

PROGRAMMA DEL CORSO DI DOTTORATO IN BIOLOGIA AMBIENTALE ED EVOLUZIONISTICA
ECOLOGICAL EFFECTS OF CLIMATE CHANGE 2023, 3 CFU

On-site/on-line (lecture room E, CU022).

Course description

The course will give a good understanding the causes and consequences of past climate change, potential effects on species and ecosystems, and how ecosystem processes affect the climate. After the course the student should be able to:

- Describe the Earth's climate history and future climate scenarios
- Understand greenhouse gases and how they influence climate
- Understand how organisms react to environmental factors that vary with climate
- Understand carbon stocks and fluxes in different ecosystems, and how these processes are expected to be affected by climate
- Discuss measures to reduce greenhouse gas emissions

Background reading

- Newman, J. A., Henry, H. A. L., Hunt, S. L., Gedalof, Z. (2011). *Climate Change Biology*. United Kingdom: CABI*. Chapter 1 (lecture on past climate change); Chapter 2 (lecture on climate models for the future); Chapters 3-4, 7, 9 (topics that will be touched by lectures on aquatic and terrestrial ecosystems); Chapters 5-6, 8, 12 (topics that will be touched mainly by lectures on animal and plant response); Chapters 10,11,13, 14 (no specific lecture on these topics but you are welcome to read them).
- Scientific papers distributed during the course

Lectures

Each two-hour lecture (11-13, 14-16) is interspersed with short exercises and seminars in which students actively participate to the lesson and interact with each other. One 15-minute break in the middle of each lecture.

Examination

A written test in the end of the course with 5 essay-type questions at 6 credits each (minimum credit 18/30) and/or student presentations

Schedule

June 15, 11-13 (Day 1)

Earth climate history I - Climate definitions, climate system, climate change drivers, atmosphere, CO₂ natural and anthropogenic sources.

June 15, 14-16 (Day 1)

Earth climate history II - Greenhouse gasses, carbon stocks and fluxes. Permafrost role in climate change. Main factors driving climate change

June 16, 11-13 (Day 2)

Earth climate history III – The climate record of the past and how we measure it. Proxies working on short time scales (dendroclimatology; glacier mass balance; lake cores; ice cores; deep-ocean cores).

* https://www.google.it/books/edition/Climate_Change_Biology/YNOogwGg6p8C?hl=en&gbpv=0

June 16, 14-16 (Day 2)

Earth climate history IV – The climate record of the past. Factors driving climate change on long time scales (albedo; ocean circulation; plate tectonics; CO₂; orbital forcing & Milanković cycles)

June 20, 11-13 (Day 3)

Climate change and ecological response I - Plant and animal response I. Immediate response (phenotype and physiology). Migration (range shifts). Evolution (adaptation). Extinction.

June 20, 14-16 (Day 3)

Climate change and ecological response II – Short-presentations exercise.

June 21, 11-13 (Day 4)

Current and future state of the climate - IPCC reports; the sixth assessment cycle

June 21, 14-16 (Day 4)

Student presentations and/or written test

Teacher

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Participants

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