

Course Syllabus

AEM 2500 **Environmental and Resource Economics**

Understanding our environment and natural resources through economics

Fall 2023

Mondays and Wednesdays

Warren Hall 175

10:10 – 11:25 AM

Instructor: Prof. Wendong Zhang, wendongz@cornell.edu, office hours: Mondays 1:30-2:30pm and by appointment, Warren 461

Graduate Teaching Assistants (Office hours at Warren 372)

1. Mike Huang, jh2737@cornell.edu, graduate TA, office hours: Fridays 9am-10am, Warren 372
2. Terry Zhang, tz387@cornell.edu, graduate TA, office hours: Wednesdays 1:30-2:30pm, Warren 372

Undergraduate Course Assistants: (Office hours at Warren 372)

1. Vedang Prajapati, vsp26@cornell.edu, office hours: Mondays 9am-10am, Warren 372
2. Clemens Sommerer, cs976@cornell.edu, office hours: Tuesdays noon-1pm, Warren 372
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Administrative Assistant: Irina Petryk, iab8@cornell.edu

Pre-requisite: ECON 1110 (Introductory Microeconomics). This course also requires basic calculus. If you do not have this prerequisite, you are advised to take AEM 1500: Introduction to Economics and the Environment.

Recommended textbook: Keohane and Olmstead, Markets and the Environment, Island Press, 2016 (Second edition). A pdf version is available on Canvas. Hard copies available from Cornell library at <https://catalog.library.cornell.edu/catalog/13164278> and on Library Reserves at Mann Library

Grading: SU/Letter, 3-credits

Course System: Canvas

1. Rationale:

This course provides an introduction to the economics of the environment and natural resources to students with some basic background in economics (ECON 1110) and calculus. The course is required for AEM students concentrating in Environmental, Energy and Resource Economics (EEERE) and Environment & Sustainability students concentrating in Environmental Economics (EE). Students in these concentrations will have priority enrolling in the course.

The course serves as a "gateway" to more advanced environmental, resource or energy economics courses, including:

- AEM 4500: Resource Economics
- AEM 4510: Environmental Economics
- AEM 4515: Business and Economics of Energy

The school offers more advanced graduate courses which introduce students to recent advances and cutting-edge techniques for conducting research in this area. If you are interested or curious about pursuing graduate work and undertaking a research career, feel free to contact me to discuss your interests.

This course also has a sister course (AEM 1500) taught by Dr. Cathy Kling which offers a similar introduction to this topic but does not require prior economics coursework or calculus.

2. Course Aims and Outcomes:

Aims

This course is about using microeconomics to understand the causes to environmental and natural resource problems and how to devise solutions. Microeconomics is the study of how individuals, firms and society chose to allocate scarce resources to maximize their welfare. This optimization inevitably entails trade-offs. For instance, spending *more* time or money on a certain activity or good means you will have to spend *less* time or money on other activities or goods because you a limited budget. The same idea underlies all tradeoffs we study in microeconomics. Environmental and resource economics, in particular, deals with tradeoffs related to our environment. For instance, clean air is a desirable environmental good. People are willing to pay for it. However, there is a tradeoff between how much "clean air" we desire (benefit of having clean air) and how much we are willing to give up to get it (cost of reducing air pollution).

In this course we will use familiar microeconomic concepts to understand the causes of environmental problems. It will become clear early in the semester that environmental issues often have striking similarities when analyzed from an economic perspective. This simplicity is very useful when thinking about potential solutions, such as the policies or institutional arrangements that govern the incentives affecting resource users and polluting firms. Environmental and resource economics can offer a unique perspective on the existing incentives to deplete and protect the environment, and provide critical insights on policy goals and design.

You may be surprised how useful this course might be, even if you do not intend to have a career related to the environment. This course will make you think hard about the role of government in the economy and how market forces can be harnessed for the greater good.

This course is not...

1. ... a course in environmental policy (*although we explore the economic basis of why policies might be necessary to solve environmental problems and what institutions may be responsible*)
2. ... a course in green business (*although we will explore the economic context in which profit-maximizing firms operate*)
3. ... a course on environmental or natural resource science (*although a simplified understanding of the nature of pollutants and natural resources is needed to address related economic problems*)
4. ... a political or policy manifesto (*although you might be able to use concepts you learn in this class to assess political discourse and determine whether it is based on rigorous economic grounding*)

Specific Learning Outcomes

By the end of this course, students will:

1. Use microeconomic theory to understand the root causes of a wide range of environmental problems
2. Articulate coherent economic solutions to enduring or emerging environmental problems as well as identify policy proposals with flawed economic grounding
3. Identify the range of potential economic benefits and costs associated with environmental projects or policies, and have familiarity with the methods used to quantify such values
4. Describe the institutions responsible for environmental and resource policy in the United States and beyond

3. Format and Procedures:

- About the lectures:
 - Attendance is not mandatory but highly encouraged
 - During some lectures you will respond to Poll Everywhere questions that will serve as one basis for your participation score.
 - Students should be on time
 - Students with laptops should sit at the back
- About the textbook:
 - The textbook is not required but is recommended
 - Please use the second edition if you get a copy for yourself

- About homework/problem sets:
 - Problem sets will be provided a week before they are due
- About quizzes:
 - There will be 9 quizzes with 8 highest accounting for your grade.
- About prelims
 - They will be in class
 - 3 prelim exams with 2 highest accounting for your grade.
 - Prelim 3 is the cumulative final but will weigh heavily for materials not covered by prelims 1 and 2.
- About office hours:
 - Instructor will focus primarily on lecture materials
 - TAs will focus on homework
 - CAs will help check completeness of your submitted problem sets
 - Come prepared with questions

4. My Assumptions

I assume you have taken an introductory economics course (ECON 1110) and know basic calculus. You should already be familiar with concepts such as producer and consumer surplus, deadweight loss, marginal costs/benefits, average costs/benefits, competitive equilibrium and non-competitive equilibrium (monopoly's problem), derivatives and integrals of linear and quadratic functions. If you are unfamiliar with these concepts you will probably struggle in this course and you are better off taking AEM 1500 this year or taking the pre-requisite courses prior to enrolling in AEM 2500 next year.

5. Textbooks and Readings:

- **Recommended text: Keohane and Olmstead, Markets and the Environment, Island Press, 2016 (Second edition).** If you plan to get a book, get this second edition. I can order a few copies for Mann Library Reserves if there is demand.
- Other supplementary readings will be made available on course website or web links. Additional required readings could be added throughout the semester.
- Lecture slides in PDF format will be posted at least a day before class. You are encouraged to take notes on them.
- Other readings will draw from non-academic policy readings taken from accessible sources including The Economist, Resources, and the New York Times. These readings will be posted on Canvas when needed.

6. Grading

- **Problem sets (25 points):** There are 5 problem sets. These will be distributed throughout the semester after each topic, typically with due periods of one week. Assignments not handed in by the due date indicated on the problem set will receive a

score of zero (only electronic submissions are accepted via Canvas). You will receive full credit if you complete the homework regardless whether your answers are correct or not. If you only attempted to complete half of the homework, you will receive half of the credit. The TAs will NOT provide you with a detailed corrections. It is critical that students check the solutions when they submit their homework. I expect each individual to fully understand all solutions provided.

- **Class attendance and participation** (6 points): To keep the class engaged, I will use PollEverywhere during the class, and at least one PollEverywhere attendance questions each week will be used to help track class attendance. 90% of attendance will receive full participation credit.
- **Quizzes** (24 points): There are ~9 online quizzes with highest grades for eight quizzes counted for your grade. Each quiz covers the material since the previous quiz. The objective of this assignment is to ensure students have assimilated the course material. There are no make-up quizzes so make sure you check the dates ahead of time. If you need special accommodations you have to let me know as soon as possible (first three weeks) so that appropriate arrangements can be made. Quizzes will be held on Canvas, and you will have 30 minutes to answer about 10 randomly-drawn multiple-choice questions from a 20-question question bank.
- **Prelims** (45 points): There are 3 in-class prelims. Only the 2 prelims with the highest grades will count. This means that each of those prelims will effectively contribute up to 22.5 points toward the final grade. Prelim 3 is the Cumulative Final Exam but will weigh heavily on materials not covered by the previous two prelims.

Letter grades will be assigned as follows:

- A+: 98-100, A: 93-98, A-: 90-93
- B+: 85-90, B: 80-85, B-: 75-80
- C+: 70-75, C: 65-70, C-: 60-65
- D: 50-60
- F: 0-50

NOTE: Dyson has implemented an A+ policy providing a cap. I cannot exceed that cap. Students with grades above 98 will receive an A if they push the course grade distribution beyond the A+ cap.

To facilitate consistency and fairness, all appeals relating to scores assigned during grading must be submitted in writing to Prof. Zhang. Relevant materials should accompany a written statement describing the case for appeal. Where a student's appeal is based in part on comparisons of his or her answer with that of another student, the other student's paper should be submitted with the appeal. Prof. Zhang reserves the right to regrade the other student's answers as well. If the appeal to an exam or homework score is with respect to a particular question, we reserve the right to regrade the entire exam. Prof. Zhang will respond to all appeals in writing.

For conflicts other than urgent, short-term medical or other crises, students must make arrangements BY E-MAIL with Prof. Zhang.

7. Academic Integrity

You are expected to abide by the Cornell University Code of Academic Integrity. With the exception of the practice problem set (which can be turned in in groups of 2), any work submitted by a student for academic credit will be the student's own work. I take academic integrity very seriously and so should you. **A student found to be in violation of the Cornell University Code of Academic Integrity on any assignment will automatically get a "Fail" (F) grade for the entire course (not just the assignment).** Please read the documentation in the link above to understand the process of appeal.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. One great way to assess what you know is to teach the idea to a peer! You may also work together on problem sets and give "consulting" help to or receive "consulting" help from your peers. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in any form (e.g. email, Word doc, Box file, Google sheet, or a hard copy).

Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the course and University disciplinary action.

During examinations (quizzes), you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the course and University disciplinary action.

8. Accommodations for Students with Disabilities

In compliance with the Cornell University policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. Students are encouraged to register with Student Disability Services to verify their eligibility for appropriate accommodations.

Cornell SDS office offers an Alternative Testing Program that will help proctor the prelim exams for students who need accommodation.

9. Planning

#	DOW	Date	Module	Topic	Quiz (and lecture covered)	Problem Sets handed out dates	Chapter
1	M	8/21	1	0. Intro to Environmental economics			1
2	W	8/23	1	1. Key concepts			4
3	M	8/28	1	2. Market Efficiency – Externality			2
4	W	8/30	1	3. Dynamic Market Efficiency	1 (0-2)		2/4
	M	9/4		Labor Day			
5	W	9/6	2	4. Benefit-Cost Analysis Logic		1	3
6	M	9/11	2	5. Measuring Benefits: Stated Preference	2 (3-4)		4
7	W	9/13	2	6. Measuring Benefits: Revealed Preference – Hedonic Property Value Model			5 (105-110)
8	M	9/18	2	7. Measuring Benefits: Revealed Preference – Travel Cost Model			5 (110-119)
9	W	9/20	1-2	PRELIM #1	3 (5-6)	2	
10	M	9/25	2	8. Measuring Benefits: Revealed Preference – Hedonic Wage & Averted Expenditures			
11	W	9/27	3	9. Market Failures: Externalities			5
12	M	10/2	3	10. Market Failures: Public Goods	4 (7-8)		5
13	W	10/4	3	11. Market Failures: Common Pool Resources - Tragedy of the Commons			5

	M	10/9		Fall break			
14	W	10/11	4	12. Pigouvian taxes	5 (9-11)	3	8
15	M	10/16	4	13. Coase theorem			8
16	W	10/18	4	14. Market-based instruments: water pricing, standards			9/10
17	M	10/23	4	15. Tradable quotas and marketable permits	6 (12-14)		9/10
18	W	10/25	4	16. Climate change			
19	M	10/30	3-4	PRELIM #2			
20	W	11/1	5	17. Renewable resources: fishery and forest	7 (15-16)	4	7
21	M	11/6	5	18. Non-renewable resources: resource extraction			6
22	W	11/8	5	19. Natural resources as capital assets			6
23	M	11/13	5	20. Biodiversity: REDD+ & eBird	8 (17-20)		
24	W	11/15	5	21. Sustainability and economic growth			
25	M	11/20	5	22. Corporate sustainability (CSR,ESG)		5	
	W	11/22		Thanksgiving			
26	M	11/27		23. Environmental Justice	9 (21-23)		
27	W	11/29	1-5	Course summary- Q&A (led by TA)			
28	M	12/4	5	CUMULATIVE PRELIM #3			