1. BASIC DATA

Subject	Thermodynamics and Heat Transfer
Qualification	Degree in Industrial Systems Engineering
School/Faculty	Architecture, Engineering and Design
Course	First
ECTS	6
Character	Required
Language(s)	Spanish or English
Modality	On-site
Semester	First semester
Academic year	25-26
Coordinating teacher	Dr. Arisbel Cerpa

2. PRESENTATION

The course belongs to the subject "Thermo-fluid mechanical Engineering". It is one of the subjects that are necessary in the formation of this degree, since it provides knowledge that serves as a basis for later subjects.

The objective of this course is to provide students with basic knowledge that will allow them to analyze thermodynamic systems, as well as to know and know how to apply the physical principles that govern heat transfer.

The concepts learned here will be the basis for the subjects:

- Thermal and Fluid Engineering
- Thermal Power Plants
- Internal Combustion Engines.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

CB2: That students know how to apply their knowledge to their work or vocation in a professional manner and possess the competencies 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 social, scientific or ethical issues.

General competencies:

CG3: Knowledge in basic and technological subjects, which enables them to learn new methods and theories, and gives them the versatility to adapt to new situations.

CG5: Knowledge for the realization of measurements, calculations, valuations, appraisals, surveys, studies, reports, work plans and other similar works.

Cross-cutting competencies:

CT2: Autonomous learning: Set of skills to select strategies for searching, analyzing, evaluating and managing information from different sources, as well as to learn and put into practice what has been learned independently.

CT5: Analysis and problem solving: Be able to critically evaluate information, decompose complex situations into their constituent parts, recognize patterns, and consider other alternatives, approaches and perspectives to find optimal solutions and efficient negotiations.

Specific competencies:

CE7. Knowledge of applied thermodynamics and heat transfer. Basic principles and their application to the resolution of engineering problems.

Learning outcomes:

RA1: understand the principles in the Fundamental Laws or Principles of Thermodynamics.

RA2: evaluate mass and energy balances

RA3: understand the properties of gases and fluids and their phase change

RA4: calculate heat transfer systems.

The table below shows the relationship between the competencies developed in the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB2, CB3, CG3, CG5, CT2, CT5, CE7	RA1: understand the principles in the Fundamental Laws or Principles of Thermodynamics.
CB2, CB3, CG3, CG5, CT2, CT5, CE7	RA2: evaluate mass and energy balances
CB2, CB3, CG3, CG5, CT2, CT5, CE7	RA3: understand the properties of gases and fluids and their phase change.
CB2, CB3, CG3, CG5, CT2, CT5, CE7	RA4: calculate heat transfer systems.

4. CONTENTS

1. Fundamental laws of thermodynamics. Mass, energy and entropy balances.
2. Properties of gases and fluids with phase change
3. Heat transmission processes: conduction, convection and radiation

5. TEACHING-LEARNING METHODOLOGIES

The following are the types of teaching-learning methodologies to be applied:

- Master class
- Cooperative learning / Aprendizaje cooperativo
- Problem-based learning PBL / Problems based learning
- Actividades académicas dirigidas / Oriented academic activities

6. TRAINING ACTIVITIES

The types of training activities to be carried out and the student's dedication in hours to each of them are identified below:

Presential modality:

Training activity	Number of hours
Individual or group tutorials	10
Resolution of exercises, problems, tests and practical work	45
Expositions and presentations by the teacher (Master classes)	15

Expositions and presentations asynchronous by the teacher (Master classes)	5
Laboratory and workshop practices	32,5
Search for information and / or preparation of written assignment and reports	12,5
Autonomous study	25
Assessment tests	5
TOTAL	**150**

7. EVALUATION

The following is a list of the evaluation systems, as well as their weight in the total grade of the course:

Presential modality:

EVALUATION SYSTEMS	Min% Min%	Max. %
Tests to evaluate theoretical / practical cognitive objectives (objective tests, written tests, oral presentations, cases / problems)	20%	40%
Tests to evaluate objectives of skills (Participation in group sessions, Simulation tests, Participation in cases / problems Role playing, Reports)	20%	40%
Tests to evaluate attitudes (Participation in class, attitudes assessment rubric)	10%	10%
Final examination of competencies (final test of the whole, includes different types of the aforementioned tests)	20%	40%

In the Virtual Campus, when you access the course, you will be able to consult in detail the evaluation activities to be performed, as well as the due dates and evaluation procedures for each of them.

7.1. Ordinary call

To pass the course in the ordinary exam you must:

- Obtain a grade higher or equal to 5.0 out of 10 in the subject project.
- Obtain a grade greater than or equal to 5.0 out of 10.0 in the evaluation of class exercises and deliverables in the virtual campus.
- Complete all internships and submit the corresponding report
- Obtain a grade greater than or equal to 5.0 out of 10.0 on the final exam.
- 50% attendance

When the minimum required to perform the weighted average of the evaluable activities is not met (the minimum is not reached in any of the above points), the final grade will be:

- the weighted average if its value is less than or equal to 4
- 4 if the value of the weighted average is greater than 4

The grade in the ordinary exam will be considered as **NP** (Not Presented) when the student has not submitted any of the evaluable activities that are part of the weighted average.

7.2. Extraordinary call

To pass the course in the extraordinary exam:

- Obtain a grade higher or equal to 5.0 out of 10 in the subject project.
- Obtain a grade greater than or equal to 5.0 out of 10.0 in the evaluation of class exercises and deliverables in the virtual campus.
- Complete all internships and submit the corresponding report
- Obtain a grade greater than or equal to 5.0 out of 10.0 on the final exam.

When the minimum required to perform the weighted average of the evaluable activities is not met (the minimum is not reached in any of the above points), the final grade will be:

- the weighted average if its value is less than or equal to 4
- 4 if the value of the weighted average is greater than 4

The grade in the extraordinary call will be considered as NP (Not Presented) when the student has not submitted any new activity with respect to what was presented in the ordinary call.

The activities that were not passed in the ordinary exam must be handed in, or those that were not handed in.

8. CHRONOGRAM

In this section you will find the chronogram with dates for the delivery of evaluable activities of the course:

Evaluable activities	Date
Construction of a Stirling engine	During the semester of the subject
Computer simulation of the Rankine	At the end of unit 4
Laboratory practices. Conduction and Radiation	During the course of the unit 6
Knowledge test on thermodynamics	At the end of unit 4
Knowledge test on heat transmission	At the end of unit 6

This schedule may be subject to modifications due to logistical reasons. Any modification will be notified to the student in due time and form.

9. BIBLIOGRAPHY .

The reference work for the follow-up of the subject is:

- "Thermodynamics", Gengel Yunus. 7th edition. McGraw-Hill. 2012
- "Fundamentals of Engineering Thermodynamics", Ed. 7. M. Moran, H. Shapiro, D. Boettner, M. Bailey. Ed. John Wiley and Son. 2011.
- "Fundamentals of Heat Transfer. Incropera, Frank. Fourth Edition. Pearson Ed. 1999
- "Heat and Mass Transfer", Gengel Yunus. Fourth Edition. McGraw-Hill. 2011

The following is a recommended bibliography:

- "Thermodynamics Logic and Thermal Engines", Agüera José, Science 3. 1999.
- "Thermodynamics for Engineers", Potter, Schaum. McGraw-Hill. 2004

10. DIVERSITY CARE UNIT

Students with specific educational support needs:

Curricular adaptations or adjustments for students with specific educational support needs, in order to guarantee equity of opportunities, will be regulated by the Diversity Attention Unit (UAD).

It will be an essential requirement the issuance of a report of curricular adaptations/adjustments by the Unit, so students with specific educational support needs should contact through: unidad.diversidad@universidadeuropea.es at the beginning of each semester.

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to participate in satisfaction surveys to detect strengths and areas for improvement about the faculty, the degree program and the teaching-learning process.

Surveys will be available in the survey area of your virtual campus or through your e-mail.

Your assessment is necessary to improve the quality of the degree.

Thank you very much for your participation.