Universitat de Lleida

DEGREE CURRICULUM

ENVIRONMENT TECHNOLOGIES AND SUSTAINABILITY

Coordination: SOLÉ GUSTEMS, MIQUEL

Academic year 2019-20

ENVIRONMENT TECHNOLOGIES AND SUSTAINABILITY 2019-20

Subject's general information

<table>
<tr><td>Subject name</td><td>ENVIRONMENT TECHNOLOGIES AND SUSTAINABILITY</td></tr>
<tr><td>Code</td><td>102338</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Not informed</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Bachelor's degree in Industrial Organization and Logistics Engineering</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRALAB</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>0.6</td><td>2.4</td><td>3</td></tr>
<tr><td>Number of groups</td><td>3</td><td>2</td><td>2</td></tr>
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<tr><td>Coordination</td><td>SOLÉ GUSTEMS, MIQUEL</td></tr>
<tr><td>Department</td><td>ENVIRONMENT AND SOIL SCIENCES</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>1ECTS = 10h class work face-to-face + 15h of independent student</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan 95%
English 5%</td></tr>
<tr><td>Distribution of credits</td><td>3 credits for the theory in 1GG
2.4 credits for problems in 1GG
0.6 credits for practice in 2 GM</td></tr>
</table>

ENVIRONMENT TECHNOLOGIES AND SUSTAINABILITY 2019-20

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MARTÍ BERNADAS, JOAN FRANCESC	joanfrancesc.marti@udl.cat	6,3	
SOLÉ GUSTEMS, MIQUEL	miquel.sole@udl.cat	6,3	

Subject's extra information

Continuous work is recommended in order to achieve the objectives of the course, as well, frequently visit the Virtual Campus because, information related to the subject will be announced and teaching materials will be provided. There are no prerequisites for this course.

Learning objectives

When finishing the subject the student must be able to:

Detect, raise, analyze, model, make decisions and solve problems in the social, economic and environmental fields.

Know and use the tools and technologies to intervene in the direction of sustainability.

Know and use the most sustainable tools and technologies.

Get to know the problem of atmospheric emissions.

Get to know the atmospheric pollutants and the focus of pollution.

It provides controls, reductions and treatments for atmospheric pollution.

Get to know the problem of wastewater.

Get to know the water resources, plan the management and apply the appropriate treatments.

Get to know the problem of solid waste.

Get to know the main sources of conventional energy and renewable energy sources.

Get to know the systems of integral management of the energy.

It is capable of developing a technology that respects the environment and integrates in the work of engineering.

Get to know the different environmental and sustainability technologies and apply them to engineering.

It applies criteria of sustainability and the codes of practice of the profession.

Know a third language with an adequate level, both orally and in writing.

Write texts with the structure appropriate to the communication objectives. Present the text to an audience with the appropriate strategies and means.

Get to know and put into practice the way and dynamics of teamwork.

Carry out the tasks assigned based on the basic guidelines given by the teacher, deciding the time to use in each section, including personal contributions and extending the sources of information indicated.

Competences

Basic Competences

B01 That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of his/her field of study.

B02 That students know how to apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

B03 That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include a reflection on relevant social, scientific or ethical issues.

B04 That students can transmit information, ideas, problems and solutions to a specialized and non-specialized public.

B05 That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

General Competences

CG3. To synthesize basic and technological subjects, which enable them to learn new methods and theories, and provide them with versatility to adapt to new situations.

CG4. To solve problems with initiative, make decisions, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Chemical Engineering.

CG6. To implement specifications, regulations and mandatory rules.

CG7. To analyze and assess the social and environmental impact of technical solutions.

CG10. To work in a multilingual and multidisciplinary environment.

Specific Competences

CE16. To define the basic knowledge and applications of environmental technologies and sustainability.

Transversal Competences

CT4. To apply basic knowledge of entrepreneurship and professional environments.

CT5. To apply essential notions of scientific thinking.

Subject contents

1. Sustainability

1.1. Introduction.

1.2. Future and sustainability

1.2.1. Sustainable paradigm. Sustainable development

1.2.2. Sustainable industry

1.2.3. Models of development

1.2.4. Needs of change

1.3. Towards sustainability

1.3.1. New economy

1.3.2. The change to the renewables

1.3.3. Environmental impact

1.3.4. Ecological footprint

1.3.5. Work places

2. **Environmental air technology**

2.1. Atmosphere

2.2. Atmospheric contamination

2.3. Contaminants and pollution sources

2.4. Control strategies

2.5. Debugging techniques

3. Water management

3.1. Hydraulic resources and water cycle

3.2. Uses of water

3.3. Management in different uses

3.4. Process waters

3.4.1. Water analysis

3.4.2. Specific parameters

3.4.3. Potabilization and water treatment

3.4.4. Conditioning

3.5. Waste water

3.5.1. Pollution parameters

3.5.2. Characteristics of wastewater

3.5.3. Debugging

3.5.4. Quality parameters.

4. Waste management

4.1. Introduction

4.1.1. Type of waste

4.1.2. Legal framework

4.1.3. Classification and characterization of waste

4.1.4. Typologies and impacts

4.2. Industrial waste

4.2.1. Waste catalog

4.2.2. Models of management

4.2.3. Agents: Producers, Carriers and Managers

4.2.4. Minimization

4.2.5. Hazardous waste

4.3. Municipal waste

4.3.1. Selective collection

4.3.2. Household waste recycling center (HWRC)

4.3.3. Generation and collection

4.4. Containers

4.5. Processing and treatment facilities

4.6. Controlled deposits

5. Energy management

5.1. Impacts of energy on the environment

5.2. Future of energy and sustainability

5.3. Conventional energy sources

5.3.1. Disposal and energy consumption

5.3.2. Supply and commercial consumption of energy

5.3.3. The problem of the use of energy

5.4. Energy saving and efficiency

5.4.1. Sources of renewable energies

5.4.2. Energy management

6. Environmental management

6.1. Introduction to Environmental Management Systems (SGA)

6.1.1. The Initial Environmental Review in the EMAS

6.1.2. Environmental indicators

6.1.3. European Directive on Integrated Pollution Prevention and Control (IPPC)

6.1.4. Industrial Ecology

6.2. Improvement of the environmental behavior of the product

6.2.1. Integrated Product Policy (IPP)

6.2.2. Life Cycle Analysis (LCV); environmental management tool

6.2.3. Design of eco-products

6.2.4. Eco-labels

6.2.5. Environmental communication and green purchasing of products

Methodology

The development of the subject is done based on 3 actions:

1) Master classes

Exposure of the concepts, principles and fundamental relationships of each topic

Presentation of examples that illustrate its application

2) Problem classes

Discussion and resolution of exercises, problems and applications related to the concepts of each topic.

The problems proposed in the collection of problems of the subject are basically worked.

3) Laboratory practices (Exercises - problems)

Practical materialization of the concepts achieved.

Development plan

Week	Methodology	Subjects	Lecture hours	Independent student work hours
1	Lecture and problems.	Subject 1. Sustainability. Introduction Subject 2. Environmental air technology	4	6
2	Lecture and problems.	Subject 1. Future and sustainability Subject 2. Environmental air technology	4	6
3	Lecture and problems.	Subject 1. Towards sustainability Subject 2. Environmental air technology	4	6
4	Lecture and problems.	Subject 4. Waste management. Introduction Subject 2. Environmental air technology	4	6

5	Lecture and problems.	Subject 4. Industrial waste Subject 2. Environmental air technology	4	6
6	Lecture and problems.	Subject 4. Municipal waste Subject 2. Environmental air technology	4	6
7	Lecture and problems.	Subject 4. Waste management. Packaging. Processing and treatment plants Subject 2. Environmental air technology	4	6
8	Problems.	Subject 4. Waste management. Dumps Subject 2. Water management	4	6
9		Evaluation. Written test, subjects 1, 2 and 4.		
10	Lecture and problems.	Subject 5. Energy management. Introduction. Impacts Subject 3. Water management	4	6
11	Lecture and problems.	Subject 5. Conventional energy sources Subject 3. Water management	4	6
12	Lecture and problems.	Subject 5. Renewable energy sources Subject 3. Water management	4	6
13	Lecture and problems.	Subject 5. Energy management Subject 3. Water management	4	6
14	Lecture and problems.	Subject 6. Environmental Management Systems (EMS) Subject 3. Water management	4	6
15	Lecture.	Subject 6. Improvement of the environmental behavior of the product Subject 3. Water management	4	6
16		Evaluation. Written test, all subjects.		
17				
18		Tutorials		
19		Recovery		

Evaluation

Exams: 60%

1st. Partial will be done in the ordinary period. (30%)

2nd Partial will be done in the ordinary period. (30%)

Recovery will take place in the ordinary period.

Documents summary works 15%

Practices (exercises - problems) will be carried out in 25%

average group timetable within the same classroom.

The practices must be approved to be able to pass the subject.

Bibliography

BASIC:

- Martí Bernadas, Joan Francesc; Solé Gustems, Miquel. Tecnolgies mediambientals i sostenibilitat. EPS (2018).
- Tecnologia i Sostenibilitat [en línia]. Terrassa, Universitat Politècnica de Catalunya. Càtedra UNESCO de Sostenibilitat, 2010. Disponible en versió electrònica:

  http://tecnologiaisostenibilitat.cus.upc.edu

- Germain L. I altres. Tratamiento de las aguas. Barcelona: Omega, 1982. ISBN 84-282-0671-6
- Kiely, Gerard. Ingeniería Ambiental: Fundamentos, entornos, tecnologías y sistemas de gestión. Madrid: McGraw-Hill Interamericana de España, S.A.U., 1999. ISBN 0-07-709127-2..

COMPLEMENTARY:

- Glynn Henry, J.; W. Heinke, Gary. Ingeniería Ambiental. Méjico: Prentice Hall, 1999. 2ª edición. ISBN 970-17-0266-2.
- Manual para la gestión de los residuos urbanos. Madrid: La Ley, 2003. ISBN 84-9725-366-3.
- Tchobanoglous, G.; Theisen, H.; Vigil, S. Gestión integral de residuos sólidos. Madrid: McGraw-Hill, 1994. ISBN 84-481-1830-8.
- Torres, A.; Capdevila, I. Medi ambient i tecnologia: guia ambiental de la UPC. Barcelona: Edicions UPC, 1998. ISBN 84-8301-278-2. També disponible en versió electrònica:

  http://bibliotecnica.upc.es/EdUPC/locate4.asp?codi=EC006XXX