JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Syllabus
Environmental Health and Engineering 570.334
Engineering Microeconomics
Fall 2017
(3 credits)

Description

The Official Boring Description: The course introduces the principles of microeconomics and engineering economics, and applications of those principles to environmental engineering and public policy analysis. The financial and economic implications of engineering designs and control policies are critical to their success. We introduce principles of engineering economics and microeconomics (demand and production theory) and their uses in engineering decision making.

The Professor's Long-winded Description: No matter what line of work you ultimately choose, you will bring no more useful skill to most tasks than an ability to understand the incentives people face and how they are likely to respond to them. A well taught introductory course in microeconomics can teach you more about human behavior in a single term than virtually any other course in the university. Throughout the course, I will try to develop economic intuition by means of examples and applications drawn from everyday experience. My aim is to encourage you to see features of the human-made social and physical landscape as a reflection of an implicit or explicit cost-benefit calculation.

Many introductory microeconomics courses (including the one I took as an undergraduate) attempt to present students with far too many concepts in a far too mathematical and mechanical manner. The unfortunate result is that, when the dust settles, most students leave these courses never having fully grasped the essence of economics. For example, the opportunity cost concept, which is central to our understanding of what it means to think like an economist, is just one among hundreds of concepts that go by in a blur. If you cannot identify the opportunity cost of taking a decision in your own life, there is no point in memorizing an infrequently-used fact like the short-run average cost curve is tangent to the long-run average cost curve at the output level for which capacity is at the optimal level. If you are taking this course because you thought you would be able to practice calculus and differential equations (like one could do in past versions of this course), you should look for another course.

My approach will be to focus on a short list of the core concepts that do most of the heavy lifting in microeconomics. Most of us learn best by example and repetition. We absorb ideas more quickly and retain them longer when the ideas are concrete rather than abstract. A clear explanation is often sufficient to enable a bright student to grasp a complex concept. But there is a deep difference between merely understanding a concept-- in the sense of being able to answer a question about it on the next exam -- and really knowing it. Even the very brightest students never fully internalize a concept unless they use it repeatedly. As an economist, I recognize that your resources are limited and that we can make the best use of them if we focus on microeconomic principles that are most applicable to your lives and future careers.

Prerequisites
College-level algebra.

Instructor
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Office: Ames 309, 410-516-5127
Office hours: Mondays 5:45 pm –6:45 pm, Wednesdays 3: 3- 4 pm. If you have class during those times, you can make an appointment for a different time. Note that, on Tuesday and Thursdays, I am typically in my office at the Carey Business School (Harbor East, 100 International Dr.).
Teaching Assistant: None.

Meetings
Monday, Wednesday 4:30–5:45 pm, Ames 402

Required Textbooks
1. McMillan, John. Reinventing the Bazaar: A Natural History of Markets. (you can get the 2003 paperback or kindle version)
2. Dixit, Avinash. Microeconomics: A Very Short Introduction (Very Short Introductions series) First Ed. (you can get the 2014 paperback or kindle version)
3. Harford, Tim. The Undercover Economist, Revised and Updated Edition: Exposing Why the Rich Are Rich, the Poor Are Poor - and Why You Can Never Buy a Decent Used Car! Revised Edition. (if you don't want to spring for the hardcover, and can't read it on a Kindle, get the paperback version of the first edition; for our class, it's similar enough)

I will supplement chapters from these texts with readings from a variety of sources (posted online) typed notes that I will give to you (posted online), and lectures.

Online Resources
Please log in to Blackboard for all materials related to this course (except the textbooks, which you have to acquire on your own). Requisite material will be posted in advance.

Course Learning Objectives
1. *General*: Using economic concepts and models, students should be able to apply the scientific method to the study of human behavior and be able to communicate their conclusions.

1. Students should be able to define Opportunity Costs (and related concept of "efficiency"), demonstrate how these costs affect economic decisions, and identify these costs in a given economic decision.
2. Students should be able to explain and apply the concepts of Marginal Benefits and Marginal Costs to determine optimal economic decisions for both consumers and firms.
3. Students should be able to apply the Benefit-Cost Principle to realistic economic decisions (e.g., take an action as long as the marginal benefits are at least as great as the marginal costs).
4. Students should be able to accurately explain the way in which economists use the following adjectives and the relationships among them: marginal, average, total, fixed, variable, and sunk. Students should also be able to determine in a given economic decision which costs and benefits are relevant (e.g., marginal) and which are not (e.g., sunk).
5. Students should be able to recognize and interpret a Demand Curve and a Supply Curve, and should be able to identify the underlying determinants of each.

6. Students should be able to differentiate between a Change in Demand (Supply) and a Change in the Quantity Demanded (Supplied).
7. Students should be able to identify the differences between a perfectly competitive market and an imperfectly competitive market and the implications of each for economic outcomes.
8. Students should be able to apply and interpret the principle that "competitive markets leave no cash on the table." In doing so, they should be able to describe the concepts of Excess Demand, Excess Supply and Equilibrium Quantities and Prices, and predict changes in each as a result of changes in the underlying determinants of market demand and supply or government intervention.
9. Students should be able to define the general concept of Elasticity for different variables in the demand or supply function (e.g. own, cross, income, etc.), and should be able to describe how elasticity shapes economic outcomes (e.g., revenues, tax burden, policy choices, etc.) in a given context.
10. Students should be able to define present value, describe the factors that affect this value, calculate present value in a given economic decision, and use present value concept to assess the profitability of an engineering project or the net societal benefits of an environmental program).
11. Students should be able to define the basic concepts of strategic interaction (e.g., elements of a game, dominant strategies, equilibrium outcomes, backward induction) and apply them in a given economic context.
12. Students should be able to differentiate private and public goods, calculate the social and private values from a public good, and identify opportunities for free-riding.
13. Students should be able to define an externality, identify one in a given context and evaluate the difference between privately and socially optimal outcomes in the context.
14. Students should be able to describe different forms of asymmetric information and describe the impacts of asymmetric information on outcomes in a given context.

Course Topics

Lectures #1 - #6: Economics and Economic Reasoning - Scarcity Principle, Benefit-Cost Principle, Opportunity Cost, Sunk Cost, Reservation Prices, Marginal and Average Benefit, Marginal and Average Cost, Marginal and Average Product, Fixed Cost, Economic Surplus, Rational Choice, Efficient Allocation, Comparative Advantage, Production Possibility Curve, Present Value

Lecture #7: Supply and Demand I - Market, Demand Curve, Supply Curve, Equilibrium, Excess Supply and Demand, Social and Private Optimality, Smart-for-One-Dumb-For-All, No-Cash-on-the-Table, Externalities

Lecture #8: Supply and Demand II - Predicting and Explaining Changes in Price and Quantity, Determinants of Supply and Demand

Lecture #9: Elasticities

Lecture #10: Perfectly Competitive Market

Lecture #11: Government Intervention

Lecture #12: Public Goods

Lecture #13: Strategic Interactions and Game Theory

Lecture #14: Economics of Information (adverse selection, moral hazard, statistical discrimination)

Lecture #15: Behavioral Economics (depends on time available)

Class lectures are meant to complement the readings and typed notes. In many cases, I will present material that is either not in the readings or not discussed in detail in them. If you are not required to read the entire reading, I will announce it in class. Otherwise, assume you are required to read it. If you are absent, lecture notes can be obtained from your classmates. I do not provide notes on lectures to students (except those that I provide via Blackboard).

Course Expectations & Grading

Attendance: You are expected to show up and be on time. I will take attendance at beginning of class.

Exams: There will be four exams. The first three exams will be given during the lecture period in the classroom. Your two highest scores among the FIRST THREE EXAMS will count for 50% of your final grade and your lowest score among the FIRST THREE EXAMS will count for 10%. You're an adult and I am not going to judge excuses for missed exams. If you do not take one of the first three exams, the weight for that exam is automatically assigned to the final exam (for the first missed exam, 10%, and for each subsequent missed exam, 25%). If you miss all of the first three exams, your grade will go down by one letter grade.

There will also be a mandatory final exam (check the University's final exam schedule for date and location). This final exam will draw on material from the entire semester. It will count for 30% of your grade.

THERE ARE NO MAKE-UP EXAMS and THE FINAL EXAM IS MANDATORY.

Homework

Of the remaining 10% of the final grade, 5% will be based on periodic homework assignments. You will be given full credit if you hand in your assignment and score 65% or higher (designated by a grade of "1" on your graded homework). If you score lower than 65% or do not hand in your homework, you receive a zero (designated by a "0" on your graded homework). No late homework or excuses will be accepted. The homework sets are designed so that (1) you can practice applying what you are learning in the course and (2) can prepare for the exams. Your lowest homework score will be dropped. Homework, except for graphs or figures, must be typed. In the past, I accepted un-typed homework occasionally. This year, I will not accept any.

Short Paper

One of the best ways to learn a subject is to write about it. The remaining 5% of your grade will be based on a short paper and a brief review of the papers of five of your classmates. Your paper can be no longer than 750 words maximum (many excellent papers use fewer words). More details about the paper will be given later, but its purpose is to encourage you to become an "economic naturalist" (idea ripped off from Bob Frank). Studying biology enables people to observe and marvel at many details of life that would otherwise have escaped notice. In much the same way, studying microeconomics can enable you to see the mundane details of ordinary existence in a sharp new light. Your assignment is to use a principle, or principles, discussed in the course to explain some pattern of events or behavior that you personally have observed. I will give you examples (which you cannot use for your paper topic) in class. Please do not lard your essay with complex terminology. Imagine yourself talking to a relative who has never had a course in economics. The best papers are ones that would be clearly intelligible to such a person, and typically these papers do not use any algebra or graphs. You need not include a bibliography, but if you are copying ideas from another source, you do need to provide a proper citation. This assignment is NOT a Ph.D. dissertation or even a term paper. You are not expected to do voluminous research in support of your argument, although a relevant fact or two might help convince yourself and others that you are on the right

track. It makes no difference whether your topic is "important," but try to choose something interesting.

Extra credit opportunities may be offered both in and out of the classroom. More information on these opportunities will be given in class.

Your Grade
Your grade is determined by calculating the percentage of the possible points that you earned during the semester. I do not "curve" grades into a bell-shaped distribution, but will sometimes add points to all exam scores if I think the entire class performed poorly on some questions. Note that this means that grades above 100% are possible. The following grading scale will be employed: A+: 98-100%; A: 94% - 97.99%; A- 90-93.99%; B+ 87-89.99%; B 83% - 86.99%; B- 80% - 82.99%; C+: 77% - 79.99%; C 73%-76.99%; C-: 70%-72.99%; D 60% - 69.99%; F 0 – 59.99%. If you want to take the course Pass/Fail, you must let me know after first exam. P/F is not allowed for required courses.

Key Dates
Exam I: 2 October
Exam II: 1 November
Exam III: 4 December
Final Exam: See university final exam schedule.
Short Paper Due Date: 15 November
Peer Reviews: 29 November

Assignments & Readings
Reading and homework assignments are posted on the Blackboard site for this course.

Electronics in Class
During exams, no electronic devices are allowed except a simple calculator that has no ability to store text. All cell phones must be in vibrate mode. During lectures, no cell phone use is allowed unless professor requests you answer questions via PollEverywhere. With regard to laptops during lecture, I recommend you don't use them. There are good experimental studies showing that (1) although you can type more than you can write in a given time period, writing leads to much better conceptual understanding and ability to apply and integrate the material; and (2) multi-tasking (which often happens when students have laptops open) leads to you to take notes of lower quantity and quality and to lower recall of lecture information. But, if you insist on wanting to use your laptop during lecture, you must sit in the last row of class so that neighboring students are not distracted (so get to class early). You will turn the internet off on the laptop so as to minimize distractions and maximize class participation.

Ethics
The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. *Collaboration of the following nature is allowed on homework*: you must first obtain complete solutions on your own. You can then compare your answers to answers obtained by others. You must not copy other people's answers; rather if yours and theirs differ, you must discuss the reasons why and only then redo the problems yourself so you understand it prior to submitting.

Report any violations you witness to the instructor. You can find more information about university misconduct policies on the web at these sites:

- For undergraduates: http://e-catalog.jhu.edu/undergrad-students/student-life-policies/
- For graduate students: http://e-catalog.jhu.edu/grad-students/graduate-specific-policies/

Students with Disabilities
Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland, (410) 516-4720, studentdisabilityservices@jhu.edu .

NOTE: The course syllabus provides a general plan for the course; deviations may be necessary.

Contribution of course to meeting ABET professional component:

This is a core course in engineering economics for majors in geography and environmental engineering

Relationship of course to undergraduate program outcomes:
This course addresses elements of two ABET outcomes:
(a) An ability to understand and apply the principles upon which engineering practice is based: economics

- This course focuses on building from basic areas of economics that are especially relevant to engineers, to the environment, and to the kinds of work environmental engineers undertake

(b) Understand contemporary issues, the social nature of environmental problems, and the context in which environmental engineering is practiced in modern society

- Economics is a social science – the course develops an understanding of how people and groups respond to incentives and make decisions within the constraints of their society