250677 - Environmental Geology

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: JOSE MOYA SANCHEZ
Others: CLÀUDIA ABANCÓ MARTÍNEZ DE ARENZANA, ALBERT FALQUES CASANOVAS, MARCEL HURLIMANN ZIEGLER, JOAN MARTÍNEZ BOFILL, JOSE MOYA SANCHEZ

Opening hours
Timetable: By appointment

Degree competences to which the subject contributes

Specific:
13340. Apply scientific concepts to environmental problems and their correlation with technological concepts.

13348. Perform, present and defend before a university tribunal an original exercise performed individually, consisting of a comprehensive study or project in the field of environmental engineering, in which the skills acquired in the lessons are synthesized by adopting the advances and developments in this field and many innovative ideas.

Transversal:
8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

8563. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology
The course consists of 3 hours per week of classroom activity. Half of the time is for theory sessions and the other half is dedicated to solving of problems and the study of real cases.

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
CE01 - Apply scientific concepts to environmental problems and their correlation with technological concepts.

CE08-Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Explore scientific concepts and technical principles of quality management of the receiving means, atmosphere, water and soil, and applied to problem solving.

Explore scientific concepts and technical principles of management and treatment of gaseous emissions, water supply,
sewage and waste and remediation techniques for groundwater and contaminated soils.
Sized systems for the treatment of major pollutants vectors in specific sectors of activity.
Interprets rules, identifies goals, assesses technical alternatives proposed unconventional solutions and priority actions.

The river basin: surface water system and groundwater systems. Deltas. Water resources, vulnerability and protection.
Impact on the physical environment of urban expansion and major infrastructures (road works, tunnels, dams, reservoirs, ...). Alteration of natural physical systems.
Resources use and extraction. Spills and waste dumps. Impacts and restoration.
Geological aspects of waste storage.


Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Theory classes: 19h 30m</th>
<th>15.60%</th>
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</thead>
<tbody>
<tr>
<td>Practical classes: 9h 45m</td>
<td>7.80%</td>
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<tr>
<td>Laboratory classes: 9h 45m</td>
<td>7.80%</td>
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<tr>
<td>Guided activities: 6h</td>
<td>4.80%</td>
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<tr>
<td>Self study: 80h</td>
<td>64.00%</td>
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</table>
### Content

<table>
<thead>
<tr>
<th>Topic 1. Organization of natural systems</th>
<th>Learning time: 7h 11m</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>Description of the Earth system and its constituents and interactions</td>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>The carbon cycle</td>
<td>Self study : 4h 11m</td>
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</tbody>
</table>

**Specific objectives:**
- Provide an integrating vision of the various subsystems that make up our planet, the intense interaction between them and the results of the interactions
- Identify in a practical and quantitative way the different components of the cycle of an essential nutrient and its relative weight. Illustrate the intimate interdependence of the various terrestrial subsystems.

<table>
<thead>
<tr>
<th>Topic 2. The pedologic system</th>
<th>Learning time: 7h 11m</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 1h 30m</td>
</tr>
<tr>
<td>The alteration of rocks and soil formation. Fertility. Degradation, erosion and pollution. Desertification</td>
<td>Laboratory classes: 1h 30m</td>
</tr>
<tr>
<td>Field practice on identification of pedogenic soils</td>
<td>Self study : 4h 11m</td>
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</tbody>
</table>

**Specific objectives:**
- To discuss the characteristics of pedogenic soils, the processes of formation and degradation, as well as their significance
- Exercise of characterization of a pedogenic soil and identification of its degree of development

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<thead>
<tr>
<th>Item 3. The surface and underground water system</th>
<th>Learning time: 14h 23m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>The hydrological cycle. Aquifers. Water balance. Vulnerability and protection</td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td>Water balance of a river basin</td>
<td>Self study : 8h 23m</td>
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</table>

**Specific objectives:**
- Introduce the evaluation of water resources and provide criteria for their protection
- Exercise to quantify the available water resources on a river basin
## Topic 4. In situ reconnaissance

**Learning time:** 7h 11m  
Theory classes: 2h  
Practical classes: 1h  
Self study: 4h 11m

**Description:**  
Description of the field reconnaissance techniques for the evaluation of environmental impacts.  
Application of techniques to a real case

## Topic 5. Natural Disasters

**Learning time:** 21h 36m  
Theory classes: 3h  
Practical classes: 3h  
Laboratory classes: 3h  
Self study: 12h 36m

**Description:**  
Prediction and prevention.  
Evaluation of susceptibility and landslide hazard by means of GIS  
Analysis and discussion of a case

**Specific objectives:**  
Introduce mechanisms that give rise to natural hazards and assessing their impact  
Practice of susceptibility and hazard assessment  
Develop criteria for evaluation of dangerous landslides

## Topic 6. Environmental geochemistry and mineralogy

**Learning time:** 7h 11m  
Theory classes: 2h  
Laboratory classes: 1h  
Self study: 4h 11m

**Description:**  
Description of real cases of geochemical and mineralogical contamination  
Analysis of a real case of geochemical contamination

**Specific objectives:**  
Knowledge of pollution processes linked to geological materials  
Exercise for identifying and evaluating a real problem of contamination
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Specific objectives</th>
<th>Learning time</th>
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</thead>
<tbody>
<tr>
<td><strong>Topic 7. Exploitation of mineral resources. Impact and restoration</strong></td>
<td>Use and resource extraction. Spills and waste dumps. Restoration. Waste storage</td>
<td>Analysis of impacts associated with the extraction of mineral resources</td>
<td><strong>Learning time:</strong> 4h 48m</td>
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<tr>
<td></td>
<td><strong>Description:</strong></td>
<td><strong>Specific objectives:</strong></td>
<td><strong>Theory classes:</strong> 2h</td>
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<td><strong>Self study:</strong> 2h 48m</td>
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<tr>
<td><strong>Topic 8. Management of fluvial systems and water reservoirs</strong></td>
<td>Climate and global change: impact and adaptation strategies. Sustainable management. Discussion of the need for sustainable management of river areas and the possible alternatives of a real case</td>
<td>Presentation of future challenges and alternatives for managing the fluvial systems Identification of the problems derived from the non-sustainable management of river systems and analysis of alternatives</td>
<td><strong>Learning time:</strong> 7h 11m</td>
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<tr>
<td></td>
<td><strong>Description:</strong></td>
<td><strong>Specific objectives:</strong></td>
<td><strong>Theory classes:</strong> 2h</td>
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<td></td>
<td></td>
<td></td>
<td><strong>Laboratory classes:</strong> 1h</td>
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<td><strong>Self study:</strong> 4h 11m</td>
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<tr>
<td><strong>Topic 9. The environmental project on civil infrastructures</strong></td>
<td>Impact on the physical environment of public works and urban development (road works, foundations, tunnels, dams and reservoirs). Physical alteration of natural systems Impact exercise on assessment of the physical environment due to the construction of a road work</td>
<td>Identify the impacts of different works on the physical environment Assess and quantify the environmental impact</td>
<td><strong>Learning time:</strong> 7h 11m</td>
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<tr>
<td></td>
<td><strong>Description:</strong></td>
<td><strong>Specific objectives:</strong></td>
<td><strong>Theory classes:</strong> 1h 30m</td>
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<td></td>
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<td><strong>Practical classes:</strong> 1h 30m</td>
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<td><strong>Self study:</strong> 4h 11m</td>
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<tr>
<td><strong>Directed work. evaluation</strong></td>
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<td><strong>Learning time:</strong> 9h 36m</td>
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<td><strong>Laboratory classes:</strong> 4h</td>
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<td><strong>Self study:</strong> 5h 36m</td>
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Qualification system

The mark of the course is obtained from the ratings of continuous assessment on classroom and form the qualification of deliverables for scheduled practical activities.

Regulations for carrying out activities

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

Bibliography

Basic:
