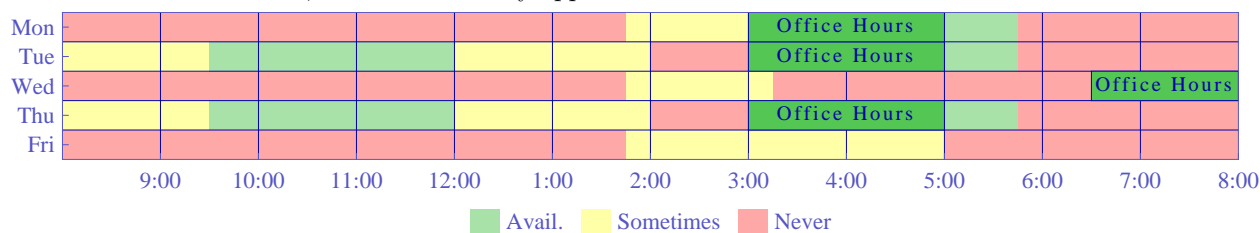


Mathematics 250, Foundations of Mathematics Spring, 2011

Instructor: Dr Michael Rogers

Office: Pierce Hall, Rm. 122, x4-4819

Hours: MTuTh 3:00–5:00; W 6:30–8:00 & by appointment:



Textbooks:

Velleman, *How to Prove It*.

E. Landau, *Foundations of Analysis*.

Handouts, and excerpts from other texts will be used.

Course Content: Mathematics 250 is a survey of basic mathematics with a focus on proving. The course will cover elements of the propositional calculus, the predicate calculus, and techniques of proof (including mathematical induction); sets and the set-theoretical development of basic mathematical objects (relations, functions, operations); and brief introductions to the fields of combinatorics, number theory, group theory, and analysis.

Course Goals: The overall goal is to prepare the student for higher mathematics as well as possible in a semester. If you do take higher mathematics courses, I would appreciate feedback about how well this goal was met.

At the end of the course, the student should achieve the following process goals: to read and apply a complicated definition; to produce an example of a thing defined; to read and understand proofs; to understand what needs to be proved in a statement; to apply various strategies for proving a statement; to create simple proofs; to write a proof cogently. And the student should achieve the follow content goals: to understand the propositional and predicate calculi; to know the basic definitions in the fields of set theory, number theory, group theory, and analysis.

Writing intensive: This course satisfies the Sophomore Writing Requirement for eligible students. The basis for this is the writing and revision of the problems (see Coursework below).

Thoughts are expressed by sentences: just so in mathematics. All work must be in complete sentences. Good mathematical style is expected. Further the student's writing must be cogent: clear, concise and convincing (i.e., logically correct).

Ways of Inquiry: This course is designated a "Ways of Inquiry" course. This means the student will learn how mathematical knowledge is constructed by constructing it. Much of the student's work is his or her seeking solutions to problems. Even in class, time will mostly be spent discussing why we need the assumptions we make and why terms are defined as they are, how to guess the solution to a problem, and how we know our answers are correct. The point is that the student will discover how to discover things that are there to be discovered. The material covered is all elementary and serves as a foundation for mathematical inquiry. (Hence the title for the course.)

Coursework: Problems will be assigned and collected for credit. To receive full credit the work must be correct, well-written, and **done alone**; the student will have the opportunity to revise their work until it is correct and well-written up to the end of classes. Problems and revisions are **due each Monday**. The problems are the major component of the course. Students may not always receive the same problems.

Homework exercises will be assigned. These are for the benefit of the student.

Sometimes the student will have to prepare a proof for presentation in class.

Examinations: Two midterm examinations will be given outside class. They will be given around mid February and late March. They will be administered at a time convenient to both the instructor and the students. The dates may be rescheduled at the instructor's discretion.

A cumulative final examination will be given at the time scheduled by the Registrar.

Grading: Grades will be based on the problems collected for credit (50%), the final examination (20%), two midterm examinations (10% each), and class participation (10%). These percentages are approximate. Each student's work will be judged in relation to the goals set for the course.

Outline of the Course: Approximately four weeks will be spent on chapters I and II of Landau's *Foundations of Analysis* and on chapters 1–3 of *How to Prove It* followed by the first midterm examination. Next approximately four weeks will be spent on chapters 4–7 of *How to Prove It* and a week and a half will be spent on the ring of integers. This will be followed by the second midterm examination. The last three weeks will be spent on chapters III through V of the *Foundations of Analysis* and topics in analysis and algebra.

The Honor Code of Oxford College applies to all work submitted for credit in this course. By placing your name on such work, you pledge that the work has been done in accordance with the given instructions and that you have witnessed no Honor Code violations in the conduct of the assignment.

This is particularly important for the problems: The only permitted references are listed on this syllabus under Textbooks (including the handouts and excerpts). In particular, no internet resources are permitted. One may not discuss the problems except with the instructor.