

Econ 530: Mathematical Economics

Fall 05, STR 248, TR 10:50am-12:05pm

Syllabus

Course Description

This class introduces the main mathematical tools used in economics. Several of those tools will be quite familiar to you from earlier classes. The main goal for this class is to offer you a more profound and thorough treatment and to extend the use of the tools beyond the basic versions you probably have encountered so far. In doing so, you will be able to not only apply the tools but also understand them from a mathematical point of view. A secondary and important goal is to understand how and where these tools can be used. We will be using as many different applications and examples as possible.

We will be covering univariate and multivariate calculus, linear algebra, constrained and unconstrained optimization, and some dynamic methods.

To give you a flavor of how this class extends beyond what you hopefully are familiar with: For instance, after having gone over univariate calculus (functions of one variable) again, we will be talking about multivariate calculus (functions that depend on several variables) quite extensively – you should have used it in Econ 310 (and 410) and possibly some other classes. Among other aspects, we will be stating the second-order conditions much more carefully and exhaustively – not just as a condition about the sign of the second derivative, but based on matrices and therefore by using linear algebra.

The detailed schedule below is a tentative schedule. Details will be added as we move along and I will adjust it as necessary. I am planning on offering a (voluntary) review session before each exam for which we are going to find a mutually agreeable time and date closer to the actual exam date. During the review session I will take any questions you may have about the material, but I will not be lecturing.

Readings

The required text for this class is

Hoy/Livernois/McKenna/Rees/Stengos, Mathematics for Economists

2001, MIT Press, 2nd edition (I do not know the 1st edition, so I cannot comment on its usefulness) – ISBN 0-262-08294-2.

As explained below, I may occasionally require some additional reading material. The exact expectations for such reading will depend on the reading and will be stated clearly in class or in writing. Required reading will be indicated by a (*).

I will be using Blackboard to post material and reading material will be available on ERes through a link on Blackboard. Please do login to Blackboard *before* the Thursday class in week 1 and enroll in the class there – for help see <http://www.lmu.edu/blackboard/studentsupport.htm>. Once you are enrolled, please send me an e-mail from Blackboard with the subject “test blackboard”. Once I have received such an e-mail from everybody, I will be sending a test e-mail to the whole class from Blackboard myself. The password for ERes is “e530f05cd” (the “0” are zeroes, not letters).

The Berck/Sydsaeter (1993) Economists' Mathematical Manual will be on reserve for this class. It is a great manual that helps you remind yourself of those basic things one keeps forgetting.

Prerequisites

Econ310 and Math 131 (or 112). Recommended: Econ320.

Grading

Class attendance is highly recommended. You will only be able to follow classes if you have mastered material covered earlier during the semester. In some of the classes, we will be discussing papers – for those classes it is paramount that everybody attends and has read the required material.

If you have to miss a class, I expect that you let me know *in advance*; it is your responsibility to catch up by consulting your classmates and the reading. I may assign additional homework if you miss class to make sure you are at the same level as everybody else in the class

Your final grade will be based on

- class participation 10%
- homework 25%
- two midterms (20 % each) 40 %
- final exam 25%

I will assign numerical grades (0-100%) to everything. At the end of the term, I will convert numerical averages into letter grades with appropriate +s and –s according to the standard scale A: 90-100%, B: 80-89%, C: 70-79%, D: 60-69%, F: <60. If appropriate and only rarely and minimally do I adjust this scale uniformly for everybody in class to the students' advantage.

The class participation grade relates mainly to the quality of your contributions, only to a small degree to the quantity. Although this class is mainly lecture-based, it relies crucially on your participation. Good contributions are questions, answers to my questions and suggestions of how to proceed or apply what we are covering, and often also requests to make me repeat something and explain something again – if it helps you, it almost certainly helps others too. If I ever feel that a contribution of yours leads us too far astray (highly unlikely), then I may relegate my response to the end of class. Please do never hesitate to ask a question or to raise an issue.

Exams

Bring your own calculator, ruler, pen and pencil, and eraser to each exam. I will provide the paper. I may also allow specific handouts to be used during the exam – if so, this will be clearly stated before and in the exam. You are *not* allowed to use any other material, nor or you allowed to use your own paper.

Doing problem sets and class attendance are the best preparation for the exams. All exams are cumulative, although there will always be a stronger emphasis on material that has not yet been tested in another exam. The majority of exam questions are derivations and proofs; some questions will be dedicated to explaining concepts and their applications.

The midterm exams are on **Oct 6** and **Nov 17** during regular class hours. The final exam is on **Dec 13 at 11:00am**.

Generally, there are no makeup exams. The only exceptions are *documented* cases of a serious family emergency, grave medical illness, or university-sponsored and required activities. In such cases, you need to contact me early *before* the missed exam and provide adequate written proof. Only if you follow these rules, will you usually be offered a makeup exam at a date set by me. Such a makeup exam may cover material that differs from the original exam. In exceptional cases where you followed the rules, you will not have the opportunity to take a makeup exam; in these cases, I will adjust the other exam weights proportionally. Contact me as early as possible to determine whether the above exceptions apply to you

and whether you are eligible for a makeup exam or not. If you do not follow these rules, then you will be assigned an F for a missed exam.

Homework

There is a problem set basically *every week*. As you probably know by now, math requires a lot of practice – the problem sets are an essential part of your learning process in this class. Please work in groups of 2 or 3 on the problem sets. Let me know by the end of week 1 who you are working with. Hand in one solution per problem set group. You are welcome and encouraged to discuss the material with others, however, the answer you provide has to be the one you as a group have worked out – do not, ever, just copy material from another group (that is cheating). Make sure you always explain what you are doing and provide derivations. If you have to graph something, provide scales, label everything, and draw carefully and precisely.

Problem sets are due by Thursday morning at 9:00am – push under my door if I am not in. They will be posted on my website latest by the weekend before the due date.

Occasionally we will read a paper or book chapter that uses the tools we have learnt in class. These materials will be available as electronic copies at least a week before the discussion date. I will provide (2-5) questions that you have to work on individually before class. The questions may focus on technical aspects, the assumptions of the model, the results and possible applications, etc. – the main point of these reading assignments is to illustrate how the tools we learn can be and are used, and to learn to read papers.

Your work on each reading assignment will count as much as one problem set. At the end of the semester, I will add up all grades on problem sets and reading assignments and drop the three weakest to determine your homework grade component.

Miscellanea

No cell phones. Turn off the sound on any other devices and do not use them in class unless it is for note taking. The second or any further time in the semester any device of yours goes off, I will ask you to leave that class session.

Academic integrity is essential for a successful learning process – please check the Bulletin (pp 61) for the University's Honor Code and Process. If I catch anyone cheating, you will receive an F in the course and will be reported to the Dean.

My office hours are TR 12:15-1:00pm, and W 12-2pm. I am happy to help you with assignments if you get stuck or are not sure you are heading in the right direction. I also am happy to go over your notes, if you have any questions. I am probably your best resource – use me. If you cannot make it during my office hours, send me an e-mail and I will try to find a different time to meet with you. I do check my e-mail quite frequently, but do not count on me to reply over the weekend or late at night.

Please make sure you talk to me as soon as you run into trouble or fail to understand something. Delaying to do so will hurt your understanding of material covered down the road. Please do also let me know if you have any concerns about the class in general or your performance.

You will have to work hard in this class – I offer you all the support you need to succeed and learn a lot.

Detailed Schedule

Date	Topic	Problem Set
Aug 30	Introduction, Syllabus, Fundamentals • (*) HLMRS 1+2	PS 1 due Sep 8 9 am
Sep 1	Fundamentals • (*) HLMRS 2+3	
Sep 6	Sequences, Series, and Limits • (*) HLMRS 3	
Sep 8	Univariate Calculus • (*) HLMRS 4+5	
Sep 13	Univariate Calculus • (*) HLMRS 5	
Sep 15	Univariate Calculus • (*) HLMRS 6	
Sep 20	Linear Algebra • (*) HLMRS 7	
Sep 22	Linear Algebra • (*) HLMRS 8	
Sep 27	Linear Algebra • (*) HLMRS 8+9	
Sep 29	Linear Algebra • (*) HLMRS 9	
Oct 4	Multivariate Calculus • (*) HLMRS 11	
???	Review Session	
Oct 6	First Midterm Exam	
Oct 11	Multivariate Calculus • (*) HLMRS 11+12	
Oct 13	No Class.	
Oct 18	Multivariate Calculus • (*) HLMRS 12	
Oct 20	Multivariate Calculus • (*) HLMRS 13	
Oct 25	Fall Break. No Class.	
Oct 27	Multivariate Calculus	

Date	Topic	Problem Set
	• (*) HLMRS 13+14	
Nov 1	Multivariate Calculus • (*) HLMRS 14	
Nov 3	Multivariate Calculus • (*) HLMRS 15	
Nov 8	Integration • (*) HLMRS 16	
Nov 10	Dynamic Methods • (*) HLMRS 17	
Nov 15	Difference Equations • (*) HLMRS 18	
???	Review Session	
Nov 17	Second Midterm Exam	
Nov 22	Difference Equations • (*) HLMRS 18+19	
Nov 24	Thanksgiving. No Class	
Nov 29	Difference Equations • (*) HLMRS 19	
Dec 1	Difference Equations • (*) HLMRS 20	
Dec 6	Difference Equations • (*) HLMRS 21	
Dec 8	Differential Equations • (*) HLMRS 22	
???	Review Session	
Dec 13	Final Exam. 11am – 1pm.	