UAB
Universitat Autònoma de Barcelona

Soil Protection

2026/2027

Code: 100816
Credits: 6

Degree programme	Type	Course
Environmental Biology	OP	4

Contact lecturer

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Teaching staff

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Group languages

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

Prerequisites

Although there are no official prerequisites to take this course the student should have previous knowledge about soils at a level equivalent to a general course on Soil Science.

The skills acquired and concepts explained in the subjects Physical Environment, Ecology, Natural Environment Survey and Valuation of Ecosystems and Species, among others, will be useful in this course.

Objectives

Soil Protection is an optional course in the fourth year Degree in Environmental Biology which introduces students to applied soil science issues, especially with regard to environmental issues, trying to bring it closer to a professional profile and activities. The concepts explained in the second-year course in Soil Science will be the starting point to introduce the soil as a natural resource and, then to explain the principles of sustainable use and management. Also, the course addresses the regulatory framework for soil protection. It also describes the main degradation processes that affect this natural resource, such as erosion, loss of organic matter, salinization, pollution, sealing, etc. and explains the conservation or rehabilitation measures most appropriate in each case. The contribution to environmental and social services provided by soils, as well as their role in aggravation or mitigation the effects of the global change will be discussed. Information about the current state of soils and about our responsibility in their management will be also tackled.

The aim of this course is to train the students in assigning the correct or more sustainable use of soils, evaluate their conservation state, detecting the main problems of soil degradation, and to enable them to propose rehabilitation measures for degraded soils.

Learning outcomes

1. Solve problems.
2. Develop creativity.
3. Evaluate soils' capacity for use.
4. Identify impacts on soil.
5. Identify soil degradation problems and propose solutions to these.
6. Draw up plans for the fertilisation or management of soils.
7. Actuar en l'àmbit de coneixement propi avaluant les desigualtats per raó de sexe/gènere.

Contents

1- The soil as a natural resource and its protection. Major environmental functions and services provided to society. People as soil users and managers. Regulations promoting soil protection, such as the Thematic Strategy for Soil Protection.

Degradation processes and soil conservation practices

2- Soil degradation processes. Main soil degradation processes. Evaluation of soil quality and soil degradation. Soil quality indicators. Acceptable rates of degradation and sustainable management of soil.

3. Soil physical degradation processes. Degradation of the structure: causes and consequences on the environment. Structure stability. Soil compaction and crusting. Preventive methods for structure conservation. Soil sealing and urban use.

4- Erosion as a land degradation problem. Water erosion: rainfall erosivity and soil erodibility. Study of erosion models: the (R)USLE. Prevention techniques and erosion control, benches and terraces. Conservation agriculture.

5- Management of water and salinity in the soil. Conservation of water in the soil and control techniques. Irrigation and drainage. Soil salinization associated with irrigation. Management and improvement of saline and sodic soils.

6- Contaminated soils. Causes and characteristics of soil pollution. Current legal framework and its application. Generic reference levels, setting, and interpretation. Environmental management of sites with contaminated soils. Remediation of polluted soils: extraction, degradation, immobilization, bioremediation. Case study: the pollutants associated with sewage sludge applied to the soil.

7- Management of soil organic matter and carbon sequestration. The soil as a reservoir of carbon and nitrogen in the context of global change. Loss of soil organic matter as a result of the use, management and climate change.Composting. Recycling organic wastes, regulations, and standards applicable to the soil. Biochar.

8- Soil fertility management and protection of forest and agricultural soils. Fertilization and biogeochemical

cycles. Nutrient availability, conservation and efficient use of nutrients. Good practices in relation to nitrogen fertilization.

Soil diversity, mapping, and evaluation

9- Soil mapping. Soil maps and their interpretation. Environmental information on current soil maps. Available maps. Applications.

10- Soil and land evaluation for different uses. General and specific systems. Applications. The basis for spatial land-use planning.

Ecological restoration of degraded areas

11- A Conceptual framework for ecological restoration of degraded areas. Objectives of the restoration. Specification of the final use of the area to be restored. Main methodological items for soil rehabilitation. Restoration projects. Quality indicators of the restoration and restoration assessment.

12- Restoration of mining activities: Evolution of rehabilitation works in a quarry and comparison of alternatives. Evaluation of restoration (one-day field practical, at Dos Maries quarry Dos, Alcover)

13- Restoration of wildfire-affected areas. Effects of fire on soils. Techniques for the regeneration of burned areas.

14- Bioengineering techniques for the restoration of road slopes and other denuded areas. Geotechnical stability, erosion control, revegetation and landscape integration.

Practical case studies

15- Obtaining and interpreting soil descriptions and analysis. Soil quality indicators.

16- Studies of fertilization plans and effects of residues or pollutants in soil. Soil fertility problems and analysis (unfertile soils, acid soils, overfertilization) and corrective measures.

16- Estudi de plans d'adobatge i d'efectes de contaminants o de residus aplicats a sòls. Anàlisis i problemes de fertilitat de sòls (sòls pobres, sòls àcids, sobrefertilització) i les mesures de correcció.

17- Identification of soil degradation problems and proposals for corrective measures. It consists of making a video-documentary about a process of soil degradation or about the processes of soil degradation that affect a certain area. Evaluable activity.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Explanation of practical work	1	0.04	2, 3, 4, 5
Field work or alternative activities	8	0.32	2, 4, 5
Resolution of cases and problems	8	0.32	1, 5, 6
Practical work (video)	25	1	2, 3, 4, 5
Interpretation of practicals results or problems	6	0.24	1, 2, 5, 6
Lab work or alternative activities	14	0.56	1, 4, 6
Personal learning	51	2.04	1, 2, 3, 4, 5, 6
Lectures	26	1.04	3, 4, 5
Case studies and practical problems	5	0.2	1, 5, 6

The teaching methodology aims to achieve the objectives of the course and enable students to continue learning once it is completed. It will combine different learning strategies so that students lead their training.

1) Lectures (26 h). Sessions will be accompanied by handouts and various educational materials that may be delivered to students through virtual campus. Learning content and concepts explained in the lectures require student's personal study to assimilate them. As guidance, it is estimated that every hour of lectures requires two hours of personal study.

2) Case studies and practical problems (5 attendance hours + 8 h hours of personal study). The case-based learning is a tool particularly useful because it allows students to apply the knowledge acquired in lectures. These activities will consist of explanation and discussion of soil erosion and pollution problems.

3) Field practice. A one-day trip to visit the restoration of a quarry and the results of various tests applied in the past. Also, students will work in small teams to evaluate the effects of two quarry restoration techniques on revegetation (8 h). In the event that the field trip cannot be carried out, examples of restoration work on extractive activities will be shown electronically.

4) Laboratory practices (14 h). These sessions are planned to assess the effects of an organic waste or a pollutant amendment on the soil. The laboratory practices comprise a first session to prepare the experiment (2h), and three sessions of four hours (12h) in which students, working in small teams, will analyse the effects of the soil amendment on some physical, chemical, and biological soil parameters. They will need autonomous work for the interpretation of the results (6h). Students will share their data and submit (per group) a summary of the results and discussion of the overall experiment. To attend these practicals, students must have passed a biosafety and security test, that can be found on the Virtual Campus, and must be aware of and accept thelaboratory operation rules of the Faculty of Biosciences. In the event that laboratory activities cannot be carried out, they will be replaced by case studies and / or problems that will be discussed and presented by each group of practices.

5) Practical (collaborative) group work: It consists on the production of a video-documentary about a process of soil degradation or about the processes of soil degradation that affect a specific area. The video will include an explanation of the soil degradation process (s), the mechanisms involved, their relevance and implications, as well as the corrective measures that could be carried out and their potential viability. The video may include interviews, visits to the field or affected areas, visits to centers (eg: waste treatment, treatment plants, etc). As an assessable previous activity, a script will be delivered with the contents of the video, the target audience and communication objectives (eg: educational and training, informative, informative, awareness, etc). The maximum length of the video will be 10 min. The video will be made in groups of 3-5 people. There will be follow-up sessions (assistance will be voluntary) in which the professors will guide the progression of the work and a collective session at the end of the semester, where all the teams will present their work.

For this course, the use of Artificial Intelligence (AI) technologies is permitted exclusively for support tasks, such as literature or information searches, text correction, translations, the generation of outlines or illustrative graphics, and personal study. If AI tools are used in assessed activities, students must clearly identify which parts have been generated using these technologies, specify the tools employed, and include a critical reflection on how they have influenced both the process and the final outcome of the activity. Failure to disclose the use of AI in an assessed activity will be considered a breach of academic integrity and may result in a partial or total penalty on the grade for the activity, or more severe disciplinary sanctions in serious cases. The use of AI in any examination of this course is strictly prohibited.

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Second test	30%	1.5	0.06	1, 2, 3, 4, 5, 6
Practical work (video)	30%	2	0.08	2, 3, 4, 5, 7
Interpretation of practical work or problems	15%	1	0.04	1, 5, 6
First test	25%	1.5	0.06	2, 3, 4, 5, 6

This subject does not include unic evaluation. The assessment of this course is done throughout the year and has a formative character. It is based on the following elements:

1. First test. It consists of 4-6 questions and/or short answer exercises or multiple choice test on the main concepts that must be known at the time of the test realization. It does not eliminate materials/topics being assessed in the second test.

2. Second test. It consists of 4-6 questions and/or exercises that will be formulated in relation to the knowledge explained about soil degradation and management problems.

3. Interpretation of results of laboratory practicals. It consists of the submission of a report of the results and discussion of the analyses carried out in the laboratoryor the resolution of problems, with a justification or interpretation of the same. The correct interpretation and critical evaluations will be assessed.

4. Video-documentary on soil degradation processes. A first evaluation consists of the presentation of a video script, made in a group, about a process or processes of degradation of an area, the mechanisms involved, their relevance and implications, as well as the corrective measures that could be carried out and their

potential viability. Thirty days before the delivery of the video, it will be delivered a video script, which will represent the 33% of the final qualification mark of the video. After this delivery, the students will have feedback from the responsible teacher and will have to make the pertinent modifications. The final video will have 66% of the weight final qualification mark of the video. The projection of the video will take place in a joint session at the end of the course.

Qualification of the course and resit

All assessment items are mandatory. Any assignment that is not submitted, or that is submitted after the established deadline, will receive a grade of zero. To pass the course, students must obtain an overall grade higher than 4.9 and achieve a minimum average grade of 3.5 across the midterm and final examinations. However, the students that do not reach such score and have been assessed of 2/3 of the overall assessment items, will be able to take an exam resit. According to the current UAB assessment regulations, having an average score equal to or greater than 3,5 will be a sine qua non (i.e. 3,5 is the minimum required mark) to be eligible for the exam resit.

Any irregularity committed in an assessment activity (including academic fraud, plagiarism, or the improper use of AI) that may result in a significant alteration of the assessment outcome will lead to that assessment being awarded a grade of 0. Consequently, the final grade for the course will be 0. Without prejudice to this measure, disciplinary proceedings may also be initiated against any student who commits any of these irregularities.

Bibliography

Further electronic resources and materials will be posted by the professors on the Campus Virtual during the developing of the course.

Basic bibliography (textbooks):

- Brady N. C. & R. R. Weil. 2017. The nature and properties of soils (15th ed.). Prentice Hall Upper Saddle River, New Jersey. 975 p.
https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991007729899706709

- Gómez Orea, D. (2004) Recuperación de espacios degradados. Mundi Prensa, Madrid, 583 p.
https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991010484551706709

- Lal, R.; W.H.Blum, C. Valentine, B.A. Stewart (1998) Methods for assessement of Soil Degradation, Advances in Soil Science, CRC press, New York, 558 p.
https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991008541239706709

- Magdoff, F. & H. van Es. 2009. Building Soils for Better Crops. Sustainable Agriculture Network (SAN) - USDA https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991002973779706709

- Porta, J., M. López-Acevedo & R. M. Poch. 2014. Edafología: uso y protección de suelos, 3ª ed, Mundi-Prensa. https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991010859405906709

- Tan, K. H. 2009. Environmental soil science. Marcel Dekker. New York.
https://bibcercador.uab.cat/permalink/34CSUC_UAB/avjcib/alma991001885739706709

- TRAGSA (1998). Restauración hidrológico forestal de cuencas y control de la erosión. Ed. Mundi Prensa.
https://bibcercador.uab.cat/permalink/34CSUC_UAB/1eqfv2p/alma991007376959706709

Web links:

- USDA - Natural Resources Conservation Service: https://www.nrcs.usda.gov/wps/portal/nrcs/site/soils/home/

- FAO Soils Portal: http://www.fao.org/soils-portal/en/

- Universidad de Granada. Departamento de Edafología y Química Agrícola: http://edafologia.ugr.es/index.htm

- Institut d'Estudis Catalans. Protecció de sòls, mapa de sòls de Catalunya: http://www.iec.cat/mapasols/

- Institut Cartogràfic i Geològic de Catalunya: https://www.icgc.cat/

- Sociedad Española de Ciencias del suelo: https://www.secs.com.es

- The nature Education Knowledge Project, Soil, Agriculture and Agricultural Biotechnology: https://www.nature.com/scitable/knowledge/soil-agriculture-and-agricultural-biotechnology-84826767/

- 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

- European Society for Soil Conservation http://www.soilconservation.eu/

Software

Comun software of Microsoft Office.

Internet browsers.

Free software for video editing (iMovie, Biteable, Shotcut, OpenShot, VideoPad, Lightworks, WeVideo, etc.)

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	24	Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	241	Spanish	second semester	afternoon
(PCAM) Field practices	241	Spanish	second semester	morning-mixed
(PCAMs) Suport a les pràctiques de camp dirigides	241	Catalan/Spanish	second semester	morning-mixed