Universidad Europea

1. BASIC INFORMATION

Course	Thermodynamics and Heat Transfer
Degree program	Degree in Aerospace Engineering of Aircraft
School	Escuela de Arquitectura, Ingeniería y Diseño
Year	2
ECTS	6
Credit type	Compulsory
Language(s)	English
Delivery mode	Face-to-face
Semester	First
Academic year	2020/2021
Coordinating professor	José Omar Martinez Lucci

2. PRESENTATION

This course is an introduction to the principles of Thermodynamic. The course develops an intuitive understanding of thermodynamics by focusing on physical explanation

In the Thermodynamics, the following topics are covered: First and second law of thermodynamics, entropy, exergy, internal combustion engine and an introduction to heat transfer and its application to thermal control y satellites.

The subject of thermodynamics is offered on the second academic year and is the basis for acquiring knowledge for advanced aeronautical engineering courses. In order to provide adequate training to the existing and predicting demand of this professional area, the student will participate in different phases of a research and real projects in the field of thermodynamics and business management. This subject is a great value for the field of aeronautical propulsion. Aeronautical engineers can apply the knowledge of thermodynamics in designing aircraft engines.

The objectives of the course are:

1.- To understand the principles of thermodynamics, first, second and third law governing the thermodynamics and its application in power plants.

2.- To know the theory of conservation of mass and energy to the volume control, which are applied in cases of turbines, compressors, nozzles, diffusers and pumps. –

3.- To know the property of entropy and its use for the analysis of thermodynamics in systems. Also know the property of exergy and its use in thermodynamics in systems. –

4.- To understand the thermodynamic model of internal combustion engines, gas turbine power plants. –

5.- To learn the basic mechanism of heat transfer.-

6.- To know the space environment, and being able to analyze the heat exchange in the design of satellites.

3. COMPETENCIES AND LEARNING OUTCOMES

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB1, CT16(N3), CE8	• LO20. To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules
CB3, CB5, CT12(N2), CT16(N3), CE8, CE19	• LO21. From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module
CB3, CT12(N2), CT18(N2), CE8	• LO22. To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.

4. CONTENT

- Principles of thermodynamics and its application to control volume.
- Behavior and analysis of the gas volumes. Thermodynamic potentials. General thermodynamic relationships.
- Equilibrium systems. Transitions of phase
- Maintenance and selection of power plants
- Introduction to combustion process
- Introduction to heat transfer mechanism, conduction, convection and radiation
- Application to the design of satellites (thermal Control and heat transfer)

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Lecture-based class
- Integration of team work
- Self-study
- Mentoring, academic monitoring and assessment

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Lecture-based class	20 h
Integration of team work	60 h
Self-study	50 h
Mentoring, academic monitoring and assessment	20 h
TOTAL	**150 h**

Online mode: Not available.

Learning activity	Number of hours

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Assessment system	Weight
Exam About Thermodynamics	35%
Exam about combustion and heat transfer	35%
Reports, articles and informs	30%

When you access the course on the *Campus Virtual*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 4.0 in all the assessments (thermodynamic test, Combustion and heat transfer test and the grades of all the reports).

When the student does not obtain at least one of the requirements decribed above to evaluate the main grade of the assessment test, the final grade will be:

- The main grade if its value is equal or less than 4,0
- 4 if the main value is higher than 4,0

It is consider NP (No pesentado) grade when the student does not complete all the asessment tests and activities.

7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 4.0 in all the assessments (thermodynamic test, Combustion and heat transfer test and the grades of all the reports).

When the student does not obtain at least one of the requirements decribed above to evaluate the main grade of the assessment test, the final grade will be:

- The main grade if its value is equal or less than 4,0
- 4 if the main value is higher than 4,0

It is consider NP (No pesentado) grade when the student does not complete any of the assessment activities between the first exam period and then second exam period.

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Thermodynamics test	At the end of unit 4
Combustion and Heat transfer test	At the end of unit 7
Lab report about heat transfer	At the end of unit 7
Report about atomic battery	At the end of unit 4
PBL about reduction of CO_2 emissions in aircraft engines	At the end of unit 7
Final exam	At the end of unit 7

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

- MORAN, M.J., SHAPIRO H. N. "Fundamentals of Engineering Thermodynamics". John Wiley and Son Inc.

10. DIVERSITY MANAGEMENT UNIT

Students with specific learning support needs:

Curricular adaptations and adjustments for students with specific learning support needs, in order to guarantee equal opportunities, will be overseen by the Diversity Management Unit (UAD: Unidad de Atención a la Diversidad).

It is compulsory for this Unit to issue a curricular adaptation/adjustment report, and therefore students with specific learning support needs should contact the Unit at unidad.diversidad@universidadeuropea.es at the beginning of each semester.