



## Course guides

### 480092 - EI - Industrial Ecology

**Last modified:** 15/06/2020

**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 2009). (Optional subject).  
MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Optional subject).

**Academic year:** 2020    **ECTS Credits:** 5.0    **Languages:** English

#### LECTURER

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**Coordinating lecturer:** JOAN DE PABLO RIBAS

**Others:**

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**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

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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

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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 large group	30,0	24.00
Self study	80,0	64.00
Guided activities	15,0	12.00

**Total learning time:** 125 h

## CONTENTS

### 1. Concepts, strategies and developments in the field of industrial ecology, and analysis and discussion of their contribution to sustainable development and industrial strategies.

#### Description:

Describe, explain and analyze the similarities and differences between an ecosystem and an industrial system. Define the concepts of industrial ecology, industrial metabolism and industrial symbiosis

#### Related activities:

The origins of the Industrial Ecology; IE flow diagram

### 2. The Industrial Ecology in the World.

#### Description:

Advantages and opportunities of IE from North-South perspective. Study of an emblematic case: Kalunborg (Denmark)

#### Related activities:

Case studies of IE in different parts of the world

### 3. Activities, strategies and policies: Cleaner Production, Best available techniques, Eco-efficiency, production networks, eco-parks.

#### 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

### 4. Methodological tools: mass flow analysis, substance flow analysis, life cycle analysis, environmental cost accounting, Industrial Ecology Indicators. The MESVAL Project: Research and Innovation.

#### Description:

Description of different tools for the development of IE

#### Related activities:

Materials flow analysis  
LCA



## ACTIVITIES

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### 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](http://www.materialflows.net) to different countries.

**Material:**

web

**Delivery:**

Results



## A6. LCA

**Description:**

Life Cycle Analysis Exercise.

**Material:**

Exercise

**Delivery:**

Results

## GRADING SYSTEM

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EV1: Written test (PE). 50%

EV2: Oral test (PO).

EV3: Individual or group coursework (TR). This includes results and reports and their oral presentation. 50%

EV4: Class and laboratory attendance and participation (AP).

EV5: Performance and quality of group work (TG).

## BIBLIOGRAPHY

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**Basic:**

- Cervantes, G. Ecologia industrial. Barcelona: Fundació Carles Pi i Sunyer d'Estudis Autònoms i Locals, 2007. ISBN 9788495417749.
- Graedel, T.E.; Allenby, B.R. Industrial ecology. 2nd ed. Englewood Cliffs, NJ: Prentice Hall, 2002. ISBN 0130467138.
- Graedel, T.E.; Allenby, B.R. Industrial ecology and sustainable engineering. Int. ed. Boston: Pearson, 2010. ISBN 9780138140342.

## RESOURCES

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**Other resources:**

Provided in class