



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
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COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros
Industriales

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

53002068 - Design And Optimization Of Thermal Systems

DEGREE PROGRAMME

05BK - Máster Universitario En Ingeniería De La Energía

ACADEMIC YEAR & SEMESTER

2025/26 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	53002068 - Design And Optimization Of Thermal Systems
No of credits	3 ECTS
Type	Optional/elective
Academic year of the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	05BK - Máster Universitario en Ingeniería de la Energía
Centre	05 - E.T.S. De Ingenieros Industriales
Academic year	2025-26

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Javier Muñoz Anton (Subject coordinator)		javier.munoz.anton@upm.es	Sin horario. Contact by mail

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

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

- Advanced maths
- fluid mechanics
- power technology
- thermodynamics
- heat transfer
- thermal engineering

4. Skills and learning outcomes *

4.1. Skills to be learned

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CE12 - Aplicar conocimientos y disponer de habilidades para acometer el diseño, control y análisis de procesos industriales basados en la generación de calor por combustión convencional y avanzada, evaluando los combustibles mejor adaptados a cada aplicación y proponer soluciones razonadas en el empleo de combustibles

CE2 - Analizar y establecer criterios de mejora energética y económica en instalaciones de generación y de consumo, incluyendo el sector transportes, conducente al diseño de alternativas más eficientes y con menor impacto ambiental.

CE3 - Utilizar las herramientas necesarias para el diseño y análisis de sistemas de generación, transformación, almacenamiento y utilización de energías nucleares, mecánicas, eléctricas, térmicas e hidráulicas.

CG1 - Aplicar conocimientos de ciencias y tecnologías avanzadas a la práctica profesional o investigadora de la Ingeniería Energética.

CG2 - Poseer capacidad para diseñar, desarrollar, implementar, gestionar y mejorar productos, sistemas y procesos en los distintos ámbitos energéticos, usando técnicas analíticas, computacionales o experimentales avanzadas.

CT1 - Aplica. Habilidad para aplicar conocimientos científicos, matemáticos y tecnológicos en sistemas relacionados con la práctica de la ingeniería.

CT11 - Usa herramientas. Habilidad para usar las técnicas, destrezas y herramientas ingenieriles modernas necesarias para la práctica de la ingeniería.

CT14 - Idea. Creatividad.

CT3 - Diseña. Habilidad para diseñar un sistema, componente o proceso que alcance los requisitos deseados teniendo en cuenta restricciones realistas tales como las económicas, medioambientales, sociales, políticas, éticas, de salud y seguridad, de fabricación y de sostenibilidad.

CT5 - Resuelve. Habilidad para identificar, formular y resolver problemas de ingeniería.

CT7 - Comunica. Habilidad para comunicar eficazmente.

4.2. Learning outcomes

RA62 - Analizar y evaluar un sistema energético desde una dimensión energética y económica.

RA34 - Analizar y evaluar un sistema energético desde una dimensión energética, exergética, medio ambiental y económica.

RA56 - Conocer el panorama de la energía térmica

RA53 - Modelizar y simular un sistema energético complejos

RA54 - Analizar y proponer mejoras a un sistemas energético existente

RA13 - Comprender un diagrama de flujo de un proceso

RA11 - Conocimiento y habilidades de integración de sistemas de almacenamiento térmico en sistemas energéticos.

RA52 - Modelizar y simular los procesos elementales que intervienen un sistema energético

* 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

0. Topic general info
1. Introduction to thermal systems optimization
2. Thermohdraulics of open and closed circuits
3. Heat exchangers design
4. Heat exchangers transient analysis
5. Refrigeration
6. Thermal systems optimization projects optimization

5.2. Syllabus

1. 0. Topic general info
2. Introduction to thermal systems optimization
3. Thermohdraulics of open and closed circuits
4. Heat exchangers design
5. Heat exchangers transient analysis
6. Refrigeration
7. Thermal systems optimization projects optimization

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	Clase magistral Duration: 02:00 Lecture			
2	Clase magistral Duration: 02:00 Lecture			
3	Clase magistral Duration: 02:00 Lecture			
4	Clase magistral Duration: 02:00 Lecture			
5	Clase magistral Duration: 02:00 Lecture			
6	Clase magistral Duration: 02:00 Lecture			
7	Clase magistral Duration: 02:00 Lecture			
8	Clase magistral Duration: 02:00 Lecture			
9				Partial work presentation Individual work Progressive assessment Presential Duration: 00:10
10	Clase magistral Duration: 02:00 Lecture			
11	Clase magistral Duration: 02:00 Lecture			
12	Clase magistral Duration: 02:00 Lecture			
13	Clase magistral Duration: 02:00 Lecture			

14	Clase magistral Duration: 02:00 Lecture			
15	Clase magistral Duration: 02:00 Lecture			
16				Final work presentation Individual presentation Progressive assessment Presential Duration: 00:10
17				Work submission Individual work Progressive assessment Presential Duration: 01:00 Work submission Individual work Global examination Not Presential Duration: 00:00

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
9	Partial work presentation	Individual work	Face-to-face	00:10	10%	5 / 10	CB10 CG1 CG2 CT1 CT3 CT5 CT7 CT11 CT14 CE2 CE3 CE12
16	Final work presentation	Individual presentation	Face-to-face	00:10	10%	5 / 10	CB10 CG1 CG2 CT1 CT3 CT5 CT7 CT11 CT14 CE2 CE3 CE12
17	Work submission	Individual work	Face-to-face	01:00	60%	5 / 10	CB10 CG1 CG2 CT1 CT3 CT5 CT7 CT11 CT14 CE2 CE3 CE12

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Work submission	Individual work	No Presential	00:00	100%	5 / 10	CB10 CG1 CG2 CT1 CT3 CT5 CT7 CT11 CT14 CE2 CE3 CE12

7.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

7.2. Assessment criteria

Progressive evaluation

Tests will be carried out every day with questions about the previous class that will serve to evaluate 10%.

Class attendance will be considered with 10%.

Towards week 9 of the course there will be an intermediate presentation of the work, which will count up to 10% of the grade through progressive evaluation.

The last week of class there will be a presentation of the subject's work that will count up to 10% of the grade by progressive evaluation.

The work itself will count up to 60% of the grade by progressive evaluation.

Final evaluation

Only the completion of the course work will be taken into account, which will lead to 100% of the grade for the subject.

Final score

The aim will always be to favor the student's grade, so the modality that most favors the student will be selected, selecting the highest final evaluation grade or progressive evaluation.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Moodle	Others	Lectures material, bibliography, additional material

9. Other information

9.1. Other information about the subject

This topic is related with SDG 7, 9 y 12.