

Soil Science

Code: 100817
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	OB	2	1

Contact

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Use of languages

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

Teachers

Josep Maria Alcañiz Baldellou

Prerequisites

Although there are no official prerequisites, it is convenient for the student to review:

- 1) The basic knowledge about Earth Sciences and the Environment that has acquired in this subject during high school.
- 2) The basic knowledge related to the contents of this subject that has acquired in Chemistry, Physical Environment and Biology.

To be able to attend to the laboratory practices it is necessary that the student have passed the biosafety and safety course.

Objectives and Contextualisation

The objective of this subject is to give the student a training that makes him able to describe the most relevant components of the soil and its relationship with the environment.

Skills

- Apply knowledge of theory to practice.
- Catalogue, assess and manage natural biological resources.
- Describe, analyse and assess the natural environment.
- Produce thematic cartographies of the natural environment.
- Reason critically.
- Solve problems.

Learning outcomes

1. Apply knowledge of theory to practice.
2. Describe and sample land and interpret its properties.
3. Distinguish between the principal soil types.
4. Interpret maps of soils and draw maps of their aptitude.
5. Reason critically.
6. Resolve exercises on interpretation of soil analysis.
7. Solve problems.

Content

BLOCK I: The soil as a natural system

1. Soil concept. The soil as a component and resource of the natural environment. Soil functions within ecosystems.
2. Morphological description of the soil profile and its horizons. Nomenclature of genetic horizons. Color of the soil.
3. The study of the soil in the field, taking samples for analytical purposes and prepare samples for analysis.

BLOCK II: Organization of soil components

4. Dimensions of components. Granulometry and texture.
5. Soil structure. Morphological type of macrostructures. Structural stability.
6. Bulk density. Porosity.

BLOCK III: Mineral constituents of soil

7. Primary and secondary minerals. Mineral transformations. Main physical and chemical processes of weathering.
8. Silicates, structure, composition and important properties. Origin of the electric charge.
9. Alteration complex: clay minerals, oxyhydroxides of iron and aluminum, specific characteristics and meaning in soil.

BLOCK IV: Organic matter, its transformations and biological activity of the soil

10. Soil organic matter within the global carbon cycle. Origin and composition. Mineralization and humification processes.
11. Stabilization of organic matter. Humification. Characteristics of humic substances. Carbon sequestration.
12. Soil biology. Biological diversity in soils. Actions of organisms in the soil. Biological activity in the soil.

BLOCK V: The soil as a water reservoir

13. Water retention in soil. Water potential and characteristic functions of humidity. Water reserve and water availability.
14. Flow of water in the soil. Infiltration and hydraulic conductivity. Sewer system.

BLOCK VI: Physical and chemical properties of soil

15. Type of interactions in the solid-liquid interface. Cation exchange capacity. Base saturation. Soil pH: meaning and measurement.
16. Soil solution: cations and anions in solution. Salinity and sodicity.

BLOCK VII: Soil diversity

17. Classification of soils. General criteria. Diagnostic horizons.
18. Main classification levels.
19. Principal Soils of Catalonia

Methodology

Lectures. The exhibitions are the main activity that will be done in the classroom, as they allow transmitting basic concepts.

Field practice. It is essential for the student to use the knowledge acquired in relation to the description and sampling of soils.

Lab practices. These sessions are designed with the aim that the students learn the most common analytical procedures.

Collaborative work. It consists on the culmination of the group work. A summary of the field practices and laboratory work.

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.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Explanation of poster work and examples	2	0.08	1, 2, 5, 7, 6
Field practices	8	0.32	2

Lab practices	12	0.48	1, 2, 5, 7, 6
Master class	32	1.28	2, 3, 4, 6
Type: Supervised			
Field work	2	0.08	1, 2, 3
Tutorial meeting	2	0.08	1, 2, 5, 7, 6
Type: Autonomous			
Independent study	58	2.32	1, 2, 3, 4, 5, 7, 6
Poster work	30	1.2	1, 4, 5, 7, 6

Evaluation

1. Partial test - It consists of 4-6 questions and / or short answer exercises on the main concepts of the subject that must be reached at the time of its realization.

2. Final test - It consists of 4-6 questions and / or exercises that will be formulated in relation to a soil that will give the morphological description and the main analytical results. This test will have an integrative character of the knowledge imparted throughout the course.

3. Poster of description and interpretation of the soil - Consists in delivery a poster in digital format about the study of the soil that each group evaluated in the field trip.

It shall include at least the following parts:

1. Description of the environment where the soil is
2. Morphological description of the profile
3. Interpretation of the different analytical results and synthesis of their fundamental properties
4. Deduction of soil formation processes
5. Assessment of possible land uses
6. Classification of the soil

Field trips and laboratory practices are compulsory activities. The non-attendance to these activities will be equivalent to a non-evaluated in the collaborative work (poster). A student will be considered not evaluated when he/she does not attend to any of the evaluation activities.

The non-presentation in one of the evaluation activities imply a score of zero in that activity. The calculation of the final grade will be done according to the following weights, expressed as a percentage:

- Partial test, 25%
- Final test, 45%
- Poster, 30%

In order to pass the subject it is necessary that the weighted average of the exams will be equal or higher than 5. If it is not the case, the average grade of the poster will not be taken account.

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Final test	45	2	0.08	1, 2, 3, 4, 5, 7, 6
Partial test	25	2	0.08	1, 5, 7, 6
Poster	30	0	0	1, 2, 5, 7, 6

Bibliography

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- Aula Virtual de l'Autònoma Interactiva
- USDA - Natural Resources Conservation Service. Technical References
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- Universidad de Granada. Departamento de Edafología y Química Agrícola
- National Aeronautics and Space Administration (NASA). We Study Soil Because It's A(n)...
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- International Union of Soil Sciences. Soil science education
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