

CAS EC 505 Mathematics for Economics
Syllabus
Fall 2015

Course description

This is an introductory course in mathematics for economic analysis, aimed at MA students with background in both economics and mathematics. The course consists of five parts. In the first, we offer a brief review of some the prerequisite material students should be familiar with from previous courses in one-variable calculus. The second part introduces concepts from linear algebra, and discusses some geometric properties of Euclidean spaces. The third section is devoted to multivariate calculus and serves as an introduction to part four, which treats constrained static optimization. The last part provides an introduction to differential equations and dynamic systems.

Instructor

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Teaching fellow

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Meetings

MW 12.30 – 2.00 pm in CAS 314.

Prerequisites

One-variable calculus, e.g. MA 123.

Academic conduct

It is a student's responsibility to know and understand the provisions of the CAS Academic Conduct Code. Cases of suspected academic misconduct will be referred to the Dean's Office.

Classroom conduct and participation

Students are expected to attend all lectures. Each lecture will build on the knowledge acquired in the previous one and, if you miss a class, you are responsible for getting the lecture notes from your classmates. *Please do not use electronic devices such as phones, ipads, computers, etc. during the lectures.*

Examination

There will be one midterm exam and one final examination. The final exam only covers material discussed after the midterm. Both exams will be held at the regular class time. Unless you have a documented health problem or family emergency, if you fail to take an exam, your score for the missed exam will be zero.

Grading

Midterm : 40%
Final: 60%

Exam dates

Midterm: October 21 in class

Final: December 18, 3.00 - 5.00 pm

Make-up exams

No make-up exams will be given.

Homeworks

A set of homeworks will be distributed throughout the semester. The homeworks will not count towards the final grade and need not be handed in. Solutions will be posted on the course website.

Recommended texts

Simon and Blume: Mathematics for Economists, W. W. Norton 1994.

Pemberton and Rau: Mathematics for Economists, Manchester University Press 2012. Copies of the textbooks have been ordered by the BU bookstore.

Course outline

Below is a *preliminary* list of topics. Deviations from the actual schedule (both in terms of contents and order of presentation) may be necessary as the class progresses. Students are responsible for attending classes and learning of any changes in the schedule. Readings are from Simon and Blume.

I. Review

Sets and set operations

Linear and affine functions

Continuity

Differentiation

Optimization

Inverse functions

Exponential and logarithmic functions

Readings: 2 - 5

II. Linear algebra

Linear systems

Matrix algebra

Linear independence and basis

Vector spaces

Linear transformations

The determinant function

Parametric expressions

Eigenvalues and eigenvectors

Inner product and norm

Convexity

Readings: 7.1-4 8.1-4, 9, 10.1-6, 11, 23.1, 26.1-3, 27.1-5, 28.1-2

III. Multivariate calculus

Multivariate functions

Partial derivatives

The gradient

Directional derivatives

The implicit function theorem

Readings: 12, 13, 14, 15.1-3

IV. Optimization

Quadratic forms

Unconstrained optimization

Constrained optimization

Value functions

Envelope theorems

Comparative statics

Readings: 16.1-2, 17.1-4, 18.1-6, 19.1-5

V. Dynamic analysis

Integration

First-order ordinary differential equations

Second-order ordinary differential equations

Systems of differential equations

Stability

Phase diagrams and phase portraits

Linearization of nonlinear ordinary differential equations

Readings: A4, 24.1-5, 25.2-5