250679 - Socio-Environmental Statistics and Decision-Making

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, English

Teaching staff
Coordinator: AGUSTÍ PÉREZ FOGUET
Others: AGUSTÍ PÉREZ FOGUET

Opening hours
Timetable: Tuesday 14-16h. C2 310

Degree competences to which the subject contributes

Specific:
9240. The ability to develop advanced approaches to analysing and assessing the sustainability of the built environment, including buildings, infrastructure and transport, which minimise their impact, and to choose the most appropriate options in agreement with one or more of the economic, social and environmental principles of sustainability.
13340. Apply scientific concepts to environmental problems and their correlation with technological concepts.

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.
8562. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
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.
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Teaching methodology

The course consists of 1.5 hours per week of classroom activity (large size group) and 1.5 hours weekly with half the students (medium size group).

The 1.5 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 1.5 hours 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

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.

Introduction to social and environmental statistics.
Multivariate statistics. Data about their composition.
Several criteria for decision making. Discrete methods.
Multiobjective optimization. Pareto efficiency.
Genetic and evolutionary algorithms.
Probabilistic graphical models.

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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<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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<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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## Content

<table>
<thead>
<tr>
<th>Course contents</th>
<th>Learning time: 93h 36m</th>
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<tbody>
<tr>
<td>Introduction to social and environmental statistics</td>
<td>Theory classes: 32h</td>
</tr>
<tr>
<td>Multivariate statistics</td>
<td>Practical classes: 7h</td>
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<tr>
<td>Decision-making. Utility theory. Risk and uncertainty</td>
<td>Self study: 54h 36m</td>
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<tr>
<td>Several criteria for decision-making.</td>
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<tr>
<td>Multi-objective optimization. Pareto efficiency.</td>
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<td>Genetic and evolutionary algorithms</td>
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<td>Probabilistic graphical models</td>
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<tr>
<td>Course activities</td>
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## Qualification system

The mark of the course is obtained from the ratings of continuous assessment. Continuous assessment consist in two activities, one to be done individually and another in group, and a written exam. 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, including computing programming, results discussions, and oral and written presentation in predefined formats.

## Regulations for carrying out activities

Failure to perform a continuous assessment activity in the scheduled period will result in a mark of zero in that activity. The group activities can be qualified considering individual contributions.

## Bibliography

### Basic: