DEGREE CURRICULUM

ENERGY MANAGEMENT AND INTEGRATION

Coordination: CASTELL CASOL, ALBERT ORIOL

Academic year 2023-24

ENERGY MANAGEMENT AND INTEGRATION 2023-24

Subject's general information

<table>
<tr><td>Subject name</td><td>ENERGY MANAGEMENT AND INTEGRATION</td></tr>
<tr><td>Code</td><td>102150</td></tr>
<tr><td>Semester</td><td>2nd 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>Bachelor's Degree in Energy and Sustainability Engineering</td><td>3</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Double bachelor's degree: Degree in Mechanical Engineering and Degree in Energy and Sustainability Engineering</td><td>4</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>
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<tr><th>Activity type</th><td>PRAULA</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>3</td><td>3</td></tr>
<tr><th>Number of groups</th><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>CASTELL CASOL, ALBERT ORIOL</td></tr>
<tr><td>Department</td><td>INDUSTRIAL AND BUILDING ENGINEERING</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>60 h face-to-face (40%)
90 h autonomous work (60%)</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>English</td></tr>
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Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CASTELL CASOL, ALBERT ORIOL	albert.castell@udl.cat	3,6	
TERRIBAS SALA, XAVIER	xavier.terribas@udl.cat	3,6	

Subject's extra information

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Blue or white laboratory gown from UdL (unisex)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos
Centre the Cultures i Cooperació Transfronterera

http://www.publicacions.udl.cat/

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratoy gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.
- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following document of the *Servei de Prevenció de Riscos Laborals de la UdL*: http://www.sprl.udl.cat/alumnes/index.html

Learning objectives

The main objectives of the subject are:

- To learn the methodologies to perform energy audits.
- To learn the methodologies to measure and verify the savings achieved, both at energetic and economic level.

Competences

Basic

CB2. That students know how to apply their knowledge to their work or vocation in a professional way 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.

CB3. 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 issues of a social, scientific or ethical nature.

CB5. That the students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

General

CG12.To have knowledge about the fundamentals of automatisms and control methods.

Specific

CE12. To have applied knowledge about renewable energies.

CE15. To acquire the ability to understand, interpret and apply the legislation on energy and environment.

CE19. Acquire capacity for the control of facilities and energy systems and their energy efficiency.

Cross-cutting

CT2. Master a foreign language, especially English.

CT5. Acquire basic knowledge on scientific thinking.

Subject contents

Chapter 1 - Energy audits

Chapter 2 - Measurement and verification protocols

Chapter 3 - Companies on energy systems

Chapter 4 - Maintenance operation of energetic facilities and registry operation

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Chapter 5 - Sustainable economic-financial concepts applied to energy efficiency projects

Methodology

The methodological axes of the course will be divided into:

- **Flipped Learning:** The students learn new content using TIC out of the classroom and the lecturer identifies incorrect concepts or doubts.
- **Just-in-time sessions at class:** The lecturer provides feedback to the activities of flipped learning and the students do practical activities or individualized activities focussed on the incorrect concepts identified.
- **Master class:** In master classes the contents are presented orally by the lecturer with no active participation of the students.
- **Problems resolution:** In this activity, the lecturer presents a complex question that the students must solve, either individually or in group.
- **Team work:** Learning activity that must be developed in collaboration with the other members of a team.

Development plan

The development plan will follow the order of the content. This plan may be subject to change throughout the year as a function of the number of students, working groups, and the evolution of the class.

Week	Methodology	Topic	Lecture Hours	Autonomous work hours
1	Lecture	Introduction and subject presentation	2	3
1-5	Lecture Resolution of problems	Chapter 1. Energy audits	18	27
6-8	Lecture Resolution of problems	Chapter 2. Measurement and verification protocols	12	18
9				
10	Lecture Resolution of problems	Chapter 3. Companies on energy systems	4	6
11	Lecture Resolution of problems	Chapter 4. Maintenance operation of energetic facilities and registry operation	4	6
12 - 14	Lecture Resolution of problems.	Chapter 5. Sustainable economic-financial concepts applied to energy efficiency projects	12	18
15		Evaluation. Written Test.		
16-19		Evaluation. Written Test. Recovery		

Evaluation

Evaluation Blocks	%	Dates	C/V (1)	I/G (2)	Observations
Written exam	30	Week 16/17	C	I	A minimum mark of 4 to count for the average is required

Tests	10	Continued	C	I	
Oral presentation - Presentation: Current situation - Presentation: Study of improvements	 10 10	 Week 10 Week 15	 C C	 G G	
Project: Analysis of the current situation - Report Current situation	15	Week 10	C	G	
Project: Proposal and study of improvements - Report Study of improvements	25	Week 17	C	G	
Recovery exam	30	Week 19	C	I	A minimum mark of 4 to count for the average is required

(1) Compulsory/Voluntary

(2) Individual/Group

Alternative Evaluation: Exam of all the content of the course.

Bibliography

- Albert Thumann, Terry Niehus, William J. Younger. Handbook of Energy Audits Ninth Edition. CRC Press. Taylor & Francis Group.
- Wayne C. Turner and Steve Doty. Energy Management Handbook. Sixth Edition. CRC Press. Taylor & Francis Group.
- International Performance Measurement and Verification Protocol (IPMVP).
- International Energy Efficiency Financing Protocol (IEEFP).