

Soil Science

Code: 100767
ECTS Credits: 6

Degree	Type	Year	Semester
2500250 Biology	OT	4	1

Contact

Name: Xavier Domene Casadesús
Email: xavier.domene@uab.cat

Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Josep Maria Alcañiz Baldellou

Prerequisites

Although there are no official prerequisites, it is convenient that the student has:

- 1) The basic knowledge about Earth Sciences and the Environment that acquired in this subject during the secondary education.
- 2) The basic knowledge of the subjects of Chemistry, Physical Environment, Ecology and Prospecting of the Natural Environment.

Objectives and Contextualisation

The objective of the subject is training the student in his/her ability:

- i) to describe the most relevant components and properties of the soil and its organization,
- ii) to take representative samples and analyze them using standardized methods, and
- iii) to interpret the results in order to deduce the soil formation processes.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Be able to analyse and synthesise
- Be able to organise and plan.
- Develop a sensibility towards environmental issues.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.

- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.
- Understand the processes that determine the functioning of living beings in each of their levels of organisation.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Analyse a situation and identify its points for improvement.
3. Be able to analyse and synthesise.
4. Be able to organise and plan.
5. Critically analyse the principles, values and procedures that govern the exercise of the profession.
6. Develop a sensibility towards environmental issues.
7. Interpret the complexity of the global dynamics of natural systems on their different scales of analysis.
8. Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
9. Propose new methods or well-founded alternative solutions.
10. Propose viable projects and actions to boost social, economic and environmental benefits.
11. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
12. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
13. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
14. Students must develop the necessary learning skills to undertake further training with a high degree of autonomy.
15. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
16. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
17. Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Content

BLOCK I: Soil as a natural system

1. Concept of soil.
2. Morphological description of the soil profile and the horizons.
3. Study of soils in the field.

BLOCK II: Organization and soil components

4. Soil texture and colour.
5. Soil structure.
6. Soil porosity and density.

BLOCK III: Mineral soil constituents

7. Parental materials and weathering.
8. Silicate minerals.
9. Non-silicate minerals.

BLOCK IV: Soil organic matter, its transformations, and biological activity

10. Soil organic matter (SOM) and role in the global carbon cycle.
11. SOM composition and dynamics.
12. The edaphic system.

BLOCK V: Soil as a water reservoir

13. Retention of water in the soil.
14. Movement of water in the soil.

BLOCK VI: Soil physical properties and chemical properties

15. Nutrients and soil retention capacity.
16. Acidity, salinity and sodicity.

*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

BLOCK VII: Soil diversity

17. Soil classification.
18. The WRB-FAO system and main soil types in Europe.
19. Soil maps.

Methodology

Lectures. The exhibitions are the main activity that will be done in the classroom, as they allow transmitting basic concepts to many students in a short time. In addition, it will be accompanied with PowerPoint presentations and diverse educational materials that, if appropriate, will be available in the virtual campus.

Field practices. It is essential for the student to use the knowledge acquired in relation to the description and sampling of soils. They will consist of an entire day's trip in which students, in groups of 5, will describe the environment where a soil has formed, excavate a soil pit, and will describe the different horizons and will take samples for analytical purposes.

Lab practices. These sessions are designed with the aim that the students learn the most common analytical procedures in the soil characterization, to obtain sufficiently reliable and representative results of the samples that will have obtained in the field. They will be organized in three four-hour sessions in which the students, in

the same groups they did in the field, will analyze the samples and interpret the results. In order to attend it is necessary that the student had passed the biosafety and safety tests that will find in the Virtual Campus and to be knowledgeable and accept the working rules of the laboratories of the Faculty of Biosciences.

Collaborative work. It consists on the culmination of the group work. A summary of the field practices and laboratory practices, and will be realized by the same working groups. It will consist of the realization of a poster that will include the description of the study area and the soil studied, the analytical results that have been obtained, and its interpretation in relation to the formation of the soil and its use abilities.

Tutorials. The collaborative work will be presented in a tutorial session that will serve to identify learning errors and seek the possibilities of solution in relation to collaborative work.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Field practices	8	0.32	7, 6, 3, 4
Lab practices	12	0.48	7, 6, 3, 4
Lectures	32	1.28	7, 6, 3, 4
Tutoria del poster	2	0.08	7, 6, 3, 4
Type: Supervised			
Autonomous fieldwork	2	0.08	7, 6, 3, 4
Group tutoring	2	0.08	7, 6, 3, 4
Type: Autonomous			
Autonomous study	58	2.32	7, 6, 3, 4
Poster preparation	30	1.2	7, 6, 3, 4

Assessment

The 2017 modification of the Title IV (Appraisal) of the UAB Regulations according to the RD 1393/2007, applicable from the 2018-2019 academic year, will rule the appraisal, which will consist of three activities:

- 1) Mid-term test (35% weight). It consists of questions and/or short answer exercises on the main concepts on the subject that must be reached at the time of its completion.
- 2) Final test (35% weight). It consists of questions and/or exercises that will be formulated in the relation the morphological description and the analytical results of a soil. This test will have an integrating character of the contents imparted throughout the course, according to the continuous appraisal system in force at the UAB.
- 3) Poster (20% weight). It consists in the hand-out of the poster in PDF format for each field and lab practices group. This activity cannot be retaken.

Test review. At the time of publication of the exam notes in the virtual campus, the date, time and place of the review will be communicated for any interested student. There will be no individual reviews outside of these hours.

Retake exam and 'No Avaluable' criteria. The students can only attend to a retake exam if the weighted mean of the midterm and the final test is below 5 and over 3.5.

The mark of the retake test substitutes the average (weighted) mark of the other tests (hence the retake test having a 75% weight), and will include all the contents of the subject.

The student will be graded as "No Avaluable" if the weight of all the evaluation activities conducted is below a 67% weight of the final score. The attendance to practical sessions (or field trips) is mandatory. Students missing more than 20% of programmed sessions will be graded as "No Avaluable".

Appraisal criteria. Once all the evaluation steps are completed, including the retake test, a student will be considered as 'failed' when the weighted average mark is below 5, or when the weighted mark of the midterm and the final exams or that of the retake exam is below 4.5.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final test	50%	2	0.08	7, 15, 11, 12, 6, 3
Mid-term test	25%	2	0.08	7, 15, 11, 12, 6, 3, 4
Poster preparation (in a workteam)	25%	0	0	1, 17, 16, 5, 2, 7, 8, 9, 10, 15, 14, 13, 11, 12, 6, 3, 4

Bibliography

Books:

- Brady NC, Weil RR. 2016. The nature and properties of soils (14th ed.). Prentice Hall Upper (http://wps.prenhall.com/chet_brady_natureandp_13)
- Porta J, López-Acevedo M, Poch RM. 2014. Edafología: uso y protección de suelo. Mundi-Prensa. Madrid.
- Schoeneberger PJ, Wysocki DA, Benham EC, Broderson WD. 1998. Libro de campaña para descripción y muestreo de suelos. National Soil Survey Center - Natural Resources Conservation Service - USDA. Nebraska. (ftp://ftp-fc.sc.egov.usda.gov/NSSC/Field_Book/FieldBookVer3.pdf)
- Stocking M. & Murnaghan N. (2003) Manual para la evaluación de campo de la degradación de la tierra. Ediciones Mundi-Prensa, Madrid, 172 p.
- Tan, K. H. 1994. Environmental soil science. Marcel Dekker. New York.
- Van Reeuwijk, L. P. 2002. Procedures for soil analysis. ISRIC - FAO. [2847]

Soil classification keys:

- IUSS Working Group WRB, 2015. Base referencial mundial del recurso suelo 2014. Actualización 2015. Sistema internacional de clasificación de suelos para la nomenclatura de suelos y la creación de leyendas de mapas de suelos. Informes sobre recursos mundiales de suelos 106. FAO, Roma. (<http://www.fao.org/3/i3794es/I3794es.pdf>)
- USDA-NRCS. 2014. Claves para la Taxonomía de Suelos (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051546.pdf)

Soil maps:

- Mapa de sòls de Catalunya 1:25.000 (
<http://www.icgc.cat/ca/Administracio-i-empresa/Descarregues/Cartografia-geologica-i-geotematica/Cartog>
)
- Dades de perfils a Catalunya: Geoíndex - Sòls (
<http://www.icgc.cat/Administracio-i-empresa/Eines/Visualitzadors-Geoindex/Geoindex-Sols>)
- IEC Cartografia de Sòls (<https://www.iec.cat/mapasols/Ca/MapaInteres.asp?Grup=F&Opcio=15>)
- European Soil Data Centre (ESDAC) (<https://esdac.jrc.ec.europa.eu/resource-type/maps>)

Webpages:

- USDA - Natural Resources Conservation Service. Technical References: <http://soils.usda.gov/technical/>
- USDA - Natural Resources Conservation Service. Soil Education. <http://soils.usda.gov/education/>
- Universidad de Granada. Departamento de Edafología y Química Agrícola.
<http://edafologia.ugr.es/index.htm>
- Soil-net. Welcome to Soil-net.com. <http://www.soil-net.com/>
- International Union of Soil Sciences. Soil science education. <http://www.iuss.org/popup/education.htm>
- Institut d'Estudis Catalans. Protecció de sòls, mapa de sòls de Catalunya.
<http://www.iecat.net/mapasols/index.html>

Software

None.