Course guide

2500209 - GECGEOEDAF - Geology and Edaphology

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: 2020  ECTS Credits: 6.0  Languages: Catalan

LECTURER

Coordinating lecturer: FRANCISCO JOSE GARCIA RUIZ, JOSEP MARIA SALVANY DURAN
Others: MARIPAU FERNANDEZ POMBO, FRANCISCO JOSE GARCIA RUIZ, JOSEP MARIA SALVANY DURAN, DANIEL TARRAGÓ MUNTÉ

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 course consists of 2 hours per week of classroom activity (large size group) and 1 hour weekly with half the students (medium size group).

The 2 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1 hour in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.
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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
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</tbody>
</table>

Total learning time: 150 h

CONTENTS

**Topic 1 - Introduction to the geology**

**Description:**

**Full-or-part-time:** 4h 48m
Theory classes: 2h
Self study : 2h 48m

**Topic 2 - Minerals**

**Description:**

**Full-or-part-time:** 4h 48m
Theory classes: 2h
Self study : 2h 48m
### Topic 3 - The igneous rocks

**Description:**
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

**R1 - Practice of intrusive igneous rocks**
**R2 - Practice of extrusive igneous rocks**

**Full-or-part-time:** 9h 36m
- Theory classes: 2h
- Laboratory classes: 2h
- Self study: 5h 36m

### Topic 4 - The superficial deposits

**Description:**
1. Concept of residual surface formation
2. The external geological cycle
3. Physical weathering
4. Chemical weathering
1. Concept of sedimentary surface formation
2. Erosion, transport and sedimentation
3. Detrital, chemical and organogenic formations

**Full-or-part-time:** 9h 36m
- Theory classes: 4h
- Self study: 5h 36m

### Topic 5 - The sedimentary rocks

**Description:**
1. Sediment lithification
2. Detrital rocks
3. Evaporitic rocks
4. Carbonated rocks

**R3 - Practice of detrital rocks**
**R4 - Practice of carbonated and evaporitic rocks**

**Full-or-part-time:** 9h 36m
- Theory classes: 2h
- Laboratory classes: 2h
- Self study: 5h 36m

### Topic 6 - Metamorphic rocks

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

**R5 - Practice of metamorphic rocks**

**Full-or-part-time:** 7h 11m
- Theory classes: 2h
- Laboratory classes: 1h
- Self study: 4h 11m
Topic 7 - The structural geology

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

M1 - The topographic map
M2 - Maps with monoclinals
M3 - Maps with discrepancies
M4 - Maps with faults
M5 - Maps with folds

Full-or-part-time: 28h 47m
Theory classes: 2h
Practical classes: 10h
Self study: 16h 47m

First partial exam

Full-or-part-time: 4h 48m
Laboratory classes: 2h
Self study: 2h 48m

Topic 8 - 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: 7h 11m
Theory classes: 3h
Self study: 4h 11m

Topic 9 - The soil morphology

Description:
1. The horizons
2. Observable attributes
3. Granulometry and texture
4. Real and apparent density
5. Porosity

E1 - Granulometry, texture and porosity

Full-or-part-time: 12h
Theory classes: 3h
Practical classes: 2h
Self study: 7h

Topic 10 - The organic matter and biologic activity in the soil

Description:
1. Soil as a reservoir of C
2. Decomposition, mineralization and humification
3. Organic matter as a component of an ecosystem

E2 - Organic matter and determination of water content

Full-or-part-time: 12h
Theory classes: 3h
Practical classes: 2h
Self study: 7h
Item 11 - Water in the soil

Description:

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study: 4h 11m

Theme 12 - The chemical properties of the soil

Description:
E3 - Complex of change, salinity and sodicity

Full-or-part-time: 9h 36m
Theory classes: 2h
Practical classes: 2h
Self study: 5h 36m

Item 13 - The problems of soil degradation

Description:
1. Physical degradation 2. Chemical degradation 3. Biological degradation

Full-or-part-time: 9h 36m
Theory classes: 4h
Self study: 5h 36m

Second partial examination

Full-or-part-time: 7h 11m
Laboratory classes: 3h
Self study: 4h 11m

GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.
BIBLIOGRAPHY

Basic: