Course guide
220577 - 220577 - Energy Technology

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Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 724 - MMT - Department of Heat Engines.

Degree: MASTER'S DEGREE IN MANAGEMENT ENGINEERING (Syllabus 2012). (Optional subject).

Academic year: 2025 **ECTS Credits:** 3.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Yolanda Calventus Solé

Others: Frida Roman Concha, Deniz Kizildag

REQUIREMENTS

Nothing

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
4. Apply theories and principles related to technology and information systems in order to analyze uncertainty complex situations and make decisions using engineering tools.

Generical:
1. Ability to apply knowledge to solve problems in new environments or unfamiliar environments within broader contexts (or multidisciplinary) related to engineering.
2. Self-learning capacity to independent continuous training.
3. Ability to understand the impact of engineering solutions in a global and social context .

TEACHING METHODOLOGY

The course is divided into three parts:

a) Theory classes
b) Guided activity
c) Self- study

In the theory classes, teachers will solve relevant examples in order to remark important concepts. On the other hand, teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning. We propose that students solve exercices in and outside the classroom, to promote contact and use the basic tools needed to solve problems.
In the guided activity class, teachers propose, by means of the ATENEA platform, to solve exercises and to visualize videos and to read divulgative articles in order to promote the achivement of the objective of the subject.
Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises/problems, in order to fix and assimilate the concepts.

LEARNING OBJECTIVES OF THE SUBJECT

Acquire a broad vision of the current situation of the energy system and where it wants to go. Learn key technologies in energy efficiency and renewable energies. Hydrogen as a key vector in a decarbonised economy.

STUDY LOAD

Type	Hours	Percentage
Guided activities	16,0	21.33
Self study	48,0	64.00
Hours large group	8,0	10.67
Hours medium group	3,0	4.00

Total learning time: 75 h

CONTENTS

Module 1: ACTUAL SITUATION OF ENERGY SECTOR. ENERGETIC TRANSITIION. THE ROLE OF HYDROGEN AND BIOFUELS

Description:
Explain the current and geopolitical situation of the energy sector. Primary energy and final energy consumption. The relevant role of fossil fuels. Alternative, renewable energies. The energy transition. Hydrogen as an energy carrier for a society, or a decarbonized economy

Specific objectives:
- Know the actual situation of primary energy consumptions and final products. The actual situation in the world, the geopolitic. Circular economy. Energy sector (economy) decentralized.
- Know the potentiality of the hydrogen. The types of hydrogen (colors) that exist according to how it is produced. Current state of hydrogen technologies. The potentiality of hydrogen: the pros and cons
- Know the main characteristics and obtaining renewable gases and biofuels. biomethane

Related activities:
Activity 1: Large/Theory class
Activity 3: Present a task (short essay) 1-2 pages. Solve an Athenea Quizz
Activity 3: Subject Essay

Full-or-part-time: 14h
Theory classes: 2h
Guided activities: 3h
Self study : 9h

Module 2: COMBINED HEAT AND POWER. COGENERATION

Description:
2.1.- Introduction to the cogeneration.
2.2 Main characteristics and areas of application
2.3 Trigeneration and microcogeneration
2.4 Technologies of cogeneration

Specific objectives:
- To know the fundamentals of cogeneration and its purpose as well as its advantages and disadvantages and trigeneration and microcogeneration
- To know the technologies of cogeneration and its advantages and disadvantages

Related activities:
Activity 1: Large/Theory and exercices classes group sessions
Activity 3 : Deliver solve problems in an Athena task
Activity 2: Subject essay

Full-or-part-time: 24h
Theory classes: 2h
Practical classes: 2h
Guided activities: 5h
Self study : 15h

- Módulo 4: Refregeration systems

Description:
4.1 Cooling system schematics
4.2 Vapor compression refrigeration systems
4.3 Aerothermal (as a renewable source)
4.4 Absorption refrigeration systems

Specific objectives:
Learn the refrigeration systems, generation of heat and cold. More environmentally friendly heating and cooling technologies

Related activities:
Activity 1: Theory class
Activity 3: Athenea Quizz resolution
Activity 2: Subject Essay

Full-or-part-time: 16h
Theory classes: 2h
Guided activities: 5h
Self study : 9h

Module 3: SOLAR ENERGY AND THERMAL ENERGY STORAGE

Description:
Introduction to solar thermal energy in buildings. Energy efficiency in buildings; main techniques by means of solar thermal systems. Active solar thermal systems for domestic hot water. Main characteristics and its adaptation to the CTE. Passive systems: bioclimatic architecture.

Specific objectives:
To know the posibilities and techniques for taking advantage of solar thermal energy in buildings

Related activities:
Activity 1: Large/Theory and exercices group sessions
Activity 3 : Exercise resolution
Activity 2: Subject essay

Full-or-part-time: 21h
Theory classes: 2h
Practical classes: 1h
Guided activities: 3h
Self study : 15h

ACTIVITIES

ACTIVITY 1:THEORY AND EXERCICES/LARGE GROUPS SESSIONS

Description:
Methodology in large group
Contains are presented following an expositive and participative class
The subject is organized in 4 modules

Specific objectives:
Transfer the necessary knowledge for a correct interpretation of the contents in the large group sessions, resolving doubts about the content of the course and generic skills development.

Material:
Noted posted to the ATENEA platform
Papers
Video
General literature of the course.

Delivery:
During some sessions, exercices will be conducted in the class, individually.

Related competencies :
CE-B5. Apply theories and principles related to technology and information systems in order to analyze uncertainty complex situations and make decisions using engineering tools.
CG1. Ability to apply knowledge to solve problems in new environments or unfamiliar environments within broader contexts (or multidisciplinary) related to engineering.
CG5. Self-learning capacity to independent continuous training.
CG6. Ability to understand the impact of engineering solutions in a global and social context .

Full-or-part-time: 29h
Self study: 21h
Theory classes: 8h

ACTIVITY 2: SUBJECT ESSAY

Description:
Students in groups will select, in agreement with professors, a report title that should develop from a list proposed by professors. This essay must follow an scheme which will be discussed and fixed conveniently by professors.

Specific objectives:
Acquire the necessary skills for the corrected correct achivement of the subject objetives.

Material:
Noted posted to the ATENEA platform.
Specific material uploaded by professors in Atenea Platform
Bibliography

Delivery:
Students will upload a report memory in Atenea Platform
It represents 50% of the final course grade

Related competencies :
CE-B5. Apply theories and principles related to technology and information systems in order to analyze uncertainty complex situations and make decisions using engineering tools.
CG1. Ability to apply knowledge to solve problems in new environments or unfamiliar environments within broader contexts (or multidisciplinary) related to engineering.
CG5. Self-learning capacity to independent continuous training.
CG6. Ability to understand the impact of engineering solutions in a global and social context .

Full-or-part-time: 24h
Self study: 16h
Guided activities: 8h

ACTIVITY 3: CONTINOUS ASSESSMENT: TASKS AND QUIZZES

Description:
Individual exercises that are 3 tasks of Athena. They can be delivery of problems solved by the student body and/or writing a short essay on some very specific and interesting aspect of the topic being discussed. It will be agreed in class
Individual resolution of Atenea questionnaires (asynchronous resolution)

Specific objectives:
It must demonstrate that the student has adquired and assimilated the contents of the subject

Material:
Lecture notes and bibliography recommended in class

Delivery:
These activites must be presented via Athenea
This activity represents a 50% of the final course grade

Related competencies :
CE-B5. Apply theories and principles related to technology and information systems in order to analyze uncertainty complex situations and make decisions using engineering tools.
CG1. Ability to apply knowledge to solve problems in new environments or unfamiliar environments within broader contexts (or multidisciplinary) related to engineering.
CG5. Self-learning capacity to independent continuous training.
CG6. Ability to understand the impact of engineering solutions in a global and social context .

Full-or-part-time: 11h
Self study: 7h
Guided activities: 4h

ACTIVITY 4: PROBLEMES RESOLUTION

Description:
It is an activity in which students will apply the main concepts explained in theory classes
Simple problems are solved in order to allow students to learn the applications of what has been studied

Specific objectives:
Know how to make very simple calculations of power generated or consumed, heat fluxes exchanged, efficiencies.
Know how to make simple calculations of a solar installation

Material:
Paper and calculator
Computer

Delivery:
Via Atenea

Full-or-part-time: 11h
Self study: 4h
Guided activities: 4h
Practical classes: 3h

GRADING SYSTEM

The final grade depends on the following assessment criteria:

- Subject essay: 50%
- Continous assessment: 50%

Students that fail or not present continuous assessment activities can do a recovery exam

EXAMINATION RULES.

All activities must be presented via Athenea

BIBLIOGRAPHY

Basic:
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Complementary:
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- Jutglar i Banyeras, Lluís. Cogeneración de calor y electricidad. Barcelona: Ceac, 1996. ISBN 8432965537.

RESOURCES

Audiovisual material:
- Apunts de l'assignatura disponibles a la plataforma digital ATENEA. They are notes and the transparencies of class

Other resources:
Noted posted to the ATENEA platform