Spring 2023

Economics 2100: Intermediate Microeconomics

January 30, 2023

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office hours: Monday 2–3PM and Wednesday 1-2PM (PCPSE 522).

Contents

1 Introduction

Scarcity implies the need to make choices. Microeconomics is the study of how individuals and society make choices. That is, the study of how individuals respond to incentives and the resulting impact on social outcomes. The course emphasizes the development of the mathematical tools needed to reason carefully about incentives and necessitates a taste (or at least patience) for long chains of reasoning (see below for prerequisites).

This course is *not* a laundry list of facts to memorize or recipes to follow. Its purpose is to change the way you think. This will be accomplished by posing questions whose answers will challenge your intuition. Merely memorizing the questions and their answers is insufficient, one must understand the reasoning process by which one arrives at them. The questions change, and you will have to figure out your own answers.

The course requires you to perform computations that are useful to convince you of things that you might at first disbelieve. Regular homework assignments will aid you in these computations. In the recitations, TAs will cover problems typically drawn from a file of review problems (with solutions) posted on Canvas.

2 Logistic Overview

1. **Lectures** will be delivered in person during the regularly scheduled class time (Tuesdays and Thursdays, 10:15-11:45). While the lectures will not be recorded, the recordings for this class from 2021 will be available under Class Recordings.

2. **Recitations** will be delivered in person during their regularly scheduled time.

3. **Office hours** are open to anyone, and you can simply "drop in." TA office hours will be posted on canvas.

4. **The final grade** will be determined by the best 8 out of 11 homeworks (15%), three midterm exams (45%), and a final exam (40%).

   I anticipate the grade distribution to be roughly

   A: 30-35%
   B: 40-45%
   C: 15-20%

3 Important Dates

1. First class Jan 12, 2023

2. Recitations begin Jan 13, 2023 (there are no recitations on MLK day, Jan 16, 2023)

3. First Midtem Exam Feb 7, 2023

4. Second Midtem Exam Mar 2, 2023

5. Third Midtem Exam Apr 4, 2023

6. Final Exam to be announced by registrar

4 Course Material

1. A file of the lecture slides (as well as a handout version) is posted on Canvas. These will be updated if necessary as the course progresses.

2. The structure of the course follows the text *Prices & Quantities: Fundamentals of Microeconomics* by Rakesh V. Vohra, 2020, Cambridge University Press. The text itself is optional. It is available online from Penn Libraries. See Canvas for details.

3. Review problems are posted on Canvas.

4. Optional for the course is: Jeffrey M. Perloff, *Microeconomics: Theory and Applications with Calculus*, fourth or fifth edition.

5. Perloff is not the only textbook of its kind available. There are many substitutes. For example, *Introduction to Economic Analysis* by McAfee, Lewis and Dale which is a free, open source text book available at https://vita.mcafee.cc/Introecon/ieav21.pdf

5   Logistic Details

1. **Canvas** is used to post announcements, slides, homework assignments, homework solutions, additional handouts, and other important materials. You are responsible for regularly checking, downloading and reading materials posted on the site, as they form an integral part of the class.

2. **Handouts, homework problems, solutions and other material prepared by the TAs and myself are *not* for distribution to those outside of the current class.**

3. **Ed Discussion** will be used for all class discussions and questions. Any questions to do with class material and organization should be posted there. Post all content-related questions about problem sets, lecture, and the course on piazza. This is a great way to collaborate with classmates. Course instructors will monitor, and occasionally post, on this forum. There is a link to Ed Discussion in canvas.

4. **Email.** Use for correspondence that is not appropriate for piazza. Emails will receive a response within 24 hours Monday through Friday. *Include Econ 2100 in the subject line.*

5. **Recitations.** I will post the problems to be covered in advance via Canvas. The problems for each session are selected to mirror those on the homework. The review sessions are for practice at the problems. Some, but not all, of the problems are of the cookbook variety. The non-cookbook problems are designed to tax your reasoning faculties rather than your ability to pattern match. **Recitations will commence on January 13, 2023.** This will be a review session covering optimization. There will be no recitations on MLK day (Monday Jan 16).

6. **Homeworks must** be uploaded on Canvas. **No late work is accepted**.

   - Write-ups must be your original work. You may not use materials containing solutions or partial solutions to the assignments (including solutions prepared by current or former students). If your analysis contains information from outside sources, you should properly cite those sources.
     While you are required to complete the assignments individually, I encourage learning from one's peers. In particular,
     (a) discussing the *general* ideas behind the problems is always a good idea, but

(b) writing formal solutions should be *completely individual*, done in the equivalent of separate rooms.

As discussions of general ideas gradually become more specific, some judgment is unavoidable, but here's the kind of interaction I have in mind: If a peer conveys an idea which seems central to the solution, *do not write it down.....immediately.* Approach the problem again on your own as if afresh, influenced by however much of their idea you remember. If you can re-create it without notes, you have mastered it, and I'm happy to give you credit. In this way we can let everyone help each other learn, while steering a wide berth around simple copying.

- **All deadlines are strict**–no submissions will be accepted after the deadline. Since you may experience connectivity issues, do **NOT** wait till the last minute before uploading. NO EXCEPTIONS. You can resubmit your solutions before the deadline, so there is absolutely no reason to wait to the last minute to submit your final version!

- Check your submission once uploaded to make sure you have uploaded the correct file, and that it is legible. **THIS IS YOUR RESPONSIBILITY!**

- The upload option is restricted to PDF. You can scan your exam using a free phone app such as Dropbox or Genius Scan. This is important for two reasons: the scanning app enhances the image to make it more legible and the result is a **single** PDF file that you can then upload on Canvas.

- Submissions **must** use the following format: the answer is to be clearly displayed **first**, demarcated, and followed by a justification written in clear, concise English. Mangled streams of consciousness should be avoided. Variables and functions should be defined. Marks are deducted for submissions that don't follow this format, are hard to read or incomprehensible. The solutions given in the packet of review problems illustrate how solutions should be presented.

- **Advice on how to write out solutions:** Your solutions should be written in English, similar to the structure of the posted solutions. At times, the posted solutions provide additional details that a correct answer will not need. However, it is typically the case that in order to appropriately justify your answer, you will need to explain *why* you are doing a particular calculation. It is not enough to present a correct calculation, you need to provide enough detail so we know why you did that calculation.

Writing out the structure of your argument is also beneficial to you, because it will help you clarify your own thinking.

7. The Economics Department Course Policies, which include rules about exams, make-up exams, grading appeals, etc., can be found at http://economics.sas.upenn.edu/undergraduate/course-information/course-policies.

Students are expected to abide by the Code of Academic Integrity in the completion of assignments and exams (https://catalog.upenn.edu/pennbook/code-of-academic-integrity/).

8. **Regrades**: Any request for a regrade must be in writing to me with a written explanation of the issue (email is fine). Any request for a regrade of a homework or exam must be

submitted within one week of the posting of the grade. I will discuss the request with the grader and communicate the result with you. The entire homework or exam is regraded, and there is no guarantee that the grade will not go down (this does not apply if the issue is a mistake in totaling the final score). While we make every effort to avoid errors, errors do occasionally creep in. Without an "all regrade" policy, a bias towards only correcting errors in one direction is introduced.

6 Course Calendar and Outline

These dates are not fixed in stone. I reserve the right to change them to adjust to the pace of the class.

NOTE: All homeworks are due on 10 am Thursdays, except for the last homework, which is due on the last day of teaching, Wednesday April 26 at 5pm.

Date	Topic and readings
1/12	Lecture 1: Introduction, the Rational Buyer Model, and Monopoly Vohra (V) §1.1–1.4

1/17	Lecture 2: Demand Sensitivity and Consumer Surplus
	        V §1.5–1.7, 2.1–2.5
	        Perloff (P) §5.1, Chapter 11

1/19	**Homework 1** due at 10AM Philadelphia time.
	Lecture 3: Profit Maximization and Costs
	        V §2.8, 2.10
	        P §7.1, 7.2

1/24	**Course Selection Period Ends**

1/24	Lecture 4: Production and Cost Minimization
	        V §2.6
	        P Chapter 11

1/26	**Homework 2** due at 10AM Philadelphia time.
	Lecture 5: Welfare and Monopoly Regulation
	        V §, 2.7, 2.11, Chapter 3
	        P Chapter 12

1/31	Lecture 6: Sales
	        V Chapter 3
	        P Chapter 12

2/02	**Homework 3** due at 10AM Philadelphia time.
	Lecture 7: Price Discrimination
	        V Chapter 3
	        P Chapter 12

2/07	**First in-class midterm**
2/09	Lecture 8: Strategic Behavior V Chapter 4

	P Chapter 13
2/14	Lecture 9: Game Theory
	V Chapter 4
	P Chapter 13
2/16	**Homework 4** due at 10AM Philadelphia time.
	Lecture 10: Imperfect Competition
	V Chapter 4
	P Chapter 14
2/20	**Drop Period ends**
2/21	Lecture 11: Sequential Games
	V Chapter 4
	P Chapter 14
2/23	**Homework 5** due at 10AM Philadelphia time.
	Lecture 12: Collusion
	V Chapter 4
	P Chapter 14
2/28	Lecture 13: Product Differentiation I
	V Chapter 4
	P Chapter 14
3/02	**Second in-class midterm**
3/07	Spring Break
3/09	Spring Break
3/14	Lecture 14: Product Differentiation II
	V Chapter 4
	P Chapter 14
3/16	**Homework 6** due at 10AM Philadelphia time.
	Lecture 15: Preferences and Utility
	V Chapter 5
	P Chapter 3
3/17	**Grade Type Change Deadline**
3/21	Lecture 16: Utility Maximization I
	V Chapter 5
	P Chapter 3, §5.2, 5.4
3/23	**Homework 7** due at 10AM Philadelphia time.
	Lecture 17: Utility Maximization II
	V Chapter 5
	P Chapter 3, §5.2, 5.4
3/27	**Withdraw Deadline**
3/28	Lecture 18: Utility Maximization III
	V Chapters 5,6
	P Chapters 2, 9
3/30	**Homework 8** due at 10AM Philadelphia time.
	Lecture 19: Perfect Competition and The Exchange Economy
	V Chapter 6
	P Chapters 2, 9

4/04	**Third in-class midterm**
4/06	Lecture 20: Competitive General Equilibrium I
	V Chapters 6
	P Chapter 10
4/11	Lecture 21: Competitive General Equilibria II
	V Chapters 6
	P Chapter 10
4/13	**Homework 9** due at 10AM Philadelphia time.
	Lecture 22: Competitive Equilibria with Production
	V Chapters 6
	P Chapter 10
4/18	Lecture 23: Externalities I
	V Chapter 7
	P Chapter 17
4/20	**Homework 10** due at 10AM Philadelphia time.
	Lecture 24: Externalities II
	V Chapter 7
	P Chapter 17
4/25	Lecture 25: Public Goods
	V Chapter 7
	P Chapter 17
4/26	**Homework 11** due at 10AM Philadelphia time.

7   Prerequisites

Introductory microeconomics and macroeconomics (Econ 1 and 2); Math 104 and Math 114 or 115 or students who have received a B+ or better in Math 104 may take Econ 101 and Math 114 or 115 concurrently. Transfer students for Math 104 must complete Math 114 or 115 before enrolling in Econ 101. All enrollment is through permission of the department.

The course assumes multivariate calculus, and a **strong** understanding of these mathematical tools is crucial to success in the course.

1. Functions and Properties of Functions

   - Monotonicity
   - Continuity
   - Concavity and Convexity
   - Logarithmic functions
   - Homogeneous functions

2. Derivatives

- How to take a derivative
- Product and Quotient Rules
- Chain Rule
- Partial derivatives

3. Solving optimization problems

- Unconstrained optimization: find the extrema of a function (maxima/ minima)
- Constrained optimization: Substitution method
- Constrained optimization: Lagrange's method
- Comparative statics of solution functions
- Comparative statics of optimal value functions

8   How to Study

1. The class is not a spectator sport, and it is important you don't approach it as such. Inspecting the answer to a problem or following the reasoning of another is insufficient to master the material; one needs to attempt problems and work through these difficulties on one's own before turning to the solution. If your "solution" does not agree with the provided solution, make sure you understand what you did wrong.

2. Space your practice out rather than compressing it into a short period.

   If you spread five hours of study into one hour a day, you'll remember more than if you study for five hours on one day. Memories have a short half-life and need reinforcement.

3. Practice retrieving information rather than recognizing it.

   Don't mistake the ability to recognize something for an ability to recall it. In an exam you don't get marks for things being familiar, you get marks for recalling relevant information and using it to answer the question.

4. Figure out what you don't know.

   Revision is not for reassurance but to identify what you don't know or understand.