Syllabus

Course Description: This course is designed to introduce new graduate students at the University of Kentucky to the kind of mathematical analysis in wide use in economics textbooks and journals. In preparing the course, I have the level of rigor in the textbook of Mas-Colell, Whinston, and Green in mind, both in terms of how fast I go and what material will be covered. By the end of the first semester of graduate school, students should be able, with effort, to read and understand texts at this level, and this course aims to develop mathematical tools in support of that goal. While a nontrivial amount of time will be spent on applications from economics, this is *not* an economic theory course; our focus will be on the mathematical tools needed to do economic theory. If this narrow goal appeals to you, you are a good candidate to take this class. If it does not, you may be better off taking a class in the math department.

The course will insist on formalism in proving, interpreting, and applying results. For those who have not taken a math course at this level, this may seem strange and difficult, but it is both intentional and, I believe, essential to being able to understand and communicate new research in economics. Perhaps the biggest challenge of beginning graduate school is to get beyond the hand-waving intuition of your undergraduate classes, and a secondary goal of this course is to assist you in this transition.

The course's schedule will not deviate wildly from last year's, which is posted on my website. Consult this schedule or myself if you wish to know where things are headed. Roughly, we will cover as much of Sundaram chapters 1-8 and 11-12 as time allows, more or less in order.

Communication: My website is jasandford.com. All course materials, including assignments, supplementary material, a detailed schedule, and information on exams will be posted here as they become available.

My email address is jeremy.sandford@uky.edu. Please contact me va email as needed with questions or concerns about the course and its content. If the question is not one requiring a great deal of thought on my part, I generally respond to email within a few hours, and often within a few minutes.

Office Hour: My office hour is 4-5pm on Tuesday. It is not a problem to meet with me outside of this time, but please email me first to set up an appointment. Please try to limit drop-in visits to urgent or trivial questions.

Homework: New homeworks will be posted to my website approximately weekly, and will be due in class about a week later. Due dates will be posted on each homework, and are not flexible. Homeworks will be graded largely for thoroughness but also for accuracy. In my view, it is highly desirable that you work in groups on your homeworks, though each student should turn in her own draft of each homework. Your lowest-scored homework will not be counted towards your course grade; if some personal or professional obligation prevents you from being able to complete a homework, this assignment will be dropped as your lowest-scored homework.

You will probably spend the bulk of your time for this course on homeworks. This is ok. They are the best preparation for exams, and the best (i.e. only) way to learn how to apply the material in ways that will be useful to you in your life as an economist. Many problems will not be solvable without serious thought and reviewing class notes and texts. Some may be too difficult even then. Consult with your classmates, and, if you are still stuck, me, and be prepared to have the occasional problem where the best you can do on the write-up is to describe why it is hard.

I strongly encourage you to write your homeworks in LaTeX, which is the best medium for writing academic papers with mathematical content. Learning now will save you aggravation in the future when you begin writing your dissertation. To further incentivize this, for each homework completed in adequate, compiled LaTeX, I will give you one point on the next exam.

Course Materials: My lectures comprise the most important component of the class; if you miss one, you should copy notes from a classmate. The (required) course textbook is "A First Course in Optimization Theory," by Rangarajan Sundaram. It is inexpensive and will correlate fairly closely with much of the class.

(Recommended) additional texts are "Fundamental Methods of Mathematical Analysis," by Alpha Chiang and Kevin Wainwright, and "Mathematics for Economists," by Carl Simon and Lawrence Blume. Each covers most of this course's topics, with different emphases. Access to one or both will provide valuable counterpoint to the Sundaram text, though will not be assumed. Also, most graduate microeconomics books contain narrowly-tailored math appendices which can be usefully consulted.

Advanced students, those who are mathematically-inclined, and those interested in economic theory should also consult good real analysis books, such as "Principles of Mathematical Analysis," by Walter Rudin, "Undergraduate Analysis," by Serge Lang, and "Real Analysis," by H.L. Royden.

Finally, books and lecture notes on reading, understanding, and writing proofs abound. You should consult them as needed. This is a source of difficulty for most economics students that, in my view, can only be overcome with practice and reflection.

Grading Policies: Course grades will be determined by a combination of homework (10%), one midterm (40%), and a final exam (50%). My grading philosophy has not changed dramatically from last year's class, which received 3 A's, 13 B's, 3 C's, and had about 12 students drop without receiving a grade.

Exams: The midterm is on Thursday, October 16, during normal class hours. The final exam is on Monday, December 15 from 10:30am-12:30pm.

You use any materials you wish in completing the exam, with the exception of cellphones, laptops, and anything else which is normally capable of communicating. You will complete exams individually.

I expect all of you to take both exams at their scheduled time. In the unlikely event of an excused absence from an exam, I will work with you to determine how to best complete the course. I alone will decide whether an absence is excused or not, within the confines of university policy.