

COURSE OUTLINE Climate Change and Water Scarcity

EDUCATION LEVEL	7		
CODE	WBCC-501	SEMESTER	1 st
TITLE	Climate Change and Water Scarcity		
TEACHING ACTIVITIES	HOURS/WEEK	ECTS	
Lectures, Literature review and analysis, Practice exercises	3	6	
TYPE OF COURSE	General background (compulsory course)		
PREREQUISITE KNOWLEDGE	-		
LANGUAGE OF INSTRUCTION AND ASSESSMENT	Greek		
AVAILABILITY TO ERASMUS STUDENTS	-		
WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL569/		

LEARNING OUTCOMES

Learning Outcomes/Subject Specific Competences

The purpose of this course is to educate students about the expected impacts of climate change on water resources. It describes the processes that determine and change the Earth's climate system on different spatial and temporal scales, through the study of climate change over geological timescales, as well as changes in the climate system during the Anthropocene epoch. Specifically, on one hand, the course explains the physical principles that underlie the science of Climatology, describes the characteristics of climate on a global, regional, and local scale, and introduces students to the use of climate information. On the other hand, the course analyzes the effects of climate change on water scarcity and the redistribution of precipitation on a global level, especially in the Mediterranean region.

Upon successful completion of the course, students will be able to:

Understand the basic processes that determine the Earth's climate system and explain the main natural and anthropogenic mechanisms of climate variability and climate change.

Identify and discuss factors influencing global and regional climate, including the carbon cycle, tectonic changes, solar radiation, ocean-atmosphere interactions, and human impacts.

Recognize uncertainties associated with future projections of global climate change.

Communicate climate history and the role of humans in the climate system and critically evaluate scientific information.

Identify the causes and consequences of climate change on water resources and human societies.

Understand the current scientific knowledge related to adaptation and mitigation strategies for the impacts of global climate change on water resources.

Evaluate best practices for water resource management under conditions of climate change.

Generic Competences

Theoretical thinking and the ability to translate theory into practice.

Ability to apply knowledge to problem-solving.

Search, analysis, and synthesis of data and information using the necessary technologies.

Decision-making.

Autonomous work.

Teamwork.

Work in an interdisciplinary environment.

Respect for the natural environment.

Promotion of free, creative, and inductive thinking.

COURSE CONTENT

The availability of fresh water in a future world influenced by climate change is expected to change significantly. In some regions, water availability will decrease, while in others, it will increase. The goal of this course is to educate students about the expected impacts of climate change on water resources. Understanding the impacts of climate change will help in understanding the process through which we will experience worsening water scarcity in the future and how this worsening will affect human society and health. Overall, this course will help those involved in water resource management to prepare for and adapt to the impacts of climate change.

Educational topics include:

Components of the global climate system, distribution of key climate elements, natural climate variability on different spatial and temporal scales, ocean-atmosphere interactions, atmospheric oscillations (ENSO, NAO, etc.), forcing mechanisms, and feedbacks.

Observed signals of climate change in the Holocene, factors influencing climate change (natural and anthropogenic).

Basic principles of climate models, climate change scenarios, climate simulations, and uncertainties related to future projections of global climate change on water resources.

Impacts of climate change on the hydrological cycle, adaptation and mitigation strategies for the impacts of climate change, and sustainable development.
 Climate change and aridity in the Mediterranean region.
 Water resource management that improves access to water and reduces climate change-related risks.

LEARNING ACTIVITIES - TEACHING and ASSESSMENTS METHODS

MODE OF DELIVERY	Distance learning	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of ICT in teaching, applications, and communication with students. Use of the e-class platform and online tools. Presentations with multimedia content (images, animation, video) and demonstration of data analysis, simulation, and interpretation methods.	
PLANNED LEARNING ACTIVITIES	Activity	Semester Workload
	Lectures	3 h x 13 weeks
	Literature review and analysis	40 h
	Practice Exercises	20 h
	Individual Project	60 h
	Total	159 h
ASSESSMENT METHODS AND CRITERIA	Multiple choice examination 50% Individual Project 50%	

TEXTBOOKS - BIBLIOGRAPHY

Roger G. Barry, Eileen A. Hall-McKim, Climatology and Climate Change (Scientific Editing: Panagiotis Nastos) 1st ed, Tziolas (2022)
 F. Ludwig, P. Kabat, H. van Schaik, M. van der Valk (eds.). Climate Change Adaptation in the Water Sector. Routledge pp. 304 (2009)
 S. Peake, J. Smith. Climate Change: From science to sustainability. Oxford University Press, pp. 304 (2009)
 Relevant scientific journals:
 Climate of the Past, EGU Climatic Change, Springer
 International journal of Climatology, Wiley
 Climatic Change, Springer
 Theoretical and Applied Climatology, Springer
 Atmospheric Research, Elsevier
 Natural Hazards and Earth System Science, EGU
 Nature Climate Change, Springer
 Global Environmental Change, Elsevier
 Additional Teaching Material
 Instructor's notes, lecture presentations, and assignment materials posted on the e-Class platform of the course.