

ECON 143: ENVIRONMENTAL ECONOMICS

Instructor : Rajveer Jat

Summer Session, 2023

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Class Room: 1127 Olmsted Hall

Office Room: 3129, Sproul Hall

Class Hours: Tues-Thurs 9:00-11:50 am

Office Hours: Tues 2-4 pm

Course Description

Brief Introduction

This course will study environmental and natural resource issues through the lens of microeconomic theory and data-driven econometric techniques. Four major topics are the valuation and financing of environmental benefits and damages, policy instruments for pollution controls, natural resources, and climate change. I'll upload all the required material on Canvas.

Learning Goals

By the end of this course, you should be able to learn the following major skill sets:

Environmental Economics Theory

1. Valuate environmental benefits and damages and hence suggest an economic decision.
2. Learn policy tools to control environmental pollution.
3. Understand issues in the optimal use of natural resources with sustainability.
4. Understand climate change scientifically, the economic issues related to it, and international efforts to mitigate the risk posed by climate change.

Dealing with Environmental Economics in Data

1. Analyze an environmental problem in depth with data analysis tools in popular programming languages (we'll use R).
2. Conduct a statistical test to prove or disprove a claim on environmental (or general problems), therefore making your arguments technically sound.
3. Estimate distributions to detect abnormal patterns in environmental variables, hence to better inform yourselves whether the climate change is real or not.

Scientific Communication and Documentation

- Creating dynamic reports (coding + documents) with RMarkdown.
- Ability to debate and scientifically argue in favor or against environmental policies and issues.

Prerequisites/Corequisites

No such prerequisites but basic micro-economic theory and mathematical knowledge is good.

Required Materials

- Lecture notes: Available on Canvas.
- Textbook: Charles D. Kolstad *Intermediate Environmental Economics*
- Software: R-studio/Posit.

Class Structure

1. 9:00 to 10:30 : Lecture

- I'll introduce the concepts and theoretical framework for environmental economics problems.

2. 10:30 to 10:50 : Break

3. 10:50 to 11:50 : Interactive Learning

- This includes presentations by students, group debates/discussions, and illustrations/applications of lectures with data in the appropriate software.

Assessments

The assessments aim to maximize learning and minimize stress. The content of this course looks demanding which is true but you need not stress out because tests are going to be very easy as long as you put in the effort in the class.

Weights

- Homeworks: 40%
- Attendance: 20%
- Participation in Debate/Group discussion: 20%
- Test-1 : 10%
- Test-2 : 10%

Grading Policy

I reserve the right to curve the scale dependent on overall class scores at the end of the session. Any curve will only ever make it easier to obtain a certain letter grade. The score to conversion table is given below, the square bracket '[' means it includes the value, while parenthesis ')' means it does not include that value, for example [90,95) means from 90 to 95 but includes 90 and excluding 95.

Table 1: Score to Letter Grade Conversion Policy (All values are in percentage)

A+	[97.5, ∞)	A	[90, 97.5)
A-	[85, 90)	B+	[80, 85)
B	[75, 80)	B-	[70, 75)
C+	[65, 70)	C	[60, 65)
C-	[55, 60)	D+	[50, 55)
D	[45, 50)	D-	[40, 45)
F	[0, 40)		

Schedule and weekly learning goals

The schedule is tentative and subject to change. The learning goals below should be viewed as the key concepts you should grasp after each week, and also as a study guide before each exam, and at the end of the semester.

- **Lecture-1 : Introduction**

Aug 01, 2023

- Course Overview.
- Environmental Heroes and Community Environmentalism.
- Guest Talk by Dr. Viraj Shah (Research Scientist, Google) on “Redefining Economics: How Incorporating Non-Human Living Beings in Utility Maximization Will Change Economic Thinking”, a broader worldview of looking at the environment through economics lenses.
- Data Analysis and Programming in R:
 1. R and R-Studio set-up, Introduction to R-markdown files
 2. Basics of R Programming: data type, operators, vectors.
 3. Data Structures in R: Arrays, Matrices, Lists, Dataframes–Reading : *01-basic-vectors.rmd* and *02-bigger-data.rmd* in ‘RLecture’ module on Canvas.

- **Lecture-2: Valuation of Environmental Benefits and Damages-I**

Aug 03, 2023

- Willingness to Pay (WTP) and Willingness to Accept (WTA)
Readings:
 1. Kolstad, Chapter 7.

2. Jason F. Shogren, Seung Y. Shin, Dermot J. Hayes, James B. Kliebenstein (1994). "Resolving Differences in Willingness to Pay and Willingness to Accept." *American Economic Review* 84(1): 255-70.

- Data Analysis and Programming in R: *ggplot2*, *dplyr*, *hypothesis testing*
 1. Control Flow: decision making in R.
 2. Writing Functions in R.

-Reading: `03-control-flow.rmd` and `04-writing-functions.rmd` in 'RLecture' module on Canvas.

• **Lecture-3: Valuation of Environmental Benefits and Damages-II** Aug 08, 2023

- Hedonic Price Methods
Reading: Kolstad, Chapters 8.
- Ecosystem Services
Reading: Heal, Geoffrey (2002). "Valuing ecosystem services" in B. Kristrom, P. Dasgupta, K-G. Lofgren (Eds.) *Economic Theory for the Environment: Essays in Honour of Karl-Goran Maler*, Cheltenham: Edward Elgar.
- Data Analysis and Programming in R:
 1. Graphics in Base R

-Reading: `05-plotting.pdf` in 'RLectures' module on Canvas.

• **Lecture-4: Policy Instruments for Pollution Control-I** Aug 10, 2023

- Regulating Pollution
Reading: Kolstad, Chapter 11.
- Externalities: Public Good and Free Rider Problems
Reading: Kolstad, Chapter 5.
- Logic of Collective Actions
 1. Chamberlin, J. R. (1978). The logic of collective action: Some experimental results. *Behavioral science*, 23(5), 441-445. [\[Link\]](#)
- Data Analysis and Programming in R: *tidyverse* (*ggplot*, *dplyr*)
 1. Graphics in Tidyverse R

-Reading: `06-Tidyverse.rmd` in 'RLectures' module on Canvas.

• **Lecture-5: Policy Instruments for Pollution Control-II** Aug 15, 2023

- Tax and Subsidies
Reading: Kolstad, Chapter 12
- Coase Bargaining
Reading: Kolstad, Chapter 13
- Price vs Quantity Restrictions (Quota Permit)
Reading: Martin L. Weitzman (1974). "Prices vs. Quantities." *Review of Economic Studies*, 41(4): 477-91.
- Data Analysis and Programming in R:
 1. Exploratory Data Analysis
Reading- `07-EDA.rmd`

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- **Lecture-6: Natural Resources** Aug 17, 2023
 - *Renewable Natural Resources* : Sustainability under different control mechanism.
Readings: Weitzman's Model of Free Access vs Private Ownership of Natural Resources. [[PDF](#)], [[Blog](#)]
 - *Non-Renewable Natural Resources*: Hotelling's rule.
Reading: Hanley, Shogren, and White, pp. 179-181 (Sections 7.2.1 and 7.2.2).
Prof. Cushman's notes: [[Link](#)]
 - Data Analysis and Programming in R:
 1. RegressionsReading- *08-Regressions.rmd*

 - **Lecture-7: Common Property Resources** Aug 22, 2023
 - Reading: Rajiv Sethi and E. Somanathan (1996). "The Evolution of Social Norms in Common Property Resource Use." *American Economic Review*, 86(4): 766-88.
 - N.S. Jodha (1990). "Rural Common Property Resources: Contributions and Crisis." *Economic and Political Weekly*, June 30, 1990.
 - Data Analysis and Programming in R:
 1. Model Evaluation and SelectionReading- *09-Model_Eval_Selection.rmd*

 - **Lecture-8: Climate Change-I (Economic Aspects)** Aug 24, 2023
 - Auffhammer, M. (2018). Quantifying economic damages from climate change. *Journal of Economic Perspectives*, 32(4), 33-52.
 - Weitzman ML (2007). "The stern review of the economics of climate change". *Journal of Economic Literature* 45(3): 703–724. [[Hyperlink](#)]
 - Data Analysis and Programming in R:
 1. Optimization Algorithms Reading- *10-optimization.pdf*

 - **Lecture-9: Climate Change-II (Political and Institutional Aspects)** Aug 29, 2023
 - The Kyoto Protocol : [[Link](#)]
 - Dasgupta, P. (2014). "Pricing climate change". *Politics, Philosophy & Economics*, 13(4), 394-416, [[Hyperlink](#)]
 - Conference of Parties (COP) meetings: [[Link](#)]

 - **Lecture-10: Cutting-edge Tools and Techniques for Data Analysis** Aug 31, 2023
 - Dealing with Climate Change data in R
 - Prediction Techniques in Machine Learning
 - Inferential Methods to Understand Causes of Climate Change

Academic Integrity

For all of your papers and assignments, please make sure that your work is original unless required to work in groups! Please understand that intentionally copying another person's paper or submitting someone else's work as your own is considered cheating and is against the academic integrity policies. All students involved in such behavior will automatically lose all points for that assignment and will be subject to any additional penalties as outlined by the administration at the University of California, Riverside.

Students with Disabilities

Students with disabilities who wish to request special accommodations are encouraged to contact me via email, during office hours, or by appointment, and I will be happy to help you in any way that I can. Please understand that the earlier you contact me, the more I will be able to accommodate you for the course.