



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Climate Change

2021-2-F7501Q084

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#### Aims

Understanding the physical bases of climate changes and their impacts on natural and anthropic systems, on different spatial and temporal scales.

At the end of the course students will have:

**KNOWLEDGE AND UNDERSTANDING.** Acquire an introductory knowledge of climate system physical components and their natural and anthropic perturbations

**APPLYING KNOWLEDGE AND UNDERSTANDING.** Acquire a specific competence and apply technical knowledge physical-chemical aspects related to climate change.

**MAKING JUDGEMENTS.** Learn to critically think about the complex interactions between physical and socio-economics aspects of climate change, focussing on atmosphere.

**COMMUNICATION SKILLS.** Demonstrate the acquisition of a correct vocabulary and to know how to expose the essential contents of the subject in a clear and mature way.

**LEARNING ABILITY.** Be able to tackle the study of advanced textbooks, technical reports and scientific articles, mostly in English, produced by research centers, governments and international organizations, related to climate phenomena and to mitigation and adaptation policies.

#### Contents

Physical bases of climate changes. Feedbacks in the Earth system. Vulnerability, impacts, adaptation and mitigation. Climate change science in the panorama of international treaties on climate.

## **Detailed program**

The aim of this course is to provide tools for understanding the causes and analyzing the effects of climate change at global and regional scales. After the acquisition of specific scientific basis, the impacts of climate change on natural and manmade systems are explored, along with the concepts of ethical, economic and energy issues related to climate change.

The first part of the course (Climate Change), by means of frontal lessons, is dedicated to the scientific bases of climate change, as well as to impacts, adaptation and vulnerability. In this module, students will learn the basics of the climate system of the Earth and the greenhouse effect, evaluate the information obtained, and draw conclusions about the causes of climate change. The topics include the analysis of different components of the climate system (atmosphere, ocean, land surface, cryosphere, biosphere), feedbacks in the climate system, the greenhouse effects, global energy budget, the global carbon cycle, aerosols, as well as impacts and adaptations concerning ecosystems, the hydrological cycle, and sea level.

The second part of the course (Climate Change Lab) offers the chance to focus more in depth on a selection of topics presented in the first part of the course. Topics include: tools of climate research (instrumental era and paleoclimate observations, data analysis, Earth system models, future climate projections), as well as the carbon cycle and greenhouse effect. The teaching strategy is a blend of frontal lessons, individual and small group exercises, small group and class-wide discussions (in proportions varying according to the possibility of classes in presence vs in remote).

## **Prerequisites**

Atmospheric Chemistry and Atmospheric Physics (recommened)

## **Teaching form**

Frontal lessons (Climate Change): 2.5 ECTS (20 hours)

Practice (Climate Change Lab): 3.5 ECTS (35 hours)

The teaching form can be fully be adapted to the sanitary situation and to the indications established at the university-wide level.

## **Textbook and teaching resource**

Check on web site: <http://elearning.unimib.it/>

## **Semester**

Second semester

## **Assessment method**

Oral exam split in two parts. The first is a discussion on a written report (10 to 15 pages) prepared by the student on one of the course topics (student choice); the second part is related to two questions on the course topics. The final evaluation is the average of the two parts.

## **Office hours**

By appointment: valter.maggi (at) unimib.it or samuel.albani (at) unimib.it

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