

Course guide

480092 - EI - Industrial Ecology

Last modified: 30/06/2023

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: MASTER'S DEGREE IN SUSTAINABILITY SCIENCE AND TECHNOLOGY (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: GEMMA CERVANTES TORRE-MARIN

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. The ability to critically analyse the features and work, business and environmental management methods and strategies of organisations, institutions and key agents for promoting sustainable human development, sustainability and environmental protection, particularly against climate change, by understanding and applying the concepts and theories of business ethics and social responsibility in the fields of engineering and scientific and technical innovation.
2. 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.
3. 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.

Transversal:

4. 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.

Problem solving and case studies (RP): group decision exercises, debates and group dynamics, with the teacher and students in the classroom; class presentation of an activity carried out individually or in small groups.

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 this module, the student will:

Knowledge and understanding of the principles of ecology and industrial metabolism and its main applications and implementation methodologies.

Development and application of concepts and theories of industrial ecology to solve sustainability challenges, identifying and formulating hypotheses or innovative ideas.

STUDY LOAD

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

Total learning time: 125 h

CONTENTS

1. INDUSTRIAL ECOLOGY CONCEPT. COMPARISON WITH CIRCULAR ECONOMY AND INDUSTRIAL SYMBIOSIS. ORIGIN OF IE

Description:

1.1 Concept of industrial ecology. 1.2 Comparison with circular economy and industrial symbiosis. 1.3 Natural and industrial ecosystems. 1.4 Origin of IE: history and other theoretical bases

Full-or-part-time: 6h

Theory classes: 3h

Guided activities: 3h

2. INDUSTRIAL ECOLOGY DEVELOPMENT IN THE WORLD

Description:

2.1 Map of examples of IE around the world. 2.2 The case of Kalundborg. 2.3 The Devens eco-industrial community. 2.4 The MESVAL project. 2.5 The by-product synergy in Tampico (México). 2.6 IE in agricultural systems. 2.7 Teaching, political, research IE initiatives.

Full-or-part-time: 12h

Theory classes: 4h

Guided activities: 8h

3. IE Methodological tools.

Description:

Description of different tools for the development of IE

Related activities:

Materials flow analysis

LCA

Full-or-part-time: 1h

Theory classes: 1h

4. IE Strategies, policies and legal systems.

Description:

Interactions between the concepts of sustainability in the context of IE, it is described from both policies and specific activities

Related activities:

Waste and solid legislation; BAT's in waste water treatment

Full-or-part-time: 9h

Theory classes: 3h

Guided activities: 6h

ACTIVITIES

A1. THE ORIGINS OF THE INDUSTRIAL ECOLOGY AND IE FLOW DIAGRAM

Description:

Scientific publication analysis.

Material:

Scientific publications.

Delivery:

Report of the IE origins.

A2. INDUSTRIAL ECOLOGY IN THE WORLD

Description:

Case study.

Delivery:

Presentation of the case by using powepoint.

A3. SPANISH AND EUROPEAN LEGISLATION

Description:

Analysis of the environmental legislation.

Material:

Legislation.

Delivery:

Presentation and discussion.

A4. APPLICATION OF BAT'S TO INDUSTRIAL WASTEWATER TREATMENT

Description:

BAT to industrial wastewater treatment in different industrial sectors.

Material:

BAT's published in Europe.

Delivery:

Report and presentation.

A5. MASS BALANCE ANALYSIS

Description:

Using the web www.materialflows.net to different countries.

Material:

web

Delivery:

Results



A6. LCA

Description:

Life Cycle Analysis Exercise.

Material:

Exercise

Delivery:

Results

GRADING SYSTEM

IN-CLASS ACTIVITIES OR HOMEWORK, INDIVIDUAL OR IN-GROUP, SHORT OR LONG, ORAL OR WRITTEN, 80%
FINAL PROJECT 20%

BIBLIOGRAPHY

Basic:

- Cervantes, G. Ecologia industrial. Barcelona: Fundació Carles Pi i Sunyer d'Estudis Autonòmics i Locals, 2007. ISBN 9788495417749.
- Graedel, T.E.; Allenby, B.R. Industrial ecology. 2nd ed. Upper Saddle River, New Jersey: Prentice Hall, 2003. ISBN 0130467138.
- Graedel, T.E.; Allenby, B.R. Industrial ecology and sustainable engineering. Int. ed. Boston: Pearson, 2010. ISBN 9780138140342.

RESOURCES

Other resources:

Provided in class