

A ATM 405: WATER AND CLIMATE CHANGE

Fall 2024, CLASS # 9265

Course website: <http://www.atmos.albany.edu/facstaff/adai/ATM405/>
(userid: atm405 password: dai405 for accessing "Lectures")

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Lecture Times: TuTh 3:00-4:20PM
Lecture Location: ETEC 480
Credits: 3

Prerequisites for Course: A ATM210 and A MAT 111 or MAT 112 or T MAT 118.

Grading Scheme: Graded A-E

Course description:

Water is essential for human society and the environment. Global warming and climate change are expected to impact our water supply and the water balance of the natural ecosystems. Potential water shortages due to population growth and climate change are a world-wide environmental issue. Starting with an introduction to the global water cycle and Earth's climate, this course aims to provide students with in-depth understanding of the key roles of water in Earth's climate and how climate change may affect the global water cycle and the freshwater resources.

Aims of Course:

To provide students with in-depth understanding of climate change and how it may impact water resources for the society and the water balance for the environment.

To provide students with a knowledge of the key role of water for the human society, the environment, and the Earth climate, and how we could mitigate future climate change and its impact on water resources.

To provide students opportunities to orally present and discuss scientific research results.

Course Assessment:

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| 1. Five homework assignments | 30% |
| 2. Mid-term exam: | 30% |
| 3. Oral presentation: | 10% |
| 4. Final project paper: | 20% |
| 5. Attendance and participation in classroom discussions: | 10% |
- Note: There will be no final exam for this course.

Absence policies: http://www.albany.edu/health_center/medicaexcuse.shtml.

Information about academic integrity:

http://www.albany.edu/undergraduate_bulletin/regulations.html.

Important Note: *Copy and paste text from another source (e.g., the internet or my slides) without putting it in quotes and citing the source is plagiarism, which is strictly prohibited. Please avoid doing this in your homework and term paper.*

Basic Course Outline (may be modified during the course):

- 1. The Role of Water on Earth**
 - 1.1 An Overview: Freshwater Resources and Water Stress
 - 1.2 The Global Water Cycle
 - 1.3 Water's Role in Earth's Climate System
- 2. Introduction to Climate Change**
 - 2.1 Introduction to Earth Climate
 - 2.2 Greenhouse Effect and Global Warming
 - 2.3 Climate Modeling
 - 2.4 Climate Projections
- 3. Observed and Model-projected Changes Related to Water**
 - 3.1 Water Vapor and Clouds
 - 3.2 Precipitation and Evaporation
 - 3.3 Soil Moisture and Groundwater
 - 3.4 Runoff, Streamflow and Continental Discharge
 - 3.5 Cryosphere: Snow-cover, Ice-ice, and Glaciers
- 4. Impacts of Water-related Climate Changes**
 - 4.1 Sea-level Rise
 - 4.2 Drought under Global Warming
 - 4.3 Impacts on Freshwater Resources, Health, etc.
Student Oral Presentations - Group 1
- 5. Regional Analysis of Climate Change and Water Resources**
 - 5.1 North America
 - 5.2 Latin America
 - 5.3 Eurasia
 - 5.6 Africa and Australia
Student Oral Presentations - Group 2
- 6. Climate Change Mitigation Measures and Geoengineering**
 - 6.1 Climate Mitigation and Renewal Energy
 - 6.2 Hydropower
Student Oral Presentations

Main Reading Materials:

Bates et al. (Eds), 2008, *Climate Change and Water*. IPCC Tech. Paper VI, IPCC Secretariat, Geneva, 210pp. Available from <https://www.ipcc.ch/publication/climate-change-and-water-2/>

Miller, K. and D. Yates, 2006: *Climate Change and Water Resources*. American Water Works Association, 92 pp. Available from https://www.atmos.albany.edu/facstaff/adai/ATM405/ReadingMaterials/MillerYates2005_ClimateChangeAndWaterRes.pdf

Brekke, L.D., Kiang, J.E., Olsen, J.R., Pulwarty, R.S., Raff, D.A., Turnipseed, D.P., Webb, R.S., and White, K.D., 2009, *Climate change and water resources management—A federal perspective*. U.S. Geological Survey Circular 1331, 65 pp. (Available online at <http://pubs.usgs.gov/circ/1331/>)

Other useful links: UN-Water: <https://www.unwater.org/water-facts/climate-change/>
UN Report on Water and Sanitation: <https://www.unwater.org/publications/summary-progress-update-2021-sdg-6-water-and-sanitation-for-all/>