Course guides
330055 - TMS - Environmental Technologies and Sustainability

Last modified: 31/05/2020

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

Degree: 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 2009). (Compulsory subject).
BACHELOR'S DEGREE IN ENERGY AND MINING RESOURCE ENGINEERING (Syllabus 2012). (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 CHEMICAL ENGINEERING (Syllabus 2016). (Compulsory subject).

Academic year: 2020 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: PERE BUSQUETS RUBIO

Others: Conxita Lao Luque
Montserrat Gómez Gamisans

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.
7. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

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

On completion of the subject, students must be able to:
- Observe and analyse the world's complex reality from a sustainability perspective.
- Demonstrate knowledge of the causes that have led to the current unsustainable situation and particularly the role of technology.
- Demonstrate knowledge of the basic elements of human development and sustainability paradigms.
- Apply the concept of sustainability to engineering activities.
- Demonstrate knowledge of environmental technologies and their application in engineering.
- Understand and critically discuss environmental problems and propose solutions.
- Demonstrate knowledge of the main problems of water and air pollution and waste.
- Demonstrate in-depth knowledge of tools and practical methods for applying industrial ecology, such as ecodesign, waste management and clean manufacturing in a range of contexts. They must also be able to understand and apply energy and mass balances and the most common energy conversion systems.
- Present a topic orally with the support of audiovisual media.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

1. SUSTAINABILITY

Description:
This topic covers:
- The state of the world: economic, political, social and environmental
- Science, technology and society. Economics and governability
- Sustainability paradigm. Concept of sustainable development
-Agenda 2030. SDG.
- Sustainability measurement. Indicators
- Cooperation and social commitment

Related activities:
Related activities:
Lectures with audiovisual support in large groups.
Directed activities 1, 2 and 3 are practicals that include audiovisual materials and debate, research, data processing and the drawing up of a report, the oral presentation of a topic, the design of a poster and an individual continuous assessment test.

Full-or-part-time: 50h
Theory classes: 15h
Laboratory classes: 5h
Self study : 30h

2. ENVIRONMENTAL TECHNOLOGIES

Description:
This topic covers:
- Natural and energy resources and sustainability
- Renewable energies
- Environmental water technology
- Environmental air technology
- Environmental waste technology

Related activities:
Related activities:
Lectures with audiovisual support in large groups.
Directed activities 4, 5 and 6 are practicals that include audiovisual materials and debate, research, data processing and the drawing up of a report and an individual continuous assessment test.

Full-or-part-time: 50h
Theory classes: 15h
Laboratory classes: 5h
Self study : 30h

3. ENVIRONMENTAL MANAGEMENT / CLIMATE CHANGE

Description:
This topic covers:
- Environmental management tools: corporate social responsibility, integrated product policy, environmental auditing, environmental impact assessment, environmental management systems (ISO-14001 and EMAS), clean manufacturing, life cycle analysis, industrial ecology.
- Climate change

Related activities:
Related activities:
Lectures with audiovisual support in large groups.
Directed activities 7 and 8 are practicals that include audiovisual materials and debate, research, data processing and the drawing up of a report and an individual continuous assessment test.

Full-or-part-time: 50h
Theory classes: 15h
Laboratory classes: 5h
Self study : 30h

ACTIVITIES

SUSTAINABILITY: ACTIVITIES 1 AND 2 (TOPIC 1)

Description:
- Practical session on information resources
- Sustainability report
- Video on sustainability, development cooperation or social impact of mineral resources

Specific objectives:
On completion of the activity, students must be able to:
- Demonstrate knowledge of the immediate causes of unsustainability.
- Demonstrate knowledge of the origin of and proposals for sustainable development.
- Demonstrate knowledge of the social impact of the main mineral resources.
- Demonstrate knowledge of the bibliographic tools that are available in the field of sustainability.

Material:
Video, audiovisual, ATENEA virtual campus, internet

Delivery:
- A report and oral presentation of slides on sustainability(continuous assessment)

- Questionnaires

Full-or-part-time: 15h
Laboratory classes: 5h
Self study: 10h

ENVIRONMENTAL TECHNOLOGIES: ACTIVITIES 3 AND 4 (TOPIC 2)

Description:

- Laboratory practicals on water pollution
- Laboratory practicals on air pollution

Specific objectives:
On completion of the activity, students must be able to:
- Solve numerical problems and problems involving the evaluation and interpretation of data on water and air pollution.
- Identify and quantify given water and air pollutants.
- Demonstrate knowledge of the current energy situation and its alternatives.

Material:
Audiovisual materials, ATENEA virtual campus, databases, chemistry laboratories

Delivery:
- Questionnaires
- Reports on the laboratory practicals (continuous assessment)

Full-or-part-time: 15h
Laboratory classes: 5h
Self study: 10h

CLIMATE CHANGE

Full-or-part-time: 15h
Theory classes: 5h
Self study: 10h

GRADING SYSTEM

The final mark is calculated from the marks awarded for the following activities, according to the weighting shown:
Nfinal = 0,375 Np1 + 0,375 Np2 + 0,25 Naca
Nfinal: final mark
Np1: mark for the first individual test
Np2: mark for the second individual test
Naca: mark for continuous assessment activities

EXAMINATION RULES.

- No mark will be awarded for continuous assessment activities that have not been completed

BIBLIOGRAPHY

Basic:
- Mulder, K., ed. Desarrollo sostenible para ingenieros [on line]. Barcelona: Edicions UPC, 2007 [Consultation: 05/03/2018]. Available on: http://hdl.handle.net/2099.3/36831. ISBN 9788483018927.
- Masters, Gilbert M.; Ela, Wendell P. Introducción a la ingenieria medioambiental [on line]. 3ª ed. Madrid: Prentice Hall, 2008 [Consultation: 31/07/2020]. Available on: http://www.ingebook.com/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: 05/03/2018]. 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: 14/06/2019]. 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.
- Ayres, Robert U.; Ayres, Leslie W. Industrial ecology: towards closing the materials cycle. Cheltenham: Edward Elgar, 1996. ISBN 1858983975.
- 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.
- Tchobanoglous, G.; Theisen, H.; Vigil, S. Gestión integral de residuos sólidos. Madrid: McGraw-Hill, 1994. ISBN 8448118308.
- Sadgrove, Kit. La ecología aplicada a la empresa. Madrid: Deusto, 1993. ISBN 8423412164.
- 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.

Complementary:
- ISO. UNE-EN ISO 14001:2015: Sistemas de gestión ambiental [on line]. Géneve: ISO, 2015 [Consultation: 14/06/2019]. Available on: https://discovery.upc.edu/iii/encore/record/C__Rb1374799?lang=cat.
- ISO. UNE-EN ISO 14040:2006: Gestión ambiental. Análisis del ciclo de vida. Principios y marco de referencia [on line]. Géneve: ISO, 2006 [Consultation: 14/06/2019]. Available on: https://discovery.upc.edu/iii/encore/record/C__Rb1374799?lang=cat.

RESOURCES

Other resources:
Pàgines web:
Web Tecnologia i Sostenibilitat:
http://tecnologiaisostenibilitat.cus.upc.edu/
Portal Sostenibilidad:
http://portalsostenibilidad.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.Productososostenible.net
Centro Catalan para el Reciclaje
http://www.arc-cat.net/es/ccr/
Ecoetiquetas
http://ec.europa.eu/environment/ecolabel/index_en.htm