CAS EC505 A1 Mathematics for Economics
Syllabus
Fall 2024

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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Teaching fellow
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Office hours**:** Fri 3.30 - 5.30 pm

Class meetings
MW 4.30 - 5.45 PM
Room: 685-725 Com Ave CAS B20

Blackboard website
Use your Kerberos password to access the course site on Blackboard Learn. Lecture notes and assignments 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 comfortable with 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).

Academic conduct
It is a student's responsibility to know and understand the provisions of the CAS Academic Conduct Code:

https://www.bu.edu/academics/policies/academic-conduct-code

The CAS Academic Conduct Code is strictly enforced, and all cases of suspected academic misconduct will be referred to the Dean's Office.

Classroom conduct and participation
Students are expected to attend and actively participate in all lectures.

Examination
There will be two midterm exams and one final examination. Unless you have a documented health problem or family emergency, if you fail to take a test, your score for the missed test will be zero. There will be no make-up exams. Please observe that the final exam date cannot be changed.

Exam dates
Midterm 1: 10/9 in class
Midterm 2: 11/13 in class
Final exam: TBA

Grading weights
Midterm 1: 30%
Midterm 2: 30%
Final: 40%

Examination policy
Please note that the following rules apply in all exams:

- No phones, communication devices, or watches (of any type) may be accessible during an exam. Students must stash them in bags or leave them with the proctors before exams are distributed.
- BUIDs are checked at every exam.
- Bathroom brakes are not allowed.
- The course instructor reserves the right to replace individual written exams with oral exams.
- Students may be moved during exams to ensure academic integrity.

Exercises
A set of exercises 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.

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