

Course Outline

ECON2125/8013

Australian National University

First Semester 2015

Titles

- Mathematics A (2125)
- Optimization for Economics and Financial Economics (2125)
- Mathematical Techniques in Economics I (8013)

Course Description

Together with ECON2127/ECON8014, this course forms a two-semester sequence that introduces students to a range of foundational mathematical concepts and techniques routinely used in economic theory and quantitative modeling for economics, finance and business. The concepts and techniques will be derived from basic principles and illustrated using a variety of applications.

Optimization will be a recurring theme in the course, since much of economic theory involves optimization, as do a diverse range of econometric, statistical and financial problems. However, a number of other foundational topics in mathematical modeling will also be treated. These include linear algebra, dynamics and probability theory.

Learning Outcomes

Upon a successful completion of this course, students should be able to:

- Understand many of the mathematical methods that are most widely used in economics, both from a formal, abstract perspective, and an intuitive perspective.
- Know how to read, understand, and construct simple mathematical proofs, and appreciate their role in the derivation of mathematical concepts and structures.
- Apply mathematical methods and techniques that are formulated in abstract settings to concrete economic applications.

List of Topics

The main topics of the course will be

1. Linear algebra
2. Elementary real analysis
3. Foundations of probability theory
4. Multivariate calculus and optimization
5. Introduction to dynamics
6. Orthogonal projection and its applications
7. Further applications

Topics may vary slightly at the instructor's discretion depending on the rate of progress and level of the students.

Instructor

John Stachurski

Office: Room 2006, HW Arndt Building 25a

Email: john.stachurski@anu.edu.au

Contact hours: Monday 9:00–11:00 AM

Lecture Timetable

Lecture A: Wednesday 10–11 AM CBE BLD LT 2

Lecture B: Thursday 9–10 AM CBE BLD LT 2

Important: Lecture C as listed in the course timetable is *not currently active*. No lecture will take place outside the two listed above unless otherwise advised. (Lectures for graduate students are likely to be held in the C slot later in the semester. Students will be advised through both lectures and Wattle if and when this occurs.)

Tutorials

Tutorials are on Fridays in Room TR6 of HW Arndt Building 25a

Group 1 12:00–13:00

Group 2 13:00–14:00

Group 3 14:00–15:00

Further details will be given in the first lecture. The two tutors for this course are

Qingyin Ma qingyin.ma@anu.edu.au Room 1125 Copeland Building

Guanlong Ren guanlong.ren@anu.edu.au Room 2018 HW Arndt Building

Resources

As well as the usual Wattle course page, which students should check regularly for up to date information related to the course, there is also a GitHub page at

<https://github.com/jstac/econ-2125-8013>

where all PDFs and other reading material related to the course can be found.

All of the lecture slides used through the course will be made available to students as PDF files. The lecture slides will be relatively comprehensive and self-contained, and serve as the primary source of reading material for students. Slides corresponding to each lecture will be made available to students at the GitHub link given above shortly before (best case) or immediately after the corresponding lecture.

On the GitHub page you will also find a PDF file called `course_notes.pdf`. These notes give additional background and practice exercises for some *but not all* topics treated in the course.

Finally, recording of lectures will usually be made available but unrecorded lectures are quite likely to occur and hence the recordings should not be relied upon.

Assessment

Assessment will consist of one mid-term exam and one final exam. The weighting is

Mid-term exam: 40

Final exam: 60

ECON2125 and ECON8013 students will be assessed in separate pools with possible variation in requirements and standards. Final grades may

not be an exact sum of exam scores, due to post-processing by the university administration. This processing might alter the absolute value of individual scores but it will not affect the ranking.

Further Reading

One recommended source of material related to the course is

- Simon, C. and L. Blume (1994) *Mathematics for Economists*. Norton

In past years this text has been compulsory but this year it is only recommended. It will be useful as background reading and a source of practice questions for many parts of the course.

All topics are standard and plenty of useful free material can be found on the Internet on a case by case basis. For example, `math.stackexchange.com` can be very helpful. Other texts that might be useful to understand the course material—but are *in no way required*—include:

- *Principles of Mathematical Analysis* by Walter Rudin
- *Linear Algebra* by David Lay
- *Calculus: Concepts and Methods* by Ken Binmore and Joan Davies
- *Optimization in Economic Theory* by Avinash K. Dixit
- *A First Course in Optimization Theory* by Rangarajan Sundaram

Prerequisites

See the ANU Programs and Courses guide

Other

Please refer any administrative questions to the course administrator Karissa Carkeet, room 1013, HW Arndt Bulding (25a).

All students are welcome to discuss course material with the tutors or myself during tutorials and respective office hours. However, please do not use email for instructional purposes.