Climate Change: Science, Economics, and Policy (ECON/ENVI 235)

Macalester College – Fall 2024

Class meetings: TTh 9.40 am – 11.10 am, THEATR 204

Instructors:

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Office hours: Mon. 10:45 – 11:45am, Wed. 1:30 – 2:30pm, and by appointment via email

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Office hours: Tues. and Thurs., 3:00-4:15pm, and by appointment (Sarah's Google appointment schedule)

Preceptor:

Arlo Heitler aheitler@macalester.edu; Office hours TBD

Course description

The causes and effects of climate change are inextricably linked with the global economy. The combustion of fossil fuels produces carbon dioxide, which traps energy near Earth's surface and leads to warmer average global temperatures. The combustion of fossil fuels also forms the backbone of the modern economy, fueling cars, power plants, and everything in between. This team-taught course will provide a framework in which to consider the costs and benefits of fossil fuel consumption in the present, but also over the coming decades and centuries. We will use concepts from climate science and environmental economics to help evaluate existing and proposed policy interventions designed to reduce fossil fuel consumption, and we will similarly consider possible technological solutions to slow or even reverse climate change. We will spend a significant amount of time exploring how the preceding topics factor into Integrated Assessment Models. Governments and NGOs use these models to combine scientific and socioeconomic information to predict the outcomes of various climate and policy scenarios. These are the state of the art in climate science, economics, and policy; students will be exposed to several of the most commonly used models and to research from their critics.

Goals for students

By the end of this course, students should be able to

- Explain the basic principles of climate science and economics to a non-technical audience
- Understand the costs and benefits of, prospects for, and obstacles to potential climate change policies
- Use an Integrated Assessment Model to simulate changes in natural and economic conditions and to analyze the relative effectiveness of policies intended to reduce greenhouse gases
- Critique Integrated Assessment Models and their alternatives using a number of scientific and economic criteria
- Communicate clearly and effectively through written presentations of ideas

Course texts and readings

Archer, David. Global Warming: Understanding the forecast, 2nd ed. Hoboken, NJ: Wiley, 2011.

Nordhaus, William. The Climate Casino: Risk, Uncertainty, and Economics for a Warming World. New Haven, CT: Yale University Press, 2013.

Various other articles, textbook chapters, and reports will be required. They will be posted on Moodle.

Moodle

The class Moodle page should be your first stop for information about readings, assignments, and what to expect in class. The page is color-coded: readings (blue) should be completed before class on the day of the entry, and assignments (orange) are due that day at the beginning of the class period. This will require some looking ahead on your part.

Grading

Your final grade for this course will be determined by the number of points you accumulate throughout the semester.

Point distribution	
Reading Responses (10 @ 6 points each)	60
Homework (6 @ 35 points each)	210
Exam	150
Summative Report	
-Draft for Peer Review	20
-Final Report	160
TOTAL POSSIBLE	600

Reading Responses

We will require reading responses for 10 of 12 course readings (indicated on Moodle); you may skip two and still receive full credit. If you complete all 12, we will drop the lowest two scores from your grade. Responses will be graded on a zero to 6-point scale. Hand in each reading response on Moodle by **9:30am** the day for which the reading is assigned.

Homework

Six homework assignments together comprise 35% of the course points. We urge you to work together on your homework, but **each of you must use your own words to write up your own assignment, and you must write on your homework the names of those with whom you worked**. Homework will be comprehensive, so starting them early and working on a section each day is a good idea. **Please upload your homework to Moodle as a pdf.** We urge you to type the written parts of your homework. You may write your problems out by hand, but your writing must be very neat, and you must put your answers in order of the questions and scan them to pdf before uploading.

Exam
To encourage you to solidify your understanding of concepts covered in class, readings, videos, and homework, we will give **one in-class exam on the Tuesday before fall break**. It will be worth 25% of the course points. This will be a **closed book, closed notes** exam, so you should prepare for it by studying the material and seeking clarification as you go.

Summative report
Being able to communicate complex information to a non-technical audience is an increasingly important skill. This assignment is designed to let you practice those skills by writing an evidence-based report about the effects of uncertainty in both scientific and economic tools for policymaking. See Moodle for a more specific description of the assignment. **Due 12/14 at 5:00pm Central Time.**

Class participation
In addition to regularly attending class and working actively with classmates, students will be occasionally responsible for leading class discussion or assuming a role in a debate. We also expect you to make positive contributions to the intellectual community of the course more regularly, which might include active participation in small group discussions, asking and/or answering questions in larger discussions, listening to and responding respectfully to others' ideas, and coming to class fully prepared.

Note taking and editing
Taking good notes is an incredibly useful life skill, and we strongly recommend that you take notes in this class. This looks somewhat different for almost everyone, but good notetaking almost always involves a few common practices. One is trying to capture the 'big picture' of what's being said rather than writing down every word. A second is rewriting and editing your notes. Hear us out! If you rewrite and edit your notes soon after the day's class, you'll see where the gaps in your notes/understanding are, and you'll be able to address them (by going to the textbook/reading, asking Sarah, Louisa, or Arlo in office hours, or borrowing a classmate's notes) while the topic is still fresh in your mind. Your edited notes should be substantially more comprehensive than the first draft.

Last, because we will write and derive equations, and draw on the board *a* lot, and you're likely going to want to copy almost all of those drawings and equations, you should take notes by hand, which may include on a tablet with a stylus.

Laptop and cell phone policy
Because of the difficulty of taking good notes on a laptop, and because laptops offer far too many tempting distractions, laptop use is not allowed during class except for specific exercises. Similarly, cell phone use is not allowed, including during breaks. Please turn off (all the way off, or Do Not Disturb on, not just to vibrate) your cell phone before coming to class. Our goal is to make the classroom feel as communal and friendly as possible. If you absolutely must check your phone during a break, you should leave the classroom, but we hope you'll choose to engage with your classmates or stand up and stretch (or dance) instead.

Concern for Students' Overall Well-Being
We care first and foremost about your overall well-being. If you are struggling in this class or in life, please let us know. We can help you strategize about the course and can refer you to great people who can help you. This is a list of resources.

Academic integrity and artificial intelligence
Cheating on homework, including by using another's solutions, or any failure to acknowledge the contributions of others' work—including classmates or artificial intelligence (AI) such as ChatGPT—to your own are serious offenses.

In this course, we urge you to avoid AI entirely, as the material generated by these tools may be inaccurate or even totally "hallucinated" by the AI tool, incomplete, or otherwise problematic. In addition, using AI for this class will undermine our efforts to become better independent thinkers and researchers. You may not submit any work generated by an AI program as your own. If you include material—including both *ideas* and *language*—generated by an AI program, it should be cited like any other reference material, both in this course and at Macalester College in general. If you have any questions, please feel free to contact us. Failure to do so is plagiarism in this class, a kind of cheating.

Cheating will result in a **grade of no-credit for the assignment and may result in a failing grade for the course**. It is your responsibility to ask Sarah or Louisa for clarification on class policies and to become familiar with Macalester's policies on what constitutes these offenses and to behave accordingly. We will report all cheating and plagiarism to the Dean of Academic Programs. For more information, check here.

Disabilities
We are committed to providing assistance to help you be successful in this course. Accommodations are available for students with documented disabilities. Follow the links on this page to request or renew accommodations. Please do this early in the semester to ensure that necessary accommodations are approved so that you can begin the semester successfully.

Inclusivity
We are committed to providing a safe and equitable learning environment for students. We insist that we all treat each other with respect and act professionally, adhering to the American Economic Association code of conduct. We will respect all viewpoints and identities, and all levels of comfort with the material. We as learners and teachers all bring various experiences and life contexts to this course. These differences will emerge in class and be part of what we negotiate and benefit from as a developing community. We hope you will feel comfortable coming to us to express any concerns or suggestions; this is an iterative process that requires the collaboration of all.

Please see the next page for a brief class calendar

Class calendar (Subject to change; Please see Moodle for readings and up-to-date schedule)

Date		Topic	Due
Sept.	3	Introduction, Principles of Econ review	
	5	Modelling the economics of climate change	
	10	Production and emissions	RR1
	12	Market failure: Public goods and externalities	RR2
	17	DICE optima	HW1
	19	Radiation budget and the layer model	
	24	The greenhouse effect and convection	RR3
	26	Climate patterns, models, and sensitivity	HW2
Oct.	1	Delta T: Why is it so hard to estimate?	
	3	Delta T: State of the science	RR4
	8	Delta T: What it means for integrated climate-econ modeling	
	10	The discount rate: Why we use one, and why it matters so much	HW3
	15	The discount rate: Using one in practice	RR5
	17	**Fall Break: No class**	
	22	The discount rate: The big picture, and exam review	HW4
	24	**In-class Exam**	
	29	Sea-level rise: Science	RR6
	31	Sea-level rise: Economics, damages, and policy	RR7
Nov.	5	Extreme heat: Science	RR8
	7	What do the election results imply for climate policy?	
	12	Extreme heat: Economics and policy	HW5
	14	Social cost of carbon	RR9
	19	Policy: Taxes versus permits versus standards	RR10
	21	Timing (of policy) is everything	
	26	Geoengineering	HW6
	28	**Thanksgiving: No class**	
Dec.	3	Catastrophe: Science (mostly)	RR11
	4	**Draft of summative report due by 9PM**	**Draft report**
	5	Peer review, end of course surveys	
	10	Catastrophe: Economics, and wrap up	RR12
	14	**Final summative report due at 5PM**	**Final report**