MATH 331, Fall 2021

MENU: Abstract Algebra

Instructor: Paul Goerss
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Teaching Assistant to be announced

Course Time: MWF 10AM in Frances Searle 2407.

Office hours: Wednesday 3PM in Annenberg G32, Th 10AM in Lunt 104, and by appointment. Zoom appointments are possible.

Overview: This is the first quarter of a year-long sequence in abstract algebra; in the Fall the topic emphasis will be on group theory, including the structure of finite groups and the basics of matrix groups.


This is an industry standard abstract algebra text for advanced undergraduates and beginning graduate students. We will cover most of Part I: Group Theory.

Read this: As of September 16, this class is scheduled to be taught in-class and in-person. Learning and teaching are highly interactive and the best learning experience is possible only if we can meet together. The current classroom is large and should allow for distance between desks. Students should be alert to and aware of any changes.

What this course is: Math 331 is a junior/senior level mathematics course for students interested in the basic and important ideas of modern mathematics. Because it is a MENU course, material will be covered in-depth and with a high level of rigor; put another way, we will come to terms with the way modern mathematicians think, work, and write. With Math 321 MENU: Real Analysis, this class is ideal and essential preparation for anyone interesting in further work in mathematics and related fields, such as statistics, operations research, data analysis, or the more mathematical aspects of finance.

Topics will include:

1. Definition and basic examples of groups
2. Special types of groups: finite, abelian, algebraic, etc.
3. Subgroups, normal subgroups, quotient groups
4. Basic isomorphism theorems
5. Group actions
6. Groups as symmetries: Cayley’s Theorem
7. Structure theorems for finite groups: Lagrange and Sylow
8. Simple groups, composition series, Jordan-Hölder Theorem
9. New groups from old: semi-direct products

Learning objectives: Basic familiarity with key ideas in and the culture of modern mathematics. This includes, but is not limited to:

1. Mastery of the basic ideas and results of group theory.
2. Fluency in the basic prose forms of the field: definitions, examples, statements of results, and proofs.
3. Practice at collaboration. Mathematics is a highly collaborative subject.

The Evaluation Component – Grades: There will be one traditional timed exam, to be held in the fifth week of class. All other student work will consist of regular smaller homeworks and larger projects, spaced evenly through the quarter with the last due at the end of the exam period. Collaboration is encouraged and desirable. In order to facilitate this students will be assigned to teams; teams will rotate, with changes occurring after the projects. Teams may be be asked to give short presentations during the quarter.

Policies and procedures for completing projects will be available on Canvas.

Canvas: All class materials, including the syllabus, more detailed descriptions of class topics, all assignments including homework and the projects, further policies and procedures, and all grades will all be available through Canvas.

University Policies and Procedures: A separate document highlighting the applicable policies and procedures, including those specific to the COVID-19 pandemic will be available on Canvas.

Should I take this class or Math 330? Good question. Math 330 covers some, but not all, of the same material. As a general rule, Math 331 is intended for students who want a fuller story or who have a mathematical field as a career goal. It is more challenging, but for the right student it can be very rewarding. Did you get a good grade in Math 300 and did you like linear algebra? Then try Math 331. Still not sure? E-mail the instructor, or talk to Professor Cañez, Director of Undergraduate Studies in the Mathematics Department.