CAS EC 505 Mathematics for Economics
Syllabus
Spring 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 four parts. In the first, we introduce some concepts from linear algebra. The second part is devoted to multivariate calculus, and the third part treats constrained static optimization. The last section provides an introduction to differential equations and dynamic systems.

Instructor
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Meetings
MW 3.30 – 5.00 pm in CAS 216

Blackboard website
Blackboard Learn site **ID: 15sprngcasec505_a1**. Lecture slides and assignments will be uploaded to 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).

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 covers material discussed after the midterm (That is, the final is not cumulative). The midterm exam will be held at the regular class time, and the final examination will be held at the regularly scheduled time shown below. This date and time cannot be changed. The location for the final examination will be announced later. 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 weights:
Midterm : 40%
Final: 60%

Exam dates
Midterm: March 4, 3.30 – 5.00 pm
Final: May 7, 3.00 – 5.00 pm

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

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. At least one of the questions asked in the midterm and in the final will be taken from the homeworks.

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. 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

II. Multivariate calculus
Open sets, closed sets, compactness
Continuity
Differentiation
The gradient
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
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