GEOG 3521 PHYSICAL CLIMATOLOGY (3 credit hours)

Elmira College

SPRING 2025

Required Text:

Dennis L. Hartmann, (2015). ***Global Physical Climatology*** (2nd ed.). Elsevier Science.

A. Barrie Pittock, (2009). ***Climate Change: The Science, Impacts and Solutions*** (2nd ed.). Routledge.

Supplemental readings might be included to illustrate or expand on textbook readings.

Pre-requisites: None.

Course Description

This course explores the dynamics of the climate system, focusing on the interactions between the atmosphere, oceans, cryosphere, and land surfaces. It covers key concepts like the carbon cycle, the greenhouse effect, natural climate variability, and climate sensitivity to external factors. Students will investigate both historical climate phenomena and human-induced climate change. Emphasis is placed on understanding physical principles and applying climate models to assess past, present, and future climate trends.

Course Objectives and Goals

- Understand the physical principles and interactions within the climate system..
- Analyze factors driving natural climate variability across different time scales.
- Examine the impacts of human activities on climate change.
- Use climate models to predict future climate trends and scenarios.
- Evaluate the role of the carbon cycle and greenhouse gases in climate dynamics.
- Assess the socio-economic, political, and environmental implications of climate change.

Evaluation of Performance

Your grade will be based upon your performance on exams, assignments, and participation.

5 Assignments	20%
3 Projects	30%
Midterm Exam	20%
Final Exam	30%
Total	100%

Grades will be assigned as follows:

A	93% and above	B-	80 - 82%	D+	67 - 69%
A-	90 - 92%	C+	77 - 79%	D	63 - 66%
B+	87 - 89%	C	73 - 76%	D-	60 - 62%

B 83 - 86% C- 70 - 72% F 59% or below

Withdrawal Policy: Please see Elmira College Bulletin for information on this policy.

Academic Honesty: Please read the section on Academic Honesty in the **Code of Conduct**. Briefly, academic dishonesty includes: cheating, fabrication, facilitating academic dishonesty, and plagiarism. Ask if you have any questions on whether something constitutes as academic dishonesty. All work must be original and new. Past assignments from current or other courses will not be accepted. Academic dishonesty will not be tolerated. It will result in zero on the assignment, and a report will be filed with the school. Continued practice will result in failure of the class. Institutional penalties may also apply with repeated acts of academic honesty.

Student Responsibility:

- It is your responsibility to keep track of assignments and due dates.
- You should ask questions concerning assignments and lectures, if you need any clarifications.
- If you are struggling in class, have concerns, and/or unsure about expectations, please stop by during office hours or make an appointment for another time.

Tentative Schedule of Topics

Topic	Materials	Tasks & Evaluations
Climate Change Matters: Understanding the Urgency	Chapter 1	
The Global Energy Balance: A Key Climate Driver	Chapter 2	Assignment 1
Atmospheric Radiative Transfer and Its Role in Climate	Chapter 3	
The Greenhouse Effect and Its Impact on Global Warming	Chapter 4	
Atmospheric Circulation and Climate Systems	Chapter 5	Project Presentation#1
Ocean Circulation and Its Connection to Climate Change	Chapter 6	Assignment 2
Cryosphere and Climate Change: Ice Sheets, Glaciers, and Sea Ice	Chapter 7	
The Carbon Cycle and Its Role in Climate Regulation	Chapter 8	
Climate Sensitivity and Feedback Mechanisms	Chapter 9	Assignment 3
Natural Climate Variability in Earth's History	Chapter 10	
Projections of Future Climate Change: A Scientific Overview	Chapter 11	Midterm Exam
Global Climate Models: Tools for Future Climate Projections	Chapter 12	
Human Activities and Anthropogenic Climate Change	Chapter 13	Project Presentation#2
Past Climate Changes: The Ice Ages and Natural Drivers	Chapter 14	
The Importance of Delayed Climate Responses and Long-Term Effects	Chapter 15	Assignment 4
Economic Impacts of Climate Change: Risks to Growth	Chapter 16	

and Development		
Political and Social Dimensions of Climate Change: Global and Local Perspectives	Chapter 17	Assignment 5
Climate Policy and International Cooperation: The Role of the IPCC	Chapter 18	Project Presentation#3
The Economics of Climate Change: Mitigation, Adaptation, and Policy Responses	Chapter 19	
The Precautionary Principle in Climate Change Decision-Making	Chapter 20	
The Role of International and National Governments in Addressing Climate Change	Chapter 21	Final Exam