

# **ATS 321: Physical Climatology**

(SLN 1527)

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## **1 Course Description**

In this course we will examine the physical and chemical processes that determine the global mean climate and climatic variability in space and time.

## **2 Course Prerequisites**

ATS 301 or equivalent or permission of instructor

## **3 Textbook**

Hartmann, D. Global Physical Climatology. Academic Press

## **4 Grading Policy**

The course grade will be based on in-class participation (20%), homework sets (30%), one midterm examination (20%) and a final exam (30%).

## 5 Course Outline

The course will be focussed on the following set of topics and questions.

1. Introduction : What is climate? What is the Greenhouse Effect?
2. Energy Balance at the Surface and in the Atmosphere: What are the major processes determining the temperature structure in our atmosphere?
3. The Roles of Atmospheric Water in Climate: What impacts do clouds have on climate? Why is water vapor so important to radiative balance?
4. Atmospheric and Oceanic Circulations : Why does climate vary so much from place to place? How do climate variations in one place (El Nino, for example) modify climate far away? Could disruption in ocean circulations cause a major climate shift?
5. The Climate Record: How has climate varied in the past and how do we know? Is the present period climatically unique?
6. Climate Feedbacks: What is a feedback? What are the most important climate feedbacks and how do they impact our projections of future climate change?
7. Nonanthropogenic and Anthropogenic Climate Variability: What makes climate variable in the absence of human activity? Are humans modifying the climate?
8. Forecasts of Regional and Global Climate Change: How are these forecasts made? How much should we believe them? What are the major uncertainties in climate predictions?

## 6 Tentative Course Schedule

<b>Week Beginning</b>	<b>Topic</b>	<b>Reading Assignments, text</b>
3/29	<b>Introduction and Global Energy Balance</b>	Chapters 1 and 2
4/5	<b>Radiative-Convective Equilibrium</b>	Chapter 3
4/12	<b>Surface Energy Balance</b>	Chapter 4
4/19	<b>Hydrological Cycle and Climate</b>	Chapter 5
4/26	<b>Atmospheric Circulation</b>	Chapter 6
5/3	<b>Midterm</b>	
	<b>Ocean Circulation</b>	Chapter 7
5/10	<b>The Climate Record</b>	Chapter 8
5/17	<b>Climate Feedbacks</b>	Chapter 9
5/24	<b>Nonanthropogenic Climate Change</b>	Chapter 11
5/31*	<b>Anthropogenic Climate Change</b>	Chapter 12

\* No class 5/31.