Universitat de Lleida

DEGREE CURRICULUM

# ENERGY FACILITIES I

Coordination: MEDRANO MARTORELL, MARCO

Academic year 2023-24

# ENERGY FACILITIES I 2023-24

## Subject's general information

<table>
<tr><td>Subject name</td><td>ENERGY FACILITIES I</td></tr>
<tr><td>Code</td><td>102311</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>Bachelor's Degree in Energy and Sustainability Engineering</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Bachelor's Degree in Mechanical Engineering</td><td>4</td><td>OPTIONAL</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><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>3</td><td>3</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>MEDRANO MARTORELL, MARCO</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 of lectures (40%)<br>90 h independent student 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>
<tr><td>Distribution of credits</td><td>Marc Medrano 6 ECTS</td></tr>
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# ENERGY FACILITIES I 2023-24

| Teaching staff | E-mail addresses | Credits taught by teacher | Office and hour of attention |
|---|---|---|---|
| MEDRANO MARTORELL, MARCO | marc.medrano@udl.cat | 7,2 | |

## Subject's extra information

This subject requires continuous work throughout the semester in order to achieve the proposed objectives. It is recommended to visit frequently the site of the subject on the Virtual Campus, since most of the information and annoucements can be found there. This is a subject that belongs to module "Optative subjects", and to the subject "Energy Facilities". It is recommended that the students contact the professor directly using the email, rather than using the internal email services within the Campus Virtual. There are no previous requirements for this subject.

In this subject, results of projects and videos from **CYPECAD MEP software** are presented, a leading program for the design of a building's facilities. Students also receive precise instructions to be able to install it on their home computer, with the UdL's campus license.

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

- Blue or withe 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

- Be able to find, understand and synthesize information in foreign language.
- Provide the students an overview of the energy situation in the world and future prospects.
- Provide the students with the basic knowledge and current legislation concerning the various services of the buildings.
- Provide the students with the knowledge of the distribution and the elements that form the various services.
- Become familiar with the applicable technical and legal language.
- Understand the concepts associated to psychrometry and understand the importance of latent heat in air conditioning services.
- Be able to pre-size water, air conditioning, drainage, electrical, steam, and cogeneration installations, as well as renewable energy systems, applying the theoretical and basic fundamentals of the different specialities.

## Competences

- **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.
- **CB4**. That students can transmit information, ideas, problems and solutions to a specialized and non-specialized public.
- **EPS4/CB5**. That the students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.
- **CB5**. That the students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.
- **CG6**. Have adequate knowledge of the concept of the company, the institutional and legal framework of the company and the organization and management of companies.
- **CG15**. Have basic knowledge of production and manufacturing systems.
- **CG16**. To have basic knowledge and application of environmental technologies and sustainability.
- **CG17**. Have applied knowledge of business organization.
- **CE2**. Have applied knowledge of thermal engineering.
- **CE3**. Have applied knowledge of the fundamentals of fluid-mechanical systems and machines.
- **CE12**. To have applied knowledge about renewable energies.
- **CE15**. To acquire the ability to understand, interpret and apply the legislation on energy and environment.
- **CE16**. Acquire capacity to assess the impacts of energy resources through knowledge of the naturalenvironment and conduct energy and environmental audits.
- **UdL2/CT2**. Master a foreign language, especially English.
- **CT3**. Acquire training in the use of new technologies and information and communication technologies
- **CT4**. To acquire basic knowledge of entrepreneurship and professional environments.
- **EPS9**. Capacity for unidisciplinary and multidisciplinary teamwork.
- **GEM-EPS31**. Capacity to design HVAC installations (heating, ventilation and air conditioning).
- **GEM-EPS32**. Applied knowledge to distributed energy generation and energy use.
- **GEM-EPS33**. Capacity of analysis of energy systems, optimization and integration.

## Subject contents

**1. Introduction about energy in the World**

**2. Gas Installations**

**3. Electrical Installations**

**4. Fire protection**

**5. Distribution and supply of potable water**

**6. Sanitation**

**7. Common infrastructures of telecommunications (CIT)**

**8. Air conditioning**

**9. Steam Installations**

**10. Cogeneration**

**11. Renewable energies**

## Methodology

The methodological axes of the course will be divided into:

1.-Lecture sessions where the professor will either explain the theory or review the answers that the students have given after carrying out the previous work in the chapter (flipped classroom) and will work in class those concepts that have been more difficult to understand as well as the necessary calculation procedures to solve the problems in each chapter.

2.-Hands-on problem solving sessions, where the professor will solve some examples, but where students will take an active part in the learning process working in small groups or individually.

Students have the responsibility to strengthen their knowledge autonomously based on the teaching material provided or recommended by the professor.

## Development plan

The development plan will follow the order of the contents:

| Week | Methodology | Topic | Lecture Hours | Autonomous work hours |
|---|---|---|---|---|
| 1 | Flipped class | Subject presentation and 1. Introduction | 4 | 6 |
| 2 | Flipped class | 2. Gas Installations | 4 | 6 |
| 3-4 | Lecture. Resolution of problems. | 3. Electrical Installations | 8 | 12 |
| 5 | Flipped class | 4. Fire protection | 2 | 3 |

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|---|---|---|---|---|
| 5-6 | Lecture.<br>Resolution of problems. | 5. Distribution and supply of potable water | 6 | 9 |
| 7-8 | Lecture.<br>Resolution of problems. | 6. Sanitation | 5 | 7.5 |
| 8 | Flipped class | 7. Common infrastructures of telecommunications (CIT) | 3 | 4.5 |
| 9 | | Evaluation. Written test. | | |
| 10 | | Evaluation. Oral presentation of group project and report. | 4 | 6 |
| 11-12 | Lecture.<br>Resolution of problems.<br>Lab practice. | 8. Air conditioning | 6 | 9 |
| 12-13 | Flipped class<br>Resolution of problems. | 9. Steam Installations | 6 | 9 |
| 14 | Flipped class<br>Resolution of problems. | 10. Cogeneration | 4 | 6 |
| 15 | Flipped class | 11. Renewable energies | 4 | 6 |
| 16-19 | | Evaluation. Written Test. Recovery | | |

## Evaluation

**EVALUATION BLOCK 1 (30%)**: FIRST PARTIAL EXAM

- *EVALUATION ACTIVITY 1*: FIRST PARTIAL EXAM (individual activity)

- WEIGHT IN THE FINAL GRADE: 30%
- MINIMUM GRADE NECESSARY TO PASS THE SUBJECT: 3

**EVALUATION BLOCK 2 (25%)**: PROJECT ABOUT ENERGY FACILITY

- *EVALUATION ACTIVITY 2:* ORAL PRESENTATION OF THE NEW ENERGY FACILITY (oral individual activity)

- WEIGHT IN THE FINAL GRADE: 10%

- *EVALUATION ACTIVITY 3:* DELIVERY DOSSIER NEW ENERGY INSTALLATION (group activity)

- WEIGHT IN THE FINAL GRADE: 15%

**EVALUATION BLOCK 3 (30%)**: SECOND PARTIAL EXAM

- *EVALUATION ACTIVITY 4*: SECOND PARTIAL EXAM (individual activity)

- WEIGHT IN THE FINAL GRADE: 30%
- MINIMUM GRADE NECESSARY TO PASS THE SUBJECT: 3

**EVALUATION BLOCK 4 (15%)**: FLIPPED LEARNING FOLLOW-UP (individual activity)

- *EVALUATION ACTIVITY 5: OPEN QUESTIONS*

- WEIGHT IN THE FINAL GRADE: 5%

- *EVALUATION ACTIVITY 6: TEST QUESTIONS*

- WEIGHT IN THE FINAL GRADE: 10%

There will be recovery only of the 2 individual written exams. In order to make the average at the end of the course, the mark in the partial exams must be >= 3,0 points.

In the event that the student does not achieve the minimum necessary qualification established in some of the evaluation blocks but the average for the subject is approved, the subject will be graded in the evaluation report with a 4,9.

**ALTERNATIVE EVALUATION**

Students who opt for the alternative assessment must carry out the following activities:

**EVALUATION BLOCK 1 (40%)**: FIRST PARTIAL EXAM

- *EVALUATION ACTIVITY 1*: FIRST PARTIAL EXAM (individual activity)

- WEIGHT IN THE FINAL GRADE: 40%
- MINIMUM GRADE NECESSARY TO PASS THE SUBJECT: 3

**EVALUATION BLOCK 2 (20%)**: PROJECT ABOUT ENERGY FACILITY

- *EVALUATION ACTIVITY 2:* DELIVERY DOSSIER NEW ENERGY INSTALLATION (individual activity)

- WEIGHT IN THE FINAL GRADE: 20%

**EVALUATION BLOCK 3 (40%)**: SECOND PARTIAL EXAM

- *EVALUATION ACTIVITY 4*: SECOND PARTIAL EXAM (individual activity)

- WEIGHT IN THE FINAL GRADE: 40%
- MINIMUM GRADE NECESSARY TO PASS THE SUBJECT: 3

There will be recovery only of the 2 individual written exams. In order to make the average at the end of the course, the mark in the partial exams must be >= 3,0 points.

In the event that the student does not achieve the minimum necessary qualification established in some of the evaluation blocks but the average for the subject is approved, the subject will be graded in the evaluation report with a 4,9.

## Bibliography

**Recommended bibliography**


- GUIA TECNICA DE APLICACION DEL REBT (REGALAMENTO ELECTROTECNICO PARA BAJA TENSION, Editorial: GARCETA GRUPO EDITORIAL, 2020, ISBN:978-84-17289-53-9.
- INSTALACIONES ELECTRICAS EN EL DISEÑO DE EDIFICIOS, Ediciones Asimétricas, Roberto Alonso González Lezcano; José Manuel del Río Campos; Felix Aramburu Gaviola; Sonia Cesteros García, 2016, ISBN/EAN: 9788494474347.
- INSTALACIONES HIDRAULICAS EN EL DISEÑO DE EDIFICIOS con Problemas Resueltos (Bilingüe Español-Ingles), por Roberto Roberto Alonso González Lezcano; Juan Bautista Echevarría Trueba; Claudia Morollón Ronda, 2016, ISBN/EAN: 9788494430046
- INSTALACIONES DE ILUMINACION EN EL DISEÑO DE EDIFICIOS, por Robeto Alonso, González Lezcano; José Manuel del Río Campos; Félix Aramburu Gaviola; María Jesús Montero Burgos; 2017, Edición Bilingüe en Español e Inglés, ISN/EAN: 9788494639926
- PLANIFICACION DE LAS INSTALACIONES ELECTRICAS EN EDIFICIOS DE VIVIENDAS,INDUSTRIAS, OFICINAS Y LOCALES DE PUBLICA CONCURRENCIA, JESÚS TRASHORRAS MONTECELOS, 2016.
- Diseño y cálculo de instalaciones de climatización, Carlos González Sierra, 2013, ISBN: 978-84-96960-88-6.
- Energy-Efficient HVAC Design. An Essential Guide for Sustainable Building, Khazaii, Javad, 2014, Springer, ISBN 978-3-319-11047-9.
- HVAC Design Sourcebook (Inglés) 1st Edición, W. Larsen Angel , ISBN-13: 978-0071753036, ISBN-10: 0071753036
- ENERGÍA SOLAR FOTOVOLTAICA Y TÉRMICA. MANUAL TÉCNICO, Inma C. Castillo, Javier M. Cenzano, Eva Esteire y Antonio Madrid Vicente, AMV Ediciones, 2020, ISBN/EAN: 9788412095487.
- Arizmendi Barnes, Luis Jesús (2003): “Cálculo y Normativa Básica de las Instalaciones en los edificios”. Tomo I y II. Editorial EUNSA.
- Huidobro, José M. Manual de Telecomunicaciones. Ed. Ra-Ma
- Lagunas Marqués, Ángel – Instalaciones eléctricas de baja tensión en edificios de viviendas-Ed.Paraninfo – Madrid – 2003
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- GEA 2012 – Global Energy Assessment. Toward a Sustainable Future. Ed. Thomas B. Johansson, Anand Patwardhan, Nenojsa Nakicenovic, Luisa Gomez-Echeverri. International Institute for Applied Systems Analysis (IIASA). Cambridge University Press, 2012.
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