

# EAR 150

## Climate Change

### Fall 2015

Instructor: Professor, Lowell D. Stott, Department of Earth Sciences  
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Lecture: Monday, Wednesday, And Friday, 10:00-10:50 a.m. Office: ZHS 235  
Laboratory Sections: TBD

Required Textbook:

**David Kitchen, 2014, Global Climate Change: Turning Knowledge into Action, Pearson, 456 pp,**

ISBN-10: 032186414X • ISBN-13: 9780321864147

**Supplemental Reading: Michael Mann, 2014, Dire Predictions**

**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.

**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.

# Course Syllabus

## **PART I- The Evidence: Is This Normal?**

### **Week 1** (Chapter 1: So, What's Up with the Weather?)

Mon. Aug. 24, Introduction: The Scientific Method, Questions, Hypotheses, Theory

**Assignment: Read Global Climate Change, Chapter 1.**

**Assignment: Read Appendix A and B**

Wed. Aug. 26, The Atmosphere Composition and Structure

**Assignment: Dire Predictions (pages 10-15)**

Fri. Aug 28, Weather vs Climate Changes

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

### **Week 2** (Chapter 2) The Evidence: Observing Climate Change

Mon. Aug. 31, Observing, Detecting and Assessing Change vs Variability

Wed. Sept. 2, Observing, Detecting and Assessing Change vs Variability

**Assignment: Chapter 2.**

Fri. Sept. 4, In-Class Discussion: Change vs Variability

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

## **PART II- Follow the Energy**

### **Week 3** (Chapter 3) Earth's Climate System

Mon. Sept. 7, **Labor Day Holiday, No Class**

Wed. Sept. 9, Earth-Sun Energy Balance and the Greenhouse Effect,

**Assignment: Read Global Climate Change, Chapter 3.**

**Assignment: Read Dire Predictions (pages 22-32)**

Fri. Sept. 11, Greenhouse Gases

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

### **Week 4** (Chapter 4) Understanding Weather and Climate

Mon. Sept. 14, Air pressure and air in motion: why the winds blow

(Horizontal and Vertical Pressure, Equation of State, hydrostatic equilibrium)

**Assignment: Read Chapter 4.**

Wed. Sept. 16, Forces acting on the atmosphere (Forces Affecting the Speed and Direction of wind, consequences of a spinning Earth, The Coriolis Force)

Fri. Sept. 18, Global atmospheric circulation (Gradient Flow, Geostrophic Flow, Cyclones and Anticyclones, Storm Tracks)

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

## **Week 5** (Chapters 4) Understanding Weather and Climate

The Role of the Oceans in Climate Change

Mon. Sept. 21, Ocean Circulation, Deep vs Surface Flow

**Assignment: Read Global Climate Change, Chapter 5.**

Wed. Sept. 23, Ocean-Atmospheric Interactions

The Monsoon systems

Fri. Sept. 25, Interannual Variations in Ocean-Atmospheric Behavior, El Nino, The Pacific Decadal Oscillation, The Atlantic Multidecadal Oscillation

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

## **Week 6**

Mon. Sept. 28, **Midterm 1**

## **PART II Looking Back at Past Climate Changes**

Wed. Sept. 30, Methods of decoding Past Climate Changes

(Chapter 5: Revealing Ancient Climate) Geologic Time/ Geologic processes and the Rock Record of Environmental Changes

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

Fri. Oct. 2, Proxies Used to Reconstruct Climate Variables (pgs139-157)

## **Week 7** (Chapter 6) Climate History

Mon. Oct. 5, The Age of the Mammals and the Paleocene-Eocene Thermal Maxima

**Assignment: Read Global Climate Change, Chapter 6**

Wed. Oct. 7, The Pleistocene Glacial Cycles and Milankovitch Orbital Theory

**Assignment: Review and Answer Questions at the End of Chapter 6.**

Fri. Oct. 9, The Ice Core Discovery of CO<sub>2</sub> cycles and the **Carbon Mystery**

**Week 8** (Chapter 6, continued) The Last Days of Summer—

Mon. Oct. 12, The Holocene time period and Human Global Expansion

**Assignment: Review and Answer Questions at the End of Chapter 6.**

Wed. Oct. 14, California's Drought History

Fri. Oct. 16, California's Current Drought. How bad is **BAD**

## **PART II Looking Forward at Climate Changes**

**Week 9** (Chapter 7)

Mon. Oct. 19, Is the Climate Changing, What is the evidence?

**Assignment: Read Global Climate Change, Chapter 7**

**Assignment: Read Dire Predictions pgs. 36-60**

Wed. Oct. 21, Climate Models and Future Projections

Fri. Oct. 23, Projected Global Impacts of 21<sup>st</sup> Century Climate Change

**Assignment: Read Dire Predictions pgs. 78-104**

**Week 10**

Mon. Oct. 26, Ocean chemistry, Ocean Acidification, Coral Bleaching

**Assignment: Read Dire Predictions pgs. 108-138**

Wed. Oct. 28, Water Availability, Drought, Rising Sea Level and coastal Flooding

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

Fri. Oct. 30, **Midterm 2**

**Week 11** (Chapter 8) Climate Change Policy and UN Protocols

Mon. Nov. 2, Climate Change Policy and UN Protocols

**Assignment: Read Global Climate Change, Chapter 8**

Wed. Nov. 4, Climate Change Policy and UN Protocols

Fri. Nov. 6, California's Evolving Environmental Policies

**Week 12 (Chapter 9) The Energy Crisis**

Mon. Nov. 9, The Energy Problem

**Assignment: Read Global Climate Change, Chapter 9**

Wed. Nov. 11, Conventional Sources of Power, From Steam Engines to Nuclear

Fri. Nov. 13, Conventional Sources of Power, From Steam Engines to Nuclear

**Week 13 (Chapter 10) Turning Knowledge into Actions**

Mon. Nov 16, Projected Population Growth –Energy and Food

**Assignment: Read Global Climate Change, Chapter 10**

Wed. Nov. 18, Sustainable Transportation

Fri. Nov. 20, Future Energy Sources and Climate Change and Possible Mitigation Strategies

**Week 14 (Chapter 10 continued)**

Mon. Nov 23, Future Energy Sources and Climate Change and Possible Mitigation Strategies

**Assignment: Read Dire Predictions pgs. 156-190**

Wed. Nov. 25, **Thanksgiving Break**

Fri. Nov. 27, **Thanksgiving Break**

**Week 15 (Chapter 11) Strategies to Mitigate Climate Change**

Mon. Nov. 30, Perspectives on the Future

Wed. Dec. 2, Semester Review

Fri. Dec. 4, last day of class

**Week of Dec 9-16 Final Exam**

# Course Policies and Grading

## Grading and Grade Calculation

Lab Portion: 30% of course

Lecture Exams Portion: 30% of course. 2 midterms @ 15% each.

In class discussion = 10% (This will require a **TopHat** account)

Final exam = 30%

## Calculating Your Final Course Score

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

## Notes about Exams

Midterm Exams (2) 50 questions each. Each question is worth 2pts.

Final exam 75 questions. Each question is worth 2pts

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.

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.

