.