

Course guide

480071 - BISS - Biodiversity and Socio-Ecological Systems

Last modified: 07/07/2023

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: 2023 **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.

Generical:

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

Type	Hours	Percentage
Hours medium group	12,0	9.60
Hours large group	24,0	19.20
Self study	80,0	64.00
Hours small group	9,0	7.20

Total learning time: 125 h

CONTENTS

1. Analysis framework and levels of organization.

Description:

1. Ecology. Framework of study of ecology. Divisions and specializations of ecology.
2. Scales of work. From global ecology to the micro scale.
3. Levels of organization.
4. Origin of Life.
5. Composition of living matter.
6. Biogeochemical cycles. Carbon Cycle. Nitrogen cycle.

Related activities:

Sessions. Classroom work. Activity 1a: Levels of organization. Activity 1b: carbon cycle and fossil fuels.

Full-or-part-time: 12h 25m

Guided activities: 2h

Self study : 10h 25m

2. Biodiversity. Concepts, measurement, international policies.

Description:

1. Concepts and elements of biodiversity.
2. Measure of biodiversity
3. Biodiversity Crisis
4. Worldwide Policy

Related activities:

Sessions. Classroom work. Activity 1: Articles on biodiversity. Working Group.

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.
3. Biodiversity and business.
4. Case studies.

Related activities:

Sessions. Classroom work.

Full-or-part-time: 13h 25m

Theory classes: 2h

Guided activities: 1h

Self study : 10h 25m

4. Population ecology. Operation, variability and ecosystems dynamics.

Description:

1. Distribution and abundance of populations.
2. Environmental factors, which affect growth. Ecological niche.
3. Ecosystem dynamics. Changes in communities.
4. Evolutionary strategies and interaction among species.
5. Metabolic diversity. Ecosystem functioning.
6. Food chains and energy flows.
7. Ecology of communities.

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
2. Resilience. Concepts and applications.
3. Biofilms as complex communities.
4. Resilience and adaptation. Adaptive strategies at different scales.
5. Vulnerability and resilience.
6. Mitigation.

Related activities:

Sessions. Classroom work. Activity 5: B. Holling, resilience and biophysical limits of the planet.

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.
3. Economic growth and resource use. Decoupling.
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:

- 1 Tools for assessment of environmental impacts. Ecological Footprint, EIA, stroke, and other indicators.
2. Risk assessment studies. Studies of environmental impact. Monitoring and evaluation of environmental impacts. Using the EIA in planning.
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

9. SETS & Appropriate Technologies – Resilience Working Principles

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). 10%

AV2 Activities carried out throughout the course (TR). 30%

AV3 Quality and performance of group work (TG). 40%

AV4 Annexes from Work Group (TG). 20%

BIBLIOGRAPHY

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