UAB
Universitat Autònoma de Barcelona

Soil Science

Code: 101069
ECTS Credits: 4

2025/2026

Degree	Type	Year
Geology	OT	3
Geology	OT	4

Contact

Name: Andrea Vidal Dura

Email: andrea.vidal@uab.cat

Teachers

Sara Marañon Jimenez

Xavier Domene Casadesús

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Although there are no official prerequisites, it is recommended that the student has basic knowledge and skills in Earth Sciences and Biology, acquired in secondary school, as well as knowledge of geomorphology and types of rocks and minerals acquired in previous subjects of the Geology Degree.

Objectives and Contextualisation

- To develop the ability to describe and interpret a field soil as related to the environmental factors present.
- To identify the main soil components and interpret their properties.
- To be capable of using soil classification systems to interpret soil diversity.
- To understand that the capacity of use of soils is linked to their properties.
- To identify some common soil degradation processes (e.g. erosion, contamination) and propose solutions.

Competences

Geology

- Display understanding of the size of the space and time dimensions of Earth processes, on different scales.
- Draw up and interpret geological maps and other means of depicting geological information (columns, correlation frames, geological cross-sections, etc.)
- Identify and tackle environmental problems, plan land-use and know the principles of prevention and mitigation of geological risks.
- Process, interpret and present field data using qualitative and quantitative techniques, and suitable computer programmes.
- Process, interpret and present laboratory data using qualitative and quantitative techniques, and suitable computer programmes.

Learning Outcomes

1. Apply Geochemistry concepts to solve problems of land and water pollution.
2. Apply knowledge of geological processes to identifying and solving environmental problems, and to land-use planning and geological risk.
3. Create and manage databases and topologies to combine data and obtain 2D or 3D graphic results using GIS for environmental management, risk analysis and inventories of the geological heritage.
4. Evaluate and process laboratory data corresponding to environmental issues.
5. Identify and process the value and the sources of field data with environmental implications.
6. Interpret relief dynamics on different time-space scales in terms of risk and land-use planning.
7. Synthesise and select field data and process it qualitatively and quantitatively using different computer programmes.

Content

THEORY

Topic 1. Soil as a natural system

• What is soil? Soil as element and resource of natural environments.

• Environmental, economic and social functions of soil.

• How a soil is born: forming factors and processes.

• Soil organization. Soil profile and horizons.

Topic 2. Organization of soil components (soil architecture)

• Particle size distribution and texture.

• Soil architecture: structure, aggregate type and stability.

• Real and bulk density. Porosity. Pore space properties.

Topic 3. Synthesis of mineral constituents of soil

• Mineral weathering processes.

• Main soil minerals

• Climatic weathering gradients.

Topic 4. The organic matter of soil, its transformations and the biological activity of the soil

• Soil as a sink of carbon and nitrogen in the context of global and climate change. Mineralization and humification. Other carbon protection mechanisms. C/N ratio.

• Genesis and nature of humus. The clay-humic complexes.

Topic 5. Soil as a water reservoir

• Water retention in soil. Water potential and its components. Characteristic humidity curve. Plant water availability.

• Water balance and soil moisture regimes. Soil water conservation good practices.

Topic 6. Physical-chemical properties

• Solid-liquid interface interactions. Cation exchange capacity. Saturation of the exchange complex.

• Soil pH: meaning and measurement. Real and potential acidity. Buffering capacity. Sources of acidity in soil. pH correction.

• Soil solution: cations and anions. Salinity and sodicity.

Topic 7. Soils diversity

• The FAO-WRB system. The soil pedon and the diagnostic horizons. Main taxonomic classes.

• Soil maps and their interpretation. Soil assessment for land planning.

FIELD PRACTICES

It consists of a one-day trip to the Cinglera del Far, about 1000 m above sea level, and located in the municipality of Susqueda, in the limits of the counties of Osona, La Selva and La Garrotxa. The students, in small groups, will perform a soil pit and will describe the soil profile. At the end of the course, they will present a poster summarising this description, interpreting the soil's edaphogenesis, as well as the limitations of its current and alternative uses.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Field practices	7	0.28	1, 2, 5, 6
Master classes	24	0.96	1, 2
Special sessions	3	0.12	2, 6

Type: Autonomous			
Autonomous learning	47	1.88	1, 2, 6
Problems and case studies	15	0.6	4, 7

1) Master classes. It will consist of 50-minute lecture sessions (depending on the final course timetable), held in the classroom, that intend the introduction of the concepts described in the syllabus, including audiovisual material prepared by the teacher as a support.

2) Resolution of problems and practical cases. It will consist of activities aiming to train the student in soil description and analysis, as well as the application of this knowledge to real problems.

3) Field practices. It will correspond to a one-day field trip where students will work in small groups to excavate a soil pit and describe the soil profile. At the end of the course, students will hand out a poster describing and interpreting this soil and its use limitations.

4) Autonomous activities. This corresponds to the time at home devoted to the study and the resolution of problems raised in the classroom for each student, as well as the preparation of the poster.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Final exam	45%	2	0.08	2
Midterm exam	25%	2	0.08	1, 2, 6
Poster	30%	0	0	1, 3, 5, 4, 6, 7

The evaluation will consist of:

1) Midterm exam (25% of the mark). It will be carried out in the middle of the semester, and it will include the concepts and skills taught in class until then.

2) Final exam (45% of the mark). It will mostly include the topics after the ones evaluated in the mid-term, although due to the inclusive nature of the subject, it will also consider the topics in the first part of the subject, in accordance with the principles of continuous evaluation principle adopted in UAB.

3) Poster (30% of the mark). It consists of a group work in poster format where a real ground studied in field conditions is described, its training process will be interpreted, and the suitability of current or alternative uses will be evaluated. This activity is not recoverable.

Retake exam. In case the weighted average of the previous exams is below 5, students could concur to a retake exam that will include all the contents of the subject, and the mark obtained will substitute that of the theoretical part (70% of the global mark). The review of the final grade follows the same procedure as for continuous assessment.

Appraisal criteria. A student will be considered as 'passed' when the average grade of the three activities equals or exceed 5. A student will be considered as 'not evaluable' when he / she does not attend to any of the evaluation activities.

Students in single evaluation mode (or avaluació única). Consult with the Faculty of Biosciences on how to opt for this evaluation mode or visit the website https://www.uab.cat/doc/CriterisAvaluacioUnica. The single evaluation in this subject will consist of a single synthesis test that will assess the content of the entire theoretical program of the subject. The grade obtained in this synthesis test will account for 70% of the final grade for the subject. The single evaluation test will be held on the same date as the final scheduled continuous evaluation test, andthe same recovery system as the continuous evaluation will be applied. As for the evaluation of practical activities (poster), it will follow the same process as the continuous evaluation, and therefore, it will account for 30% of the final grade for the subject. This final evaluation activity cannot be recovered.

Bibliography

Books:

Brady N. C. & R. R. Weil. 2008. The nature and properties of soils (14th ed.). Prentice Hall Upper Saddle River, New Jersey. 975 p. http://wps.prenhall.com/chet_brady_natureandp_13

Porta, J.; M. Lopez-Acevedo & C. Roquero. 2003. Edafología para la agricultura y el medio ambiente, Ed Mundi-Prensa, Madrid.

Porta, J., M. López-Acevedo & R. M. Poch. 2009. Introducció a l'Edafologia. Ús i protecció del sòl. Mundi-Prensa. Madrid.

Schoeneberger, P. J.; D. A. Wysocki, E. C. Benham & W. D. Broderson.1998. Libro de campaña para descripción y muestreo de suelos (Field book for describing and sampling soils). National Soil Survey Center - Natural Resources Conservation Service - USDA. Nebraska.

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]

Porta, J.; López-Acevedo, M. 2005. Agenda de campo de suelos. Información de suelos para la agricultura y el medio ambiente. Ed. Mundi-Prensa, Madrid, 541p., ISBN 84-8476-231-9

Soil classification keys:

USDA-NRCS. 2014. Claves para la Taxonomía de Suelos (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051546.pdf)

FAO World reference base for soil resources (2006) A framework for international classification, correlation and communication. WORLD SOIL RESOURCES REPORTS 103. ISBN 92-5-105511-4

Soil maps:

Mapa de sòls de Catalunya 1:25.000 (http://www.icgc.cat/ca/Administracio-i-empresa/Descarregues/Cartografia-geologica-i-geotematica/Cartografia-de)

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)

Webs:

USDA - Natural Resources Conservation Service. Technical References: http://soils.usda.gov/technical/

USDA - Natural Resources Conservation Service. Soil Education. http://soils.usda.gov/education/

Software

Does not apply.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PCAM) Field practices	1	Catalan	second semester	morning-mixed
(SEM) Seminars	1	Catalan	second semester	afternoon
(TE) Theory	1	Catalan	second semester	afternoon