

CARNEGIE MELLON UNIVERSITY, HEINZ COLLEGE

95-710 - ECONOMIC ANALYSIS (B3)
Spring 2024 – Mini 3

Monday, Wednesday, Friday (Recitation) 9:30 AM – 10:50 AM

Professor: Karen Clay

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<https://karenclay.org/>

412-268-4197

Office Hours: I try to end a bit early so we can have in class office hours. In addition, I have zoom office hours. See details on Canvas.

For additional office hours, please email me at kclay@andrew.cmu.edu to schedule.

Teaching Assistants: Annabel Hu and Hemalatha Gowda

1. TEXTBOOKS

- Varian, Intermediate Microeconomics (5th edition or later, see discussion in Section 9)
- Shapiro and Varian, Information Rules
- Handouts and Links to Readings are available on Canvas

2. COURSE DESCRIPTION

This is a course in microeconomics and its implications for management and strategy – particularly (but not exclusively) in the context of information technology firms.

Microeconomics, as discussed in this course, focuses on the models and methods by which managers can analyze their market and organizational environment to make optimal decisions. The key to such optimal decision-making is an understanding of the trade-offs in allocating scarce resources. The core models of microeconomics are fundamental to more applied areas of management such as strategy, marketing, production, and finance.

The course will begin with an examination of the underlying structure and models of competitive markets, and the efficiency and welfare implications of those models. We will then examine economic models that describe firm output, pricing and entry/exit decisions. These models will then be applied to a variety of market contexts, including monopoly, oligopoly, and monopolistic competition. As we go through this analysis, we will seek to understand the implications of the theory for information technology firms and for consumers. We will also examine interesting dynamics between information, agents, and economic outcomes in the context of game theory. Most of our discussions of the economic models will be accompanied by explorations of the ideas and examples presented in the Shapiro and Varian text and in the readings.

3. OBJECTIVES

The main objective of this course is to provide a level of economic “literacy” adequate to understand and apply crucial economic concepts to areas as diverse as management decision making and finance; marketing and strategy; policy making and social analysis.

A second, related objective of this course is to discuss the particular economic characteristics of the IT industry, and to offer tools to understand its processes and mechanisms.

4. GRADING

There are three components of your grade: homework, midterms, and short assessments. The weighting of these components is:

- 3 Homeworks 25%
- 3 Midterms 60% (Midterm 1 = 20%; Midterm 2 = 20%; Midterm 3 = 20%)
- 11 Short assessments 15% (drop lowest 2)
- Optional quizzes 0%

Monday and Wednesday classes are used for lectures and include short assessments. Friday review sessions are, in general, used for homework submission and discussion, as well as for midterms.

Homework assignments will consist of problems and open-ended questions (e.g. short essays or analyses) designed to extend your understanding and knowledge of the course materials; in this sense, homeworks are **extensions of our lectures**, rather than mere applications of a formula or an equation. Students are permitted to collaborate on the homework in groups of up to **three students** (see Section 8). Each Homework assignment will be submitted online via Gradescope (Gradescope is accessible through Canvas; detailed instructions will be provided with the Homework). Your answers will have to be submitted before the start of the Friday review session in which Homework solutions will be discussed with the class (see Schedule in Section 12, below). To minimize the possibility of confusion, please type your Homework's answers (you can use hand-writing for figures and graphs). Alternatively, you can hand-write your answers, scan the paper, and submit the digital scanned version of it – but if you do so, please make sure that your handwriting is legible and that all figures/equations are clear.

Midterms will be administered, in person, during the Friday review sessions, and will last 1 hour and 20 minutes. Thus, review sessions are mandatory on the days when midterms are given. Midterms will consist of true/false questions, numerical problems, and open-ended questions. No collaboration is allowed during the midterm.

In the interest of fairness to all students, any requests for a re-grade must be submitted **within one week of the day that the exam or homework is returned using the Gradescope regrade request feature**. For each question, provide a *detailed* explanation of why you believe that your answer is correct. A detailed explanation should identify specific parts of your explanation that you believe were overlooked. (Example: In the second sentence of my answer I stated “XYZ” and the third sentence of the answer key said “XYZ.” Therefore I am requesting a regrade of my answer.) Requests that simply ask for a regrade without a detailed explanation cannot be processed.

Short assessments are designed to encourage you to try problems, which makes both the homework and the exams easier. They are paper based and will be turned in at the end of class. Students can receive full credit if their work reflects a significant effort to solve problems and apply concepts. The work is not graded based on the correctness of the final

answer and solutions showing only the final answer do not receive credit. To allow for illness and other conflicts, the grades for the lowest two short assessments will be dropped.

Optional quizzes offer a chance to test your comprehension. The questions for the quizzes are circulated ahead of time. The questions for the quizzes are circulated ahead of time. Canvas present six multiple choice questions for a student to answer in 30 minutes. The circulated questions are not multiple choice, but preparing answers for the circulated questions will allow the student to select the correct answer. To get credit, quizzes must be completed before the next lecture. Quiz grades are worth 0% of the grade, but are used as a tie-breaker in cases where students are on the border between two grades.

Every year, students are interested in knowing what score is needed “to get an A.” This curiosity is entirely understandable (even though preoccupation over final grades is unwarranted: grades are more useful in assessing how and what you are learning, than in influencing your future career options). While, *historically*, a score of 90.00% or above has **often** been a threshold for an “A” grade, **there is no fixed grading scale for this course**, because every class and every year are different from other classes/other years of the same course.

The best advice regarding grading I can give (in addition to those under Section 10 of this Syllabus) is to please check carefully the schedule of Homeworks and Midterms in the latter part of this document, and avoid scheduling meetings (e.g., job interviews) that conflict with your Homework and Midterm sessions, because anticipating or postponing Homeworks or Midterms will unfortunately not be allowed, nor can you take extra Homeworks or extra Midterms to make up for lost ones. While I understand that many of you may have job interviews to do during this Mini, allowing students to take midterms at a different time than the rest of their classmates creates unfair advantages. So, please plan ahead. In cases of illness, please consult with your academic advisor. With the approval of the academic advisor, the weight of a missed midterm will be reallocated to future midterm(s).

5. LOGISTICS

Classes and Review sessions will be in person on CMU campus. However, we will follow CMU safety regulations concerning COVID 19. We will use Canvas (or some of Canvas add-ons, such as Gradescope) for online discussions, for homework submission, and for grading.

6. CLASSES, LECTURE SLIDES, HOMEWORK, AND MIDTERMS

Some important notes about classes, lectures slides, homework, and midterms.

First, the relation between: a) the models and exercises discussed in class, and b) the homework and the midterms is the following:

- As noted above, homeworks are designed to extend your understanding and knowledge of the course materials, rather than asking you to merely apply a formula or an equation. Each homework is designed to make you think critically about the models and topics discussed in class. Hence, each homework will challenge you to reflect on a number of different topics and models discussed in class and extend/expand on the models we will discuss together in class, by combining them and critically applying them to a variety of different scenarios with different complexities. In other words, be ready for the fact that each homework

will extend the material and the exercises discussed in class. Some of the homework scenarios are numerical exercises. Some are open-ended questions that have more than just one “right” answer. In general, the homework will make you think – they will not simply ask you to “plug in” a formula and find a value. Solutions to the homework will be discussed during the Friday Recitation sessions; in addition, we will use Gradescope to communicate comments, errors, corrections and/or solutions to your submitted homework.

- Midterms cover conceptual, numerical, and application questions from the lectures and homeworks. If you seek opportunities for extra practice with economic problems, you can find exercise questions (and solutions) in Hal Varian's textbook and in the practice problems for each lecture.
- Short assessments, as mentioned, will be simple and relatively straightforward questions about class material asked at the end of each lecture.

Second, the relation between: a) the lecture slides and b) the textbooks and readings is the following:

- **The lecture slides I will provide cover all the topics that will be part of homework and midterms, but not all the details.** They can be used as a summary of the relevant topics, but they are not meant to substitute for the books and the more detailed explanations that the textbooks and the readings contain. Please also see Section 9, below, for more information about the textbooks.

7. THEORY VS. APPLICATIONS IN THIS CLASS

Some of our lectures will be about formal models of economic behavior and will apply (simple) mathematics to represent those models and describe that behavior. Some others of our lectures will be about applications, and may be more discursive. Different lectures may be challenging and luckily interesting in different ways. More precisely, the first three weeks of this course will focus on formal models a little more than the remaining weeks of the course. Formal models will give us the theoretical foundations to understand the rest of the topics. So, don't get discouraged if you have never taken economic courses before, or if the first two weeks will appear a bit “theoretical:” the level of mathematics necessary to do well in this class is actually quite basic, and **the theoretical tools that we will learn in the first weeks will turn useful as we will discuss more practical applications and study concrete market examples in the second part of this course.**

8. COLLABORATION AND ACADEMIC INTEGRITY

Students are permitted to collaborate on the homework in groups of up to **three students**, whose names must be clearly indicated in the submitted homework (however, trust me: you will learn much more if you first try and do the homework by yourself, and then collaborate). There is no collaboration on midterms. That includes no discussion among students in any form during midterms.

Posting homework or midterm questions online to solicit solutions, plagiarizing from online sources (e.g., using answers found online), copying from another group's homework or another student's midterm or from previous years' homework and midterms, discussing with other students during the midterm, as well other forms of cheating, are considered university offenses. Just don't do it. Please. It's not worth it. These rules, as well as the academic integrity standards outlined in your student handbook, will be strictly enforced. You are responsible for being familiar with the university standard

for academic honesty and plagiarism. Please see the CMU Student Handbook for information. In order to deter and detect plagiarism, online tools and other resources are used in this class.

An overarching goal of this class is for you to learn the class material. Violations of these rules or standards are considered a fundamental breach of trust and may result in loss of grades and/or failure of the entire course. **And remember: an academic record showing evidence of cheating or of having failed a course will harm your career much more than getting a slightly lower grade in a homework or midterm - thus, don't do it.**

Regarding **Generative AI, Large Language Models (LLM), ChatGPT**, and so forth:

- You may use Generative AI and Large Language Model (LLM) tools to further explore topics related to this course and for research – essentially leveraging these tools as powerful search engines
- During some class sessions, we may leverage together these tools to support your learning, provide you with an opportunity to explore how they can be used, and/or better understand their benefits and limitations
- However, other than the use cases described above, you may not use these tools to generate work for an assignment to be submitted for a grade, as this cannot be considered a substitute for developing the fundamental skills and expertise represented by the learning objectives of this course. Please note that generative AI tools rely on predictive models to generate content that may appear correct, but has been shown to at times be incomplete, inaccurate, taken without attribution from other sources, and/or biased. Consequently, an AI tool should not be considered a substitute for traditional approaches to research. You are ultimately responsible for the content of the information you submit and may not attempt to pass off any work generated by an AI program as your own.

9. ABOUT THE TEXTBOOKS

I will use examples from Varian's Intermediate Microeconomics for the modeling portions of our classes. Any recent edition (from 5th onward) is acceptable (note: the chapter numbering listed in the Schedule of classes presented below in Section 12 is based on the 9th edition). In recent years, new copies of this textbook have become increasingly scarce and therefore pricey. I strongly recommend not trying to find a new version of the book, but rather purchasing or renting one of many used versions of this book available from numerous online sellers (including Amazon, which also offers a semester rental option) at much more reasonable prices.

While I will often adopt the approach and the arguments that you can find in Varian's textbook, in reality you may (at your own judgment) replace Varian's book with any other decent Microeconomic book, as long as you make sure to cover equivalent material to what we will cover in Varian's book. Two textbooks that I also like, and which you are free to choose as replacement for Varian's Intermediate Microeconomics, are:

- Frank and Bernanke, Principles of Microeconomics
- Cabral, Introduction to Industrial Organization

Why do we use Varian's textbook instead of those others? Because – among other reasons - it offers a sound yet simple mathematical approach that will turn useful for other courses you will take at the Heinz College, and hopefully for your future career as well.

We will use Shapiro and Varian's Information Rules for applications of economic theory to information technology and information systems. Although it was first published in 1998 (that is, in the very early days of the ecommerce revolution), it remains one of the best guides to understanding the economics of information technology.

10. HOW TO DO WELL IN THIS CLASS

Here are some tips that I (as the instructor) and previous students of this class have learnt about how to perform well in this class:

- Even if you collaborate on the homework with other students, try first to solve the exercises by yourself, alone. You will learn much more this way. **Absolutely do not “split” the questions among the members of your team** – during the midterm you will be alone in answering similar questions, and you will not have anybody to split questions with.
- Study the readings before the lecture – this way the topic of the lecture will not be completely novel to you, and you will find it easier to follow the lecture.
- Study the readings and the book chapters once again after the lecture – **the lecture slides I will provide cover all the topics that will be part of homework and midterm, but not in complete detail.** As I mention above, the lecture slides can be used as a summary of the relevant topics, but they are not meant to substitute for the books and the more detailed explanations that the books contain.
- Check back on Canvas the version of your homework graded and corrected by the TAs. The TAs will note errors and solutions in the graded homework. And since midterm are similar (although not identical) to the homework, you should try and learn as much as you can from the graded, corrected homework in order to do well in the midterm.
- In addition: do attend the Friday review sessions when homeworks are discussed and solved in front of the class. The TA will also go over additional problems.
- Be ready to not just plug in formulas, but think about the economic problems we discussed in class in order to complete the homework.
- From time to time, get some sleep (but not in class). No, seriously: sleeping enough, eating well, taking care of yourself are very important things. See Section 11, below.

11. TAKING CARE OF YOURSELF AND VARIOUS FORMS OF SUPPORT

Do take care of yourself. Do your best to maintain a healthy lifestyle - eating well, exercising, getting enough sleep, and taking some time to relax. This will help you achieve your goals and cope with stress. Courses at CMU can be intense. If you are stressed out, please know that you are not alone, and that there are many helpful resources available on campus - an important part of the college experience is learning how to ask for help if it is needed. Asking for support sooner rather than later is often helpful. If you, or anyone you know, experiences academic stress, difficult life events, or feelings like anxiety or depression, please seek support: consider reaching out to a friend, faculty or family member you trust. Also, Counseling and Psychological Services (CaPS) is there to help: you can call 412-268-2922 or visit their website at <http://www.cmu.edu/counseling/>.

Furthermore, CMU has a [Student Academic Success Center \(SASC\)](#) that focuses on creating spaces for students to engage in their coursework and approach learning through a variety of group and individual options, including academic coaching, peer tutoring, and more. The Center offers many opportunities for students to deepen their understanding of

who they are as learners, communicators, and scholars. Their services and [workshops](#) are free to the CMU community and meet the needs of all disciplines and levels of study.

Finally, if you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@andrew.cmu.edu.

We must treat every individual with respect. We are diverse in many ways, and this diversity is fundamental to building and maintaining an equitable and inclusive campus community. Diversity can refer to multiple ways that we identify ourselves, including but not limited to race, color, national origin, language, sex, disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Each of these diverse identities, along with many others not mentioned here, shape the perspectives our students, faculty, and staff bring to our campus. We, at CMU, will work to promote diversity, equity and inclusion not only because diversity fuels excellence and innovation, but because we want to pursue justice. We acknowledge our imperfections while we also fully commit to the work, inside and outside of our classrooms, of building and sustaining a campus community that increasingly embraces these core values.

Each of us is responsible for creating a safer, more inclusive environment. Unfortunately, incidents of bias or discrimination do occur, whether intentional or unintentional. They contribute to creating an unwelcoming environment for individuals and groups at the university. Therefore, the university encourages anyone who experiences or observes unfair or hostile treatment on the basis of identity to speak out for justice and support, within the moment of the incident or after the incident has passed. Anyone can share these experiences using the following resources:

Center for Student Diversity and Inclusion: <mailto:csdi@andrew.cmu.edu>, (412) 268-2150
Report-It online anonymous reporting platform: reportit.net username: *tartans* password: *plaid*

All reports will be documented and deliberated to determine if there should be any following actions. Regardless of incident type, the university will use all shared experiences to transform our campus climate to be more equitable and just.

12. COURSE SCHEDULE AND TOPICS

Readings listed below must be completed **prior** to the class for which they are listed, since we will discuss them together. Readings other than “Shapiro and Varian” or “Varian” **available on Canvas**. The material for each class should be read by the date indicated below, even if we have not yet finished going through the previous class lectures.

Note: for Varian’s book, the chapter numbers reported below refer to the 9th edition. If you are using different editions, chapter numbers *may* have changed slightly. Please use the title of the lecture to find the appropriate chapter.

I hope that you will enjoy and learn from this course. (Did I mention that readings should be completed *prior* to the class for which they are listed?)

Lecture 1 (Wednesday, January 17)

Topic: Introductions and Market Experiment

Today’s Readings: None

Review Session 1 (Friday, January 19)

Topics: Math Review

(You can use the Mathematical Appendix in Varian’s textbook to prepare)

Lecture 2 (Monday, January 22)

Topics: Market Demand

Today’s Readings: Varian, Chapter 15.1-15.7, 15.11

Homework 1 available

Lecture 3 (Wednesday, January 24)

Topics: Equilibrium

Today’s Readings: Varian, Chapter 16.1-16.5, 16.9

Review Session 2 (Friday, January 26)

Homework 1, covering Lectures 1-3 due

Lecture 4 (Monday, January 29)

Topics: Firm Costs

Today’s Readings: Varian, Chapter 22

Lecture 5 (Wednesday, January 31)

Topic: Perfect Competition

Today’s Readings: Varian, Chapters 23.1-23.5 and 24.1-24.5

Homework 1 graded; Homework 2 can be found on Canvas

Review Session 3 (Friday, February 2)

Midterm 1, covering Lectures 1-3

Lecture 6 (Monday, February 5)

Topic: Monopoly

Today’s Readings: Monopoly – Varian, Chapter 25

Lecture 7 (Wednesday, February 7)

Topic: Pricing

Today's Readings: Varian, Chapter 26.1-26.6, Shapiro and Varian, Chapters 1, 2, and 3
Midterm 1 Graded

Review Session 4 (Friday, February 9)
Homework 2, covering Lectures 4-7 due

Lecture 8 (Monday, February 12)
Topic: Game Theory
Today's Readings: Varian, Chapter 29

Lecture 9 (Wednesday, February 14)
Topic: Oligopoly
Today's Readings: Varian, Chapter 28.1-28.9
Homework 2 graded; Homework 3 can be found on Canvas

Review Session 5 (Friday, February 16)
Midterm 2, covering Lectures 1-7 (Focusing on materials from Lectures 4-7)

Lecture 10 (Monday, February 19)
Topic: Collusion and Strategic Behavior
Today's Readings: Varian, Chapter 28.10-28.12, Ethyl, Rapid Price Communication,
(Links on Canvas)

Lecture 11 (Wednesday, February 21)
Topic: Asymmetric Information
Today's Readings: Varian, Chapter 38

Lecture 12 (Friday, February 23)
Topic: Complements, Lock-in, and Network Externalities
Today's Readings: Varian, Chapter 36.1-36.4; Shapiro and Varian, Chapters 5 and 6
Midterm 2 graded

Review Session 6 (Monday, February 26)
Homework 3, covering Lectures 8-12 due

Lecture 13 (Wednesday, February 28)
Review for Midterm 3

Review Session 7 (Friday, March 1)
Midterm 3, covering Lectures 1-12 (Focusing on materials from Lectures 8-12)