University of Oklahoma

Department of Economics

2023 Fall

ECON5153 MATHEMATICAL ECONOMICS I

Professor MJ Kim email: mjkim@ou.edu
Office: 308 Cate Center Drive, Room 432 Classroom: CCD1 0145 & Online
. Office hours: W 10 am -12 pm (by appointment)
Class hours: M - F for 3 weeks in Aug. and then TR 10:30 - 11:45 am .
Tentative syllabus: more details and adjustments TBA on Canvas and/or via email .

• The Delivery Method is BLEND, primarily due to its FRONT-LOADED structure, which combines both online instruction (synchronous and asynchronous lectures) and in-person lectures. The proposed approach involves predominantly providing online content (such as videos and reading materials) before the regular semester begins. Once the semester commences, the lectures will transition to in-person sessions.

• For the initial three weeks (7/31 - 8/18) before the semester officially begins, the lectures will be conducted online, with each session lasting approximately 2 to 2.5 hours. After the semester commences, the class will meet in person on Tuesdays and Thursdays from 10:30 am to 11:45 am, following the regular class hours. The final day to attend the course, that is, the Final Exam, will be on Sep. 21st, 2023.

- The initial meeting will take place on Monday, 7/31/2023, from 10:30 am to 12:30 pm CST via Zoom.
- The online meeting link for the first class and office hours has been published on the course website and is also provided below:

  $https://oklahoma.zoom.us/j/91849298360?pwd = MnloMmxWenR4cUFxTUUvMW5nazc2Zz09$

  Meeting ID: 918 4929 8360

  Passcode: 79744524
- Please make sure to check the course website for any updates or changes regarding the schedule or links.
- Asynchronous instruction in an online format (i.e., video lectures and reading materials) will be made available in advance on Canvas.

• Communications: Communications will be conducted through in-person interactions, Zoom meetings, and email. All relevant student emails will receive responses within 24-48 hours upon receipt, unless prior notice of a delayed response is given. To receive a faster reply, please include the course prefix and number in the subject line (e.g., ECON5153: Question about the Syllabus).

• Email Account and Canvas: Students are expected to check their OU email accounts and the course site on Canvas daily for updates from the instructor. You will need to be sure to do the following:

Set up your default email address so you can reply to email directly from Canvas.

Set your profile photo as well and make sure to set up your Canvas notifications.

Recommend installing the Canvas Mobile app for on-the-go access to schedule and communications.

• Office Hours: W 10 am -12 pm by appointment. Video conferencing appointments for additional office hours can be made when needed with advanced notice.

Course Description

Economics 5153 is a graduate-level course lasting the entire semester, focused on mathematical concepts and methods for economics. It is part of the graduate Mathematical Economics/Econometrics sequence, aiming to familiarize students with the necessary mathematical techniques for economics.

The course is divided into two main parts. The first part covers matrix algebra and functions of several variables. Topics include determinants, applications of matrix algebra in economics, and the implicit function theorem. The second part delves into optimization and dynamics, encompassing unconstrained and

constrained optimization, homogeneous and homothetic functions, concave/convex functions, and differential equations. By mastering these concepts, students will be equipped to set up and solve variable optimization problems in economics and handle linear difference equations and ordinary differential equations.

This class adopts a heavily front-loaded approach, meeting more than twice a week both online and in person. Lectures will conclude before the end of September, and the course begins three weeks ahead of the fall semester. The teaching style will alternate between "lecture style" and "practice & discussion style." During each class, I will present theoretical concepts and methods, accompanied by examples in a lecture format. Additionally, practice questions will be provided, and the class will focus on solving them. It is important to note that the topics covered may be subject to change depending on the class's progress.

Course Delivery Method

This course is offered in both online and in-person formats. All assignments and activities will be posted and conducted through the Canvas course management system. Available online at: canvas.ou.edu. It is students' responsibility to check the site regularly. All important announcements will be posted on it.

Course Material

The textbook for the course is: Simon and Blume:
Mathematics for Economists, W.W.Norton, 1994. This book is available at the OU bookstore, or you can buy it online.

A useful but not required reading is:
Chiang and Wainwright: Fundamental Methods of Mathematical Economics, McGraw-Hill, Fourth Edition, 2005.
Darrell A. Turkington: Mathematical Tools for Economics, Blackwell Publishing, 2007.
Avinash Dixit: Optimization in Economic Theory, Oxford University Press, Second Edition,1990.
Michael D. Intriligator: Mathematical Optimization and Economic Theory, Prentice-Hall, 1971.

Teaching Assistant

TA : Junyeol Ryu — Office: 236 CCD1
Contact Info. : $junyeol.ryu - 1@ou.edu$ — **Office Hours**: Fri. 1 pm - 3 pm & by appointment

Grading

1. **Points Breakdown: The midterm exams for 40% and the final exam counts for 60%.**
2. No credit and/or points negotiation. No extra credits.
3. Grading Scale: Assigning final letter grades - If your final cumulative score is at least 90% out of 100% then your final letter grade will be an A. If your final cumulative score is less than 90% and at least 80% then a B. If less than 80% and at least 70% then a C. If less than 70% and at least 60% then a D. The lowest grade is F. That is:
Letter grades: A: 89.5-100 B: 79.5-89.4 C: 69.5-79.4 D: 59.5.0-69.4 F: less than 59.5

Exams

There will be two midterm exams that cover the class material and homework problems relevant to the corresponding periods.

- **Midterm 1** : 8/8 online
- **Midterm 2** : 8/29 in class

There is a **cumulative final examination** scheduled. Due to the adjusted course schedule (heavily front-loaded), the final exam will be in September.

- **Final exam: 10:30am - 12:30pm "in class" on Sep. 21.**
- **If you have any time conflicts, please inform the professor in the first 3 weeks of coursework and request for an adjustment/accommodation.**

You are responsible for double-checking your own final exam schedule.

Exam Policy

1. **The worst score out of the two mid-term exams will be dropped. That is, the best mid-exam score will be counted and have a weight of 40%.**
2. **If you miss one midterm exam, then the other midterm exam has a weight of 40%.**
3. **If you miss both midterm exams, then the weight will be transferred to the final exam. That is, your final exam has a weight of 100% if you miss both midterm exams.**
4. **If you happen to take one or both of the midterm exams and are dissatisfied with your scores, you have the option to drop the midterm exam scores. In this scenario, all the weights will be transferred to the final exam, resulting in the final exam having a weight of 100%, which will have a greater impact on your overall grade.**
5. **NO makeup exams for missed exams.**
6. Failure to take the final exam will automatically result in a course grade of F unless there are unavoidable exceptional circumstances verified by the College of Arts & Sciences. In case of such unavoidable exceptional circumstances it is the students' responsibility to inform the professor at least 24 hours prior to the start of the final exam in written form.
   Any medical conditions resulting in unavoidable exceptional circumstances require documentation from Student Health Services at the University of Oklahoma.
7. If there are any exam schedule conflicts with other classes, it is the students responsibility to inform the professor at least 7 days prior to the exam.
8. You have one chance to request a regrading after each exam. Any requests for regrading of exams must be submitted within one week from the date that exams are returned in class, and must be done in written form. The one-week period for submission of exams for regrading begins on the date that the exams are returned in class and not from the date that you pick up the exam. If you miss the class during which the exams are returned, it is your responsibility to pick up your graded exam within the one-week period. If a regrade is requested, the whole exam is subject to regrading. Submitted exams must be in original condition. Alternation of answers may lead to violation of course policies.
9. All in-class (in-person) exams must be closed book and no laptops, cellphones, kindles, and tablets are allowed in exams. All in-class (in-person) exams will be carbon-copied. Students are allowed to use a calculator and scratch papers. No engineering calculator is allowed.
10. **All online exams must be saved as .pdf and submitted to Canvas. The submission window will be created under the "assignment" navigation. You are responsible for double-checking completion of your submission on time. Late submission will not be counted. Students are allowed to use a calculator and scratch papers. No engineering calculator is allowed.**
11. **NO cheating in exams**. Cheating is the fraudulent or dishonest presentation of work. Cheating policy: F in course and reported to the CAS Dean's office for investigation and possible referral to the CAS Academic Conduct Committee.

Policy regarding Class Attendance

Class attendance is encouraged.

Course & University Policies

1. Late Work: Except in cases of documented serious illness or documented emergency no late work will be accepted. Technical difficulties do not qualify as an emergency unless the problem is severe, prolonged, and on the server end (the problem is with Canvas). In such cases, the due date will be modified and a new due date specified. Expect technical difficulties on your own end and make arrangements for a secondary location from which to post and/or an alternative Internet Service Provider.

2. Posting Difficulties: Files which do not post correctly in the assignments area or responses which do not correctly post on the discussion board will not be accepted for a grade. If your file does not post (you are timed out, for example), becomes corrupted, contains a virus, or if your response is blank/partial, you should re-post prior to the deadline so that you may receive a grade. Always check to see that your response or file has correctly posted before you exit Canvas. Be sure to post in advance so that you have enough time to correct for any posting difficulties.

3. Academic Integrity: Cheating is strictly prohibited at the University of Oklahoma, because it devalues the degree you are working hard to get. As a member of the OU community it is your responsibility to protect your educational investment by knowing and following the rules. Absolutely no incidences of academic misconduct will be tolerated in this course. See the Academic Integrity website for more information.

4. Special Accommodations: Any student in this course who has a disability that may prevent the full demonstration of his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

5. Students requiring academic accommodation should contact the Disability Resource Center for assistance at (405) 325-3852 or TDD: (405) 325-4173. For more information please see the Disability Resource Center website http://www.ou.edu/drc/home.html

6. Religious Holidays: It is the policy of the University to excuse absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays.

7. Since online courses allow students to complete course work around their unique schedules, and because you are given assignments well in advance of their due dates, most religious holidays should not conflict with the class schedule for this course. However, if you do have plans to observe a religious holiday, please notify your instructor as soon as possible in order to make appropriate arrangements for class work or rescheduling of assignments.

8. Adjustments for Pregnancy/Childbirth Related Issues: Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see www.ou.edu/content/eoo/faqs/pregnancy-faqs.html for commonly asked questions.

9. Title IX Resources: For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24.7, counseling services, mutual no contact orders, scheduling adjustments and disciplinary sanctions against the perpetrator. Please contact the Sexual Misconduct Office 405-325-2215 (8-5, M-F) or OU Advocates 405-615-0013 (24.7) to learn more or to report an incident.

10. Incompletes: The OU College of Arts and Sciences advises its faculty to be very strict about the conditions under which a student is allowed to take an incomplete in a regularly scheduled, letter-graded course. A grade of Incomplete (I) will be given only for a justifiable reason (due to unavoidable circumstances, not lack of planning on the student's part) and only if the student is passing the course. It is the responsibility of the student to request a grade of "I" and to meet with the instructor as early as possible to determine requirements for completing the course. Any incomplete granted must be removed by the deadline specified by the instructor. The time limit set for removal of an incomplete will take into account the circumstances of the situation but may not exceed one calendar year.

Course Outline *(*preliminary)

The actual time spent on each topic is likely to be adjusted as the semester proceeds.[1]
SB stands for Simon and Blume.

1. Introduction (0.5)
   Lecture 1 on July 31, 2023

2. One-variable calculus. *The first two lectures will be a review and refresher.*
   Lectures 2, 3, 4, & 5 on Aug. 1, 2, 3, & 4th
   SB Part I, Appendix A1, A2.1-A2.3, A2.7 (1.5)

3. Matrix algebra (6)
   Lecture 6 (1-hour short) on Aug. 7th;
   Midterm Exam 1 "online" on Aug. 8th
   Lectures 7, 8 & 9 on Aug. 9, 10 & 11th

   (a) System of linear equations, matrix operations and rank. SB 7.1-7.4, 8.1-8.4.

   (b) Determinant and applications. SB 9.1-9.2, 26.1-26.3.

   (c) Euclidean spaces and linear independence. SB 10.1-10.4, 11.1.

4. ch4: Functions of several variables (3)
   Lectures 9, 10, & 11 on Aug. 11, 14, & 15th

   (a) Limits and sets. SB 12.

   (b) Functions of several variables. SB 13.2-13.5, 30.1.

   (c) Calculus of several variables. SB 14.2, 14.4, 14.6, 14.8. (iv) Implicit function theorem. SB 15.3

5. ch5: Optimization (11)
   Lectures 11, 12, 13 & 14 on Aug. 15, 16, 17 & 18th
   Lecture 15 on Aug. 22nd (First In Class meeting)
   Lecture 15 on Aug. 24th in class
   Midterm Exam 2 "in the classroom" on Aug. 29th
   No class on Aug. 31st

   (a) Quadratic forms and definite matrices. SB 16, especially pp. 391-392.

   (b) Unconstrained optimization. SB 17, 30.2-30.42

   (c) Constrained optimization I: FOCs. SB 18, Dixit. 1-6.

   (d) Constrained optimization II. SB 19.1-19.3, 30.5.

   (e) Homogeneous and homothetic functions. SB 20.1, 20.3-20.4.

   (f) Concave/convex and quasiconcave/quasiconvex functions. SB 21.1-21.3.

6. ch6: Dynamics (7)
   Lecture 16: Discuss Math, Modeling & Data Analysis on Sep. 5th in class
   Lecture 17 on Sep. 7 & 12th

   (a) Linear difference equations, eigenvalues and eigenvectors. SB 23.1-23.4, 23.7-23.8.

   (b) Ordinary differential equations. SB 24.1-24.3.

7. Handouts: Integration; Probability and Statistics (1) *(if time allows)*

   Follows Must-have Math Tools for Graduate Study in Economics by William Neilson, Chapters 10-13. The book is downloadable at *http : //web.utk.edu/ wneilson/mathbook.pdf*

Final exam **on Sep. 21**.

[1]Special thanks to Dr. Liu who have taught this course for many years.