

CAS EC 505A Mathematics for Economics
Syllabus
Fall 2023

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 three main parts. In the first, we introduce some concepts from linear algebra. The second part is devoted to multivariate calculus, and the last part treats constrained static optimization. If time permits, a fourth section will provide an introduction to differential equations and dynamic systems.

Instructor

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Office hours: M 2.00 - 3.30 pm and R 10.00 - 11.30 am

Teaching fellow

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Meetings

MW 4.30 – 5.45 pm in CAS 216

Blackboard website

Use your Kerberos password to access the course site on Blackboard Learn. Lecture notes, assignments, and lecture recordings 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.

Prerequisites

Students are expected to be familiar the material covered in chapters 2-5 and A2 in SB (one-variable calculus/optimization, logarithmic and exponential functions and their derivatives, and basic trigonometry).

Exercises

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

Examination

There will be two midterm tests and a final exam. The exam dates are:

Midterm 1: 10/10

Midterm 2: 11/13

Final exam: TBA

Grading weights

Midterm 1: 30%

Midterm 2: 30%

Final: 40%

Make-up exams

No make-up exams will be given unless acceptable reasons can be provided as defined by the university.

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 fellow students.

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.

Course outline

Below is a preliminary list of topics. Some deviations from the actual schedule may be necessary as the class progresses. Students are responsible for attending classes and learning of any changes in the schedule. The readings refer to the text by Simon and Blume.

I. Linear algebra

Linear systems

Matrix algebra

Linear independence and basis

Vector spaces

Linear transformations

The determinant function

Parametric expressions

Inner product and norm

Convexity

Readings: 7.1-4 8.1-4, 9, 10.1-6, 11

II. Calculus

Open sets, closed sets, compact sets

Calculus (gradients, total derivatives, directional derivatives)

Implicit function theorem

Readings: 12, 13, 14, 15.1-3

III. 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

IV. Dynamic analysis

First-order ordinary differential equations

Second-order ordinary differential equations

Eigenvalues and eigenvectors

Systems of differential equations

Stability

Phase diagrams and phase portraits

Linearization of nonlinear ordinary differential equations

Readings: A4, 23.1, 24.1-5, 25.2-5, 26.1-3, 27.1-5, 28.1-2