AAEC 3984 & 3984H – Climate Risk Management

Virginia Tech
Fall 2023

Instructor: Dr. Elinor Benami (Office: 540-231-1147)
Course Meeting Time: Tues & Thurs 2.00 - 3.15PM in XX classroom
Student Advice Hours: Tues. 4.30-5.30pm & Thurs. 9-10am
Credits: 3

1 Course Summary and Objectives

Climate change poses a series of fundamental challenges to sustaining human lives and livelihoods around the globe, influencing flood risk, species distributions, agricultural yields, conflicts, and many other measures linked to human health and welfare. This course breaks down the science and economics of extreme weather associated with climate change, examining how we detect changes in the earth's long-term weather patterns, what we know about the implications of those changes on how society functions, and policy options to help people manage the risks it poses. In the process, we will also develop our technical skills by enhancing our understanding of the common tools used in economics to understand impacts as well as practicing the skills of interpreting scientific work for general audiences. This course is oriented for upper level undergraduate students who are curious to delve into the underpinnings of and responses to the human dimensions of global environmental change. We expect students with a background in economics and/or data science will find this course the most accessible, though curiosity, diligence, and pro-active behavior can help fill in specific gaps. By the end of this course, you should be able to:

1. Clearly describe the causes and consequences of climate change
2. Characterize how we know what we know about climate change and scientific approaches to distinguish signal from noise
3. Identify and discuss the trade-offs of different climate risk management techniques, from diversification, migration, through to financial risk management
4. Present an informative and concise synthesis of relevant risk management approaches for a well-defined geographic area undergoing change in a cumulative course project

Overall, this course takes a transdisciplinary approach to its subject matter, using source material from multiple fields—including economics, public policy, philosophy of science, and earth system science—to help prepare students for the types of collaborations often involved in addressing these real-world issues.

2 Topical Outline

1. **Introduction to the Course**: Weather variability and economic life

   Questions: What do weather patterns and climate have to do with economics? What is risk?

   Concepts: uncertainty vs. risk, social welfare, public goods, collective action problems, weather versus climate, externalities

2. **The Science:** A brief introduction to climate change science and disciplinary standards of evidence

   Questions: How do we know what we know about the climate?

   Concepts Examining data distributions and deviations from historical patterns, global climate models/general circulation models, triangulation of mounting bodies of evidence, e.g., IPCC synthesis reports.

3. **Physical Bases**: *Detected* Changes in the Environment due to Climate Change

   Questions: How do we isolate a particular variable and attribute it as a cause?

   Concepts: Changes in flooding & temperature patterns; discussion of regular climate oscillations: differences and connections between ENSO, NAO, El Nino/La Nina and Climate Change, Climate Impact Labs

4. **Physical Bases**: *Projected* Changes in the Environment due to Climate Change

   Questions: What do we expect to happen in the future, and how do we build confidence in those projections?

   Concepts: Climate projections and hindcasting, model intercomparison, emissions pathways, Shared Socioeconomic Pathways, scenarios vs. storylines, the role of integrated assessment models

5. **Mitigation Approaches**

   Questions: What options are available to address the sources of climate change?

   Concepts: sample mitigation actions, policy debates on prices vs. quantities for abatement, lessons from prior air pollution reduction programs, stabilization wedges; climate smart agriculture; social cost of carbon; estimating demand/willingness-to-pay for climate action (part 1)

6. **Adaptation Approaches and Resilience**

   Questions: How do we break the links between changes and human lives/livelihoods?

   Concepts: sample adaptation actions; risk as a function of hazard, exposure, and vulnerability; defining resilience; substitution (elasticities); migration/managed retreat; financial instruments; diversification; nature based solutions; climate smart agriculture (part 2); the social costs of disasters and disaster risk reduction

3 Readings and Materials

There is no required textbook. Readings will include academic journal articles, book chapters, policy-oriented publications, and government reports. These resources will be made available in advance.

4 Evaluation

Grading Scale

I will sum your scores of the various course components listed below to compute your final grade, out of 100, which will then translate into a letter grade based on VT's grading scale below. To encourage you all to to collaborate rather than compete against each other, grades will not be adjusted to a "curve" that sets your score against that of your classmates. *At the same time, note that the scale below defines the minimum letter grade you will receive; the instructor may revise letter grade ranges, but will only do so such that your final letter grade remains the same or better than it would under this published scale.*

$\geq$ 93 A	90–92 A−	87–89 B+	83–86 B	80–82 B−	77–79 C+
73–76 C	70–72 C−	67–69 D+	63–66 D	60–62 D−	$<$ 60 F

Fundamentally, we believe that with some planning, everyone can master the essential components of this class. Reach out to the instructional team and your classmates to overcome stumbling blocks you perceive in the path to content mastery. The earlier you connect, the more options are available to address your questions.

Assignments

1. Syllabus Reflection (5%)
   To help the teaching team get to know you better and gauge where the class is starting from, in the first week of class you will be asked to complete a survey in which you will share a bit more of your academic background as well as reflect on some of the highlights of this syllabus as it relates to your goals.

2. Course Discussions and Engagement (20%)
   Throughout the course I expect you to engage in the course content and share your learning with your classmates. This engagement may manifest in several ways, including (1) posting relevant topics from ongoing news on our course discussion board (2) asking questions in class or on our course discussion board, and/or responding constructively to others' questions on our course website (3) being responsive and active participants in class activities, including providing constructive feedback on your classmates' term project presentations. The purpose of this emphasis on engagement is to provide you with examples of how the economic principles that we learn in class apply to current issues you encounter in your lives as well as foster conversations and connections among students.

3. Quizzes and Short Assignments (30%)
   We will have a few short quizzes throughout the semester to help check in on where the class is with the content of the course and to encourage synthesis of course materials.

4. Cumulative Course Project (45%)
   The course project combines the skills and content knowledge from throughout the course and applies it to a question you care about in an area undergoing change. I encourage you to work in groups of 2-3 people with diverse skills on this project, as science is often a team sport, and each of us can a learn a lot from each other. I will set up a space on our course website for you to make your team. The project will require your team to:

   - Synthesize what is known about a given area undergoing climate-induced biophysical change – what is changing, and what techniques and data were used to determine the changes was happening? How does the work express certainty and uncertainty around its conclusions?
   - Discuss the social and economic impacts of these changes, drawing upon studies done related to the area and problem domain. What are the main impacts that have happened to date and what is projected to occur? What are the primary mitigation or adaptation strategies suggested for those impacts (if any), and how might those impacts change with mitigation or adaptation?
   - Prepare a 10-12 minute presentation for the class to capture the key points of your report/memo.

   We will approach the project at the outset of the course and build in milestones along the way, including:

   (a) Topic Selection
   (b) Outline for Project Report
   (c) Outline for Project Presentation
   (d) Final Presentation
   (e) Final Project Report

5. *Course Evaluations (Bonus 2%)*:
   Course evaluations are important for assessing student perceptions of the course and improving course quality, yet nonrandom response bias can dilute the value of them. We'll have a mid-term evaluation and a near-end-of term evaluation. While the content of these surveys will be anonymized, I can see the submission rate. To help overcome non-sampling errors, if the submission rate exceeds 80% of the enrolled course participants, everyone will receive a bonus 2% to their final grades.

Honors Students: We have opportunities to deepen your engagement with the course materials and get honors course credit via a Faculty-Student Agreement. Please reach out to me to discuss these opportunities early in the semester, as agreement must be submitted and approved within the first three weeks of class.

5 Course Policies

Class Attendance

Regular attendance is expected as well as beneficial to course discussion. Although we will not formally be taking attendance in every class, notable lack of participation can affect your 'engagement' grade. If you think you may be unwell, however, please do not come to class and reach out to the instructor as soon as is feasible.

Late Submissions

Prompt submission of assignments allows the instructor team to provide guidance and timely feedback. Due dates for each assignment are noted on the course calendar.

You have four "slip days" that can be used throughout the semester for homework assignments (not quizzes) – you do not need to contact the instructor to use a slip day, just turn in your assignment late. Once you are out of slip days, assignments submitted after the due date will receive a 10% grade deduction per day past the due date. **To keep you from falling too far behind, no assignments are accepted beyond 48hrs after the deadline, regardless of the number of slip days you have.**

If an emergency arises that prevents you from completing your work on time, please contact the instructors as soon as possible so that arrangements can be made for you to keep up in the class. The late policy may be waived at the instructor's discretion in case of an emergency.

Honor Code

While I strongly encourage you to work in groups and help tutor each other on concepts and examples, all work submitted in this course must be of your own production, and all sources must be properly acknowledged and documented. Failure to acknowledge your sources, whether deliberate or not, constitutes plagiarism. If you have questions about this policy, please reach out. I will appreciate your efforts to behave with integrity and will be happy to help. Each student enrolled at Virginia Tech is responsible for abiding by the Honor Code. A student who has doubts about how the Honor Code applies to any graded assignment is responsible for obtaining specific guidance from the instructor before submitting the assignment for evaluation. Ignorance of the rules does not exclude any member of the University community from the requirements and expectations of the Honor Code.

"As a Hokie, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

For more info, visit the Office of Undergraduate Academic Integrity at https://honorsystem.vt.edu/.

Accessibility

Virginia Tech welcomes students with disabilities into the University's educational programs. The University promotes efforts to provide equal access and a culture of inclusion without altering the essential elements of coursework. If you anticipate or experience academic barriers that may be due to disability, including but not limited to ADHD, chronic or temporary medical conditions, deafness or hearing impairment, learning disabilities, mental health, or vision impairment, please contact the Services for Students with Disabilities (SSD) office (540-231-3788, ssd@vt.edu, or visit www.ssd.vt.edu). If you have an SSD accommodation letter, please meet with me privately during office hours as early in the semester as possible to deliver your letter and discuss your accommodations. You must give me reasonable notice to implement your accommodations, which is 5 business days generally and 10 business days for exams.

Other University Resources

Virginia Tech has an array of resources available to students at low or no additional cost, including writing support, mental health services, or career counseling. I've included some of these resources below, and I ask that you please help share others in our class discussion page that you've found helpful and that your classmates might, too.

- Writing Center: https://lib.vt.edu/study-learn/writing-center.html
- Cook Counseling Center: https://ucc.vt.edu/
- Career and Professional Development Advising: https://career.vt.edu/advising.html
- Technical Assistance requests can be directed to VT4Help at 540-231-HELP (4357) or https://4help.vt.edu/

Emergency Well-Being Resources (Lauren's Promise)

I will listen and believe you if someone is threatening you. Any form of harassment or violence will not be excused or tolerated at VT. If you are in immediate danger, call 911. If you are experiencing harassment, relationship violence, or stalking, you can report it to me, and I will (and am obligated to) connect you to resources such as VT's Office of Equity and Accessibility, which has established procedures and resources for Sexual Misconduct Response and Prevention, detailed here: https://oea.vt.edu/title-ix-vawa.html. You may also contact a 24-7 emergency evaluation and crisis intervention team from the NRVCS (New River Valley Community Services) Emergency Services line at 540-961-8400.

Changes to this syllabus

This syllabus may be updated at the discretion of the instructor at any time. We'll post on the course website if there are any substantive changes, and the most recent version will be made available on the course website.

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