Course guide  
480071 - BISS - Biodiversity and Socio-Ecological Systems  

Unit in charge: Barcelona School of Civil Engineering  
Teaching unit: 731 - OO - Department of Optics and Optometry.  
Degree: MASTER'S DEGREE IN SUSTAINABILITY SCIENCE AND TECHNOLOGY (Syllabus 2013). (Optional subject).  
Academic year: 2022  
ECTS Credits: 5.0  
Languages: Spanish, English  

LECTURER  
Coordinating lecturer: JORDI MORATO FARRERAS  
Others:  

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES  

Specific:  
3. The capacity to apply the methods and tools used in the identification, information management, planning, management, execution and evaluation of programmes and projects in the fields of sustainability and environmental management to specific problems in a collaborative manner.  
4. The ability to design, develop and apply, in an integrated and coordinated manner, the theories and analytical techniques of the social, economic and Earth sciences, as well as management and research-action techniques and approaches based on sustainability science and technology in the fields of biodiversity and natural resources, the built environment and services, and production systems and information.  
2. The ability to critically analyse theories and perspectives on the traits and properties of the geosphere and biosphere that facilitate and frame the development of socio-environmental systems, as well as the main challenges posed by climate change.  
5. The ability to integrate knowledge of integrated management of the natural environment and natural resources, particularly water and energy resources, in the development and proposal of scientific and technological solutions to challenges to sustainability.  
6. The ability to apply the methods and tools used in the integrated management of the natural environment and natural resources in the identification, information management, planning, management, execution and assessment of programmes and projects in the fields of food and rural development.  
7. The ability to apply the methods and tools used in the integrated management of the natural environment and natural resources in the identification, information management, planning, management, execution and assessment of programmes and projects in water engineering and technology.  

General:  
9. Develop and / or implement innovative ideas in a research context by identifying and formulating hypotheses and by submitting to prove objectivity, consistency and viability.  

Transversal:  
1. 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 following teaching methods will be used in the development of the course:

Lecture or conference (EXP): Sharing knowledge through lectures by professors or by external guest speakers.
Tutorials of practical or theoretical works (TD): to perform an activity in the classroom, or a theoretical or practical exercise, individually or in small groups, with the advice of the teacher.
Carry out a project, activity or work of reduced scope (PR): to carry out, individually or in a group, of a homework assignment of reduced complexity or scope, applying knowledge and presenting results.
Evaluation Activities (EV)

Training activities:

The following training activities will be used in the development of the course:

Face-to-face
Theoretical classes and conferences (CTC): knowledge, understanding and synthesis of contents presented by the lecturer (professor) or by guest speakers.
Practical classes (CP): participation in group exercises, as well as discussions and group dynamics, with the teacher and other students in the classroom.
Theoretical/practical work tutorials (TD): carry out in the class an activity or exercise, theoretical or practical in nature, individually or in small groups, with the advice of the professor.

Remote
Carry out a project, activity or work of reduced scope (PR): to carry out, individually or in a group, of a homework assignment of reduced complexity or scope, applying knowledge and presenting results.
Autonomous study (EA): study or development of the subject individually or in groups, understanding, assimilating, analysing and synthesising knowledge.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the student:

Will learn the principles and instruments of ecology. Will understand and be able to analyze the relationships between living organisms and the environment, the structure and dynamics of populations and ecosystems, the metabolism of ecological systems and the available tools for measuring, management and recovery through environmental services.

Will know and understand the interrelationships of water cycles, hydrologic principles, characteristics of different water resources, quantitative and qualitative problems of surface and groundwater, as well as the main treatment technologies and more extended integrated management mechanisms.

Will understand the need of water and energy resources for sustainable human development and will know the changes along the process from the source to the service and supply of resources as well as its security constraints and quality.

Will be able to critically and holistically analyze energy systems at global and local scale, considering the complex relationships between the economy, the environment and society that influence them. Will be able to provide original ideas in the search for solutions and alternatives to current problems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>15,0</td>
<td>12.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>24.00</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>64.00</td>
</tr>
</tbody>
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Total learning time: 125 h
## CONTENTS

### 1. Analysis framework and levels of organization.

**Description:**

2. Scales of work. From global ecology to the micro scale.
3. Levels of organization.
5. Composition of living matter.

**Related activities:**


**Full-or-part-time:** 12h 25m  
Guided activities: 2h  
Self study : 10h 25m

### 2. Biodiversity. Concepts, measurement, international policies.

**Description:**

2. Measure of biodiversity
3. Biodiversity Crisis
4. Worldwide Policy

**Related activities:**


**Full-or-part-time:** 11h 45m  
Theory classes: 2h  
Guided activities: 1h  
Self study : 8h 45m

### 3. Ecosystem services.

**Description:**

1. Environmental and ecosystem services.
2. Economic valuation of environmental goods and services. Methods and tools.
4. Case studies.

**Related activities:**

Sessions. Classroom work.

**Full-or-part-time:** 13h 25m  
Theory classes: 2h  
Guided activities: 1h  
Self study : 10h 25m

**Description:**
1. Distribution and abundance of populations.
2. Environmental factors, which affect growth. Ecological niche.
4. Evolutionary strategies and interaction among species.
5. Metabolic diversity. Ecosystem functioning.
6. Food chains and energy flows.

**Related activities:**
Sessions. Classroom work. Activity 2: Environmental factors that affect living beings

**Full-or-part-time:** 13h 25m  
Theory classes: 2h  
Guided activities: 1h  
Self study: 10h 25m

### 5. Biofilms and Biofilms based Natural Treatment Technologies

**Description:**
1. Biofilms
2. Biofilms based Natural Treatment Technologies

**Related activities:**
Sessions. Classroom work. Activity 4: ciclo del nitrógeno

**Full-or-part-time:** 13h 25m  
Theory classes: 2h  
Guided activities: 1h  
Self study: 10h 25m

### 6. Mitigation, adaptation and ecosystems resilience.

**Description:**
1. Biophysical limits of the planet  
3. Biofilms as complex communities.  
4. Resilience and adaptation. Adaptive strategies at different scales.  
5. Vulnerability and resilience.  
6. Mitigation.

**Related activities:**

**Full-or-part-time:** 13h 25m  
Theory classes: 2h  
Guided activities: 1h  
Self study: 10h 25m
### 7. Natural resources, Traditional Ecological Knowledge and Intangible Cultural Heritage

**Description:**
1. History and environmental impact of resource use.
2. Sustainable Development.
4. Agriculture and environment.
5. Traditional Ecological Knowledge and Intangible Cultural Heritage

**Related activities:**
Sessions. Classroom work. Activity 7: Impact of agriculture on climate change.

**Full-or-part-time:** 13h 25m  
Theory classes: 2h  
Guided activities: 1h  
Self study : 10h 25m

### 8. Integrated and sustainable natural resources management.

**Description:**
3. Lifecycle Assessment (LCA).
4. Sustainability criteria in territorial planning.
5. Frameworks. DPSIR models. Population management
6. Natural treatment systems.
7. Good practices for adaptation to climate change.

**Related activities:**
Sessions. Classroom work. Activity 8: Analysis of EIA conducted in mobility infrastructure

**Full-or-part-time:** 13h 25m  
Theory classes: 2h  
Guided activities: 1h  
Self study : 10h 25m


**Description:**
1. SETS  
2. Appropriate Technologies  
3. Resilience Operative Principles

**Full-or-part-time:** 14h 20m  
Theory classes: 2h  
Guided activities: 1h 05m  
Self study : 11h 15m

### 10. Visit & Field Trip on Sant Llorenç del Munt i Serra de l'Obac Natural Park

**Description:**
Morning Visit to Natural Park (6 h)

**Full-or-part-time:** 6h  
Guided activities: 6h
ACTIVITIES

A1. ORGANIZATIONAL LEVELS

Description:
Micro scale to macro scale
Presentation highlighting the connection between the different scales of work in ecology.

Material:
Presentation in PDF

Delivery:
No

Full-or-part-time: 0h 25m
Theory classes: 0h 25m

A2. CARBON CYCLE AND FOSSIL FUELS

Description:
Impact of fossil fuels on the carbon cycle video.

Material:
Video

Delivery:
Synthesis and analysis problem

Full-or-part-time: 0h 30m
Theory classes: 0h 30m

A3. ENVIRONMENTAL FACTORS THAT AFFECT LIVING THINGS

Description:
Identify factors in the growth of living things environmental factors. Workgroups

Delivery:
Ordered list of factors

Full-or-part-time: 0h 30m
Theory classes: 0h 30m

A4. ARTICLES ON BIODIVERSITY. WORKGROUPS

Description:
Review articles

Material:
Scientific articles

Delivery:
Abstract, keywords and problematic.

Full-or-part-time: 1h
Theory classes: 1h
## A5. B. HOLLING, RESILIENCE AND BIOPHYSICAL LIMITS OF THE PLANET

**Description:**
Video

**Material:**
Video (English)

**Delivery:**
No

**Full-or-part-time:** 0h 25m  
Theory classes: 0h 25m

## A7. IMPACT OF AGRICULTURE ON CLIMATE CHANGE

**Description:**
Video

**Material:**
Video (English)

**Delivery:**
No

**Full-or-part-time:** 0h 15m  
Theory classes: 0h 15m

## A8. EIA ANALYSIS IN MOBILITY INFRASTRUCTURE

**Description:**
EIA review and analysis. Workgroups

**Material:**
EIA

**Delivery:**
EIA critical analysis

**Full-or-part-time:** 1h  
Theory classes: 1h

## GRADING SYSTEM

The evaluation system is maintained.

- AV1 Individual Presentation Test (PE). 15%
- AV2 Activities carried out throughout the course (TR). 35%
- AV3 Quality and performance of group work (TG). 45%
- AV4 Annexes from Work Group (TG). 5%
BIBLIOGRAPHY

Basic: