

# ECO 4401: INTRODUCTION TO MATHEMATICAL ECONOMICS

FALL SEMESTER 2024

Instructor: Dr. Joel D. Carton

Office: DM 313B

Phone: 305-348-2682

E-mail: [joel.carton@fiu.edu](mailto:joel.carton@fiu.edu)

Teaching Assistant: TBA

## Office hours and appointments:

I will hold in-person office hours on Wednesdays, from 5:00 – 6:30, and virtual office hours on Thursdays, from 3:00 – 5:00, via Zoom. Those can be accessed at the scheduled times with the link: <https://fiu.zoom.us/j/4332681122>. No passcode is required to join. In addition, I will be available for appointments as the need arises. To insure availability, appointments should be made with at least 24 hours advance notice.

## Textbook and references:

The required textbook for the course is:

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

Other useful references for additional explanation and exercises are:

- *Fundamental Methods of Mathematical Economics, 4<sup>th</sup> 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, 2<sup>nd</sup> edition* (2007) by Malcolm Pemberton and Nicholas Rau (Manchester University Press)
- *Mathematics for Economists, 2<sup>nd</sup> edition* (2001) by Michael Hoy et. al (The MIT Press)
- *Linear Algebra and its Applications, 4<sup>th</sup> edition* (2012) by David C. Lay (Pearson)

### **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 content:**

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.

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](#))
- Matrix operations (ch. 15.2 – 15.5 )
- Systems of linear equations and  $A\mathbf{x} = \mathbf{b}$  (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](#))
- Diagonalization (online)
- Discrete time dynamical systems ([online](#))
- 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](#))
- Constrained optimization (ch. 14)

### **Course Grades:**

Grades will be based on six homework assignments and three exams, including two midterm exams and a comprehensive final exam. In particular, a student's overall numerical score for the course will be a weighted average of his/her average homework score, average midterm score, and final exam score. The average homework score will receive a weight of .30 in the overall grade. Of the midterm average and final exam grade, the better score will receive a weight of .50, while the worse score will receive a weight of .20.

Letter grades for the course will be determined by students' relative overall numerical scores for the course. Specifically, grades will be based on the following scale, although I reserve the right to be more generous if appropriate:

- A: Top 20% of scores
- B: Next 20% of scores
- C: Next 40% of scores, or all remaining scores over 39.5 (whichever is smaller)
- D, F: Lowest 20% of scores, or all remaining scores (whichever is larger)

**Note:** There will be no extra credit of any kind offered to any student under any circumstances

### **Exam schedule:**

Exams are scheduled as follows:

- Exam 1: Monday, September 30<sup>th</sup>
- Exam 2: Monday, November 4<sup>th</sup>
- Final Exam: Monday, December 9<sup>th</sup> at 2:15

**Note:** If you take this class, you must take the exams at the scheduled times, unless you have a university sanctioned schedule conflict. If you won't be available to take the exams at the scheduled times, don't take this class. There will be no makeup exams offered to students who miss exams without prior authorization!

### **Late homework:**

In order to encourage timely submission of homework, late homework will be penalized as follows.

- Assignments submitted after the deadline (including after class on the due date), but within 3 days of the deadline will lose 50% of their value.
- Assignments submitted more than 3 days late will receive a zero.

### **Attendance policy:**

For this class, **attendance is mandatory**. In particular, each student will be allowed to miss only 6 lectures. Any student who misses more than 6 lectures will receive a failing grade (D or F), regardless of their performance on homework assignments and exams. For attendance purposes, a student will be counted as absent if they are not present within 10 minutes of the beginning of the class period.

## **Academic dishonesty:**

I will not tolerate cheating of any kind. Although you are free to collaborate with other students on your homework assignments, you will be expected to submit your own assignments and complete your exams without assistance from anyone (or anything) else. Any student who, in my judgment, is responsible for academic misconduct on an assignment or an exam will receive an automatic zero for that assignment/exam and have a complaint filed against them with FIU's Office of Student Conduct and Academic Integrity.

FIU's Student Conduct and Honor Code define academic misconduct as:

### *1. Cheating*

- The unauthorized use of any materials, information, study aids, or assistance from another person on any academic assignment or exercise, unless explicitly authorized by the instructor
- Assisting another student in the unauthorized use of any materials, information, study aids, or assistance from another person on any academic assignment or exercise, unless explicitly authorized by the instructor
- Having a substitute complete any academic assignment, or completing an academic assignment for someone else, either paid or unpaid

### *2. Commercial Use*

- The selling of course material to another person or student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to: class notes, instructor's power points, tests, quizzes, labs, instruction sheets, homework, study guides, and handouts.

### *3. Multiple Submission*

- Submitting the same or substantially the same academic work (including oral presentations) for credit more than once. Multiple submissions shall not include situations where written approval by the instructor in the current course is given to the student to use a prior academic work or endeavor. It is each instructor's responsibility to make expectations regarding the incorporation of existing academic work into new assignments clear to their students in writing.

### *4. Plagiarism*

- The deliberate use and appropriation of another's work without any indication of the source, and the representation of such work as the student's own.
- Assisting another student in the deliberate use and appropriation of another's work without any indication of the source, and the representation of such work as the student's own.

**Accommodating disabilities:**

In keeping with the Americans with Disabilities Act, I will make every effort to accommodate the needs of students with disabilities. Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact me as soon as possible to make necessary accommodations.

**Drop/add deadlines:**

- Tuesday, September 3rd: Drop/Add period ends. You will not be refunded for the course if you drop it after this date.
- Monday, November 4th: Last day to drop with DR grade or withdraw from the University with a WI grade.