

01:220:485 **Mathematical Economics**

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Required text: **Microeconomic Analysis** by Hal Varian (Norton, 3rd edition, 1992)

Optional supplement: **Mathematics for Economists** by Carl Simon and Lawrence Blume (Norton, 1st edition, 1994)

Optional supplement: **Mathematical Optimization and Economic Theory** by Michael Intriligator (SIAM Classics in applied Mathematics 39, 2002))

Prerequisites: 01:220:320, 321, and 322; 01:640:136 or 152. In addition, a familiarity with the basic concepts of linear algebra is strongly recommended. Familiarity with the basic ideas of analysis (e.g., open, closed and compact sets, convergent sequences, continuous functions), while also strongly recommended, will not be assumed and we will develop the necessary concepts as we need them.

Learning Outcomes: This course will use mathematical concepts from convex analysis and optimization theory to study questions arising in equilibrium theory for games and economies. The student will learn how to apply these concepts to address questions important aspects of consumer and firm behavior, especially those pertaining to consumer demand, cost minimization and profit maximization. The ideas developed in the study of optimizing decisions by individual economic agents will be applied to the analysis of equilibrium in economies. Insight will be gained concerning the relationship between economic equilibrium and economic welfare.

Attendance: There is no formal attendance policy. However, regular class attendance is strongly recommended. The use of cell phones and/or computers is both distracting and annoying. In order to maintain a class environment that is respectful of the participants and the instructor, please refrain from using cell phones and/or computers during lecture.

Exercise Sets: Weekly exercise sets will be posted on our Sakai site every Thursday. The sets will vary in length, but students should submit solutions to the five exercises indicated with a *. Of the five submitted exercises, two will be chosen randomly for grading. Solutions are due in class on the following

Thursday. Since the solutions will be posted on each due date, late submissions will obviously not be accepted.

The 10 highest scores on the exercise sets will be used for grading and, after scaling to obtain a score out of 100, will count as 10% of the final grade.

Examinations and grading:

In class midterm: **Monday, February 19**

In class midterm: **Monday, April 2**

Final Examination: **Monday, May 7, 8:00-11:00 AM**

There will be no makeup dates for the midterms. Instead, a missed midterm exam will be dropped. In addition, there will be no make up date for the final exam. If there is reason to believe that you may not be able to take the final exam at its scheduled time, you should reconsider enrolling in this course. The final numerical score S will be determined according to the following formula where H = higher of the two midterm scores, F = final exam score and E = the exercise set score:

$$S = (.5 \times \max\{H, F\}) + (.4 \times \min\{H, F\}) + (.1 \times E)$$

Final grades will be assigned according the following table

| S | Grade |
|-------------------|-------|
| $85 < S \leq 100$ | A |
| $80 < S \leq 85$ | $B+$ |
| $73 < S \leq 80$ | B |
| $67 < S \leq 73$ | $C+$ |
| $60 < S \leq 67$ | C |
| $50 < S \leq 60$ | D |
| $S \leq 50$ | F |

Academic Honesty and Code of Conduct: Adherence to all of Rutgers University's policies and regulations are expected. In addition to normal standards of acceptable behavior, everyone should be familiar with and adhere to the current Rutgers University Academic Integrity Policy, available at:<http://academicintegrity.rutgers.edu/academic-integrity-policy/>. Any violation of that policy will be reported as required by University procedures.

Course Outline: Note that the subject matter and order of presentation may change depending on time and other factors.

1 Convex analysis and nonlinear optimization: V27.1-27.6, SB18, SB 21, I.2, I.4.1-4.3, I.A.5

2. Applications in game theory

3. Firms 1: Technology V.1, I.8.1
4. Firms 2: Profit maximization V.2.1-2.3, V3.1, I.8.2
5. Firms 3: Cost minimization V.4.1-4.4, V5.3, V6.1-6.2
6. Firms 4: Comparative statics and the envelope theorem V.5.4-5.5, V.3.2-3.3, SB.19.1-19.2
7. Consumers 1: Preferences and utility V.7.1, I.7.1-7.2
- 8 Consumers 2: Utility maximization V.7.2-7.4, I.7.3
9. Fixed point theory
10. General equilibrium: pure exchange economies V.17, I.9.3
11. General equilibrium: economies with production V.18.1-18.8, I.10.1-10.2