# EAS 501.022: Climate Economics and Policy

Winter 2019 Course Syllabus
(Version: January 10th, 2019)

## Logistics

Lecture: T/Th 1:00-2:20 p.m. (Dana 1028)
Professor: Samuel Stolper (sstolper@umich.edu)
Graduate Student Instructor: Benjamin Rego (benrego@umich.edu)
Website: https://umich.instructure.com/courses/270321
Office Hours: T 3:00-4:00pm, Th 4:00-5:00pm, Dana 3006 (Prof. Stolper)
M 12:00-1:00pm, W 11:30am-12:30pm, Dana 4325 (Ben)

## About this course

Climate change is sometimes called the greatest challenge humanity as a whole has ever faced. It is a truly global collective action problem, whose social costs will be massive, widespread, unpredictable, and inequitably distributed. Economic analysis of the climate problem is valuable for a number of reasons: economics provides a framework for understanding incentives for human behavior; it facilitates the measurement of costs and benefits; and it is a language to which people listen, from the highest levels of government down to the individual household. In this course, we will use the lens of economics to clarify the costs and benefits of climate change, the challenges of climate change mitigation, and the theoretical and empirical impacts of the climate policies at our disposal. We will start by reviewing some foundational economic concepts and studying the impacts of climate change. From there, we will set our sights on the general policy problem and assess the performance of different policy instruments along a variety of dimensions. In the second half of the course, we will zero in on the two largest sources of greenhouse gas emissions globally: electricity and transportation.

*Suggested prior coursework*: EAS 570. Environmental Economics: Principles, Methods, and Tools; or equivalent coursework elsewhere

## Class format and teaching goals

I have designed this course with several teaching goals in mind. I want you, the students, to:

- Become knowledge experts in the area of climate economics and policy

- Develop a versatile economic intuition, for use in any environmental professional setting
- Become more comfortable with quantitative thinking and analysis
- Improve your ability to communicate, translate, and wield rhetoric in the highly divisive scientific debate about how to respond to the changing climate

I think the best way to achieve these goals is to engage you, the students, as much as possible, and in as many ways as possible. I will devote some part of most class meetings to lecture, but I will also emphasize discussion, both during lecturing and in dedicated periods of class time. I will strive to make students feel comfortable speaking up and raising questions. In-class activities will not be limited to lecture and discussion; we will also play a multi-round, team-based game simulating Michigan's wholesale electricity market, devote two class days to student group presentations on policies of interest, and possibly take a tour of U of M's Central Power Plant. Lastly, course assignments will give you practice in a variety of tasks to which you may be exposed in your future careers.

## Readings

For most classes, you will be assigned readings from some combination of textbook, academic journals, blogs, and popular media. There is less assigned reading in this course than in many others; as a result, I expect everyone to complete it.

The textbook is Nathaniel O. Keohane and Sheila M. Olmstead, Markets and the Environment, 2nd Edition (2016). It is available in digital form from the University of Michigan library system, at <https://mirlyn.lib.umich.edu/Record/015159266>.

Several of the assigned readings come from the blog run by the Energy Institute at Haas, based at the University of California Berkeley, Haas School of Business. There is an excellent group of environmental and energy economists at Berkeley, and I encourage you to peruse the blog (https://energyathaas.wordpress.com/) beyond the assigned readings.

For review of key concepts in microeconomics, Jeffrey M. Perloff's Microeconomics, 6th Edition (2012) is a good resource. It can be freely downloaded from <https://ugess3.files.wordpress.com/2016/01/microeconomics-perloff-jeffrey.pdf>.

## Assignments and grading

I have designed the assignments in this course to help you develop skills that I think will be useful in your professional environmental careers. These assignments are listed below, along with class participation and two exams. Numbers in parentheses are weights for each graded component in your final grade.

- Class participation (10%): Speaking up in class will give you valuable practice communicating in your future careers, and the course will be more fun and more thought-provoking if we all share our perspectives, our questions, our ideas.

- Problem sets (10%): Two problem sets will give you practice working through foundational models of supply and demand in different settings.
- Op-ed (5%): The format and readership of a newspaper op-ed is a good setting in which to practice written communication to a broad, non-expert audience.
- Policy analysis (10%): Here you will play the role of government analyst, assessing the impacts of a proposed policy and summarizing your findings for your superiors.
- Midterm exam (15%): You will be tested on your understanding of material covered in the first half of the course.
- Program evaluation (10%): Playing the role of an analyst at an electric utility, you will evaluate the impacts of an energy efficiency program, using data on treatment status and household electricity use over time. You will describe your findings in a short report.
- Electricity game memo (10%): With your team, detail the strategies you employed in the electricity game, what went right and wrong, and why.
- Group presentation (10%): With your team, you will make a 12-minute presentation on, and answer questions about, a climate policy of your choosing. Available policies will be provided at the outset of the course, and students will each be assigned to one based on stated preferences.
- Final exam (20%): You will be tested on your understanding of material covered throughout the semester.

Problem sets and written assignments are due at the beginning of class, unless otherwise stipulated. Please submit problem sets via hard copy in class to Ben, and writing assignments digitally to Canvas. Late (unexcused) assignments will be penalized 5 percentage-points per day. I grade this course on a curve, aiming to give A/A- grades to approximately 40% of students. The exact percentage varies from year to year.

## Other course information

Attendance: You may miss up to three class meetings without excuse. Beyond this number, your attendance grade will be affected by absences and lateness without timely explanation and reasonable justification. I will try my best to accommodate religious observance that affects your attendance or more generally ability to complete course activities; please try to inform me in advance of known absences or difficulties. Don't hesitate to come talk to me in person if attendance is an issue for you.

Laptops and phones: Neither laptops nor phones are allowed in class. They would inevitably draw your attention away from class lecture and discussion.

Correspondence: We (Ben and I) will try to get back to your emails within 24 hours. Please note EAS 501 in your subject line. If you plan on asking multiple involved questions, please come to office hours or schedule a meeting.

Grade grievances: You must submit requests for a re-grade within one week of receiving the original grade. You must also attach the original graded item and provide a clear written

explanation of what you would like to be re-evaluated and why. Your adjusted grade may be higher or lower than the original.

Work ethic: Do not plagiarize. If you paraphrase or copy work that is not your own, you must reference that work. The risk of plagiarizing is not worth the reward. More generally, cheating and academic dishonesty in any form will not be tolerated. Any student found to have cheated or behaved unethically or dishonestly will be given a zero on the assignment or exam involved and referred to the appropriate disciplinary committees at U of M.

Writing resources: The Sweetland Center for Writing offers one-on-one writing assistance, among many other services. It also offers mini-courses and casual conversation groups for international students or anyone wanting to improve their English.

## Course calendar

| Date | Day | # | Unit | Assignment Due |
|---|---|---|---|---|
| 1/10 | Th | 1 | Introduction | |
| 1/15 | T | 2 | Costs, benefits, supply, and demand | |
| 1/17 | Th | 3 | Externalities and public goods | |
| 1/22 | T | 4 | The impacts of climate change | Problem set 1 |
| 1/24 | Th | 5 | The social cost of carbon | |
| 1/29 | T | 6 | International climate policy | |
| 1/31 | Th | 7 | Policies in theory I: carbon pricing | |
| 2/5 | T | 8 | Policies in theory II: markets vs. mandates | Op-ed |
| 2/7 | Th | 9 | Policies in practice I: cost-effectiveness | |
| 2/12 | T | 10 | Policies in practice II: distributional equity | |
| 2/14 | Th | 11 | Policies in practice III: political economy | |
| 2/19 | T | 12 | Policies in practice IV: trade | Policy analysis |
| 2/21 | Th | 13 | Group presentations I | |
| 2/26 | T | 14 | Review | |
| 2/28 | Th | 15 | Midterm exam | |
| 3/5 | T | | NO CLASS – SPRING BREAK | |
| 3/7 | Th | | NO CLASS – SPRING BREAK | |
| 3/12 | T | 16 | Electricity I: power systems | |
| 3/14 | Th | 17 | Electricity II: power plants | |
| 3/19 | T | 18 | Electricity III: renewables | Problem set 2 |
| 3/21 | Th | 19 | Electricity IV: portfolio auction | |
| 3/26 | T | 20 | Electricity V: climate policy | |
| 3/28 | Th | 21 | Energy efficiency | |
| 4/2 | T | 22 | Transportation I: fuel economy | |
| 4/4 | Th | 23 | Transportation II: buses, trains, automobiles | |
| 4/9 | T | 24 | Transportation III: electrification | Program evaluation |
| 4/11 | Th | 25 | Transportation IV: ridesharing and automation | |
| 4/16 | T | 26 | Group presentations II | |
| 4/18 | Th | 27 | Case study: U of M GHG emissions | |
| 4/23 | T | 28 | Review | Electricity game memo |
| 4/26 | F | | Final exam | |

## Detailed course schedule

### Class #1 – January 10th. Introduction

### Class #2 – January 15th. Costs, benefits, supply, and demand

Readings

1. KO: Chapter 3, pp. 44-48; Chapter 4, pp. 70-79.
2. Clemente, Jude. "Yes, Americans Still Love Gasoline." *Forbes*, May 4th, 2018.

### Class #3 – January 17th. Externalities and public goods

Readings

1. KO: Chapter 5, pp. 80-94.
2. "The Battle over Methane Leaks." *Energy Policy Now* podcast, October 30th, 2018.

### Class #4 – January 22nd. The impacts of climate change

Readings

1. Heal, Geoffrey and Jisung Park (2016). "Temperature Stress and the Direct Impact of Climate Change: A Review of an Emerging Literature." *Review of Environmental Economics and Policy* 10(2): 347-362.
2. Davenport, Coral and Kendra Pierre-Louis. "U.S. Climate Report Warns of Damaged Environment and Shrinking Economy." *New York Times*, November 23rd, 2018.

Assignments

1. Problem set 1 due

### Class #5 – January 24th. The social cost of carbon

Readings

1. Metcalf, Gilbert E. and James H. Stock (2017). "Integrated Assessment Models and the Social Cost of Carbon: A Review and Assessment of U.S. Experience." *Review of Environmental Economics and Policy* 11(1): 80-99.
2. Plumer, Brad. "Trump Put a Low Cost on Carbon Emissions. Here's Why It Matters." *New York Times*, August 23rd, 2018.

### Class #6 – January 29th. International climate policy

Readings

1. KO: Chapter 5, pp. 94-97.
2. Evans, Simon and Jocelyn Timperley. "COP24: Key Outcomes Agreed at the U.N. Climate Talks in Katowice." *Carbon Brief*, December 16th, 2018.

**Class #7 – January 31st. Policies in theory I: carbon pricing**

Readings

1. KO: Chapter 8, pp. 143-162.
2. Harvey, Fiona. "China Aims to Drastically Cut Greenhouse Gas Emissions Through Trading Scheme." *The Guardian*, December 19th, 2017.

**Class #8 – February 5th. Policies in theory II: markets vs. mandates**

Readings

1. KO: Chapter 9, pp. 168-184.
2. Rabe, Barry G. Can We Price Carbon? Cambridge: MIT Press, 2018.
3. Climate Justice Alliance and Indigenous Environmental Network. "Carbon Pricing: A Critical Perspective for Community Resistance." Volume 1, 2017.

Assignments

1. Op-ed due

**Class #9 – February 7th. Policies in practice I: cost-effectiveness**

Readings

1. Gillingham, Kenneth and James H. Stock (2018). "The Cost of Reducing Greenhouse Gas Emissions." *Journal of Economic Perspectives* 32(4): 53-72.
2. TBD

**Class #10 – February 12th. Policies in practice II: distributional equity**

Readings

1. Fullerton, Don (2011). "Six Distributional Effects of Environmental Policy." *Risk Analysis* 3(6): 923-929.
2. Guerin, Emily. "Environmental Groups Say California's Climate Program Has Not Helped Them." *National Public Radio*, February 24th, 2017.

**Class #11 – February 14th. Policies in practice III: political economy**

Readings

1. Roberts, David. "Washington votes not on a carbon tax – again." *Vox*, November 6th, 2018.
2. Roberts, David. "The Green New Deal, explained." *Vox*, December 26th, 2018.

**Class #12 – February 19th. Policies in practice IV: trade**

Readings

1. Fowlie, Meredith. "California's Carbon Border Wall." *Energy Institute at Haas* blog, May 22nd, 2017.
2. TBD

Assignments

1. Policy analysis due

**Class #13 – February 21st. Group presentations I**

**Class #14 – February 26th. Review**

**Class #15 – February 28th. Midterm**

**March 5th. NO CLASS – SPRING BREAK**

**March 7th. NO CLASS – SPRING BREAK**

**Class #16 – March 12th. Electricity I: power systems**

Readings

1. "Electricity Explained: How Electricity is Deliver to Consumers." *Energy Information Administration*, last updated August 31st, 2018.
2. Sengupta, Somini. "The World Needs to Quit Coal. Why Is It So Hard?" *New York Times*, November 24th, 2018.

**Class #17 – March 14th. Electricity II: power plants (field trip)**

Readings

1. "U-M Central Power Plant expansion expected to reduce emissions." *University of Michigan Office of the Vice President of Communications*, March 16th, 2017.
2. O'Brien, Maeve. "Environmental group raises concerns over new natural gas turbine." *Michigan Daily*, September 10th, 2018.

**Class #18 – March 19th. Electricity III: renewables**

Readings

1. Wolfram, Catherine. "Is the Duck Sinking?" *Energy Institute at Haas* blog, April 24th, 2017.
2. Davis, Lucas. "Why Am I Paying 65 $/year for Your Solar Panels?" *Energy Institute at Haas* blog, March 26th, 2018.

Assignments

1. Problem set 2 due

**Class #19 – March 21st. Electricity IV: portfolio auction**

Readings

1. TBD

**Class #20 – March 26th. Electricity V: climate policy**

Readings

1. Fowlie, Meredith. "Carbon Markets, Waterbeds, and You." *Energy Institute at Haas* blog, April 15th, 2018.
2. Funes, Yesenia. "California's New Solar Mandate Is For Rich White People." *Earther*, May 11th, 2018.

**Class #21 – March 28th. Energy efficiency**

Readings

1. Gillingham, Kenneth and Karen Palmer (2015). "Bridging the Energy Efficiency Gap: Policy Insights from Economic Theory and Empirical Evidence." *Review of Environmental Economics and Policy* 8(1): 18-38.
2. Burlig, Fiona. "Cutting Energy Use Is One Way Cash-Strapped Schools Can Save. But By How Much?" *Forbes*, September 27th, 2017.

**Class #22 – April 2nd. Transportation I: fuel economy**

Readings

1. Robinson, Michelle. "Dear Automakers – Consumers Want Cleaner Cars this Year and Every Year!" *Union of Concerned Scientists* blog, December 19(th), 2018.
2. Allcott, Hunt and Christopher Knittel (2017). **Sections I-IV** in "Are Consumers Poorly-Informed about Fuel Economy? Evidence from Two Experiments." National Bureau of Economic Research Working Paper 23076.

**Class #23 – April 4th. Transportation II: buses, trains, automobiles**

Readings

1. Sallee, James. "Does CAFE work?" *Energy Institute at Haas* blog, April 8th, 2018.
2. Manville, Michael, Brian D. Taylor, and Evelyn Blumenberg (2018). "Transit in the 2000s: Where Does It Stand and Where Is It Headed?" *Journal of Public Transportation* 21(1): 104-118.

**Class #24 – April 9th. Transportation III: electrification**

Readings

1. Campbell, Andrew. "Counteracting the EPA's Tilt Away from Electric Vehicles." *Energy Institute at Haas* blog, August 20th, 2018.
2. Davis, Lucas. "Are Clean Energy Tax Credits Equitable?" *Energy Institute at Haas* blog, July 20th, 2015.

Assignments

1. Program evaluation due

**Class #25 – April 11th. Transportation IV: ride-sharing and automation**

Readings

1. Auffhammer, Maximilian. "The Economics of an Electrified Autonomous Future." *Energy Institute at Haas* Blog, August 21st, 2016.
2. Bliss, Laura. "Uber and Lyft Could Do a Lot More for the Planet." *CityLab*, April 30th, 2018.

**Class #26 – April 16th. Group presentations II**

**Class #27 – April 18th. Case study: U of M GHG emissions**

Readings

1. TBD

**Class #28 – April 23rd. Review**

Assignments

1. Electricity game memo due

**FINAL EXAM – April 26th, 4:00 pm – 6:00 pm**