

GEOG 2133b: Climate Change

Course Instructor

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Office hours: Wednesdays 2:30 – 3:30pm (Voogt), or by appointment via email.

TAs

Rebecca Doyle; Office Hours / Location – see OWL.

Rainer Hilland; Office Hours / Location – see OWL

Lectures: Tuesday 1:30-3:30 SSC 2028, Thursday 2:30 – 3:30 SSC 2028

Course Description

This course examines the processes that underlie natural and human-induced climate change at global and regional scales and describes the resultant climates that have existed, those projected to occur in the future, and the past and future impacts of climate change on the physical and human environment.

Climate change is one of the most important environmental issues that faces humans. Here we provide an introduction into how Earth's climate works, how internal and external forcings lead to climate changes on different time scales and how past, current and future actions by humans to both the Earth's surface and atmospheric composition have and will affect climates. The course is in large part an examination of global scale climate change, but we will also look at regional and smaller scale climate change to illustrate that climate change is not only a large scale phenomenon. Impacts of climate change will be explored, with a range of examples chosen to illustrate geographical diversity and sectors affected. Finally, we will briefly examine options that may be used to address climate change and their linkage to the physical basis of climates.

The course is taught from a physical scientist's perspective – with an emphasis on how systems work (processes), use of the scientific method, collection and interpretation of data and development and use of numerical models to represent physical processes, but it does so recognizing that many students will come from non-science disciplines and is intended to be accessible to them. Towards the end of the course we will examine in brief, some elements of climate change policy.

General Course Objectives

The goal of the course is to provide climate literate students. By the end of this course, students will:

- understand the principles of Earth's climate system;
- understand the interrelated nature of climate with the atmosphere, hydrosphere, biosphere, lithosphere and cryosphere;
- describe sources of natural variability and their impact on climate and appreciate the data sources and techniques used to assess past climate variability;
- appreciate the human impact on climate and climate change and its consequences;
- assess scientific data on climate;
- synthesize and communicate climate change information;
- be able to make informed decisions related to climate change.

Format

Instruction occurs during two classes (a one and a two hour time slot) and will be a mix of lectures, videos, in-class activities, quizzes and group work. It is imperative to be at all classes.

Teaching Assistants

Teaching Assistants will help deliver and evaluate course material and assignments.

Evaluation

The material covered in lectures including assigned readings and assignments will be evaluated in short in-class quizzes, a midterm and a final exam. A mixed exam format (e.g. short answer, diagram questions) will be used. Marking schemes will be used to assess answers to assignments and exams. Partial marks are awarded for incomplete answers.

Assignments (3 @ 10% each)	30%
Quizzes (3 @ 10% each)	30%
Final exam	30%
Participation	10%
Total	100%

Notes:

1. Marks as posted by the course instructor are considered provisional until approved by the Department Chair. Final marks are received from the Registrar; errors may be corrected through use of a Marks Revision Form.
2. Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.
3. No electronic devices will be allowed during test and examinations

Participation

Participation is an important part of the success of the course and ensuring students learn the material in Climate Change, so part of the final grade will be based on participation. To facilitate participation, the course will use iClicker technology, with participation assessed through completion of in-class questions. To get full marks for participation, a minimum of 80% of the questions must be answered. This recognizes that illness or other factors that affect attendance can be accommodated. One additional way to earn participation marks – if you send me a great current news story about Climate Change then it will earn you 2% of the 10% participation mark component. Participation marks cannot exceed 100%.

Statement on Use of Electronic Devices

No calculators will be required or permitted in the exams. Students who require electronic assistance with language translation must obtain prior approval from the instructor.

Penalties

Exams: In accordance with university policy, missed exams cannot be made up except on written medical grounds and notification prior to exam date.

Assignments: Late assignments will have a penalty of 10% per day. Assignments submitted more than 1 week late will not be accepted. Exceptions can be made for documented medical and other significant reasons beyond your control (see subsequent sections).

Non-medical Absences

Non-medical absence from quizzes require prior approval of the instructor or approval by the Dean's office (appropriate documentation will be required by the Faculty Dean's Office for approval if it is not obtained prior to the quiz).

Medical Absences

Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments worth **10% or more** of their final grade must apply to the Academic

Counselling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department.

For UWO Policy on Accommodation for Medical Illness and a downloadable SMC see:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

Downloadable Student Medical Certificate (SMC):

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Students with special accommodation will write make-up tests and examinations administered by the department on Fridays during respective periods of fall and winter terms. To prevent prior disclosure, the format and contents of make-ups may differ substantially from the scheduled test or examination.

Statement on Use of Personal Response Systems (“Clickers”)

Geog 2133b will use iClickers, an audience response device. iClicker is Western’s officially-supported audience response system. It supports both virtual and physical clickers.

To use iClicker, you need to create an account. If you have previously used iClicker at Western you will use the existing account, but need to sign-in to iClicker Reef once per course, using the OWL portal.

To create an account please follow the instructions at

http://www.uwo.ca/its/presswestern/students_and_audience/index.html

Once your account is created, you can participate using iClicker using a ‘virtual clicker’ by way of a mobile app (Android or iOS mobile device) or web browser. These are free. Or you can purchase a physical clicker from The Book Store.

We will use the iClicker system to encourage participation and active learning. Questions posed using the system will provide you examples of the types of questions to be used on quizzes and the exam. The participation mark will be based on responses to questions using the iClicker system (the participation mark is based on a response, rather than a correct vs incorrect answer). See the section on Participation for how this component is evaluated.

iClickers can only be used by the account owner, clicker misuse (including use by a student other than the owner) is considered a form of Scholastic Offence <http://www.westerncalendar.uwo.ca/2016/pg1909.html>

iClicker uses an external account. Student responses are anonymized when displayed. Responses associated with the participation mark are treated in a similar manner to all other marked components of the course and are only available to the student, instructor and TAs.

Guidelines for Students on the use of Personal Response Systems (“Clickers”)

Personal Response Systems (“clickers”) may be used in some classes. If clickers are to be used in a class, it is the responsibility of the student to ensure that the device is activated and functional. Students must see their instructor if they have any concerns about whether the clicker is malfunctioning.

Students must use only their own clicker. If clicker records are used to compute a portion of the course grade:

- the use of somebody else’s clicker in class constitutes a scholastic offence,
- the possession of a clicker belonging to another student will be interpreted as an attempt to commit a scholastic offence.

University Statement on Academic Offences

“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.”

“Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.”

Mental Health

If you or someone you know is experiencing distress, there are several resources here at Western to assist you. Please visit the site below for more information on mental health resources:

<http://www.uwo.ca/uwocom/mentalhealth/>.

Course Text

The course text is available from the UWO Bookstore.

Dessler, A., 2016: *Introduction to Modern Climate Change*, 2nd Edition, Cambridge University Press.

Other Useful Texts

Fletcher, C. 2013. *Climate Change: What the Science Tells Us*, Wiley, ISBN 978-1-118-05753-7
This book is on one day reserve from Weldon library. It was the previous course text so is generally useful for understanding the science of climate change.

Dessler, A., 2012: *Introduction to Modern Climate Change*, 1st Edition, Cambridge University Press.
This book is on 2 hour reserve from Weldon library and is useful for understanding the modern climate system.

Burch, S.L. & S.E. Harris, 2014: *Understanding Climate Change: Science, Policy and Practice*, University of Toronto Press.

IPCC AR5 Fifth Assessment Reports, 2013: Available from <http://www.ipcc.ch/> .

These reports represent a synthesis of the science on climate change. The summary for policy makers is written in a more accessible form suitable for students.

A wide range of web resources and discussions (i.e. “blogs”) on climate change exist. These may help provide explanation and discussion of climate change, especially with respect to recent findings. However, many of these encompass much more than just the science of climate change. We urge some caution in using these resources – these are, unlike texts and journal articles which undergo a formal review process by independent experts in the subject matter, unreviewed commentary by individuals. We will discuss this further in class.

Supplementary Material:

Course supplementary materials will be provided through the course OWL site.

Course Web Site

Additional course information will be provided on the web using OWL. Use <http://owl.uwo.ca/> and then log in using your uwo username and password. Your log in will require that you be officially enrolled in the course. Please become familiar with this site, and carefully check that your computer meets the OWL requirements.

Western's commitment to accessibility

The University of Western Ontario is committed to achieving barrier free accessibility for persons studying, visiting and working at Western.

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Fire Drills:

Students are required to evacuate the building when the fire alarm is activated.

Support Services

Registrarial Services: <http://www.registrar.uwo.ca/>

Student Development Services: <http://www.sdc.uwo.ca/>

Emotional/Mental Health: Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

SCHEDULE: Assignment and quiz dates are fixed, but the lecture schedule may change periodically – double check OWL for updates.

Wk	Date	Lecture Topic	Text Reading	Assignments, Quizzes
1	Jan 9 & 11	Course Introduction, Environmental Systems, Weather vs Climate, Scientific Method, The Present Climate System	Chp 1	
2	Jan 16 & 18	Past Climates: Tectonic and Orbital Scale Past Climates: Climate Change within Human History	Chp 2	
3	Jan 23 & 25	Radiation and Energy Balance The Greenhouse Effect Greenhouse gases and the atmosphere	Chp 3 & 4	
4	Jan 30 & Feb 1	Carbon Cycle	Chp 5	Assignment 1 Due
5	Feb 6 & 8	Forcing, Feedbacks and Climate Sensitivity	Chp 6	Quiz 1
6	Feb 13 & 15	Controls on Climate Change	Chp 7	
7	<i>Feb19-25</i>	<i>Reading Week</i>		
8	Feb 27 & Mar 1	Projections of Future Climates: Emissions Scenarios	Chp 8	Quiz 2
9	Mar 6 & 8	Thin Ice the Movie (Mar 6) Future Climates – Model Projections	Chp 8, OWL	Assignment 2 Due
10	Mar 13 & 15	Future Climates – Model Projections, Climate Surprises	Chp 9, OWL	
11	Mar 20 & 22	Climate Change Impacts	Chp 11, 12	Quiz 3
12	Mar 27 & 29	Mitigation & Adaptation to Climate Change	Chp 11, 12	Assignment 3 due
13	Apr 3 & 5	Geoengineering of Climate Change	Chp 11, 12	
14	Apr 10	Effective Response to Climate Change	Chp 14	