Overview
After a study of the historical development of climate change policy, this course analyzes current policy options for mitigating and adapting to long-term climate change. The course will examine various approaches available in the U.S. for national-level policy, including regulatory and market-based approaches, particularly cap and trade and carbon taxation. Various models for designing a cap and trade system will be studied, including the European experience and regional programs in the United States. Special attention will be paid to methods for setting initial prices and accounting for discounting of future benefits. The course will focus primarily on national-level carbon management policies, but international agreements will also be included, as well as equity considerations on a global level.

Course Goals and Learning Outcomes
Understand common policy types used to mitigate GHG emissions, adapt to climate change, and promote geoengineering.

Know the major regulations & efforts that have been applied or proposed within the United States at the federal level.

Understand how to apply common tools of policy analysis to regulations, along with the pros and cons of a given approach.

Textbooks
There are no textbooks required for purchase for this course. See Readings for links to online readings. Required readings should generally be available on E-Reserves through Blackboard.
Grading and Assignments

Class Participation: 30 points
Students are expected to participate actively in class.

Weekly Assignments: 5 points each (for about 10 weeks)
Most weeks a short set of questions will accompany the readings.

1 Class Presentation: 20 points
At some point during the semester, each student will prepare and present an 8-10 minute talk (with powerpoint slides, if appropriate) regarding specific climate policy topics. These presentations will be opportunities for students to research a subject that will not be covered in depth in the course itself – city or state level policies, rolling easements and coastal protection, specific non-US national actions, climate financing, etc. (see sample topics at end of syllabus)

1 Policy Memo: First draft: 5 points, Final draft: 15 points
The student will write a two page memo regarding a specific climate policy topic, as if briefing an assistant Administrator of a Federal Agency (or equivalent position in an NGO). The memos will set out the key background information, detail a decision that needs to be made, and weigh the pros and cons of different options. (see sample topics at end of syllabus). Feedback will be provided on the first draft (as if by a branch chief), and the student will incorporate the feedback in preparing the final draft. In addition to the two page memo, the student can include up to two additional pages with citations and background information (as a class assignment can benefit from some information that an assistant Administrator would not be interested in).


1 Quiz: 20 points
The quiz will be 45 minutes long, and will be a mix of short essay questions, analytical problems, and multiple-choice questions.

Model analysis exercise: 20 points
Students will apply a simple model (provided) to answer a set of questions regarding climate policies. They will provide the Excel spreadsheets and a description of the results.

1 Final Paper: First draft: 10 points. Final draft: 30 points
The final paper should be an analysis of a climate policy issue. Topics will be chosen at the midpoint of the class. The paper should be written in the form of a journal article. A potential target journal could be Climate Policy Journal ([http://climatestrategies.org/climate-policy-journal/](http://climatestrategies.org/climate-policy-journal/)): an article is a 1000-3000 word piece that presents a “rigorous and insightful commentary on key policy issues and debates”.
Grading Policy
This class will follow the general JHU grading policy available at: http://advanced.jhu.edu/current-students/policies/grading-policy/
Each assignment will be graded on an A+ to F scale, and then all assignment grades will be combined at the end of the semester to produce an overall grade. Assignments are generally due at 6 pm on the day before the class for which they are required. Late assignments will be docked one step (e.g., A to A-) (unless prior arrangements for an extension have been made). The assignment will be docked an additional step one week from the original due date. Additional penalties may be applied after that date. Quizzes and other quantitative assignments may be graded on a curve.

Assignment Feedback
The instructor will aim to return assignments to you within two weeks following the due date. You will receive feedback in the My Grades area of the course which can be accessed via the navigation menu.

Time Management Expectations
It is expected that you look ahead to schedule your time. Plan to complete coursework across several days of the week rather than all in one day. Some assignments require that you work on them for multiple weeks. Be sure to review the assignment directions at the beginning of the course so that you can plan your time accordingly. Please seek help before becoming frustrated and spending a significant amount of time to resolve an issue.

Specific Technology Requirements & Skills for this Course
One assignment for this course requires the use of a computer that includes a program that can interpret an Excel spreadsheet with macros and the use of the Solver (instructions on installing and using Solver will be provided during the class). If this is a problem, please let the instructor know.

Learning online requires some basic knowledge of computer technology. At a minimum, you need to be able to:
- Navigate in and use Blackboard; the Blackboard Student Orientation course on your “My Institution” page
- Create and save MS Word documents; review MS Word training and tutorials for PC users (all versions); Word Help for Mac users
- Find basic resources on the Internet
- Create and organize files & folders on your computer
- Send, receive, and manage email
General

This course adheres to all University policies described in the academic catalog. Please pay close attention to the following policies:

Students with Disabilities

Johns Hopkins University is committed to providing reasonable and appropriate accommodations to students with disabilities. Students with documented disabilities should contact the coordinator listed on the Disability Accommodations page. Further information and a link to the Student Request for Accommodation form can also be found on the Disability Accommodations page.

Ethics & Plagiarism

JHU Ethics Statement: The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Report any violations you witness to the instructor.

Read and adhere to JHU’s Notice on Plagiarism.

Dropping the Course

You are responsible for understanding the university’s policies and procedures regarding withdrawing from courses found in the current catalog. You should be aware of the current deadlines according to the Academic Calendar.

Getting Help

You have a variety of methods to get help on Blackboard. Please consult the resource listed in the "Blackboard Help" link for important information. If you encounter technical difficulty in completing or submitting any online assessment, please immediately contact the designated help desk listed on the AAP online support page. Also, contact your instructor at the email address listed in the syllabus.

Copyright Policy

All course material are the property of JHU and are to be used for the student's individual academic purpose only. Any dissemination, copying, reproducing, modification, displaying, or transmitting of any course material content for any other purpose is prohibited, will be considered misconduct under the JHU Copyright Compliance Policy, and may be cause for disciplinary action. In addition, encouraging academic dishonesty or cheating by distributing information about course materials or assignments which would give an unfair advantage to others may violate AAP’s Code of Conduct and the University’s Student Conduct Code. Specifically, recordings, course materials, and
lecture notes may not be exchanged or distributed for commercial purposes, for compensation, or for any purpose other than use by students enrolled in the class. Other distributions of such materials by students may be deemed to violate the above University policies and be subject to disciplinary action.

**Code of Conduct**

To better support all students, the Johns Hopkins University non-academic Student Conduct Code has been integrated and updated to include all divisions of the University. In addition, it is important to note that all AAP students are still accountable for the Code of Conduct for Advanced Academic Programs.

**Title IX**

**Confidentiality and Mandatory Reporting**

As an instructor, one of my responsibilities is to help create a safe and inclusive learning environment on our campus. I also have mandatory reporting responsibilities related to my role as a Responsible Employee under the Sexual Misconduct Policy & Procedures (which prohibits sexual harassment, sexual assault, relationship violence and stalking), as well as the General Anti-Harassment Policy (which prohibits all types of protected status based discrimination and harassment). It is my goal that you feel able to share information related to your life experiences in classroom discussions, in your written work, and in our one-on-one meetings. I will seek to keep information you share private to the greatest extent possible. However, I am required to share information that I learn of regarding sexual misconduct, as well as protected status based harassment and discrimination, with the Office of Institutional Equity (OIE). For a list of individuals/offices who can speak with you confidentially, please see Appendix B of the JHU Sexual Misconduct Policies and Laws.

For more information on both policies mentioned above, please see: JHU Relevant Policies, Codes, Statements and Principles. Please also note that certain faculty and other University community members also have a duty as a designated Campus Safety Authority under the Clery Act to notify campus security of certain crimes, as well as a duty under State law and University policy to report suspected child abuse and/or neglect.
**Class Schedule**

This syllabus may be revised as appropriate depending on the interests and backgrounds of the students in the class, and any relevant climate policy events that occur during the semester.

<table>
<thead>
<tr>
<th>Dates</th>
<th>Class</th>
<th>Reading</th>
<th>Assignment</th>
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<tbody>
<tr>
<td>Week 1</td>
<td><strong>Introduction</strong>&lt;br&gt;Logistics&lt;br&gt;Why are we here?&lt;br&gt;Why Climate?&lt;br&gt;Syllabus organization &amp; reasoning&lt;br&gt;Logistics&lt;br&gt;Discussion</td>
<td>NA</td>
<td>Syllabus distributed&lt;br&gt;Weekly assignment placed on Blackboard&lt;br&gt;Class presentation, final paper, weekly assignments, quiz, &amp; memo topics discussed</td>
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<tr>
<td>Week 2</td>
<td><strong>Economics</strong>&lt;br&gt;Supply &amp; Demand&lt;br&gt;Externalities&lt;br&gt;Taxes&lt;br&gt;Coase Theorem&lt;br&gt;Marginal Abatement Curves&lt;br&gt;Leakage&lt;br&gt;Integrated Assessment Models</td>
<td>CBO (2003): Chapter 1, skim chapter 2, chapter 3&lt;br&gt;OMB Circular A-4</td>
<td>Weekly assignment due (every week unless announced otherwise)</td>
</tr>
<tr>
<td>Week 3</td>
<td><strong>The Carbon Economy</strong>&lt;br&gt;Kaya Identity&lt;br&gt;Fossil Fuels &amp; Emissions Intensities&lt;br&gt;Projects&lt;br&gt;Introduction to Excel-based model</td>
<td>EPA GHG Reporting Website&lt;br&gt;EPA GHG Inventory Executive Summary&lt;br&gt;IPCC AR5, WGIII, SPM.3&lt;br&gt;IPCC AR5, WGIII, Ch5, Box 5.1 (Kaya Identity)</td>
<td>Excel simple climate model and computational exercise distributed</td>
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<tr>
<td>Week 4</td>
<td><strong>Valuation and Targets</strong>&lt;br&gt;Market approaches&lt;br&gt;Valuation</td>
<td>National Academies SCC Assessment: (chapters 1, 2, and 6)</td>
<td>Hand in proposed class presentation topic</td>
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| Week 5 | **Policy Structures**  
Cap and Trade  
Taxes  
Command and Control  
Voluntary Programs | Stavins blog 2012  
Metcalf, 2007  
RFF, 2006 (Goulder & Pizer)  
EPA Economics of Climate Change website  
Yin, 2012  
Schmalensee and Stavins, 2017  
Barron, 2018 (Sections 1,2,9,10) | Class presentation topics and dates are assigned  
Draft memo due |
| --- | --- | --- | --- |
| Week 6 | **US Legislation**  
SO₂ cap and trade as a model  
Waxman-Markey  
McCain-Lieberman  
Renewable Fuel Standard  
Markey packet (pages 2, 19-25, 27-28)  
Schmalensee and Stavins, 2012  
Climate Action Plan  
Mid-Century Strategy (Exec Summary) | Final paper topic proposals due |
| Week 7 | **Clean Air Act and Climate Change**  
Guest speaker: Jeb Stenhouse, EPA | The Waxman Report  
WRI, 2015  
Clean Air Act rules:  
Three vehicle rule fact sheets  
Oil and Gas fact sheet  
Clean Power Plan, 2 fact sheets | Memo feedback returned  
Final paper topics finalized |
| **Spring Break** | NA | NA |
| Week 8 | **Endangerment Finding**  
Solutions  
Mitigation technologies: solar, | The Endangerment Finding (Introduction)  
(Summary)  
Pacala and Socolow (2004) | First possible date for class presentations, continuing through 2nd to last lecture |
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<tbody>
<tr>
<td>Wk. 10</td>
<td>International Policies&lt;br&gt;Montreal Protocol as a model for the UNFCCC&lt;br&gt;Kyoto v. Paris Accords&lt;br&gt;ETS, carbon taxes&lt;br&gt;2 Degree Target&lt;br&gt;The Arctic Council</td>
<td>UN Framework Convention&lt;br&gt;Paris Agreement &lt;br&gt;Fawcett et al. 2015&lt;br&gt;Keohane and Oppenhemier, 2016</td>
<td>Quiz</td>
</tr>
<tr>
<td>Wk. 11</td>
<td>Geoengineering</td>
<td>National Academies: Climate Intervention (Exec Summary, and pick an intervention for deeper reading)</td>
<td>Final Memo version due&lt;br&gt;Final paper draft returned</td>
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<tr>
<td>Wk. 12</td>
<td>State Level Policies</td>
<td>C2ES&lt;br&gt;Gilmore and St. Clair (2017)</td>
<td></td>
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<tr>
<td>Wk. 13</td>
<td>Non-CO2 GHGs&lt;br&gt;Global Warming Potentials&lt;br&gt;EPA Voluntary Programs</td>
<td>Giordano &amp; Sarofim&lt;br&gt;Ocko et al.&lt;br&gt;Melvin et al.&lt;br&gt;Shindell et al.</td>
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<tr>
<td>Wk. 14</td>
<td>Environmental Justice&lt;br&gt;Between nations&lt;br&gt;Within nations&lt;br&gt;Intergenerational</td>
<td>Kaswan (2008)&lt;br&gt;Declaration on Climate Justice&lt;br&gt;Althor et al. (2016)&lt;br&gt;Klinsky et al. (2016)</td>
<td>Final Paper Due</td>
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READINGS

Note: required readings are listed above in the schedule. However, for any given lecture more readings may be listed – these are optional for students that are interested in additional information on the topic in question.

Economics
A good review of the subject, if a little dated.

OMB Circular A-4: https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/: 
The guidance document for federal regulatory actions

Additional readings:
General:
Orszag, P., 2007, Issues in Climate Change: 
https://www.cbo.gov/sites/default/files/presentation/11-16-climatechangeconf0.pdf

Integrated Assessment modeling:

Barron, A (2018), Time to refine key climate policy models, Nature Climate Change volume 8, pages350–352

Energy Modeling Forum: https://emf.stanford.edu

SSP Model Descriptions:
https://tntcat.iiasa.ac.at/SspDb/download/iam..doc/SSP_Model_Documentation.pdf

The Carbon Economy
EPA Documents:
GHG Reporting Website: https://www.epa.gov/ghgreporting
Landing page for GHGRP. The FLIGHT tool is a great way to map large GHG emitters.

The annual GHG inventory.

IPCC AR5 (2014): The IPCC is the primary international climate assessment body: working group III addresses mitigation and economics
Additional Readings:
Global Carbon Project: http://www.globalcarbonproject.org/index.htm : bringing together key carbon inventory

**Valuation and Targets**
National Academies SCC Assessment:
https://www.nap.edu/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of

The NAS evaluated the Social Cost of Carbon and presented advice for how to improve the SCC over the coming years.

Trump administration executive order on climate:

Value of a Statistical Life:
https://www.epa.gov/environmental-economics/mortality-risk-valuation

Discount Rates:
Arrow et al. 2013:

Cumulative Carbon:
http://trillionthtonne.org

Allen et al. 2009:
https://www.nature.com/articles/nature08019

Matthews et al. 2012:
http://rsta.royalsocietypublishing.org/content/370/1974/4365

2 Degrees:
https://doi.org/10.1080/14693062.2013.835705
An analysis by the Obama Council of Economic Advisors on updating OMB Circular A-4 discount rates

DICE model:
https://sites.google.com/site/williamdnordhaus/dice-rice
(link appears to be broken for Excel model download, but it is available in the wayback machine:

Policy Structures
Cap and Trade, Taxes, & Market Mechanisms:
EPA (economics of climate change)
https://www.epa.gov/environmental-economics/economics-climate-change

RFF (2006):
Goulder L and Pizer W, The Economics of Climate Change, RFF DP 06-06, June 2006


Metcalf, 2007:
http://www.hamiltonproject.org/assets/legacy/files/downloads_and_links/An_Equitable_Tax_Reform_to_Address_Global_Climate_Change.pdf

Schmalensee and Stavins, 2017:

Yin, 2012, The Carbon Tax Fantasy:


EMF-32 Special Issue, 2018: https://www.worldscientific.com/toc/cce/09/01

CBO, 2013, Effects of a Carbon Tax on the Economy and the Environment:
https://www.cbo.gov/publication/44223


State and Trends of Carbon Pricing, 2018, World Bank:

**US Legislation**


https://scholars.org/sites/scholars/files/rff_final_report_bartosiewicz_miley.pdf : One opinion on why USCAP & Waxman-Markey failed (too much focus on compromise with industry interests, and insufficient grass-root engagement)

https://research.hks.harvard.edu/publications/getFile.aspx?Id=827

The SO2 Allowance Trading System and the Clean Air Act Amendments:
https://dash.harvard.edu/bitstream/handle/1/8160721/RWP12-003-Stavins.pdf

Obama Climate Action Plan:

INDC:
http://www4.unfccc.int/ndcregistry/PublishedDocuments/United%20States%20of%20America%20First/U.S.A.%20First%20NDC%20Submission.pdf

Mid Century Strategy:

**Clean Air Act and Climate Change**

Endangerment Finding: https://www.epa.gov/ghgemissions/endangerment-and-cause-or-contribute-findings-greenhouse-gases-under-section-202a-clean

Link to the Findings, the Response to Petitions, and the ICTA Petition:


http://www.wri.org/sites/default/files/Delivering_on_the_US_Climate_Commitment_ES.pdf

EPA Regulations:

Vehicle Rules:


(Overview Fact Sheet)

Methane Rules:

Clean Power Plan:
https://archive.epa.gov/epa/cleanpowerplan/clean-power-plan-existing-power-plants-regulatory-actions.html (in particular, the following two Fact Sheets):
Overview Fact Sheet: https://19january2017snapshot.epa.gov/cleanpowerplan/fact-sheet-overview-clean-power-plan_.html
Components Fact Sheet:
https://19january2017snapshot.epa.gov/cleanpowerplan/fact-sheet-components-clean-power-plan_.html

https://www.epa.gov/Energy-Independence

Solutions
Mitigation Technologies:
http://science.sciencemag.org/content/305/5686/968.full


Clack C et al., Evaluation of a proposal for reliable low-cost grid power with 100% wind, water, and solar, PNAS 114, 26, 6722-6727, 2017, doi: 10.1073/pnas.1610381114

**Adaptation**

*Sea level:*


*General:*

[https://www.epa.gov/arc-x/strategies-climate-change-adaptation](https://www.epa.gov/arc-x/strategies-climate-change-adaptation)


**Geoengineering**


Available at: [https://nas-sites.org/americasclimatechoices/other-reports-on-climate-change/climate-intervention-reports/](https://nas-sites.org/americasclimatechoices/other-reports-on-climate-change/climate-intervention-reports/)

**International Policies**

UNFCCC

Convention on Climate Change, 1992: [https://unfccc.int/resource/docs/convkp/conveng.pdf](https://unfccc.int/resource/docs/convkp/conveng.pdf)

The founding document of the UNFCCC. Article II in particular is the overall goal of the Convention.


State Level Policies:
https://www.c2es.org/us-states-regions/policy-maps
50 states of solar: https://nccleantech.ncsu.edu/the-50-states-of-solar-report-2016-annual-review-and-q4-update/

Non-CO₂ GHGs
Sarofim MC, Giordano MR, A quantitative approach to evaluating the GWP timescale through implicit discount rates, Earth Syst. Dynam., 9, 1013-1024, 2018
https://doi.org/10.5194/esd-9-1013-2018

http://science.sciencemag.org/content/356/6337/492

http://pubs.acs.org/doi/pdf/10.1021/acs.est.6b00367


http://science.sciencemag.org/content/356/6337/493

CCAC: http://www.ccacoalition.org/en

**Environmental Justice:**

Declaration on Climate Justice:
http://www.wri.org/sites/default/files/declaration_on_climate_justice_0_0.pdf

Althor G, Watson J, Fuller R, Global mismatch between greenhouse gas emissions and the burden of climate change, Scientific Reports 6, 2016, doi:10.1038/srep20281
[https://www.nature.com/articles/srep20281](https://www.nature.com/articles/srep20281)

[https://doi.org/10.1016/j.gloenvcha.2016.08.002](https://doi.org/10.1016/j.gloenvcha.2016.08.002)
https://ueaeprints.uea.ac.uk/61563/1/Published_manuscript.PDF

**OTHER RESOURCES**
IPCC: www.ipcc.ch
National Academies Assessments
USGCRP National Climate Assessment
  NCA4 review: [https://review.globalchange.gov](https://review.globalchange.gov)
EPA Regulatory Impact Assessments
CBO reports: [https://www.cbo.gov/topics/climate-and-environment](https://www.cbo.gov/topics/climate-and-environment)

**EPA Reports**
EPA Indicators: [https://www.epa.gov/climate-indicators](https://www.epa.gov/climate-indicators)
EPA Climate Impacts and Risk Assessment:
[https://www.epa.gov/cira/](https://www.epa.gov/cira/)
Climate and Health Assessment: [https://www.globalchange.gov/health-assessment](https://www.globalchange.gov/health-assessment)
Sample Presentation Topics

Present on one state’s climate-related policies and interests
    Or a state-level mechanism such as portfolio standards
Present on a regional policy body (RGGI, US Climate Alliance)
National policy of a foreign nation (see their intended Nationally Determined Contributions)
Policy issues related to a geoengineering technology (solar demand management, ocean or air capture)
Policy issues related to a low-carbon energy source (such as nuclear)
Policy issues related to an adaptation measure (e.g., sea level rise & easements)
Present on a specific US policy (Renewable fuel standard, CAFE/vehicle rules)
An analysis of Renewable Energy Credits
Analysis of emissions and abatement within a specific sector or sub-sector (e.g., agriculture, landfill waste)
Analysis of climate strategy of a specific company or organization (such as a university)

Sample Memo Topics

Should the power plant regulation be limited to the facility or “go beyond the fenceline”?  
Which renewable energy project should we award a grant to in [pick your favorite state]?  
How much or our cap and trade permits should be distributed to covered industries rather than auctioned?  
Should we build a sea wall in [pick your favorite city]?  
How should [pick your favorite university] choose an internal carbon price?  
What happened with the Washington State carbon tax initiative and what are the options for a renewed effort?