

Course guide

330055 - TMS - Environmental Technologies and Sustainability

Last modified: 28/04/2025

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2016). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2016). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2016). (Compulsory subject).
BACHELOR'S DEGREE IN MINERAL RESOURCE ENGINEERING AND MINERAL RECYCLING (Syllabus 2021). (Compulsory subject).
BACHELOR'S DEGREE IN MINERAL RESOURCE ENGINEERING AND MINERAL RECYCLING / BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2024). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Ribas Fargas, David

Others: Conxita Lao Luque
Montserrat Solé Sardans
Montserrat Gómez Gamisans
Busquets Rubio, Pere
López Martínez, Cristina
Anticoi Sudzuki, Hernán Francisco

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

1. Basic knowledge and application of environmental technologies and sustainability.

Transversal:

2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world's situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.

3. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.

4. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

5. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

6. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

08 GEN. GENDER PERSPECTIVE: An awareness and understanding of sexual and gender inequalities in society in relation to the field of the degree, and the incorporation of different needs and preferences due to sex and gender when designing solutions and solving problems.

TEACHING METHODOLOGY

The subject consists of three hours a week of lectures (large group) and one hour a week of activities, problem solving, laboratory practicals, etc. (small group).

The directed learning hours consist in lectures in which the professor introduces the learning objectives for the subject and presents the basic subject matter. The practical class hours include exercises, debates, practicals, research and problem solving. Students are encouraged to actively participate in their own learning. Some of the activities are carried out in small groups and the generic teamwork competency is worked on.

Independent learning hours may be devoted to supervised reading, audiovisual displays, exercise solving, etc.

LEARNING OBJECTIVES OF THE SUBJECT

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Self study	90,0	60.00
Hours large group	45,0	30.00

Total learning time: 150 h

CONTENTS

1. SUSTAINABILITY

Description:

This content works on:

MODULE 1. THE STATE OF THE WORLD

- The world situation: economic, political, social and environmental
- Science, Technology and society. Economy and governance.

MODULE 2. DEVELOPMENT, ECONOMY AND SUSTAINABILITY

- Sustainable paradigm. Concept of sustainable development
- Measurement of sustainability. Indicators
- Cooperation and social commitment
- Agenda 2030. SDGs.

Full-or-part-time: 22h

Theory classes: 10h

Laboratory classes: 2h

Self study : 10h

2. ENVIRONMENTAL TECHNOLOGIES

Description:

This content works on:

MODULE 3. STRUCTURE OF THE ATMOSPHERE AND CLIMATE CHANGE

- The climate change

MODULE 4. ATMOSPHERIC POLLUTION

- Air environmental technology

MODULE 5. WATER POLLUTION

- Water environmental technology

MODULE 6. ENERGY FLOWS AND RENEWABLE ENERGY

- Natural resources, energy and sustainability
- Renewable energies

Related activities:

Full-or-part-time: 70h

Theory classes: 32h

Laboratory classes: 6h

Self study : 32h

3. ENVIRONMENTAL MANAGEMENT

Description:

This content works on:

MODULE 7. WASTE MANAGEMENT

- Environmental waste technology.
- Integrated waste environmental management systems.

MODULE 8. ENVIRONMENTAL MANAGEMENT

- Environmental management tools: corporate social responsibility, integrated product policy, environmental audits, environmental impact assessment, environmental management systems (ISO-14001 and EMAS), cleaner production, life cycle analysis, industrial ecology.

Full-or-part-time: 10h

Theory classes: 4h

Laboratory classes: 2h

Self study : 4h

ACTIVITIES

SUSTAINABILITY: PRACTICE 1, 2 and 3

Description:

- P1. Documentary sustainability and free market + debate
- P2. Cooperation
- P3. Critical Raw Materials and smartphones

Specific objectives:

At the end of this activity the student must be able to:

- Knowing the immediate causes that have led us to unsustainability.
- Know the origin of the DS concept and make a first approach to different specific proposals in order to achieve it.
- Know the social impact of the main mineral resources, specifically the technologically critical ones.
- Get to know the UPC's NGOs and cooperation agreements.

Full-or-part-time: 5h

Self study: 2h

Laboratory classes: 3h

ENVIRONMENTAL TECHNOLOGIES: PRACTICE 4, 5 AND 6

Description:

- P4. Laboratory: Acid rain.
- P5. Laboratory: Water hardness.
- P7. Photovoltaic energy practice and exercises.

Specific objectives:

At the end of this activity the student must be able to:

- Solve numerical problems, evaluation and data interpretation of issues related to water and air pollution.
- Knowing how to identify and quantify certain pollutants in water and air.
- Know the current energy situation and its alternatives.
- Sizing a small solar installation.

Full-or-part-time: 12h

Self study: 6h

Laboratory classes: 6h

ENVIRONMENTAL MANAGEMENT: PRACTICE 7

Description:

- P6. Recycling conceptual poster.

Specific objectives:

- Understand the concept of circular economy through an example of recycling.
- Know different techniques for separating and classifying materials.
- Understand the complexity behind any recycling process. It is important to prioritize elimination, reuse and reduction.

Full-or-part-time: 4h

Self study: 2h

Theory classes: 2h

GRADING SYSTEM

The subject is passed by continuous assessment if an overall grade greater than or equal to 5 is obtained by taking the weighted average of:

- The theoretical contents (75%). There are two partial tests (P1: 37.5%, P2: 37.5%).
- Practices/activities (25%). Some proposed tasks are evaluated: participation in debates, exhibitions, reports, flow charts, posters and exercises.

There is a make-up assessment for students who have not passed the subject by continuous evaluation, both of the content and the practices. The content can be recovered with a single P1+P2 exam (75%). The practices, through a global exam (25%).

EXAMINATION RULES.

Compulsory attendance in small group sessions (laboratory practices / activities)

BIBLIOGRAPHY

Basic:

- Masters, Gilbert M.; Ela, Wendell P. Introducción a la ingeniería medioambiental [on line]. 3ª ed. Madrid: Prentice Hall, 2008 [Consultation: 02/06/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=3884. ISBN 9788483224441.
- Xercavins, J., i altres. Desarrollo sostenible [on line]. Barcelona: Edicions UPC, 2005 [Consultation: 06/11/2020]. Available on: <http://hdl.handle.net/2099.3/36752>. ISBN 8483018055.
- Maymó, Jaume, coord. Ecoproducte, ecodisseny. Barcelona: Museu de les Arts Decoratives, 2005. ISBN 8476091664.
- Guía para el desarrollo de la norma de ecodiseño UNE 150301:2003, base de ISO 14006: evaluación de aspectos ambientales de producto [on line]. 3ª ed. Bilbao: IHOBE, 2011 [Consultation: 12/11/2020]. Available on: http://www.euskadi.eus/contenidos/documentacion/une150301/es_def/adjuntos/PUB-2004-038-f-C-001_UNE%20CAST.pdf.
- Fiksel, Joseph, ed. Ingeniería de diseño medioambiental: DFE :desarrollo integral de productos y procesos ecoeficientes. Madrid: McGraw-Hill, 1997. ISBN 8448107527.
- Mackenzie, Dorothy. Green design: design for the environment. London: Laurence King, 1991. ISBN 1856690962.
- Tchobanoglous, G.; Theisen, H.; Vigil, S. Gestión integral de residuos sólidos. Madrid: McGraw-Hill, 1994. ISBN 8448118308.
- Ayres, Robert U.; Ayres, Leslie W. Industrial ecology: towards closing the materials cycle. Cheltenham: Edward Elgar, 1996. ISBN 1858983975.
- Sadgrove, Kit. La ecología aplicada a la empresa. Madrid: Deusto, 1993. ISBN 8423412164.
- Bringezu, S.; Moriguchi, Y. "Material flow analysis". Ayres, R. U.; Ayres, L. W. A handbook of industrial ecology. Nothampton: Edward Elgar, 2001. p. 79-90.
- Clemente, G.; Sanjuán, N.; Vivancos, J. L., eds. Análisis de ciclo de vida: aspectos metodológicos y casos prácticos. Valencia: Universidad Politécnica de Valencia, 2005. ISBN 8497058526.
- Enger, E.; Smith, B. Field and laboratory activities for environmental science. 13a. McGraw Hill, 2013. ISBN 9780077599829.
- Molins, Francesc. Experiments i idees amb CO2. Hamburg: Schaukel Verlag, 2021. ISBN 9783982365312.

Complementary:

- ISO. UNE-EN ISO 14001:2015: Sistemas de gestión ambiental [on line]. Gineve: ISO, 2015 [Consultation: 10/06/2022]. Available on: https://portal-aenormas-aenor-com.recursos.biblioteca.upc.edu/aenor/Suscripciones/Personal/pagina_per_sus.asp.
- ISO. UNE-EN ISO 14040:2006: Gestión ambiental. Análisis del ciclo de vida. Principios y marco de referencia [on line]. Gineve: ISO, 2006 [Consultation: 10/06/2022]. Available on: https://portal-aenormas-aenor-com.recursos.biblioteca.upc.edu/aenor/Suscripciones/Personal/pagina_per_sus.asp.

RESOURCES

Other resources:

Pàgines web:

Web Tecnologia i Sostenibilitat:

<http://tecnologiaisostenibilitat.cus.upc.edu/> />Portal Sostenibilidad:

<http://portalsostenibilitat.upc.edu/> />Compra verde:

www.uab.cat/compraverda

Generalitat de Catalunya y ecodiseño:

www.gencat.net/mediamb/ipp/ecodisseny.htm

Productos sostenibles. IHOBE País Vasco

www.Productosostenible.net

Centro Catalan para el Reciclaje

<http://www.arc-cat.net/es/ccr/> />Ecoetiquetas

http://ec.europa.eu/environment/ecolabel/index_en.htm />