

Climate Change Economics: AEDECON 8303
Autumn 2021 (The 2nd Session)

Professor Contact

Dr. Yongyang Cai
Office: 326 Ag Admin
Email: cai.619@osu.edu
Office Hours: TBD

Short Description

This course will provide students an in-depth exploration of theoretical concepts, methodological advances, and contemporary issues in climate change economics.

Course Description:

How can we optimally allocate the use of renewable and non-renewable resources over time in the face of climate impact in future? How much can uncertainty and risk affect our optimal decisions in mitigation of carbon emission, adaptation to climate damage, subsidy and investments on technology? This course addresses these central questions and aims to provide students a solid foundation in the theory of climate change economics. The course will focus on the optimal control theory, integrated modeling, and computational methods to solve dynamic stochastic problems in climate change economics. We will cover the seminal papers in the field.

Prerequisites:

This course is designed for second-year or third-year PhD students in economics, agricultural, environmental and development economics, or public policy. It is assumed that students have completed at least one graduate-level course in microeconomic theory (ECON 8711, 8712 or equivalent) and econometrics (ECON 8731, 8732 or equivalent), and are comfortable with differential and integral calculus.

Learning Objectives: Upon completion of this course, students will:

1. Be familiar with the literature in climate change economics and the contemporary climate policy issues.
2. Be able to set up and solve integrated assessment problems using numerical methods.
3. Have the theoretical foundation and methodological tools to pursue research in the field on climate change economics, and teach a course in this subject in the future.

Timeline:

Monday & Wednesday 12:40 – 2:30pm (the 2nd session). Location: Animal Science Building 111N

Assignments and Grading

The grade will be determined by two homework assignments (30% grade) with equal weights, class participation (10%), in-class presentations (10%) and reading summaries/referee reports (20%), and a final project/paper (20%) that will require a mid-term proposal (10%). Students can work in small groups (not exceeding three students) and turn in one homework assignment per group. Late submissions will carry a 10% deduction in grade; submissions overdue by more than 24 hours will not be accepted.

Books and Readings:

In this course, we will rely primarily on journal articles. This is a second-year/their-year Ph.D. course and the literature on climate change economics is vast, so students will be expected to show considerable initiative in seeking out and reading additional materials.

Course Policies:

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in room 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities.

From the [Code of Student Conduct](#), “Plagiarism is the representation of another's works or ideas as one's own; it includes the unacknowledged word for word use and/or paraphrasing of another person's work, and/or the inappropriate unacknowledged use of another person's ideas”. Plagiarism is a violation of the Code of Student Conduct and is considered academic misconduct. It is my policy to follow the university recommendation that all incidences of academic misconduct be reported to the committee on academic misconduct for disciplinary action.

Tentative Course Outline (✓ indicates student led discussion)

Week #1: Introduction

- Introduction to Climate Change Economics
- Introduction to Dynamic Stochastic Economic Modeling
- Introduction to GAMS (https://www.gams.com/latest/docs/UG_MAIN.html)

Week #2: Climate Impact

- ✓ Burke, M., S.M. Hsiang, and E. Miguel (2015). Global non-linear effect of temperature on economic production, *Nature*, 527(7577), 235–239.
- ✓ Barreca et al. (2016). Adapting to climate change: The remarkable decline in the US temperature-mortality relationship over the twentieth century. *Journal of Political Economy*, 124(1):105–159,
- ✓ Deschênes, O., and M. Greenstone (2007). The economic impacts of climate change: evidence from agricultural output and random fluctuations in weather. *American Economic Review*, 97(1): 354–385.
- ✓ Hsiang et al. (2017). Estimating economic damage from climate change in the United States. *Science*, 356, 1362–1369.

Week #3: DICE, RICE and Discounting

- Nordhaus, W.D. (2008). A Question of Balance: Weighing the Options on Global Warming Policies. Yale University Press.
- Nordhaus, W.D., and Z. Yang (1996). A regional dynamic general-equilibrium model of alternative climate-change strategies. *American Economic Review*, 86, 741–765.
- ✓ Frederick, S., G. Loewenstein, and T. O'Donoghue (2002). Time Discounting and Time Preference: A Critical Review. *Journal of Economic Literature* 40 (2):351–401.
- ✓ Weitzman, M.L. (2001). Gamma Discounting. *American Economic Review* 91 (1):260–271.

Week #4: Technology and Renewable Energy

- ✓ Goulder, L.H., and K. Mathai (2000). Optimal CO₂ Abatement in the Presence of Induced Technological Change. *Journal of Environmental Economics and Management*, 39 (1): 1–38.
- ✓ Acemoglu, D., U. Akcigit, D. Hanley, and W. Kerr (2016). Transition to clean technology, *Journal of Political Economy*, 124(1): 52–104.
- Baldwin, E.C., Y. Cai, and K.Z. Kuralbayeva (2020). To Build or Not to Build? Capital Stocks and Climate Policy. *JEEM*. <https://doi.org/10.1016/j.jeem.2019.05.001>
- Golosov, M., J. Hassler, P. Krusell, and A. Tsyvinski (2014). Optimal taxes on fossil fuel in general equilibrium. *Econometrica*, 82(1): 41–88.

Week #5: Climate Uncertainty and Overview of Computational Methods

- ✓ Weitzman, M.L (2011). Fat-tailed uncertainty in the economics of catastrophic climate

- change. *Review of Environmental Economics and Policy*, 5(2):275–292.
- ✓ Pindyck, R.S. (2013). Climate change policy: what do the models tell us? *Journal of Economic Literature*, 51(3): 860–872.
- ✓ Roe, G.H., and M.B. Baker (2007). Why is Climate Sensitivity So Unpredictable? *Science*, 318, 629–632.
- Cai, Y. (2019). Computational Methods in Environmental and Resource Economics. *Annual Review of Resource Economics* 11, 59–82.
- Cai, Y. (2021). The role of uncertainty in controlling climate change. In Oxford Research Encyclopedia of Economics and Finance. Oxford University Press.
<https://doi.org/10.1093/acrefore/9780190625979.013.573>

Week #6: Dynamic Stochastic Integration of Climate and Economy

- Cai, Y., K.L. Judd, T.M. Lenton, T.S. Lontzek, and D. Narita (2015). Environmental tipping points significantly affect the cost-benefit assessment of climate policies. *Proceedings of the National Academy of Sciences*, 112(15), 4606–4611.
- Lontzek, T.S., Y. Cai, K.L. Judd, and T.M. Lenton (2015). Stochastic integrated assessment of climate tipping points indicates the need for strict climate policy. *Nature Climate Change* 5, 441–444.
- Cai, Y., T.M. Lenton, and T.S. Lontzek (2016). Risk of multiple interacting tipping points should encourage rapid CO2 emission reduction. *Nature Climate Change* 6, 520–525.
- Cai, Y., and T.S. Lontzek (2019). The social cost of carbon with economic and climate risks. *Journal of Political Economy*, 6:2684–2734.

Week #7: Regional Climate Model and Project Presentations

- Cai, Y., W. Brock, A. Xepapadeas, and K.L. Judd (2019). Climate Policy under Spatial Heat Transport: Cooperative and Noncooperative Regional Outcomes. NBER working paper 24473. <https://arxiv.org/abs/1909.04009>
- ✓ Project Presentations

Other Readings:

- Nordhaus (2017). “Revisiting the social cost of carbon.” *Proceedings of the National Academy of Sciences of the United States of America* 114 (7):1518–1523.
- Stern, N.H. (2007). *The economics of climate change: the Stern Review*. Cambridge, UK: Cambridge University Press.
- Deschênes, O., and M. Greenstone (2011). Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the US. *American Economic Journal: Applied Economics*, 3(4): 152–185.
- Kahn et al. (2019): “Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis,” Tech. Rep. w26167, National Bureau of Economic Research.