

**ECON 675**  
**Environmental Economics**  
**Fall 2021**

**Instructor:** Hong Kim, Ph.D.

**E-mail:** [hkim6773@umd.edu](mailto:hkim6773@umd.edu);

**Zoom office hours:** Sundays, 8:00-9:00pm, or by appointment

**Class location:** TYD 2111

**Class meets:** Mondays, 6:30 to 9:15pm, with a 15-minute break in between 7:30 and 8:15.

No class on Labor Day (September 6)

Class is not cancelled on the Monday before Thanksgiving, November 25.

**Teaching Assistant:** Zu Yao Hong

**E-mail:** Zhong1@umd.edu

**Office hours:** TBD

### **Texts**

#### **Required:**

*Market and the Environment*, Nathaniel Keohane and Sheila Olmstead, Island Press

**Supplemental:** Additional academic papers and book chapters will be provided.

### **Course Overview**

This course covers the interdependencies between the environment and the economy. The goal of the course is to show how economic theory provides guidance to finding solutions to serious environmental problems such (e.g., global warming, ozone depletion, air and water pollution) at different scales (global, regional). This course examines market failure and applies microeconomic principles to markets for environmental resources. Methods of measuring the damages that result from polluting activities, and the benefits of improving environmental quality, are examined. I will implement the most current environmental issues and policies as examples during the course. We will also explore the proper role of government in the regulation of the environment and managing the natural resources.

### **Course Objectives**

Our program has 7 general learning outcomes for students:

**1. Ability to understand, evaluate and analyze economic data**

**2: Ability to understand and interpret statistical evidence from economic data**

**3: Ability to apply empirical evidence to assessing economic arguments**

4: Ability to apply macroeconomic theories to policy discussions

**5: Ability to apply microeconomic theories to policy discussions**

**6: Ability to communicate economic ideas to a broader audience**

**7: Ability to evaluate the effectiveness of policy programs using sound economic techniques**

The learning outcomes that pertain to this course are 1, 2, 3, 5, 6, and 7.

At the end of the course, students should be able to:

- Apply the concept of market failure and applied microeconomic principles to understand and analyze environmental and natural resource issues.
- Identify and evaluate a range of environmental policy tools to address environmental and natural resource issues.
- Understand how economic tradeoffs and incentives influence individuals and firms in developing environmental policies.
- Develop written and presentation skills in communicating environmental economic concepts, applications, and perspectives.
- Be able to use a cost-benefit analysis to assess U.S. government environmental policies.
- Be able to use sound economics tools/methodologies to help societies achieve their environmental goals.

**Prerequisites**

To enroll this course, students must have completed ECON 641 (Microeconomic Analysis), and they must have completed or be currently enrolled in ECON 645 (Empirical Analysis III: Econometric Modeling and Forecasting).

**Before the First Class**

Please write a few paragraphs telling me: (1) why you are enrolled in the MS in Applied Economics program, (2) what was your undergraduate major and why you chose it, (3) your career goals, (4) what you hope to get out of this course, and (5) anything else you'd like to tell me about yourself. Please send me your response by email before the first class.

**Graded Course Components**

There are 5 graded components to the course. The 5 components and their relative weights in the course grade are: problem sets (15%), weekly online discussions (5%), midterm exam (25%), final exam (30%), and research paper and class presentation (25%).

*Problem Sets (15 course points)*

There will be 3 problem sets. Problem sets will be distributed one week prior to their due date (see course schedule for due date). The purpose of the problem sets is to provide you with the opportunity to practice and apply what you learned in classes and to prepare for the midterm and final exam. The problem sets will include theoretical problems and empirical assignments. You can work with other classmates on the problem sets, however, you should write up your answers independently from other classmates. Verbatim answers will be detected and will be penalized. They must be submitted electronically via ELMS/Canvas. The problem sets will contribute 15% of the total course grade.

*Weekly Online Discussion (5 course points)*

I will post a question/series of questions relevant to the course material every Tuesday morning on the course's ELMS/Canvas site. The online discussion will be open until 11:59 PM the following Monday night. I will check in at least once a day to participate and respond. Your contributions to the discussions will be graded on a scale of 0 to 5 points. Grading rubric will be posted on the course's ELMS/Canvas site. At the end of the semester, I will average each student's scores.

*Midterm Exam (25 course points)*

The midterm exam (90-minute test) will be administered online and will include all relevant cumulative course material through the previous week.

*Final Exam (30 course points)*

Because economics is a progressive subject, all course material builds upon previous work. For this reason, the final exam (2 hours) will also be cumulative in nature, although questions will be more heavily focused on the second half of the course. The midterm and final exam are both open note, open book, and open internet. Students are advised to make a compact sheet or two of the most important formulas for quick reference. Students should not communicate with anyone except the instructor during the exam. Students who spend a lot of time leafing through books and web pages will run out of time.

*Research Paper and Online Class Presentation (25 course points)*

Students will prepare one research paper (see course schedule for due date). The research paper will be modeled on empirical/practical economic research and will be on any environmental economics topic. Your research paper should motivate a particular economic question, describe the related literature, and motivate and undertake an empirical analysis, and you should conclude your research paper with a set of recommendations. Students will present their research paper to the class on the last online meeting for the term. Since the objective of this course is to learn and apply tools of economic analysis, the research paper assignment will

provide an opportunity for application of these skills in a “real world” setting. Your paper should be at least a 10-page (double spaced, 12-point font) analysis. We will allocate 20 to 30 minutes per presentation. Your presentation will be scheduled during the last four weeks before the final exam and we will have one or two presentations in each of those four weeks. The paper and presentation will contribute 25% of the total course grade. Students will submit the research paper and presentation assignment in 4 installments (see the Schedule for due dates):

- Topic Proposal (2 points)
- Outline of the research paper, 2-3 pages (3 points)
- Online class presentation (8 points)
- Final research paper (12 points)

More information about the research paper and presentation including grading rubrics will be provided in class and on the course ELMS/Canvas site.

Final Course Letter Grades

At the end of the semester I will add up each student’s course points. This will be a number between 0 and 100. I do not grade on a curve. Numerical course grades will be translated into letter grades as follows:

93-100	90-92	80-89	70-79	60-69	50-59	40-49	30-39	20-29	10-19	0-9
A	A-	B+	B	B-	C+	C	C-	D+	D	F

## Other Standard Policies for the Program and the University of Maryland

**Workload:** Mastering the material covered in this course requires a significant amount of work outside of class. Students should expect to spend more time outside of class than in class – typically at least twice as much time.

**Academic Integrity:** The University of Maryland has a nationally recognized Code of Academic Integrity. You should inform yourself about the UMD policies related to academic misconduct:

<https://www.studentconduct.umd.edu/home/current-students>

Cases of academic misconduct, including plagiarism and giving or receiving unauthorized assistance on exams, will be referred to the UMD Office of Student Conduct. If found responsible for academic misconduct, students can be subject to sanctions. The standard sanction for graduate students found responsible for cheating on exams is expulsion from the university.

{An optional addition to this blurb, at the instructor’s discretion: The exams in this course will ask students to affirm the UMD Honor Pledge: “I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination.”}

**Student Conduct:** Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to show civility to one another or myself will be referred to the Office of Student Conduct. You are expected to adhere to the Code of Student Conduct.

**Excused Absences:** The University of Maryland’s policy on excused absences is posted here:

<http://www.president.umd.edu/administration/policies/section-v-student-affairs/v-100g>

Please note:

If you miss any class meetings for any reason, you are still responsible for all material covered during the meeting you missed. It is your responsibility – not the instructor’s – to make sure you catch up on the missed material. Instructors routinely facilitate things by posting lecture notes, etc.

If you need to miss an exam or other graded course requirement because of illness, injury, or some other emergency: Follow doctor’s orders and get documentation. Get in touch with the instructor as soon as you’re able – preferably prior to missing the exam or deadline. Communicate with the instructor to make up the course requirement as soon as possible. You are entitled to recover before you make up the course requirement, but you are not entitled to extra days to study beyond the time the doctor’s note says you’re incapacitated. If you are incapacitated for more than a week or so beyond the end of the term, your grade in the course will be an “Incomplete”. In such cases you must negotiate a plan with your instructor for completing the course requirements. Once you make up the course requirement the instructor will change your “I” to the appropriate letter grade.

**School Closings and Delays:** Information regarding official University closing and delays can be found on the campus website and the snow phone line: (301) 405-SNOW (405-7669) The program director will also announce cancellation information to the program as an announcement on the program’s ELMS/Canvas site. This will generally be done by 1:00 p.m. on days when weather or other factors are an issue. If classes need to be cancelled during the semester, it may be necessary to move the final exam back a week so missed classes can be made up.

**UMD Counseling Center:** Sometimes students experience academic, personal and/or emotional distress. The UMD Counseling Center in Shoemaker Hall provides comprehensive and confidential support services that promote personal, social, and academic success. The cost of these services is covered by the fees you already paid when you registered for classes, and there is no additional charge if you use the services. Proactively explore the range

of services available, including the Counseling Service, Accessibility and Disability Service, and the Testing Office, all described at <http://www.counseling.umd.edu/>

**Graduate Academic Counselor:** The UMD Graduate School also has an academic counselor available to support students who are having difficulty navigating mental health resources on campus, are considering a leave of absence and/or need assistance finding mental health care off campus. The Graduate Academic Counselor also facilitates bi-weekly Graduate Student Circle Sessions which provide an opportunity to learn about resources and connect with other graduate students. Students can learn more about the Graduate Academic Counselor by going to: <https://gradschool.umd.edu/gradcounselor>

**Students with Disabilities:** The University of Maryland does not discriminate based on differences in age, race, ethnicity, sex, religion, disability, sexual orientation, class, political affiliation, or national origin. Reasonable accommodations will be arranged for students with documented disabilities. Students who have an accommodations letter from the Accessibility and Disability Service (ADS) should meet with me during the first few weeks of the semester to discuss and plan for the implementation of your accommodations. If you require reasonable accommodations but have not yet registered with ADS, please contact the Accessibility and Disability Service at 301-314-7682 or [adsfrontdesk@umd.edu](mailto:adsfrontdesk@umd.edu).

**Course Evaluations:** Near the end of the term, you will receive an email inviting you to submit a voluntary and anonymous course evaluation. Your feedback on courses will be very helpful in improving the quality of instruction in our program.

**Academic Progress:** The graduate school requires that students maintain a GPA of at least 3.0. Students whose cumulative GPA falls below 3.0 will be placed on academic probation by the graduate school. Students on academic probation must ask the program's director to petition the graduate school if they want to remain in the program. The petition must include a plan for getting the student's GPA up to at least 3.0. Students who do not live up to their plan can be forced to leave the program without having earned the degree. Note: a grade of "B" corresponds to a GPA of 3.0. A grade of "B-" corresponds to a GPA of 2.7.

**Access to Morrill Hall and Morrill 1102:** Morrill Hall is locked every day from 7:00 p.m. - 7:00 a.m. Your university ID gives you swipe access to the back door of the building.

**Tentative Schedule**

	Date	Deadlines	Topics Covered	Assigned Readings
Week 1	8/30/2021		Course Introduction Economy and Environment <ul style="list-style-type: none"> <li>• Environmental Economics vs. Ecological Economics</li> <li>• Market Efficiency and Market Failure</li> <li>• Justification for Government Intervention (Property Right and Coarse theorem)</li> <li>• Internalization of pollution and optimal pollution control</li> <li>• Natural Resource Economics in Short</li> <li>• Economic Sustainability in Short</li> </ul>	Required Readings: <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 1</li> <li>• Costanza and O’Neill, <i>Introduction: Ecological Economics and Sustainability</i></li> </ul> Optional Readings: <ul style="list-style-type: none"> <li>• Youli and Xiongyi, <i>The Models for Internalization of Environmental Costs in Tech-Eco Assessment</i></li> <li>• European Environmental Agency, <i>Economy and the Environment</i>, <a href="https://www.youtube.com/watch?v=IF9YsVpZnSE">https://www.youtube.com/watch?v=IF9YsVpZnSE</a></li> </ul>
Week 2	9/6/2021	Labor Day – No Class		
Week 3	9/13/2021		Market Failure and Welfare Analysis <ul style="list-style-type: none"> <li>• Externalities, Public Goods, Tragedy of the Commons</li> <li>• Optimal Pollution Control Level</li> <li>• Marshallian and Hicksian Demand Curves</li> <li>• Consumer Surplus, Producer Surplus, Compensating Variation, Equivalent Variation, Willingness to Pay, Willingness to Accept</li> </ul>	Required Readings: <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapters 2, 4-5</li> <li>• Tuncel and Hammit, A New Meta-Analysis on the WTP/WTA Disparity</li> <li>• Varian’s Consumers’ Surplus chapter</li> </ul>

<p>Week 4</p>	<p>9/20/2021</p>	<p>Research topic proposal Due on 9/20/2021</p>	<p>Measuring Environmental Benefits Part 1</p> <ul style="list-style-type: none"> <li>• Stated Preference Method</li> <li>• Contingent Valuation Method</li> <li>• Mean WTP estimation with Logit regression output</li> </ul>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 3</li> <li>• Carson, “Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez Oil Spill”</li> <li>• Donovan and Nicholls, “Estimating Consumer Willingness to Pay a Price Premium for Alaska Secondary Wood Products”</li> <li>• OMB, “Guidance on Agency Survey and Statistical Information Collections”</li> </ul> <p>Optional Readings:</p> <ul style="list-style-type: none"> <li>• Kim and Cho, “Estimating Willingness to Pay for Reduced Copper Contamination in Southwestern Minnesota”</li> <li>• Hanemann, “Welfare Evaluation in Contingent Valuation Experiments with Discrete Response”</li> </ul>
<p>Week 5</p>	<p>9/27/2021</p>		<p>Measuring Environmental Benefits Part 2</p> <ul style="list-style-type: none"> <li>• Revealed Preference Method</li> <li>• Weak Complementarity</li> <li>• Production Function Approach</li> <li>• Hedonic Approach</li> <li>• Travel-cost methods</li> </ul>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 3</li> <li>• Kim, Helfand, Howitt, “An Economic Analysis of Ozone Control in California’s San Joaquin Valley”</li> <li>• Aljazaerli, “Hedonic Valuation of Marginal Willingness to Pay for Air Quality in Metropolitan Damascus”</li> <li>• Jan Spacek, “Individual single-site travel cost for Czech Paradise Geopark”</li> <li>• Chau, Wong, Lam, “How do people price air quality: empirical evidence form Hong Kong”</li> <li>• Train, “Recreation Demand Models with Taste Differences over People”</li> </ul>

				<ul style="list-style-type: none"> <li>• Haab, Hicks, Schnier, and Whitehead, “Angler Heterogeneity and Species-specific Demand for Marine Recreational Fishing.”</li> </ul> <p>Optional Readings:</p> <ul style="list-style-type: none"> <li>• Berman and Kim, “Endogenous On-Site Time in the Recreation Demand Model”</li> </ul>
Week 6	10/4/2021	1 <sup>st</sup> Problem Set Due on 10/4/2021	<p>Measuring Environmental Benefits Part 3</p> <ul style="list-style-type: none"> <li>• Benefits Transfer and Meta-Analysis</li> <li>• Value of Statistical Life (WTP and Cost of Illness Approach)</li> <li>• Non-Fatal Illness Valuation (Cost of Illness Approach)</li> <li>• Non VSL Valuation Methods</li> </ul>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Johnston and et al. “Chapter 2: Introduction to Benefit Transfer Methods”</li> <li>• Department of Transportation, “Guidance on VSL 2016 Adjustment”</li> <li>• Visusi, “Using data from the Census of Fatal Occupational Injuries to estimate the value of a statistical life”</li> <li>• Hjerpe, Hussain, and Phillips, “Valuing type and scope of ecosystem conservation: A meta-analysis”</li> </ul> <p>Optional Readings:</p> <ul style="list-style-type: none"> <li>• Viscusi and Aldy, “The Value of Statistical Life: A Critical Review of Market Estimates Throughout the World”</li> </ul>
Week 7	10/11/2021	Research paper Outline Due on 10/11/2021	<p>Measuring Abatement Costs</p> <ul style="list-style-type: none"> <li>• Analysis Period</li> <li>• Discounting and Price Adjustment</li> <li>• Direct and Indirect Costs</li> <li>• Wage Calculation</li> <li>• Capital and Maintenance Costs</li> </ul>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• EPA, “Guideline for conducting economic analysis (Chapter 8)”</li> <li>• OMB Circular A-4, “Regulatory Impact Analysis a Primer”</li> </ul> <p>Optional Readings</p>

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			<ul style="list-style-type: none"> <li>• Present value</li> <li>• Deadweight loss</li> </ul>	<ul style="list-style-type: none"> <li>• EPA, "EPA Air Pollution Control Cost Manual"</li> </ul>
Week 8-9	10/18/2021-10/25/2021	2 <sup>nd</sup> Problem Set Due on 10/25/2021	<p>Environmental Regulations and Cost-Benefit Analysis</p> <ul style="list-style-type: none"> <li>• Regulatory Impact Analysis</li> <li>• Regulatory Flexibility Analysis</li> <li>• EPA's CBA Example</li> </ul> <p>Review for Midterm Exam</p>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 3</li> <li>• OMB Circular A-4, "Regulatory Impact Analysis a Primer"</li> <li>• EPA's Regulatory Impact Analysis on Ambient Ozone Standards (Chapters 1, 5 and 6 only)</li> </ul>
Week 10	11/01/2021	-	<p><b>Midterm Exam (6:30 – 8:00PM)</b></p> <p>Introduction to Environmental Policy Instruments</p>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 8</li> </ul>
Week 11	11/08/2021		<p>Environmental Policy Instruments Part One</p> <ul style="list-style-type: none"> <li>• Voluntary Approach</li> <li>• Traditional Standards (Command and Control)</li> <li>• Taxes/Subsidies</li> <li>• Real-World Applications</li> </ul>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 8,9, and 10</li> <li>• Kim, "The Effectiveness of Alternative Emission Control Policies in the San Joaquin Valley of California.</li> <li>• IMF, "Taxes and Tradable Permits as Instruments for Controlling Pollution: Theory and Practice.</li> </ul>
Week 12	11/15/2021	Student presentations on 11/15/2021	<p>Environmental Policy Instruments Part Two</p> <ul style="list-style-type: none"> <li>• Tradeable Emission Permit</li> <li>• Tradeable Ambient Permit</li> <li>• Tradeable Localized Permit</li> <li>• Real-World Applications</li> <li>• Administration and Enforcement</li> <li>• Comparison of Policy Instruments</li> </ul>	

Week 13	11/22/2021	Student Presentations on 11/22/2021	<p>Exhaustible and Renewable Natural Resources – Petroleum and Fishery</p> <ul style="list-style-type: none"> <li>• Supply of Nonrenewable Resources</li> <li>• Economics of Nonrenewable Resources</li> <li>• Principles of Renewable Resources Management</li> <li>• The Economics of Fisheries</li> <li>• Policies for Sustainable Fisheries Management</li> </ul>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 6, 7, 9 and 10</li> <li>• Introduction to Dynamic Model by Tuft University Press</li> <li>• Dewees, “Effects of Individual Quota Systems on New Zealand and British Columbia”</li> </ul>
Week 14	11/29/2021	<p>3<sup>rd</sup> Problem Set Due on 11/29/2021</p> <p>Student Presentations on 11/29/2021</p>	<p>Macro-Environmental Economics</p> <ul style="list-style-type: none"> <li>• Sustainable Economic Development</li> <li>• Greening the National Income Accounts</li> <li>• Green Net National Product</li> <li>• Guanine Saving</li> <li>• Ecological Footprint</li> <li>• Research Paper Presentation</li> </ul>	<p>Required Readings:</p> <ul style="list-style-type: none"> <li>• Keohane and Olmstead, Chapter 11</li> <li>• Ecological Footprint (<a href="http://www.footprintnetwork.org/our-work/ecological-footprint/">http://www.footprintnetwork.org/our-work/ecological-footprint/</a>)</li> <li>• Adjusted Net Saving (<a href="https://snbchf.com/global-macro/net-national-savings/">https://snbchf.com/global-macro/net-national-savings/</a>)</li> <li>• Harris, Roach, and Codur, “Economics of Global Climate Change”</li> <li>• Stavins, “Addressing Climate Change with a Comprehensive U.S. Cap-and-Trade System”</li> </ul> <p>Optional Reading:</p> <ul style="list-style-type: none"> <li>• OECD, “Sustainable Development Linking Economy, Society, and Environment”</li> <li>• Alfsen, Hass, Tao, and You, “International Experience with Green GDP”</li> </ul>
Week 15	12/06/2021	Student Presentations on 12/06/2021	<p>Climate Change Economics</p> <ul style="list-style-type: none"> <li>• Causes and Consequences of Climate Change</li> </ul>	<ul style="list-style-type: none"> <li>• Harris, Roach, and Codur, “Economics of Global Climate Change”</li> <li>• Stavins, “Addressing Climate Change with a Comprehensive U.S. Cap-and-Trade System”</li> </ul>

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			<ul style="list-style-type: none"> <li>Economics of Climate Change Policy Options</li> </ul> <p>Climate Change Policies in Practice</p> <p>Research Paper Presentations</p> <p>Course Recap and Conclusion</p>	
Week 16	12/13/2021	Final Research Paper Due on 12/19/2021	<b>Final Exam</b>	