

Course guide

2500209 - GECGEOEDAF - Geology and Edaphology

Last modified: 01/10/2023

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
745 - DEAB - Department of Agri-Food Engineering and Biotechnology.

Degree: BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JOSEP SALVADOR BLANCH ROURE, JOSE MOYA SANCHEZ

Others: JOSEP SALVADOR BLANCH ROURE, JOSE MOYA SANCHEZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

14446. Solve mathematical problems that may arise in engineering by applying knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, optimization, ordinary differential equations.
14447. Obtain basic knowledge about the use and programming of computers, operating systems, databases and basic numerical calculation and applied to engineering.
14448. Manage the basic concepts about the general laws of mechanics and thermodynamics, concept of field and heat transfer, and apply them to solve engineering problems.
14449. Apply the basic principles of general chemistry, organic and inorganic chemistry and their applications in engineering.
14450. Describe the global functioning of the planet: atmosphere, hydrosphere, lithosphere, biosphere, anthroposphere, biogeochemical cycles (C, N, P, S), soil morphology and apply it to problems related to geology, geotechnics, edaphology and climatology.

Generical:

14440. Identify, formulate and solve problems related to environmental engineering.
14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.
14444. Apply business management techniques and labor legislation.

TEACHING METHODOLOGY

The subject consists of the following activities in classroom:

- 1) Sessions in large groups that include expository theory classes and theory quiz discussion workshops (30 h).
- 2) Intermediate group sessions on practices and problems in geology and edaphology (24 hours).
- 3) Evaluation activities (exams) (6 h).

Specific optional sessions are held to resolve and discuss the exams.

The subject calendar and detailed support material are provided on the ATENEA virtual campus.

LEARNING OBJECTIVES OF THE SUBJECT

Environmental engineering problems are very often located in a geological framework and in contact with the fluid layers of the Earth, where edaphic soils are formed. The products of geological activity (geological materials -minerals, rocks and soils-, geological structures and landforms) and the most important geological processes (magmatism, tectonics, erosion-sedimentation) are studied, including those that are potentially dangerous for the society. The objective of soil science is the edaphic soils, which form the skin of the earth's crust and which are essential for life. This module studies the different characteristics of soils (mineralogy, chemistry, texture and structure, physical properties, biology and ecology), the typology of soils, their formation and evolution processes, and degradation problems.

1. Identify the different types of materials and geological structures, as well as infer some basic mechanical or hydraulic properties.
2. Interpret geological maps and make simple geological cuts from cartographic information.
3. Characterize active geological environments and identify the processes that occur in them, particularly dangerous ones.

Geology and Edaphology. Environmental engineering problems are very often located in a geological framework. Basic knowledge of geology (geological materials including edaphic soils, active erosive and sedimentary geological environments, and hazardous geological processes), and soil science and methods for application to environmental engineering problems are provided.

STUDY LOAD

Type	Hours	Percentage
Hours large group	40,0	26.67
Self study	90,0	60.00
Hours small group	20,0	13.33

Total learning time: 150 h

CONTENTS

Introduction to the geology

Description:

1. Concept of geology 2. Geological materials: rocks and soils 3. The geological cycle of rocks 4. Texture and composition 5. Age

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m



The geologic materials

Description:

1. Concept of ore, primary mineral and secondary mineral 2. Chemical properties of minerals 3. Physical properties of minerals
1. Concepts of magma and igneous rock 2. Forms of location of igneous rocks Intrusive rocks: plutonic and filonian Extrusive or volcanic rocks: lavas and pyroclasts 3. Textures and mineral composition 4. Classification

PR1 - Igneous rock identification practice

1. Concept of surfperfcial formation
2. Review of weathering
3. Geomorphological environments
4. Types of surfperfcial formations

1. Concept of sedimentary surface formation 2. Erosion, transport and sedimentation 3. Detrital, chemical and organogenic formations

PR2. Sedimentary rock identification practice

1. Concept of metamorphism and metamorphic rock 2. Types of metamorphisms 3. Texture and mineral composition 4. Classification

PR3. Metamorphic rock identification practice

PR4. Rock identification review practice

Full-or-part-time: 43h 12m

Theory classes: 10h

Laboratory classes: 8h

Self study : 25h 12m

The geological structures

Description:

1. Causes of the deformation of geological materials 2. Folds 3. Fractures: faults and diaclasis

PM1.Practice of geological maps 1: The topographic map, maps with monoclinial structure

PM2. Practice of geological maps 2: maps with unconformities, apparent dip

PM3. Geological mapping practice 3: maps with faults

Full-or-part-time: 19h 12m

Theory classes: 2h

Practical classes: 6h

Self study : 11h 12m

Introduction to geological risks

Description:

Topic 8. Hazardous external geological processes

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m

Evaluation

Full-or-part-time: 14h 23m

Laboratory classes: 6h

Self study : 8h 23m



Introduction to soil science

Description:

1. Components and organization of soils 2. Soil formation: soil phases, solid phase, liquid phase 3. Gas phase 4. Soil as a natural system: functions

Full-or-part-time: 4h 48m

Theory classes: 2h

Self study : 2h 48m

Physical properties of soils

Description:

1. Genetic horizons: nomenclature and types. 2. Physical properties of soils (1): color 3. Physical properties of soils (2): texture and granulometry 4. Physical properties of soils (3): structure, real and apparent density, porosity 5. Taxonomy and classification of soils: diagnostic horizons

E1 - Granulometry, texture and porosity

Full-or-part-time: 12h

Theory classes: 3h

Practical classes: 2h

Self study : 7h

The organic matter and biologic activity in the soil

Description:

1. Composition of organic matter
2. Biological activity of the soil: edaphic fauna
3. The Carbon cycle and organic matter in the soil: processes of decomposition, mineralization and humification
4. Organic matter as a component of an ecosystem: factors that influence the dynamics of organic matter, ecosystem functions of organic matter.

5. The soil as a Carbon reservoir

E2 - Organic matter and determination of water content

Full-or-part-time: 9h 36m

Theory classes: 2h

Practical classes: 2h

Self study : 5h 36m

Water in the soil

Description:

1. Chemical properties of water 2. Water retention in the soil: states of saturation, field capacity, and permanent wilting point 3. Water potential 4. Water flow in the soil: available water, gravitational water, hygroscopic water 5 Soil water balance 6. Soil moisture and temperature regimes 7. Irrigation and drainage: redoximorphic features

E3 - Water in the soil: availability calculations

Full-or-part-time: 9h 36m

Theory classes: 2h

Practical classes: 2h

Self study : 5h 36m



The chemical properties of the soil

Description:

1. Cation exchange and exchange complex 2. pH 3. Salinity and sodicity 4. Nutrients in the soil
E3 - Complex of change, salinity and sodicity

Full-or-part-time: 12h

Theory classes: 3h

Practical classes: 2h

Self study : 7h

The problems of soil degradation

Description:

1. Loss of soil resources: water erosion, wind erosion and mass movements. 2. Soil degradation: physical, chemical and biological. 3. Actions on the territory to avoid/correct the degradation and loss of soil.
E4 - Exchange Complex, Salinity and Sodicity

Full-or-part-time: 9h 36m

Theory classes: 2h

Practical classes: 2h

Self study : 5h 36m

GRADING SYSTEM

The assessment includes: 1) Two partial exams, with a weight of 80% of the subject's grade (40% each partial). 2) Deliverables from practices and problems, with a total weight of 20% (10% geology and another 10% edaphology). Delivery of any assessable activity is mandatory. In case of failure to hand in an exam or two or more practice deliverables within the deadline indicated by the teaching staff, the student will be graded 'not presented' in the subject. Criteria for qualification and admission to the re-evaluation: Students suspended from the ordinary evaluation who have appeared regularly in the evaluation tests of the suspended subject will have the option to take a re-evaluation test in the period set in the academic calendar. Students who have already passed or students classified as not present will not be able to take the reevaluation test of a subject. The maximum grade in the case of taking the reassessment exam will be five (5.0). The non-attendance of a student called to the re-evaluation test, held in the fixed period, cannot give rise to the completion of another test with a later date. Extraordinary assessments will be carried out for those students who, due to accredited force majeure, have not been able to take any of the ordinary assessment tests. These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will be carried out within the corresponding teaching period.

EXAMINATION RULES.

Practice sessions are held in medium groups.

Each week the schedule of the practice group alternates so that the same group does not always have the last hour of the afternoon. This schedule is indicated in the subject calendar that is published at the beginning of the semester in Atenea.

It is mandatory to respect the schedule of the practice group. Access to the classroom will not be allowed outside the hours of the assigned practice group. If you do not show up for a practice at the assigned time, it will be classified as "no show".



BIBLIOGRAPHY

Basic:

- Tarbuck, E.D.; Lutgens, F.K.. Ciencias de la Tierra : una introducción a la geología física [on line]. 10a ed. Madrid: Pearson Educación, 2015 [Consultation: 02/02/2021]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=3937. ISBN 9788490352816.
- Plummer, Ch.C., Carlson, Diane H.; McGeary, David. Physical Geology. 11th ed.. Boston [etc.]: McGraw-Hill, 2007. ISBN 0071107258.
- Gutiérrez Elorza, M. Geomorfología [on line]. Madrid: Prentice Hall, 2008 [Consultation: 08/02/2023]. Available on: https://www.ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1256. ISBN 9788483223895.
- Porta, J.; López-Acevedo, M.; Roquero de Luburu, C. Edafología : para la agricultura y el medio ambiente [on line]. 3ª ed. rev. y ampl. Madrid: Mundi-Prensa, 2003 [Consultation: 10/10/2023]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=3175768>. ISBN 8484761487.
- Honorato Pinto, R. Manual de edafología. 4a ed. México, D.F: Alfaomega, 2000. ISBN 970150531X.
- Porta, J., López-Acevedo, M., Poch, R.M.. Introducció a l'edafologia : ús i protecció del sòl. Madrid: Mundi-Prensa, 2009. ISBN 9788484763857.
- Weil, R.R., Brady, N.C. The nature and properties of soils. 15th ed., Global ed. Harlow, England: Pearson, 2017. ISBN 9781292162232.