# Syllabus
## Fall, 2023

## Course Information

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| Course Number: | ECMT 660/ECON 460 |
| Course Title: | Mathematical Economics |
| Section: | 600/500 |
| Time: | TR 1:05 pm–2:20 pm |
| Location | ALLN 1006 |
| Credit Hours: | 3 |

## Instructor Details

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| **Instructor:** | Professor Guoqiang Tian |
| Office: | LASB 256 |
| Phone: | 845-7393 |
| E-Mail: | gtian@tamu.edu |
| Office Hours: | TR 10: 30 am-11:30 am or by appointment (face to face or online) |
| Link: | https://tamu.zoom.us/j/362-397-3071 |
| | **Password: 123456** |

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| Teaching Assistant: | Tian Lin Liu |
| Office: | LASB 246 |
| Phone: | 901-279-4393 |
| E-Mail: | liutl8976@tamu.edu |
| Office Hours: | MW 8:00- 9:00 am or by appointment (face to face or online) |
| Link: | https://tamu.zoom.us/j/5380449584 |

## Course Description

The purpose of this course is to introduce basic mathematical methods (solution techniques) used in the three major types of economic analysis: solving the equilibrium of a linear equation system, comparative statics, and optimization methods. These methods correspond to Parts 2-4 in the textbook, respectively. The mathematical topics covered in this course include linear algebra (matrix algebra), mathematical analysis, and optimization theory. These mathematical methods are fundamental as they are essential for a proper understanding of modern economics. They also provide basic mathematical tools needed in many fields related to economics and business sciences, as well as for your future studies.

## Course Prerequisites

MATH 131/141 (or MATH 151/152)

## Special Course Designation

This is a stacked course designed for both graduate and undergraduate students. Students enrolled in ECMT 660 are required to study additional materials in each major topic area, which is not mandatory for students taking ECON 460. Moreover, it is important to note that students taking ECON 460 are not in competition with those taking ECMT 660. Grades will be assigned separately for students taking ECON 460 and those taking ECMT 660.

## Course Learning Outcomes

Through the study of the fundamental mathematical methods (solution techniques) introduced in this course, students are expected to attain mastery of essential concepts crucial for a solid comprehension of modern economics. They will also gain a firm grasp of the basic mathematical tools necessary in various fields related to economics and business. Specifically, upon successful completion of this course, students will be able to:

1. Demonstrate a clear understanding of linear models, involving matrices, vectors, and operations like addition, subtraction, and matrix multiplication.
2. Calculate determinants using basic properties and find the inverse of a nonsingular matrix.
3. Apply Cramer's Rule effectively.
4. Test the positive or negative definiteness of a quadratic matrix.
5. Grasp the concepts and definitions of limits, continuity, and differentiability of functions.
6. Utilize various rules to compute derivatives, partial derivatives, or differentials of functions with one or more variables, and employ them for comparative static analysis of economic models.
7. Determine and assess the existence of maxima or minima of functions with one or more variables, utilizing the first-order necessary and second-order sufficient conditions.
8. Understand and solve optimization problems with equality and/or inequality constraints, employing the first-order necessary and second-order sufficient conditions.

## Textbook and/or Resource Materials

The textbook used for this course is:
"**Fundamental Methods of Mathematical Economics**" by Chiang, A. and Kevin Wainwright, fourth edition, published by McGraw-Hill Book Company in 2004.

However, the lectures will primarily rely on my lecture notes titled "**Mathematical Economics**." These lecture notes can be downloaded from Canvas and my website at: http://people.tamu.edu/~gtian/teaching_and_class_materials.html.

## Grading Policy

You will be evaluated based on seven homework assignments, two 75-minute tests, and the final exam. Homework assignments will be given periodically to facilitate learning through practical application. Working on these problem sets will significantly enhance your understanding of the course materials. It is encouraged to form study groups to collaborate on these assignments. Each study group, consisting of up to three students, should submit only one copy of each assignment. Additionally, it is strongly recommended to study the questions in the exercises provided in the textbook to prepare for the tests and the final exam.

Your final grade will be calculated using the following method:

**Homework: 20%**
**Test 1: 20%**
**Test 2: 20%**
**Final exam: 40%**

The total possible points are 100. The grade distribution is as follows:

For graduate students: A grade will be awarded for a point range between 90-100, B for 80-89, C for 70-79, D for 60-69, and F for 0-59.

For undergraduate students: A grade will be awarded for a point range between 85-100, B for 75-84, C for 65-74, D for 55-64, and F for 0-54.

## Late Work Policy

Late work and missed exams will be governed by university rules on university-excused absences (*See Student Rule 7:* https://student-rules.tamu.edu/rule07/).

## Tentative Course Schedule

**Part I. Equilibrium Analysis and Linear Algebra**

1.  The Nature of Mathematical Economics (Chapter 1): Week 1
2.  Equilibrium Analysis in Economics (Chapter 3): Week 2
3.  Linear Models and Matrix Algebra (Chapter 4): Week 2-3
4.  Linear Models and Matrix Algebra Continued (Chapter 5): Week 3-5

**Due Date of Homework 1 (for Chapter 3-4): Tuesday, September 12**
**Due Date of Homework 2 (for Chapter 5): Tuesday, September 26**

**Test 1: Tuesday, October 3, 1:05 pm–2:20 pm**

**Part II. Comparative-Static Analysis and Mathematical Analysis**

5.  Comparative Statics and the Concept of Derivative (Chapter 6): Week 5-6
6.  Rules of Differentiation and Their Use in Comparative Statics (Chapter 7): Week 7-8
7.  Comparative-Static Analysis of General Function Models (Chapter 8): Week 9

**Due Date of Homework 3 (for Chapter 6-7): Tuesday, October 17**
**Due Date of Homework 4 (for Chapter 8): Tuesday, October 24**

**Test 2:  Tuesday, October 31, 1:05 am–2:20 pm**

**Part III. Optimization Theory**

8.  Optimization: One Choice Variable (Chapter 9): Week 10
9.  Exponential and Logarithmic Functions (Chapter 10): Week 11
10. Optimization: More Than One Choice Variable (Chapter 11): Week 12-13
11. Optimization with Equality Constraints (Chapter 12): Week 13-14
12. Optimization with Inequality Constraints (Chapter 13): Week 15

**Due Date of Homework 5 (for Chapter 9-10): Tuesday, November 7**
**Due Date of Homework 6 (for Chapter 11): Tuesday, November 21**
**Due Date of Homework 7 (for Chapter 12): Tuesday, November 28**

**Final Exam:  Friday, December 12, 8:00 am -10:00 am**

## University Policies

## Attendance Policy

All students in the course are **required** to attend class and complete all homework assignments and exams. Regular class attendance will be monitored.

The university considers class attendance and participation as the individual responsibility of each student. It is expected that students attend class and fulfill all assigned tasks.

Please refer to Student Rule 7 in its entirety for information about excused absences, including definitions, and related documentation and timelines.

## Makeup Work Policy

Make-up exams are permitted only under specific circumstances and in accordance with the rules outlined in Sections 7.1-7.4 of the University Students' Rule. To obtain permission for a make-up exam, you must adhere to the guidelines specified in Section 7.3:

"Except in the case of the observance of a religious holiday, in order to be excused, the student must provide written notification to the instructor in advance of the absence, if feasible. Notification can be submitted via an acknowledged email message. If advance notification is not feasible (e.g., due to an accident or emergency), the student must provide notification no later than the end of the second working day after the absence. This notification should include an explanation as to why prior notice could not be sent before the class. Requests for accommodations due to absences related to the observance of a religious holiday can be made either before or after the absence, but must be submitted no later than two working days after the absence."

Please refer to Student Rule 7 in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" (Student Rule 7, Section 7.4.1).

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" (Student Rule 7, Section 7.4.2).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. (See Student Rule 24.)

## Agreement in Wring

All agreements should be in writing. If you have an inquiry regarding the possibility of obtaining an excuse or any other circumstance that requires special accommodation in class, it is necessary to communicate the details in writing. In order to confirm any arrangements, if our conversation leads you to believe that you are entitled to a special accommodation, please send me an email to inquire and request confirmation. Unless there is written communication from me, you are not entitled to any special accommodation.

## Academic Integrity Statement and Policy

"**An Aggie does not lie, cheat or steal, or tolerate those who do.**"

*During the exams, it is important that you refrain from talking or sending messages to other students in your class. If you have any questions or need assistance, please direct them to the proctors who are present to help you.*

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](#).

## Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](#). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

## Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters

must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services](#) (CAPS).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

## Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the Texas A&M Helpline (979-845-2700) from 4 p.m. to 8 a.m. weekdays and 24 hours on weekends. Emergency help is also available 24 hours through the National Suicide and Crisis Hotline 988.