

# ENV 520 Resource and Environmental Economics I

## Fall 2023

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Room: Grainger Hall 1112

Time: Tu/Th, 10:05-11:20AM

(2023/08/29-2023/10/10)

**Instructor:** Yu Ma, Ph.D.

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**Office:** 4101 Grainger Hall

**Office Hours:** W 5-6PM, Th 5-6PM

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**Office Hours:** Tu 1-2pm, W 2:30-3:30pm

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**Course Description:** This course focuses on basic theory and methods of economic analysis of environmental problems including benefit-cost analysis, non-market valuation, and instrument choice.

**Course objectives:**

- Part 1 (Market Failures & Economic Efficiency): Understanding economic efficiency and market failures. All environmental challenges involve economic issues and tradeoffs, and you will learn different scenarios that could lead to market failures. Studying economics helps us to understand why environmental problems occur and what possible solutions there are in public policy.
- Part 2 (Cost-Benefit Analysis & Non-Market Valuation): Understanding analytical methods for conducting cost-benefit analysis and non-market valuation methods. Benefit-cost analysis is one of the most prevalent ways the field of economics has impacted environmental policy. Students will learn the philosophical foundation for benefit-cost analysis and several key methods for valuing environmental goods and services in a benefit-cost framework.
- Part 3 (Cost Effectiveness & Policy Instruments): Understanding economic and market approaches to environmental policy. Market-based approaches such as cap-and-trade and pollution taxes have been widely promoted in policies ranging from air pollution, to fisheries, to climate change. Students will learn the economic foundations of these policies as well as the circumstances under which these policies are most likely to be effective.
- Critical analysis of the role of economic analysis in both fostering systemic racism and combating systemic racism. Students will understand how economists analyze questions of

environmental injustice, develop an appreciation for the limits of economic analysis, and understand efforts to promote inclusion of distributional concerns in benefit-cost analyses.

**Prerequisites:** Students are required to have taken introductory courses in microeconomics and one semester of college-level calculus.

You need to be familiar with the following introductory microeconomics concepts: demand and supply, market equilibrium, consumer and producer surplus, deadweight loss, opportunity cost, and marginal analysis. An old textbook may be useful if you need a refresher. Any Principles of Microeconomics book will work (Principles of Microeconomics by Gregory N. Mankiw or Principles of Microeconomics by John B. Taylor and Akila Weerapana (2019)).

**Required Readings:** The required book for the course is *Markets and the Environment* by **Nathaniel O. Keohane and Sheila M. Olmstead** (2nd Edition, Washington, D.C.: Island Press, 2016). It is available through amazon.com or you can access it for free from the Duke Library as a digital resource. Other required readings will be posted to Sakai.

### Grading:

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| 10% Class Participation | We will use Sakai "Tests & Quizzes" to respond to questions during classes. There is no additional actions required on your side. You can submit answers with a smartphone, tablet, or laptop. You must bring a device with you to each class.<br><b><i>You will be given extra credit for perfect attendance (1%).</i></b>   |
| 10% Reading Response    | The papers that are assigned for readings will provide a "real-world" context to the economic theory that we cover in class. I will ask you to write 1-2 paragraphs in response to questions that I will assign. There will be 4 required reading responses and an extra one for extra credit (2%).   |
| 40% Problem Sets        | There are 4 problem sets each worth 10% of your grade. They are due by <b>5pm on Friday</b> . They will be graded using Gradescope. Late homework will be penalized 10% per day.<br><br>You are encouraged to work together and create study group to work on the homework. However, each student must submit their own work, and copying someone else's work is not allowed. |
| 20% Exam 1              | Exam 1 will be administered in class on September 19 <sup>th</sup> and will cover the first half of course materials.   |
| 20% Exam 2              | Exam 2 will be administered in class on October 10 <sup>th</sup> (the last day of class). The final exam is not cumulative and will cover the second half of course materials.  |

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| A+ | >= 99% |
| A  | 94-98  |
| A- | 90-93  |
| B+ | 87-89  |

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| B  | 83-86 |
| B- | 80-82 |
| C+ | 77-79 |
| C  | 73-76 |
| C- | 70-72 |
| F  | <72   |

**Late Policy:** If an illness will prevent you from completing an assignment on time, please notify me via e-mail before the assignment is due. Makeup exams will only be given in case of an emergency or unavoidable problems such as an illness requiring hospitalization. You must communicate with me as early as possible about the problem.

**Sakai Conversation:** In this course we will utilize Sakai Conversation to facilitate discussion of the course material and will serve as a means for you to get real-time help with course material from me, the TAs, and other students in the class. We will use Conversation as a tool for discussing course content (i.e., lecture material) and approaches to solving Problem Sets. The tool works best when you post questions and/or start discussions about problem solving approaches and ideas.

The course TAs and I will monitor questions and responses on Conversation will be actively engaged in this online platform. I have enabled the settings so that you may post or respond to questions anonymously (to TAs and classmates), but please note that all of your posts will be identifiable by me.

**Recording:** Students do not have the right to record (audio or video) a class without the permission of the instructor. If you need recordings (audio or video) of the lecture for instructional purposes related to a documented disability, please contact me to make the necessary arrangements.

The class will not be recorded. But if you have to miss a class session due to illness or schedule conflict, please contact me in advance and I will request a recording for that session and upload to Panopto later.

### **The Nicholas School Honor Code**

All activities of Nicholas School students, including those in this course, are governed by the Duke Community Standard.

*Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and nonacademic endeavors, and to protect and promote a culture of integrity. To uphold the Duke Community Standard, students sign the following pledge on assignments and exams:*

- *I will not lie, cheat, or steal in my academic endeavors;*
- *I will conduct myself honorably in all my endeavors; and*
- *I will act if the Standard is compromised.*

You are encouraged to share ideas with other students currently enrolled in the course and to discuss homework assignments with each other. You must submit your own solutions to the homework assignments, however. ***Discussing homework assignments with students who took***

*the course in previous years or examining their solutions are both strictly prohibited and will result in expulsion from the course.*

**Use of ChatGPT and other AI tools:** All work submitted in this course must be your own. Contributions from anything else—including AI sources—must be properly quoted and cited every time they are used. ChatGPT and other AI tools are not allowed for reading response that require you to use your own critical thinking and learning.

**Diversity statement**

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students’ learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is my intent to conduct the course in a manner that is respectful of diversity in all its dimensions: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.

**Schedule and Reading Assignments:**

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| <p>Week 1</p> | <p><b>August 29 – Overview of Environmental Economics</b><br/>         KO: Chapter 1<br/>         Fullerton, Don, and Robert Stavins. "How economists see the environment." <i>Nature</i> 395.6701 (1998): 433-434.</p> <p><b>August 31 – Market Failures &amp; Externalities</b><br/>         KO: Chapter 4<br/>         KO: Chapter 5 (Externalities)</p>  |
| <p>Week 2</p> | <p><b>September 5 – Public Goods &amp; Dynamic Efficiency</b><br/>         KO: Chapter 5 (Public Goods)<br/>         KO: Chapter 2 (Dynamic Efficiency and Environmental Policy)<br/>         Chapter 6 of Guidelines for Preparing Economic Analyses (Washington, D.C.: U.S. Environmental Protection Agency, 2010)<br/> <a href="https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-06.pdf">https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-06.pdf</a></p> <p><b>September 7 – Cost-Benefit Analysis</b><br/>         KO: Chapter 3 (Benefit-Cost Analysis)<br/>         Horowitz, John K., and Kenneth E. McConnell. "A review of WTA/WTP studies." <i>Journal of environmental economics and Management</i> 44.3 (2002): 426-447.</p> |

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|        | <p><b>Problem Set # 1:</b> due September 8<sup>th</sup> 5pm</p>   |
| Week 3 | <p><b>September 12<sup>th</sup> – Benefits Estimation: Revealed Preference I (Travel Cost)</b></p> <p>KO: Chapter 3</p> <p><i>Recommended readings:</i></p> <p>Timmins, Christopher, and Jennifer Murdock. "A revealed preference approach to the measurement of congestion in travel cost models." <i>Journal of Environmental Economics and management</i> 53.2 (2007): 230-249.</p> <p><b>September 14<sup>th</sup> – Benefits Estimation: Revealed Preference II (Hedonic Methods) &amp; Stated Preference</b></p> <p>KO: Chapter 3</p> <p><i>Recommended readings:</i></p> <p>Rosen, Sherwin. "Hedonic prices and implicit markets: product differentiation in pure competition." <i>Journal of political economy</i> 82.1 (1974): 34-55.</p> <p>Linden, Leigh, and Jonah E. Rockoff. "Estimates of the impact of crime risk on property values from Megan's laws." <i>American Economic Review</i> 98.3 (2008): 1103-1127.</p> <p>Kling, Catherine L., Daniel J. Phaneuf, and Jinhua Zhao. "From Exxon to BP: Has some number become better than no number?." <i>Journal of Economic Perspectives</i> 26.4 (2012): 3-26.</p> <p><b>Problem Set # 2:</b> due September 15<sup>th</sup> 5pm</p> |
| Week 4 | <p><b>September 19<sup>th</sup> – Exam 1</b></p> <p><b>September 21<sup>st</sup> – Benefits Estimation: Valuing Morbidity and Mortality</b></p> <p>Cameron, Trudy Ann. "Euthanizing the value of a statistical life." <i>Review of environmental economics and policy</i> (2010).</p> <p>Bosworth, Ryan C., Alecia Hunter, and Ahsan Kibria. "The value of a statistical life: economics and politics." <i>STRATA: Logan, UT, USA</i> (2017).</p> <p>Zhang, Junjie, and Quan Mu. "Air pollution and defensive expenditures: Evidence from particulate-filtering facemasks." <i>Journal of Environmental Economics and Management</i> 92 (2018): 517-536.</p>  |
| Week 5 | <p><b>September 26<sup>th</sup> – Cost Estimation &amp; Economics of Pollution Control I (Cost Effectiveness)</b></p> <p>KO: Chapter 8, Chapter 9</p> <p>EPA chapter on Cost Analysis</p> <p><b>September 28<sup>th</sup> – Economics of Pollution Control II</b></p>   |

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|        | <p>KO: Chapter 8, Chapter 9, Chapter 10</p> <p><b>Problem Set # 3:</b> due September 29<sup>th</sup> 5pm</p>  |
| Week 6 | <p><b>October 3<sup>rd</sup> – Economics of Pollution Control III</b></p> <p>KO: Chapter 8</p> <p><b>October 5<sup>th</sup> – Environmental Justice</b></p> <p>Banzhaf, Spencer, Lala Ma, and Christopher Timmins. "Environmental justice: The economics of race, place, and pollution." Journal of Economic Perspectives 33.1 (2019): 185-208.</p> <p>OECD (2018), Cost-Benefit Analysis and the Environment: Further Developments and Policy Use, OECD Publishing, Paris, <a href="https://doi.org/10.1787/9789264085169-en">https://doi.org/10.1787/9789264085169-en</a>. (Chapter 11: Distribution and cost-benefit analysis) (<a href="https://www.oecd-ilibrary.org/sites/9789264085169-14-en/index.html?itemId=/content/component/9789264085169-14-en">https://www.oecd-ilibrary.org/sites/9789264085169-14-en/index.html?itemId=/content/component/9789264085169-14-en</a>)</p> <p><b>Problem Set # 4:</b> due October 5<sup>th</sup> 5pm</p> |
| Week 7 | <p><b>October 10<sup>th</sup> – Exam 2</b></p>  |