



SOIL ECO

## Soil ecology and ecosystem services

**Lecturers:** Teresa Dias and Cristina Cruz (cE3c)

**Calendar:** January 22<sup>nd</sup> – 26<sup>th</sup> 2024

**Duration:** 36 hours (contact hours)

**Schedule:** 9h-13h and 14h00-17h00 Monday to Thursday; 9h-13h and 14h00-18h00 Friday

**Objectives:** The course SoilEco aims at introducing attendants to an updated state of the art of diversity of the soil biota and the functional roles played by soil organisms in key ecological processes. SoilEco will have the participation of some of the most relevant specialists in the field and will enable an ‘hands on’ approach to the study of soil biology and ecology. The course will include both theoretical and practical (laboratory and desk) classes oriented in a problem solving perspective.

Lack of fertile land to feed the exponentially growing population, insufficient water availability and quality, changes in the flow of nutrients through the bio-geo-cycles (especially N and P) and climate and land use changes are impacting ecosystems and their capacity to deliver goods and services for humans. It is striking that all these issues interact around one common resource - **SOIL** and its biodiversity. While scientists have long recognized soils as living and of central importance to food production, there is now wide appreciation that they are a foundation for human and ecosystem sustainability. The ecosystem services that flow from soils and their biodiversity include soil formation and renewal of its fertility, maintenance of the composition of the atmosphere through carbon storage and greenhouse gas flux, erosion prevention, the regulation of diseases, the decontamination and bio-remediation of toxic chemicals and habitat and food for a variety of wildlife. Additionally, living soil is a global receptacle of genetic diversity that is yet to be fully explored by humans. Despite this, soils are being degraded at high rates. Policy makers are seeking multiple solutions and need reliable scientific information on soils, their biodiversity and the many services they provide, as well as their resilience under the interacting environmental challenges. Thus, the need for improvement basic skills and their utilization on soils is a true challenge throughout Europe.

The advanced course on Soil ecology and ecosystem services (SoilEco) is conceived to give an integrated view of the living component of soils, and its key role on ecosystem functions and processes. Therefore, the course will assess the link between soil biological diversity and ecosystem functions. Relying on different specialists on soil the course is made up of two interrelated strands of work: theoretical and laboratory classes, tuned according to the attendants interests, aiming at the possibility to put in practice their own basic problem on soil ecosystem services.

**General Plan:**

Theoretical classes with the participation of specialists (presential or video-conference) on the following subjects:

- (i) The intimate relation between soil ecology and ecosystem services.
- (ii) Key genes and key functions in soil, sequence and consequence.
- (iii) Symbioses - the key for soil biotic assemblages and soil quality.
- (iv) Microbiological methods to assess soil quality.
- (v) Soil threats and bioindicators of soil quality and services.
- (vi) Soil quality, policies and stakeholders.

Each subject will have a coordinator, who will be responsible for the preparation of a background document tailored according to the attendants profile. Soil Eco will count with the participation of facilitators to promote and integrate the subjects under discussion.

Practical classes will be focused on the use of bioindicators of soil quality linked to ecosystem services. Attendants will be organized in groups, will identify a question and will define a minimal data set to assess soil quality or changes on soil quality, which will then be put into action in the laboratory. Finally, they will prepare a presentation of their project's main results, difficulties and conclusions.

Day	Morning	Afternoon
<b>Monday</b>	1. The intimate relation between soil ecology and ecosystem services Soil definition, and biodiversity.	1. Questions about soil quality. Project development (by each group of participants).
<b>Tuesday</b>	2. Key genes and key functions in soil, sequence and consequence. 3. Symbioses - the key for soil biotic assemblages and soil quality.	2. Project into action Project discussion Soil sampling strategies (ISO).
<b>Wednesday</b>	4. Microbiological methods to assess soil quality.	3. Processing samples. Soil analyses and standard methods.
<b>Thursday</b>	5. Soil threats and bioindicators of soil quality and ecosystem services.	4. Continuation of project development.
<b>Friday</b>	6. Soil quality, policies and stakeholders.	5. Attendants' Presentations Discussion

Participants have to be present at 85% of the contact hours (this means that they can miss one half-day), and actively participate in all activities.

This course can give credits to PhD programmes at FCUL or of programmes with partnership from FCUL and other institutions with 6h-7h of contact hours per ECT, as a function of specific requirements. **For these students additionally to the exercises done during the week the delivery of a written report done after the course is mandatory.** For programmes with less hours of contact per ECT (6h/ECT, getting 6 ECTs from the course) students need to do an additional assignment (summary report). If needed 1 or 2 additional hours of contact may be added. Such report(s) are also advised for other students requesting accreditation of the course in their institutions.

**Location:** Departamento de Biología Vegetal, FCUL

**Nº (min, max) students:** 10-20

**Minimum formation:** Bachelor's degree in biology or related areas.

**Directed to:** The course is targeted for post-graduates studying or working directly on (soil) ecology, or simply

interested in increasing their knowledge on this topic.

Fees: free for 1st year PhD students in Doctoral programmes at FCUL (e.g. Biologia), Biodiversity, Genetics and Evolution (BIODIV UL; UP), Biology and Ecology of Global Changes (BEAG UL, UA) and Sustainability Science (UL, several institutions), when the course counts credits for their formation, in which case the delivery of a final report done after the course is mandatory; the course is also free for more advanced PhD students of the BIODIV programme (ULisboa or UPorto); 50 € for more advanced PhD students of cE3c of other programmes; 80 € for PhD students of the PEERS network (CFE); 125 € for FCUL Master students and unemployed; 180 € for BTI, BI and other PhD students; 250 € for Professional and postdocs.

When the maximum number of students is reached, 10 vacancies will be available for non-paying 1st year PhD students mentioned above, being, by order of preference students from: 1) cE3c; 2) BIODIV (not from cE3c); 3) FCUL (not from cE3c); 4) Sustainability Science (not from cE3c or FCUL); 5) BEAG (not from cE3c or FCUL).

Deadline for applications: January 2<sup>nd</sup> 2024

## **How to apply**

Candidates should fill in the following FORMULARY:

<http://inqueritos.ciencias.ulisboa.pt/index.php/872761?lang=pt>

This formulary is strictly confidential, as explained in the introduction, and the data are required because the cE3c Advanced Courses are also offered as part of the PRR programme of FCUL.

When filling the formulary mind to:

- 1) FILL ALL THE MANDATORY FIELDS
- 2) UPLOAD CV AND MOTIVATION LETTER, both mandatory; use the names as instructed there
- 3) If you want to resume later SAVE the formulary, otherwise you will need to fill everything again
- 4) At the end SUBMIT the formulary before exiting

For any doubts please contact the cE3c coordinator of the cE3c courses Margarida Matos ([mmmatos@fc.ul.pt](mailto:mmmatos@fc.ul.pt)) and the teacher Cristina Cruz ([cmhoughton@ciencias.ulisboa.pt](mailto:cmhoughton@ciencias.ulisboa.pt)) and Teresa Dias ([mtdias@ciencias.ulisboa.pt](mailto:mtdias@ciencias.ulisboa.pt))