

Earth Science 1111

Climate and Global Change

Assistant Professor Ron Stenz

Spring 2019 - 3 Contact hours; 3 Lecture Credit Hours

Description: Introduction to the earth's climate, climate change, and the interactions between climate and the global environment. Physical, chemical, biological, and social factors contributing to climate and global change are investigated. Topics explored are: climate classifications, global warming and greenhouse effect, acid rain, ozone depletion, regional drought, and cataclysmic climate change. Man-made climate change as opposed to natural variability, along with human responses to potential climate change are debated.

Prerequisite: MATH-0465 or MATH-0481 (or college equivalent) with a grade of C or better or qualifying score on the mathematics placement test or a qualifying A.C.T. math score. Course requires Reading Placement Test Score-Category One.

Phone/Office: Office: (630) 942-3496 BIC 3502
E-mail: stenzr@cod.edu
Homepage: <http://weather.cod.edu/>
Class page: <http://bb.cod.edu>

Office Hours: Monday: 4:30-5:00 PM, 6:30-7:00 PM; Tuesday: 3:00-4:00 PM;
Wednesday: 10:30-11:00 AM, 4:30-5:00 PM;
Thursday: 10:30-11:00 AM, 1:00-4:00 PM, 5:15-5:45 PM;
Friday: 10:30-11:50 AM

I will also be available at other times. Please try to set up an appointment if you wish to see me at any time. Please feel free to contact me with questions using email as well (stenzr@cod.edu).

Text: Understanding Weather and Climate, Seventh Edition, Aguado and Burt, 2015.

Additional Reading: Students will access additional material via a free website for meteorological information called MetEd. MetEd provides education and training resources to benefit the operational forecaster community, university atmospheric scientists and students, and anyone interested in learning more about meteorology, weather forecasting, and related geoscience topics. MetEd is populated and maintained by the COMET® Program, which is part of the University Corporation for Atmospheric Research's (UCAR's) Community Programs (UCP).

Additional Materials: #2 pencils for tests and good colored pencils (at least red, blue, yellow and green) are required *daily*. A three-ring notebook is also required to assist in maintaining sufficient organization.

Attendance: Attendance is extremely important, much of the material is covered only in class. It is expected that you will attend all classes. Attendance at the final is mandatory. Contact the instructor as soon as possible in the event of an unavoidable absence. Only in exceptional circumstances can tests be given at a time other than the announced date. Exceptions must be pre-arranged. A missed test is a zero.

Grading:	<p>Homework assignments ~ 75 points (25%)</p> <ul style="list-style-type: none"> - 10 points: 2-page summary (Intro to Statistics) - 5 points: (Review 1... Due February 21st 11:00AM) - 10 points: 2-page summary (Global Circulation) - 5 points: 1-page summary (Intro to Climatology) - 10 points: Group Climate Matching Activity - 5 points: (Review 2... Due April 9th 11:00AM) - 30 points: Final Paper (Due May 10th 11:59PM) <p>Quizzes ~ 5 points (1.67%)</p> <p>Attendance ~ 15 points (5%)</p> <ul style="list-style-type: none"> - Each class is worth 0.5 points - Attendance will be taken at the beginning of class! - Late attendance will not receive points! - Excused absences will have an opportunity to gain the missed points <p>Participation ~ 15 points (5%)</p> <p>Test 1 (February 21st) ~ 55 points (18.33%)</p> <p>Test 2 (April 9th) ~ 55 points (18.33%)</p> <p>Final exam (May 16th) ~ 80 points (26.67%)</p> <p>Total 300 points (100%)</p>
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Extra Credit Opportunities:

Extra Credit Paper (Due May 10th 11:59PM) ~ **5 POINTS**

Additional extra credit opportunities may arise during the semester!

Grades will be curved based upon expected results and class participation and attitude. Generally speaking, the grades will be as follows:

- A - 264 points or more (88% or better)
- B - 228 points or more (76% or better)
- C - 192 points or more (64% or better)
- D - 150 points or more (50% or better)
- F - Less than 150 points (< 50%)

All work must be completed. An incomplete will be given only in an exceptional circumstance. It is the student's responsibility to withdraw from the course due to non-attendance. Failure to withdraw by April 12th will result in an "F". Late assignments will be penalized at the discretion of the instructor. Students wishing to take this course on a pass/fail basis must earn a grade of a "C" or higher to receive a "Satisfactory" for the course. In order to fulfill the general education requirements a letter grade must be received.

Academic Honesty: Students are expected to comply with the College of DuPage academic honesty policies:
http://www.cod.edu/student_life/student_services/academic_honesty.asp
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Course Objectives: Upon successful completion of this course the student should be able to do the following:

1. Identify the basic forces and processes that govern global weather and climatic conditions
2. Describe and explain the distribution of various climatic types over the surface of the earth
3. Identify both anthropogenic and natural causes of climate change
4. Recognize and debate the arguments of both sides in the global warming debate
5. Evaluate the positive and negative implications of proposed global warming mitigation strategies
6. Explain the current theory regarding the depletion of stratospheric ozone and its consequences
7. Identify the sources of, and the chemical reactions involved in, the production of acid rain
8. Describe the conditions that could lead to regional drought and desertification
9. Summarize the impact of cataclysmic climate change (i.e., planetary impact and nuclear winter)

Topical Outline:

1. Weather and climate (*Week 1*) *(Course Objectives 1,2)*
 - a. Definitions
 - b. Statistics used in climate science
 - i. Meted: Introduction to Statistics for Climatology
2. Fundamental physics of the atmosphere (*Weeks 2,3*) *(Course Objectives 1-3,6)*
 - a. Composition and structure of the atmosphere
 - b. Water vapor
 - c. Forces and wind
 - d. Clouds and precipitation processes
3. Earth-Sun relationships (*Weeks 4,5*) *(Course Objectives 1-4)*
 - a. Electromagnetic radiation
 - b. The global radiation budget
 - c. Factors influencing surface temperature
 - d. Milankovitch cycles
4. General circulation (*Weeks 6,7,8*) *(Course Objectives 1-4,8)*
 - a. The Hadley cell and the 3-cell model
 - i. Meted: Global Circulation (Section 3.2 only)
 - b. Large scale oscillations
 - i. Madden-Julian Oscillation
 - ii. El Niño- Southern Oscillation
 - iii. Arctic Oscillation
 - iv. North Atlantic Oscillation
 - v. Pacific Decadal Oscillation
 - vi. Global Wind Oscillation
5. Köppen-Geiger climate classification scheme (*Weeks 9,10*) *(Course Objective 2)*
 - a. Identifying climate regions
 - b. Local influences on climate
 - i. Meted: Introduction to Climatology (Section 3)
6. Global climate change (*Weeks 10,11,12*) *(Course Objectives 1-5,8)*
 - a. Historical climates
 - a. Glaciation and ice ages
 - b. Interglacial periods
 - b. Greenhouse effect
 - a. Equilibrium and transient climate sensitivity
 - c. Feedback mechanisms
 - d. Land use change and climate
7. Future climates (*Weeks 13,14,15*) *(Course Objectives 3-9)*
 - a. IPCC assessments
 - b. General circulation models
 - i. Meted: Introduction to Climate Models
 - c. Impacts of various spheres of the earth

- i. Atmosphere
 - ii. Cryosphere
 - 1. Meted: Snowpack and Its Assessment:
 - iii. Biosphere
 - iv. Hydrosphere
 - 1. Meted: Sea Level Change: Basics
 - 2. Meted: Ocean Acidification
- d. Dealing with climate change
 - i. Risks
 - ii. Benefits
 - iii. Mitigation strategies
- e. Political discourse and climate change

Advising:

Please feel free to speak to me concerning school plans and classes to take, whether or not you are involved in meteorology as a major. I will be more than happy to discuss anything related to school or anything else in your life that might be a problem or obstacle to your success.

Expectations:

Students are expected to attend all classes, participate fully in classroom and on-line discussions and cooperate in learning experiences with other classmates. The expected out-of-class workload is two hours of work for every hour of time spent in class.

Participation in discussion is a vital part of this course. Some are less comfortable in a classroom setting and can enhance their participation grade by writing on class discussion boards. Debate and discussion will always be respectful. This is not a television debate. You will not be graded on your opinion but on how well you are able to discuss your opinion and base it on facts and research. It is not my goal to tell you what to believe but rather help you understand an extraordinarily complex topic. I want to help you learn how to approach hot topics with composure and intelligence. Your ability to listen and respond appropriately will give you a significant advantage in class and in life.

In addition to discussion, you will be expected to understand scientific concepts. Your desire to further your knowledge in the science of climatology will factor into the curving of your grades.

Final Exam:

A cumulative final exam will be given Thursday, May 16th from 11:00AM-12:50PM. The College of DuPage final exam schedule is available at: https://www.cod.edu/academics/pdf/final_exam.pdf