

GEOL 150

Climate Change

Fall 2017

Instructor: Professor, Lowell D. Stott, Department of Earth Sciences
Office Hours: MWF: 11-12
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Teaching Assistants:

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Lecture: Monday, Wednesday, And Friday, 10:00-10:50 a.m. Office: ZHS 235
Laboratory Sections: TBD

Required e-Textbook: **Our Changing Climate: Introduction to Climate Science**
ISBN-**9781935704829**

Course Description: Climate variability and change is potentially one of the most serious challenges the world has ever faced. This class will survey the scientific basis of global warming and future climate change and the possible impacts that will accompany that change. We will examine the factors that influence climate system behavior on our planet. To provide perspective on the climate changes taking place today we will also examine how the Earth's climate has varied in the past, prior to the short period that humans have inhabited the planet. We'll see that the Earth has experienced significantly different climate conditions in the past. There are important lessons to be learned from Earth's past.

Learning Outcomes: Students will gain an understanding of the major processes that affect the Earth's climate system including the energy balance that maintains the atmosphere's temperature and distinguishes our planet from every other planet in the solar system. Students will learn how the sources of greenhouse gas concentrations vary over time, contributing to climate change and the impact of climate change on the droughts, flooding, health, and the economy. Students will also learn how climate science is carried out and how new scientific knowledge can aid in policy decision making.

e-Book: This semester we will use, **Our Changing Climate: Introduction to Climate Science**. The author is Chad Kauffman. The book is published by the American Meteorological Society as an e-book. You can purchase your rental at the following link: <https://edubooks.ametsoc.org/CLTX-Ed1>. This format has many advantages over the traditional printed texts.

A special note about the e-book. At the beginning of each chapter there are a series of questions that provide you a guide to the main points you should learn from the chapter. Please be sure to read these questions before you embark on the chapter so that you know what the main points are for that chapter.

At the end of each chapter are a series of questions. If you can answer the questions correctly, you have successfully learned what you need to from this chapter.

Homework: You are required to answer the **Progress Questions** the end of each chapter. These multiple-choice questions will be due at 11:59pm on Sunday the night before the next chapter starts with Monday's lecture.

To access the **Progress Questions**, login to: <https://amsedu.ametsoc.org/amsedu/login.cfm>
login username: **uscal17**
password: **reflection*17**

Laboratory: You are required to do a laboratory section, which will be taught by a TA. These labs provide hands on experience that we have designed so that you get a sense of how climate science is conducted and how scientists formulate hypotheses and then test these hypotheses against observations and experiments.

Grading: Details about grading are summarized at the end of the syllabus

Academic Integrity: University policies on academic dishonesty are printed in SCAMPUS and SJACS, s. Because cheating negatively affects everyone in the class, we will follow USC guidelines and report all academic misconduct. USC policies on cheating are strict and the minimum punishment is a "0" on the assignment. The instructor and TA's are always available for extra help and advice. If the Prof. thinks you are at risk of failing the course, he will let you know via email and will encourage you to get extra help.

Disability Services: Students requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP when adequate documentation is filed; *please be sure the letter is delivered to the professor as early in the semester as possible, and at least 2 weeks prior to the first midterm.* DSP is open Monday-Friday, 8:30-5:00. The office is in Student Union 301 and the phone number is (213) 740-0776.

Course Syllabus

PART I- Earth's Climate as a Dynamic System

Week 1 (Chapter 1: Earth's Climate as a Dynamic System)

Mon. Aug. 21, Introduction: The Scientific Method, Questions, Hypotheses, Theory
Climate and Society

Assignment: Read Chapter 1.

Wed. Aug. 23, Importance of the Climate System

Fri. Aug 25, Current Climate Paradigm

Assignment: review and answer Questions at the End of Chapter 1.

Week 2 (Chapter 2) **Observing Climate Change**

Mon. Aug. 28, Climate System Variables

Wed. Sept. 30, Observing, Detecting and Assessing Change vs Variability

Assignment: Chapter 2.

Fri. Sept. 1, How Climate System Observations are Used

Assignment: Review and Answer Questions at the End of Chapter 2.

Week 3 (Chapter 3) **Tools for Investigating Earth's Climate**

Mon. Sept. 4, **Labor Day Holiday, No Class**

Wed. Sept. 7, Measures using Statistical Procedures,

Assignment: Read Global Climate Change, Chapter 3.

Fri. Sept. 9, GeoSpatial Analysis

Assignment: Review and Answer Questions at the End of Chapter 3.

PART II Principles of Climatic Processes

Week 4 (Chapter 4) **Radiation and Heat in the Climate System**

Mon. Sept .11, Energy and Entropy (Distributed Energy, The Greenhouse Effect)

Assignment: Read Chapter 4.

Wed. Sept. 13, Global Radiation Budget (Incoming vs Outgoing Energy)

Fri. Sept. 15, Controls on Climate Characteristics (clouds, ocean circulation)

Assignment: Review and Answer Questions at the End of Chapter 4.

Week 5 (Chapter 5) Water in Earth's Climate System

Mon. Sept. 19, Properties of Water in Earth's Climate System

Assignment: Read Global Climate Change, Chapter 5.

Wed. Sept. 21, Humidity and Saturation

Fri. Sept. 23, Atmospheric Stability (Clouds and Precipitation Types)

Assignment: Review and Answer Questions at the End of Chapter 4.

Week 6 (Chapter 6) Global Atmospheric Circulation

Mon. Sept. 25, **Midterm 1**

Wed. Sept. 27, Forces that Cause Air to Move

Assignment: Read Chapter 5. Review and Answer Questions in Chapter 6.

Fri. Sept. 29, Winds

Week 7 (Chapter 7) Atmosphere-Ocean Relationships

Mon. Oct. 2, Air-Sea Interactions, Ocean Circulation

Assignment: Read Global Climate Change, Chapter 7

Wed. Oct. 4, El Niño, La Niña and the Southern Oscillation, The Monsoons

Assignment: Review and Answer Questions at the End of Chapter 7.

Fri. Oct. 6, Changing Ocean in a Changing Climate (carbon uptake, ocean acidification, sea level rise)

PART III Variability of the Climate

Week 8 (Chapter 8) Natural and Anthropogenic Drivers of Climate Change

Mon. Oct. 9, Natural Drivers of Climate Change

Assignment: Review and Answer Questions at the End of Chapter 8.

Wed. Oct. 11, Feedbacks and Biogeochemical Cycles

Fri. Oct. 13, Trends in Greenhouse Gases

Week 9 (Chapter 9) Paleoclimatic Investigations: Reflecting Back

Mon. Oct. 16, Reconstructing Climate of the Past

Assignment: Read Global Climate Change, Chapter 9

Wed. Oct. 18, Climate Changes over Geologic Time

Fri. Oct. 20, The Appearance of Humans and the Ice Ages

Week 10 (Chapter 10) Future Projections and Extremes of Climate

Mon. Oct. 23, What are Models?

Wed. Oct. 25, Assessing Climate Output

Assignment: Review and Answer Questions at the End of Chapter 10

Fri. Oct. 27, Projections of Weather Extremes

PART IV Our Relationship to Climate Variability

Week 11 (Chapter 11) Human and Ecosystem Vulnerabilities

Mon. Oct. 30, **Midterm 2**

Assignment: Read Global Climate Change, Chapter 11

Wed. Nov. 1, Ocean and Cryosphere Vulnerabilities (sea level rise, shrinking glaciers)

Fri. Nov. 3, Biosphere Vulnerabilities

Week 12 (Chapter 12) Climate Change Mitigation and Energy Use

Mon. Nov. 6, Energy-CO₂ Connection

Assignment: Read Global Climate Change, Chapter 12

Wed. Nov. 8, Renewable Energy Sources

Fri. Nov. 10, Geoengineering the Climate System

Week 13 (Chapter 13) Human Needs, Actions and Public Policy

Mon. Nov 14, Climate Policy Making at the National Level

Assignment: Read Global Climate Change, Chapter 13

Wed. Nov. 16, Mitigation and Adaptation

Fri. Nov. 18, Climate Change: The Economic Perspective

Week 14 (Chapter 13 continued)

Mon. Nov 20,

Wed. Nov. 22, **Thanksgiving Break**

Fri. Nov. 24, **Thanksgiving Break**

Week 15 (Chapter 14) Climate Studies as a Scientific Endeavor in a Changing Society

Mon. Nov. 27, Resistance to Climate Change Evidence

Assignment: Read Global Climate Change, Chapter 14

Wed. Nov. 29, Disparaging Science and the Climate Scientist

Fri. Dec. 1, last day of class

Week of Dec 6-13 Final Exams

Course Policies and Grading

Grading and Grade Calculation

Lab Portion: 30% of course

Lecture Portion: 30% of course. 2 midterms

Lecture quizzes/participation 4-5. 10%

Final exam =30%

Calculating Your Final Course Score

$(0.30 * \text{Lab}) + (0.30 * \text{Midterms}) + (0.30 * \text{Final Exam}) + (0.10 * \text{In-class quizzes}) = \text{Final Course Score}$

Notes about Exams

Midterm Exams (2), 50 questions. Each question is worth 1pt.

Final exam 100 questions. Each question is worth 1pt

Exams will be multiple-choice questions.

No early exams are allowed.

Exams must be taken at the scheduled time.

Students who do not take an exam receive zero points as a grade on that exam.

Make-up exams can be only taken in cases of illness or family emergency or other university event.

Make-up exams are scheduled and set by the instructor.

Exam scores will be **curved**

Notes about Grade Curves

A curve is applied to each exam. This means that the highest score on an exam is considered 100% and all other scores are adjusted to that. For example, if 90pts was the highest score on midterm 1, that would become 100%. A score of 80pts on midterm 1 would become 89%, etc.