# RES 520/GPP 584 - Climate Change: Science, Technology and Sustainable Development

*Syllabus*

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**Office:** AERL 442
**Classes:** Mondays from 9:30-12:30 at AERL 107 or 419 (depending on class size)
**Office Hours:** Mondays from 1 to 3 pm and by appointment

## *Course Overview*

This course will introduce climate change, its drivers, impacts and related policies and. policies to address these. Climate change will contextualized within global change and the interplay of socio-economic development and technical change with climate policies. This course is about understanding the complexity of these interactions and identifying policy responses that are more likely to succeed.

Changes in global climate will have a range of impacts across different geographies, ecosystems and societies. Some will benefit while others will face devastation. The challenges lie in finding solutions that address this diversity of outcomes without thwarting the rights of different peoples to "develop".

In addition to direct intervention to help with development, we can draw on three approaches to climate policy:

- Decide to have as little climate change as possible by choosing to curb the drivers of climate change through *mitigation* of greenhouse gases;
- Accept at least some climate change and develop strategies for *adaptation* to its consequences;
- Resort to modifying the way the earth's climate system responds to GHG emissions (because there was insufficient mitigation and impacts are too large for effective adaptation).

Whatever we do, it will be in the context of:

- Uncertainty about natural long-term variations in the climate system
- Inequitable responsibility for historic GHG emissions
- Vastly different endowments of natural and synthetic capital.

## *Learning Outcomes:*

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

- Possess basic scientific knowledge about the climate systems and its impacts;
- Demonstrate working familiarity with different policies that can be used to address climate change;
- Have a working appreciation of the role of technology;
- Explain basic economic and political concepts in climate policy;
- Apply course concepts to 'real-world' cases of climate policy;
- Analyze the synergies and trade-offs between development and climate policy.

## *Course Format:*

The course consists of one three-hour meeting per week. Each class will have two components:

- half of the class will be devoted to presentations on core concepts and discussing their implications;
- half of the class will be devoted to examining case studies to gain experience in applying the introduced concepts.

The class sessions are divided into five modules, each requiring readings and leading into a case study session developed and run by students. Students will work in groups to either develop a new case study or to modify an existing case, and then lead the class through an exercise. The cases will provide students with the opportunity to examine global issues in a very specific and local context and learn how to analyze these problems.

## *Course Requirements*

This course is open to all UBC graduate students. Advanced undergraduate students may also attend. Please contact me prior to enrollment. Students will be required to apply concepts from a variety of disciplines. Hence, prerequisite knowledge of basic microeconomics and environmental science is encouraged. Auditing of this course is not advisable.

## *Evaluation Criteria and Grading*

The course is graded on a numeric basis, and evaluation will be based on four factors of assessment:

### 1. Class Presentation (10 points)

Each student will be asked to review and present one of the suggested readings for the course. You are expected to summarize the paper and critique its findings. The presentation should take no longer than 20 minutes, and will be followed by a 10 minute Q&A session. Resources for how to present papers are here http://web.stanford.edu/~jacksonm/present.pdf and here http://www.cs.rpi.edu/courses/spring99/robotics/paperdiss.html

### 2. Short writing assignments (total 40 points):

There are five short writing assignments (1000-1500 words) each worth 8 points. Topics are specified in the course outline. Papers should be well argued and well presented. They should try to include quantitative evidence where possible. Assignments are due on Mondays at noon. Please email them as a word document – using the following naming convention <surname>#<assignment number>.doc to: assignment to: climatecourse@gmail.com.

### 3. Final paper (30 points):

Each student is expected to write a high-quality final paper or project on the topic of their choosing or to an expansion of one of the two final short assignments. If you wish to write on a topic of your choosing, please provide me with a short write-up about your paper by November 10th. The paper will be due at noon on Monday December 5.

### 4. Participation (20 points):

The remainder of the course grade will be determined by each student's active and constructive participation in class sessions. Students are expected to attend each class, to prepare for each session by completing the weekly readings, and to participate actively and constructively in class discussions.

## *Course Schedule*

L: lecture, D: discussion/case study

| Week | Part 1 (9:30 -~10:50) | Part 2 (~11:00-12:20) | Homework (in addition to suggested readings) |
|---|---|---|---|
| | Module 1: Context | | |
| #1 | Course organization | L1: The global context | Case studies of impacts attributed to climate change (CC):<br>- Syrian civil war<br>- Hurricane Katrina<br>- California's drought<br>- 1995 Chicago heat wave |
| #2 | D1: Discussion of the four case studies of attribution to CC | L2: Climate dynamics & Drivers<br><br>D2: Review of interactions between climate change and context. Implications for solutions | * Prepare a hand-in assignment as a diagram depicting various global change processes, along with their spatial and temporal characteristics. |
| | Module 2: Climate Dynamics & Drivers | | |
| #3 | D3: Scales and interactions in global change processes | *Modelling Long-term Future Climate Change* | Prepare for discussion of policies to impact drivers of climate change, key their spatial and temporal scales, uncertainties and politics of implementation |
| #4 | D4: CC drivers in different settings from post-industrial to agrarian ... | D5: Review of interactions & policy solutions<br>*Class exercise introducing a new source of renewable fuels: Canadian Bio-Energy* | Prepare case studies of global environmental challenges and successful accords: CFCs, Persistent Organic Pesticides, ... |
| | Module 3: Climate Change Mitigation | | |
| #5 | D6: Lessons from global and regional policies to control pollution | L3: GHG emissions and climate policies so far...<br>• standards<br>• permit markets<br>• taxes<br>• investments<br>*guest speaker: S Shah* | * Prepare a hand-in assignment on climate policies in one of these regions:<br>• The EU<br>• China<br>• USA<br>• British Columbia |
| #6 | D7: discussion of climate change mitigation policies | L4: Assessment of climate change mitigation policies | Prepare for discussion of international mechanisms for building support for CC mitigation.<br>• GEF<br>• ODA, tech transfer, development & markets |
| | Module 4: Climate Change impacts & Adaptation | | |
| #7 | D8: discussion of international mechanisms for CC | L5: Climate impacts & Adaptation | * Hand-in assignment on policies that reduce the impacts of climate change on one of these: |

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|---|---|---|---|
| | mitigation | | • Flood and storm damages<br>• Crop failures<br>• Sea level rise<br>• Eco-systems |
| **Week** | **Part 1 (9:30 -~10:50)** | **Part 2 (~11:00-12:20)** | **Homework** |
| #8 | D9: Case studies of adaptation to CC in different settings from post-industrial to agrarian ... | D10: Fairness, and climate change issues' distribution through space and time | How would you solve the deep de-carbonization challenge?<br>• Technically<br>• Politically<br>• Economically |
| | Module 5: Solutions for the long run | | |
| #9 | D11: Ideas for deep de-carbonization | D11: Feasibility analysis for << these ideas | Characterize technological innovations leading to regime changes (at least one from each of the following sectors):<br>• public health<br>• communication<br>• transport<br>• finance |
| #10 | D12: Solutions for transport | D13: Solutions for built structures | * Prepare a hand-in assignment as a policy brief on one of:<br>• Site C<br>• LNG<br>• Nuclear power |
| #11 | D14: Solutions for industry | D15: Solutions for agriculture | * Prepare a hand-in assignment as a policy brief on one of:<br>• Consumerism<br>• Globalization<br>• Terrorism |
| #12 | D16: Geo-engineering | Review | |

## *Suggested readings*

This is a preliminary readings list. There is no text book, although if you are to read just one book, I would suggest D. MacKay (2009). Sustainable Energy – Without the Hot Air. UIT Cambridge Ltd. http://www.inference.eng.cam.ac.uk/sustainable/book/tex/sewtha.pdf

Additional readings and assignment of paper presentations will be arranged each week.

## *Academic Integrity*

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept to monitor and prevent recurrences.

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar.

## *Access & Diversity:*

Access & Diversity works with the university to create an inclusive living and learning environment in which all students can thrive. The university accommodates students with disabilities who have registered with the Access & Diversity unit.

Students must register with the Disability Resource Centre to be granted special accommodations for any on-going conditions.

## *Religious Accommodation:*

The university accommodates students whose religious obligations conflict with attendance, submitting assignments, or completing scheduled tests and examinations. Students should let their instructor know in advance, preferably in the first week of class, if they will require any accommodation on these grounds. Students who plan to be absent for varsity athletics, family obligations, or other similar commitments, cannot assume they will be accommodated, and should discuss their commitments with the instructor before the course drop date. UBC policy on Religious Holidays can be found here.

## *UBC Statement on Respectful Environment for Students, Faculty and Staff*

The University of British Columbia envisions a climate in which students, faculty and staff are provided with the best possible conditions for learning, researching and working, including an environment that is dedicated to excellence, equity and mutual respect. The University of British Columbia strives to realize this vision by establishing employment and educational practices that respect the dignity of individuals and make it possible for everyone to live, work, and study in a positive and supportive environment, free from harmful behaviours such as bullying and harassment.