Course guide
330130 - ETE - Thermal Engineering

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.
Degree: BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
Academic year: 2022  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Pérez Ràfols, Francisco
Others: Cobo Molina, Raúl

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific: 1. Understanding the problems of energy and its transformation. Understanding and mastery of the fundamental concepts of thermal machines.

Transversal: 2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

TEACHING METHODOLOGY

The course consists of two hours of theory a week in face-to-face classes (large groups), with lectures with audiovisual support, and two hours a week in small groups dedicated to laboratory practices and application problems.

LEARNING OBJECTIVES OF THE SUBJECT

- At the end of the course the student must be able to:
  - Know, understand the problem of energy and its transformation.
  - Understand and apply the technologies of direct exothermic heat engines.
  - Understand and apply the technologies of direct endothermic heat engines.
  - Understand and apply the technologies of reverse heat engines.
  - Prepare technical reports and resolution of technical application problems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
# CONTENTS

## Title of content 1: Energy and the problems of its transformation: thermal machines heat engines

**Description:**

**Specific objectives:**
Know, understand the problem of energy and its transformation.

**Related activities:**
Continuous assessment test (Deliverable 0 and Deliverable 1).
Specific test (First Partial).

**Full-or-part-time:** 15h
Theory classes: 3h
Laboratory classes: 3h
Self study : 9h

## Content Title 2: Direct Exothermic Heat Engines

**Description:**

**Specific objectives:**
Understanding, analysis and application of the technologies of thermal, nuclear and open cycle turbines. Understanding, analysis and application of the principles of operation of heat exchangers.

**Related activities:**
Continuous assessment test (Deliverable 2a, 2b, 2c and 2d).
Specific test (First Partial).

**Full-or-part-time:** 45h
Theory classes: 9h
Laboratory classes: 9h
Self study : 27h

## Content Title 3: Endothermic Direct Heat Engines

**Description:**

**Specific objectives:**
Understanding, analysis and application of the operating principles and technology of endothermic engines.

**Related activities:**
Continuous assessment test (Deliverable 3a and 3b).
Final evaluation test (Second Part).

**Full-or-part-time:** 45h
Theory classes: 9h
Laboratory classes: 9h
Self study : 27h
Content Title 4: Reverse Heat Engines

Description:
Refrigeration and air conditioning. Compression refrigeration machines (one stage and multistage). Refrigerating machines without compression.

Specific objectives:
Understanding and application of refrigeration and air conditioning technologies.

Related activities:
Continuous assessment test (Deliverable 4).
Final evaluation test (Second Part).
Laboratory practices (Laboratory Report).

Full-or-part-time: 45h
Theory classes: 9h
Laboratory classes: 9h
Self study: 27h

ACTIVITIES

TITLE OF ACTIVITY 1: LABORATORY PRACTICES (Laboratory Report)

Description:
Carrying out practices in the laboratory related to the subject of refrigeration machines.

Specific objectives:
Development of reasoning techniques and strategies for the analysis and resolution of problems.
Preparation of a report with the results obtained experimentally.
Written communication.
Autonomous Learning.

Material:
Statements and practical scripts in the digital Campus.

Delivery:
10% of the final grade.

Full-or-part-time: 10h 20m
Laboratory classes: 2h
Self study: 8h 20m

TITLE OF ACTIVITY 2: CONTINUOUS ASSESSMENT TEST (Deliverables 0, 1, 2a, 2b, 2c, 2d, 3a, 3b and 4)

Description:
Carrying out one or more problems for each of the topics seen.

Specific objectives:
Autonomous Learning.

Material:
Problems in the digital Campus.

Delivery:
10% of the final grade.

Full-or-part-time: 20h
Self study: 20h
TITLE OF ACTIVITY 3: SPECIFIC TEST PROBLEMS (First Partial)

Description:
Taking a written problem-solving test.

Specific objectives:
Upon completion of the activity, the student should be able to:
Understand the fundamentals of direct exothermic heat engines.

Material:
Statements problems and calculator.

Delivery:
40% of the final grade.

Full-or-part-time: 32h
Theory classes: 2h
Self study: 30h

TITLE OF ACTIVITY 4: FINAL EVALUATION TEST (Second Part)

Description:
Taking a written problem-solving test.

Specific objectives:
Upon completion of the activity, the student should be able to:
Understand the fundamentals of reverse heat engines and direct endothermic machines.

Material:
Statements problems and calculator.

Delivery:
40% of the final grade.

Full-or-part-time: 32h
Laboratory classes: 2h
Self study: 30h

GRADING SYSTEM

Deliverables: 10% of the final grade.
Laboratory practices: 10% of the final grade.
First Partial: 40% of the final grade.
Second Partial: 40% of the final grade.

EXAMINATION RULES.

Activities not submitted will be considered a "0".
BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

Other resources:
Non-tabulated resources: Notes on digital campuses.
Audiovisual material: Presentations on the digital campus.