

Syllabus

ECON 772001 - Math for Economists
Boston College, Department of Economics

Peter Ireland
Fall 2023

Tuesdays and Thursdays, 10:30 - 11:45am
O'Neill Library, Room 257

Course Description

Economics studies the efficient allocation of scarce resources.

It follows almost immediately from this definition that while verbal and graphical analyses are often helpful too, economists derive their sharpest and most powerful results by setting up and solving constrained (because resources are “scarce”) optimization (because allocations should be “efficient”) problems. Hence, this course, ECON 7720, will introduce you to variety of techniques for doing just that: setting up and solving constrained optimization problems.

Specific methods to be covered include those based on the Kuhn-Tucker and envelope theorems, the maximum principle, and dynamic programming. Since this is a “math for economists course” as opposed to a “course in mathematical economics,” its emphasis will be not so much on stating and proving theorems (although, of course, we will have to do some theorem stating-and-proving) as on developing an intuitive understanding of how and why each method works and determining when one particular approach may be easier or more convenient than all others to apply to a specific problem.

Course Materials

My lecture notes, which will serve as the main text for the course, are freely available through the course webpage at <http://irelandp.com/econ7720.html>.

Much of the material from these lecture notes is also covered in two textbooks:

A.K. Dixit, *Optimization in Economic Theory* (2nd ed), Oxford University Press, 1990.

Carl P. Simon and Lawrence Blume, *Mathematics for Economists*, W.W. Norton, 1994.

Another excellent reference that deals with the same topics in greater depth and detail but in most cases goes beyond what we will strictly speaking need for this course is:

Daron Acemoglu, *An Introduction to Modern Economic Growth*, Princeton University Press, 2009.

Finally, two books that go well beyond what we can accomplish in this single-semester, introductory course but will be invaluable if you wish to dig more deeply are:

Efe A. Ok, *Real Analysis with Economic Applications*, Princeton University Press, 2007.

Nancy L. Stokey and Robert E. Lucas, Jr. with Edward C. Prescott, *Recursive Methods in Economic Dynamics*, Harvard University Press, 1989.

Course Requirements and Grading

Your grade for this course will be based on a series of problem sets (1/3), a take-home midterm exam (1/3), and a take-home final exam (1/3).

The problem sets will be made available through the course webpage and your answers to the questions on those problem sets will be collected on dates announced ahead of time in class. Some of the problem sets will follow the material covered in class quite closely; others will highlight results that extend those covered in class. All of the problem sets will help you prepare for the exams.

While it is fine for you to work together with other students on the problem sets, I still expect you to hand in your own individual answers to each question. Also, if you do work with others, make sure that you fully understand the answers to each problem, keeping in mind that you will have to work individually on the exams.

The exams will also be made available through the course webpage and your answers to the questions on those exams will be collected on dates announced ahead of time in class.

Both exams will be “open book” exams: it is fine to consult your notes, textbooks, and other references when working on the exam questions. Different from the problem sets, however, I will expect you to work independently on the exams without consulting with other people, inside or outside of this class. That is, I expect that the work you will hand in for the exams will be yours and yours alone.

Academic Integrity

Please familiarize or re-familiarize yourself with the University’s policies on academic integrity, which can be found at <https://www.bc.edu/content/bc-web/academics/sites/university-catalog/policies-procedures.html>, and take care to uphold these standards as they apply to your work for this course.

Along these lines, to repeat: while it is fine for you to work together with other students on the problem sets, I expect that your work on the midterm and final exams will be yours and yours alone.

Office Hours

I will announce my regular office hours (Maloney Hall, Room 338) shortly after the semester starts. You can always reach me by email at peter.ireland@bc.edu to ask a question or to make an appointment to talk in person.

Course Outline

1. The Kuhn-Tucker and Envelope Theorems
 - Dixit, Chapters 2, 3, and 5
 - Simon and Blume, Chapters 18 and 19
 - Acemoglu, Appendix A
 - Ok, Chapter E
 - Stokey and Lucas with Prescott, Chapter 3
2. The Maximum Principle
 - Dixit, Chapter 10
 - Acemoglu, Chapter 7
3. Dynamic Programming
 - Dixit, Chapter 11
 - Acemoglu, Chapters 6 and 16
 - Stokey and Lucas with Prescott