ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

133000201 - Energy Efficiency In Industrial Processes

DEGREE PROGRAMME

13AC - Master Universitario En Economia Circular

ACADEMIC YEAR & SEMESTER

2025/26 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	133000201 - Energy Efficiency In Industrial Processes
No of credits	3 ECTS
Type	Optional/elective
Academic year ot the programme	Second year
Semester of tuition	Semester 3
Tuition period	September-January
Tuition languages	English
Degree programme	13AC - Master Universitario en Economia Circular
Centre	13 - E.T.S.I. Montes, Forestal Y Medio Natur.
Academic year	2025-26

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Regino Jose Alvarez Sanchez		jose.alvarez.sanchez@upm.es	M - 08:00 - 08:15
Jose Luis Garcia Fernandez (Subject coordinator)		joseluis.garciaf@upm.es	- -

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

2.3. External faculty

Name and surname	Email	Institution
Vanesa Valiño López	vanesa.valino@upm.es	Universidad Politécnica de Madrid

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Electrotecnia

4. Skills and learning outcomes *

4.1. Skills to be learned

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CG03 - El alumno tendrá capacidad para evaluar los procesos de producción y consumo que permitan una gestión sostenible de los recursos.

CT04 - El alumno tendrá capacidad para proponer alternativas creativas y originales, valorando su viabilidad en la solución de problemas.

4.2. Learning outcomes

RA1 - - Capacidad para calcular y seleccionar calderas de calefacción y suministro de agua caliente, con combustibles convencionales y con biomasa, y estimar los consumos de combustible.

RA6 - - Capacidad para comparar la viabilidad económica de sistemas de suministro de energía convencionales y renovables en industrias.

RA5 - - Capacidad para realizar una auditoría energética.

RA3 - - Capacidad para calcular, diseñar o seleccionar equipos e instalaciones de automatización, y sistemas de medida y monitorización, en base a su complejidad, flexibilidad y presupuesto.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

- Energy supply: overview. Conventional installations: hot water and heating, electricity supply. Design and calculation of a energy supply installation with conventional sources: types of boilers, heating applications and hot water supply. Options in the electrification of an industry.
- Energy saving techniques. Integration of different energy sources in industries.

- Industry 4.0 and energy efficiency in industrial processes. Measurement and monitoring facilities regarding energy supply. Automation options: automation technologies required for optimization, self-diagnosis, and digital support for workers in industries.

- Energy audits. Economical evaluation of a energy supply installation.

- El suministro de energía: visión general. Instalaciones convencionales: agua caliente y calefacción, suministro de

energía eléctrica. Diseño y cálculo de una instalación de suministro de energía con fuentes convencionales: tipos de calderas, aplicaciones en calefacción y suministro de agua caliente. Opciones en la electrificación de una industria.
- Técnicas de ahorro de energía. Integración de distintas fuentes de energía en industrias.
- Industria 4.0 y eficiencia energética en procesos industriales. Instalaciones de medida y monitorización respecto al suministro energético. Opciones en automatización: tecnologías de automatización requeridas para la optimización, autodiagnóstico y apoyo digital para los trabajadores en industrias.
- Auditorías energéticas. Evaluación financiera de una instalación de suministro de energía.

5.2. Syllabus

1. Energy supply: overview.

2. Design and calculation of a thermal energy supply installation with conventional sources.

3. Options in the electrification of an industry.

4. Energy saving techniques.

5. Industry 4.0 and energy efficiency in industrial processes. Measurement and monitoring facilities.

6. Industry 4.0 and energy efficiency in industrial processes. Automation options.

7. Energy audits.

8. Economical evaluation of a energy supply installation.

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1		**Design and calculation of an electrical energy supply installation. Industry 4.0 and energy efficiency: measurement and monitoring facilities.** Duration: 12:00 Additional activities	**Design and calculation of an electrical energy supply installation. Industry 4.0 and energy efficiency: measurement and monitoring facilities.** Duration: 10:00 Additional activities	
2		**Design and calculation of a thermal energy supply installation. Industry 4.0 and energy efficiency: automation facilities. Energy saving techniques. Energy audits.** Duration: 01:00 Additional activities	**Design and calculation of a thermal energy supply installation. Industry 4.0 and energy efficiency: automation facilities. Energy saving techniques. Energy audits.** Duration: 10:00 Additional activities	**Progressive evaluation** Individual work Progressive assessment Not Presential Duration: 11:00
3		**Energy saving techniques. Energy audits. Economical evaluation of a power supply installation.** Duration: 01:00 Additional activities	**Energy saving techniques. Energy audits. Economical evaluation of a power supply installation.** Duration: 10:00 Additional activities	**Progressive evaluation** Individual work Progressive assessment Not Presential Duration: 11:00
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				**Final examination** Written test Global examination Not Presential Duration: 02:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Progressive evaluation	Individual work	No Presential	11:00	50%	5 / 10	CT04 CB07 CG03
3	Progressive evaluation	Individual work	No Presential	11:00	50%	5 / 10	CB07 CG03 CT04

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final examination	Written test	No Presential	02:00	100%	5 / 10	CT04 CB07 CG03

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Final examination	Other assessment	Face-to-face	02:00	100%	5 / 10	CT04 CB07 CG03

7.2. Assessment criteria

The evaluation criteria will guarantee that the student acquires the competences and learning results described in the guide, both in the continuous evaluation and in the evaluation only by final exam.

The student can be evaluated by continuous evaluation or only by final exam. For continuous evaluation, partial deliveries can be made in the first half of the course, and final deliveries in the second half of the course.

The general competences will be evaluated with the following qualifications, depending on the degree of acquisition of the competence: D- Not satisfactory, C. Satisfactory, B.- Advanced, A.- Excellent.

Los criterios de evaluación garantizarán que el alumno adquiera las competencias y resultados de aprendizaje descritos en la guía, tanto en la evaluación continua como en la evaluación sólo por prueba final.

El alumno puede ser evaluado por evaluación continua o sólo por prueba final. Por evaluación continua, se pueden realizar entregas parciales en la primera mitad del curso, y entregas finales en la segunda mitad del curso.

Las competencias generales se evaluarán con las siguientes calificaciones, en función del grado de adquisición de la competencia: D- No satisfactoria, C. Satisfactoria, B.- Avanzada, A.- Excelente.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Moodle	Web resource	

9. Other information

9.1. Other information about the subject

The subject is related to SDG 7.

La asignatura está relacionada con el ODS 7.