Introduction to Climate System Dynamics (Geo 318)

4 credits

Note: *This Course has a Moodle Site. A detailed class schedule and other information will be posted there with frequent updates, so check the site regularly.*

Instructor information

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Course objective

This course will introduce students to the processes driving the Earth's climate system using the laws and principles of physics. The focus is on energy and mass flow to/from and within the earth system. The course has three sections – Part 1 is an introduction to Earth's energy balance and the role of greenhouse gasses; Part 2 is a brief overview of heat transport through oceans and atmospheres; Part 3 utilizes the concepts learned in Parts 1 and 2 to examine past and future change of Earth's climate system. The course is team taught with two sessions per week: one to present the physical processes and workings of the climate system, and the other to present the guiding physical laws and methods for modeling climate.

Learning outcomes

Students will be able to:

• illustrate earth's energy balance and its major components through conceptualization and simple analytic and numerical models.
• describe the physical processes governing global heat flow through oceans and atmosphere.
• integrate and explain global energy feedbacks, couplings, and imbalances over a range of scales.
• apply basic computational tools and physics-based approaches to earth science problems.

Format

Classes will consist of lectures and discussions, and in class exercises. A major component of this course is completing the assigned reading and preparing for class discussions. Lectures will not necessarily cover all material presented in the reading, nor will all material presented in the lectures be replicated by the reading material. However, exams will cover material from both the lectures, assigned reading, and discussions. Most assignments will require Python

programming language; students will have access to this and other computational tools in the geosciences computer lab.

Prerequisites

Prereq., GEO 101/102, GEO 211 (or instructor permission), College level algebra.
Familiarity and comfort with computers will be necessary. We will be learning to code in Python.

Course text

Climate System Dynamics and Modelling, Hugues Goosse, 2015, Cambridge University Press, New York, NY, ISBN 978-1-107-44583-3 (Paperback). Free online version will be distributed via Moodle

Evaluation criteria for letter grade

-3 equally weighted exams (2 midterms and a final): **(40%)**

All exams are cumulative, but will emphasize the most recent material.
Lowest of the two mid-term scores will be dropped.
Final will not be dropped.

-Problem sets: **(40%)**
-In class participation and exercises **(20%)**

Schedule

A tentative schedule with detailed topics has been posted on the Moodle site. Note that this schedule is subject to change as the course progresses. The course topics in particular may be adjusted. However the following dates will not be changed.

Midterm, Exam-1:	*Thursday Sept 26*
Midterm, Exam-2:	*Tuesday October 29*
Final, Exam-3:	*Monday December 9, (3.20 PM)*

Policies

Attendance

No formal attendance will be taken. However, the format of this course requires class attendance for success. Substantial course content (i.e., graded in-class exercises and discussions) and information transfer will only occur in class. We cannot accommodate individual make-ups for missed classes. **This is not a good course for you if you expect to miss class, even occasionally.**

Emailing

We may occasionally conduct email correspondence with class members and we will use official UM email addresses. All email sent to us must originate from your official UM email address. Email originating from non-UM addresses cannot be read or responded to (Sorry, but this is a law we are required to follow).

Due dates

All assignments are due at the start of class on designated due date.

Disabilities

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

Conduct Code

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at: http://www.umt.edu/vpsa/policies/student_conduct.php