UAB
Universitat Autònoma de Barcelona

Climate and Global Change

Code: 106786
ECTS Credits: 6

2025/2026

Degree	Type	Year
Environmental Sciences	OB	3

Contact

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Teachers

Peter Graham Mortyn

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

There are no specific prerequisites.

Objectives and Contextualisation

This course explores the physical processes determining Earth's climate, focusing on anthropogenic climate change. It will study the components of the Earth's climate system and the history of climate change. It will also discuss how climate change is measured and evidenced through instrumental observations, documentary data, and environmental proxies. The causes of climate changes, including factors such as ocean currents, volcanic and solar activity, orbital variations, and greenhouse gases, will also be analyzed.

Additionally, the course will cover future climate prediction using global and local models. Finally, the anthropogenic climate change will be addressed, focusing on the impacts of global change related to temperature, sea level, and rainfall patterns, as well as on human population, economy, consumption, development, and energy and land use. The consequences of climate change, including pollution, migrations, biodiversity, food security, and health will be discussed.

By the end of the course, students should be able to understand the scientific foundations of climate change, climate variability, and various basic climate phenomena, the reliability of climate predictions, and their consequences. This course aims to provide basic insights into the Earth's climate system and how its functioning affects and is affected by human activities.

Learning Outcomes

1. CM44 (Competence) Interpret the social, economic and environmental impact of issues related to demographic flows, global change or management in companies.
2. CM46 (Competence) Contrast the different current and future options for environmental risk management, especially in the context of resource management, human health, and global and climate change.
3. KM57 (Knowledge) Identify the complex network of knowledge necessary to comprehensively address the main contemporary challenges in environmental science.
4. KM58 (Knowledge) Recognise the relationship between human activity and processes of global and climate change, in particular the actors involved in this relationship and the possible strategies for adaptation/mitigation.
5. SM55 (Skill) Integrate different types of scientific, technological and social knowledge necessary for the in-depth analysis of environmental processes related to human health, climate change, and environmental management in companies, among others.

Content

- The Earth's Climate System
  - The atmosphere, oceans, atmosphere-ocean interactions, the cryosphere, the lithosphere, and the biosphere.
  - Solar radiation and the Earth's energy balance. The Earth's climate zones.
  - Radiative forcing and climate system feedbacks.
- Causes of Climate Change
  - Brief history of climate changes over the last 5 million years up to the present.
  - Solar activity. Orbital variations.
  - Changes in atmospheric composition.
  - Time Scales
- Measuring and Evidencing Climate Change
  - Instrumental observations, documentary data, and indirect (proxy) records.
- Predicting Future Climate
  - Global climate models.
  - Climate change prediction: scenarios.
- Global Change (possibly taught in English)
  - Global change vs. climate change.
  - Human population, demography, urbanization, development, land-use change.
- Consequences of Global Change (possibly taught in English)
  - Acceleration of the hydrological cycle.
  - Hurricanes.
  - Arctic amplification.
  - Pollution.
  - Biodiversity loss and invasive species.
  - Migration.
  - Agriculture and food security.
  - Human health.
- Project on the Impacts of Climate Change or Global Change

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			

Lectures	38	1.52	CM44, CM46, KM57, KM58, CM44
Practicum	10	0.4	CM46, KM57, SM55, CM46
Type: Supervised			
Tutoring sessions	2	0.08	CM44, KM57, SM55, CM44
Type: Autonomous			
Readings	86	3.44	CM44, CM46, CM44

Lectures and discussion of topics in class between students and professors. The idea is to facilitate active and inclusive participation. The topics covered in class will be controversial points, current events, and local phenomena whenever possible. The course will include other researchers in conferences in addition to the formal lectures.

The course will also include practical cases, solving exercises in the classroom, and the completion of a group project related to the causes and consequences of climate and global change.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
First term exam	35/100	2	0.08	CM44, CM46, KM58, SM55
Group Project	30/100	10	0.4	CM44, KM57, KM58, SM55
Second term exam	35/100	2	0.08	CM44, CM46, KM58, SM55

70% of the final grade is calculated based on the average grades from two independent midterm exams.

The remaining 30% of the final grade corresponds to the grade for submitting and presenting a group project on the impacts of climate change and/or global change.

To pass the course, the average grade must be equal to or greater than 5 (out of 10), and the grade for each midterm exam must be equal to or greater than 4 (out of 10). Otherwise, each assessment with a grade below 4 must be retaken in the recovery exam. To attend the recovery exam, the student must have previously been assessed in continuous assessment activities equivalent to 2/3 of the final grade.

Single evaluation: The single evaluation consists of a single exam covering all the theoretical content of the course. The exam will be held on the same date scheduled for the second midterm exam, and the same recovery system will apply as for the continuous evaluation. In any case, the student must have completed and submitted the project. The grade of the single exam must be equal to or greater than 4 for it to be averaged with the project's grade in the final grade. Students who wish to opt for this evaluation must request it through the Academic Office.

The final grade will be NOT EVALUATED if the student has not attended any of the exams.

Bibliography

Climate Change: The Science of Global Warming and Our Energy Future

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991011069808406709

Sixth IPCC Report: "The Physical Science Basis".

https://www.ipcc.ch/report/ar6/wg1/

Global Physical Climatology, D.L. Hartmann, Academic Press

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991008482769706709

Atmosphere, ocean, and climate dynamics: an introductory text, John Marshall and R. Alan Plumb.

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010898081306709

Physics of climate, José P. Peixoto and Abraham H. Oort

https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991007575649706709

Intro to R

https://datacarpentry.org/R-ecology-lesson/

Intro to Python

https://datacarpentry.org/python-ecology-lesson/

Software

Apart from the basic software, the rest will be free software, such as R or Python.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	2	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	1	Catalan/Spanish	second semester	morning-mixed