

**ECO 4401: INTRODUCTION TO MATHEMATICAL ECONOMICS**

**Fall Semester 2025**

**Instructor Information:**

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| Instructor: | Dr. Swati Sharma |
| Office: | DM 311A |
| Email: | swsharma@fiu.edu |
| TA: | Omar Vanegas Virgüéz |

**Class Information and Office hours:**

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| Class hours: | 4:00 pm – 4:50 pm (MWF) |
| Classroom: | DM 194 |
| Office hours: | * 11:00 am – 12:00 pm (M,W,F) * 12:30 pm – 1:30 pm (T, TR) * Also by appointment |
| TA hours: | TBA |

**Prerequisites:**

Students should have completed ECO 3101, ECO 3203, and a course in Calculus (MAC 2233 or MAC 2311) with a C or better before enrolling in this course.

**Course Description and Purpose**

The purpose of this course is to introduce students to the mathematical tools commonly used by economists to rigorously describe and analyze the predictions made by the models that they use. To that end, the course examines a variety of classic problems from economic theory, and develops the mathematical methods required to solve those problems.

**Required Materials**

The required textbook for the course is:

* Essential Mathematics for Economic Analysis, 5th edition (2016) by Knut Sydsaeter and Peter Hammond, published by Pearson Education Limited.

Other useful references for additional explanation and exercises include:

* *Fundamental Methods of Mathematical Economics, 4th edition* (2005) by Alpha C. Chiang and Kevin Wainwright (McGraw-Hill Irwin)
* *Mathematics for Economists* (1994) by Carl Simon and Lawrence Blume (W. W. Norton and Company)
* *Mathematics for Economists, an Introductory Textbook, 2nd edition* (2007) by Malcolm Pemberton and Nicholas Rau (Manchester University Press)
* *Mathematics for Economists, 2nd edition* (2001) by Michael Hoy et. al (The MIT Press)

**Course Structure**

**Class Structure**

* The class is meeting face-to-face three times a week for 50 minutes.
* Attendance will be taken at the end of each class and will contribute to the final grade.
* Students are allowed to miss two classes without penalty toward their grades.
* Being tardy will count as half an absence. Students who come to class more than 10 minutes late will be counted as absent. Students who leave more than 10 minutes early from class will be counted as absent. Students who are on their phones during the lecture or sleeping will be marked as absent.
* I will use “Announcements” on Canvas to convey important information. Please make sure your notifications are turned on.
* **Extra credit assignments** will not be given on an individual basis, **so do not ask**. If and when extra credit is given, the entire class will have the opportunity to get it. Usually, extra credit opportunities are available during the class. You may miss the extra credit opportunity if you do not attend class.
* If you have any questions or concerns about your grade, please contact me immediately. You should be proactive about your grades and not wait until the last minute.

**Homework**

* There will be 6 HW assignments in total, with respective due dates given throughout the semester.
* In order to encourage the timely submission of homework, late homework will be penalized as follows.
* Assignments submitted after the deadline, but within 3 days of the deadline, will lose 50% of their value.
* Assignments submitted more than 3 days late will receive a zero.

***Note:*** An assignment will be counted as late if it is not submitted within 10 minutes of the start of class on the day that it is due.

**Exams**

* There are three exams in total: 2 Midterms and 1 final exam. All exams are hard-copied exams taken in class. While the midterm exams will test on the material taught up until the exam date, the final exam will be cumulative/comprehensive.
* **Make-up exams:** You are required to take all the exams at the scheduled time unless you have a university-sanctioned schedule conflict or a well-documented emergency. If you think you have a schedule conflict, please notify the instructor at least two weeks before the exam. All such situations will be dealt with on an individual basis.
* Students who fail to abide by the FIU honor code and are found cheating on the exam will be marked “0” and will not have their grade resurrected/replaced from the final exam.
* Students who fail to take an exam on the due date and do not have valid reasoning and documentation to support their claim will not have their grade resurrected/replaced from the final exam.
* Students who have a well-documented medical emergency or university-related schedule conflict will be given the option of a make-up exam or to have their grade replaced with the final exam.
* **Exam Schedule:**

1. Midterm 1 - September 29, 2025 (During regular class hours)
2. Midterm 2 – TBA
3. Final Exam – December 8, 2025; 2:15 pm – 4:15 pm (DM 194)

**Grading Policy**

**Incomplete grade Policy Statement**

A student who is passing a course but has not completed all work due to exceptional circumstances may temporarily receive a grade of incomplete (“I”). The assignment of the “I” grade is at the discretion of the instructor and the deptartment chair but is allowed only if the student has a grade of at least a “C” and has completed at least 75% of the course.

**Grade Calculation**

The grade will be calculated using the following proportions:

* **70%** of your grade will be determined by in-class exams
* **25%** of your grade will be determined by homework
* **5%** of your grade will be determined by attendance.

*Final Grade* = (*Midterm* 1 *∗* 0.20) + (*Midterm* 2 *∗* 0.20) + (*Homework Average ∗* 0.25) + (*Final Exam ∗* 0.30) + (*Attendance ∗* 0.05)

If your final exam is a higher score than any of your three previous exams, then your final grade will be calculated as follows:

*Final Grade = (Average of Two Highest Exam Scores ∗ 0.4) + (Homework Average ∗ 0.25) +*

*+( Attendance ∗ 0.05) + (Final Exam ∗ 0.30)*

**Grading Scheme**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Letter** | **Range** | **Letter** | **Range** | **Letter** | **Range** |
| A | 90.00 or above | B | 75.00- 79.99% | C | 60.00- 64.99% |
| A- | 85.00-89.99% | B- | 70.00- 74.99% | D | 55.00- 59.99% |
| B+ | 80.00-84.99% | C+ | 65.00- 69.99% | F | 54.99 or less |

**Weekly schedule**

The schedule is tentative and subject to change. Midterm exam 1 will test on the material that was taught up until the exam date, while Midterm 2 and Final exam will be cumulative. The material taught in the second half of the semester tends to build on the concepts in the first half of the semester, so it is important to at least review those concepts throughout the semester.

**Please note: Although I reserve the right to make modifications as I see fit, my tentative plan is to cover the following topics in order:**

* Gaussian elimination and row echelon forms (Ch. 15.6)
* Vectors and vector equations (Ch. 15.7, 15.8)
* Linear independence ([online](https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/resources/lecture-9-independence-basis-and-dimension/))
* Matrix operations (Ch. 15.2 – 15.5)
* Systems of linear equations and Ax = b (Ch. 15.3)
* Determinants (Ch. 16.1 – 16.5)
* Finding the inverse of a matrix (Ch. 16.6, 16.7)
* Cramer’s rule (Ch. 16.8)
* Eigenvalues and eigenvectors ([online](https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/resources/lecture-21-eigenvalues-and-eigenvectors/))
* Diagonalization (online)
* Discrete time dynamical systems ([online](https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/resources/lecture-24-markov-matrices-fourier-series/))
* Derivatives of univariate functions (Chs. 6, 7)
* Partial derivatives of multivariate functions (Ch. 11)
* Total differentials (Ch. 12.9 – 12.11)
* Differentiating implicit functions (Ch. 7.1 – 7.3)
* Comparative statics (Chs. 13.7)
* Critical points of an objective function (Chs. 8.1 - 8.6, 13)
* Second derivatives (Ch. 6.9)
* Concave and convex functions (Chs. 6.9, 8.7, 13.2)
* Second order conditions for local extreme values (Chs. 6.9, 13.2 – 13.3)
* Hessian matrices (Ch. 11.6)
* Positive definite and negative definite matrices ([online](https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/resources/lecture-25-symmetric-matrices-and-positive-definiteness/))
* Constrained optimization (Ch. 14)

**Key Dates**

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| --- | --- |
| Classes start | Monday, August 25, 2025 |
| Last day to add/drop | Sunday, August 31, 2025 |
| Labor Day (No classes) | Monday, September 1, 2025 |
| Last day to drop with DR grade | Monday, November 3, 2025 |
| Veterans’ Day observed (No classes) | Tuesday, November 11, 2025 |
| Thanksgiving Holiday | Wednesday - Sunday, November 26-30, 2025 |
| Last regular class day | Saturday, December 6, 2025 |
| Finals Week | Monday-Saturday, December 8-13, 2025 |
| End of term | Saturday, December 13, 2025 |
| Grade available to students | Thursday, December 18, 2025 |

**Course Policies**

**Attendance Policy**

Class attendance is **required** for all scheduled class lectures. However, you can miss classes (as stated in University Guidelines) if you have Covid-19 symptoms or were in contact with someone who tested positive for Covid-19. In case you miss a class, please send me an email. Make sure to adhere to all the health safety protocols issued by the university.

Students who miss classes fall to the bottom of the grading ladder. Reading the textbook is a complement to the lectures, not a perfect substitute for missing classroom lectures. The lectures may deviate from the textbook, and you can only be aware of the appropriate material if you attend the class. If you’ve read this entire syllabus during the first two weeks of classes, please email me your favorite type of candy. Some material in the textbook may be skipped in the lectures, while other material may be studied in more detail than is presented in the textbook. I will give examples, make clarifications, answer questions, and offer interpretations that may not be found in the textbook. Announcements concerning which material in the textbook will be emphasized or ignored will be made in class. Students are responsible for all announcements made in class. Students are also responsible for all subsequent changes in the syllabus that are announced. Missing a lecture is no excuse.

Note: The University may administratively drop you from the course if there is no verified record of your attendance during the first two weeks of classes.

**Technology policy**

I have a no cell phone policy. You may choose to use a laptop/tablet to take notes. I find that although there are merits to taking notes on these devices, they can cause a distraction, sometimes even distracting those around you. Additionally, because my goal is to promote long-term retention of this material, this is best done through taking notes with a paper and pencil/pen.

**Email policy**

Please use email to send a message if you have any questions or concerns. Include your name and section at the end for clarity. Please use common courtesy when sending messages. Please allow 48 business hours for a response. Messages will be checked periodically Monday-Friday from 9:00 AM – 5:00 PM. Messages will not be checked on the weekends.

**Classroom etiquette**

* Arrive on time.
* No food or beverages except for water.
* Please silence cell phones during class.
* If you need to use your cell phone for any non-academic purposes during class (i.e., social media, texting, checking voicemails, phone calls, etc.) please step outside the classroom.

**Exam etiquette**

This is a large class and I have to proctor this exam on my own. I ask you to adhere to a few rules on exam days.

* You cannot leave the class once the exam has started unless you are finished. Once you leave the classroom you will have to turn in your exam. Please use the bathroom before coming to class.
* No calculators on wireless devices or sharing of calculators is allowed on the exam.
* Please remove smartwatches.

**Academic Integrity and Honesty**

Students are required to comply with the F.I.U. university policy on academic integrity found in the [Academic Misconduct](https://online.fiu.edu/faculty/resources/university-resources/academic-misconduct-policies-and-procedures.php). Cheating in exams, homework, or any other assignment will not be tolerated. Students found cheating on an exam you will be given a score of “0” on the exam and you the zero will not be replaced with the final exam grade.

**Accommodations for Disabilities**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register at [Disability Services Office.](https://studentaffairs.fiu.edu/get-support/disability-resource-center/students/request-accommodations/index.php)

Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or Florida International University policy and will not be tolerated.