340038 - FENT-F3029 - Fundamentals of Termical Engineering

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics
Academic year: 2017
Degree:
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6  Teaching languages: Catalan

Teaching staff
Coordinator: JAUME MIQUEL MASALLES
Others: JAUME MIQUEL MASALLES
CARLOS PRUDENCIO DE GRACIA
JORDI PONS SEGALA
DAVID PUJOL BRECÓ

Prior skills
Previous knowledge of basic thermodynamics and heat transfer.
Basic previous knowledge of the behavior of fluids.
Integral and differential calculus.

Requirements
340022 - Chemistry
340023 - Physics I
340026 - Advanced calculus

Degree competences to which the subject contributes

Specific:

Transversal:
3. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
4. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
5. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
340038 - FENT-F3O29 - Fundamentals of Termical Engineering

Teaching methodology

- Lectures and participatory classes, consisting of explanation and development of the theory and, if necessary in the resolution of problems. The material user will be available to the student in the Digital Campus section of the subject.

- Practical lessons in problem-solving, where it will seek the maximum involvement of students through their direct involvement in solving the problems. Students must solve in class / outside of class individually problems that are assigned. In the Digital Campus section of the subject, the student can look up the list of problems before they are done in class.

- Hand in resolved problems by students. Submittals will consist on individual, in class or outside class, of some problems of the list or similar, the student will have in the Digital Campus. This activity will be evaluated. The student feed-back can made from the submission of the revised problems.

- Laboratory and simulation practical classes, made directly by students, guided by the teacher, allowing them to directly observe relevant aspects of the theory. The student can look up the explanatory text of the practices to develop in the Digital Campus. The students will give the teacher a copy of the experimental extracted data. Later, students must make a report of the practices carried out. This report will be evaluated and will be delivered before the date set by the teacher.

- Tutorial classes in group or individual.

- Students will make two exams of all theoretical and practical knowledge developed in the subject.

Learning objectives of the subject

When the student finishes the subject, he/she has to be capable of:
- Understanding the principles of applied thermodynamics and heat transfer.
- Knowing the principles of thermal equipment and generators.
- Analyzing and solving problems in the area of thermal engineering.
- Interpreting, analyzing, synthesizing and extracting conclusions of results of measurements and tests.
- Writing texts with the structure adapted to the aims of communication.
- Knowing and putting into practice the dynamics teamwork.
- Carrying out assignments from basic directions given by the teacher.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>52h 30m</th>
<th>35.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>7h 30m</td>
<td>5.00%</td>
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<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
<tr>
<td>Content</td>
<td>Learning time: 32h</td>
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<td>------------------------------------------------------------------------</td>
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<tr>
<td><strong>(ENG) TEMA 1: CONCEPTES FONAMENTALS DE TERMODINÀMICA. PROPIETATS DE LES SUBSTÀNCIES PURES</strong></td>
<td></td>
<td>Theory classes: 12h</td>
<td></td>
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<tr>
<td>Description:</td>
<td></td>
<td>Laboratory classes: 2h</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Self study: 18h</td>
<td></td>
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<tr>
<td>1.1. Concept of thermodynamic system. Classification and examples</td>
<td></td>
<td></td>
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<tr>
<td><strong>Related activities:</strong></td>
<td></td>
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<tr>
<td>A6. First individual written test.</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
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<tr>
<td>At the end of this teaching unit, the student must be able to:</td>
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</tbody>
</table>

| **(ENG) TEMA 2: PRIMER I SEGON PRINCIPIS DE LA TERMODINÀMICA**          | Learning time: 32h | Theory classes: 12h                                                                  |
|                                                                       |                     | Laboratory classes: 2h                                                                |
| Description:                                                           |                     | Self study: 20h                                                                       |
| 2.1. Work of volume change in a reversible process in a closed system. |                     |                                                                                      |
| **Related activities:**                                                |                     |                                                                                      |
| A2. Problems of the first and second principles of thermodynamics.     |                     |                                                                                      |
| **Specific objectives:**                                               |                     |                                                                                      |
| At the end of this teaching unit, the student must be able to:         |                     |                                                                                      |

| **(ENG) TEMA 3: PRINCIPIS DE TRANSMISSIÓ DE CALOR. APLICACIONS.**        | Learning time: 28h | Theory classes: 10h                                                                  |
|                                                                       |                     | Laboratory classes: 1h                                                                |
| Description:                                                           |                     | Self study: 17h                                                                       |
| 3.1 Introduction to heat transfer mechanisms.                          |                     |                                                                                      |
| **Related activities:**                                                |                     |                                                                                      |
| A8. Laboratory: Determination of thermal conductivity of an insulating material. |                     |                                                                                      |
| A11. Second individual written test.                                   |                     |                                                                                      |
| **Specific objectives:**                                               |                     |                                                                                      |
| At the end of this teaching unit, the student must be able to:         |                     |                                                                                      |
(ENG) TEMA 4: FONAMENTS DE TERMODINÀMICA TÈCNICA

**Description:**

**Related activities:**
A9. Laboratory: Determination of the heat balance and the COP of a heat pump as a function of time.
A10. Computer practice: Analysis of the operation of a conventional power plant with the "PROPAGUA" software.
A11. Second individual written test

**Specific objectives:**
At the end of this teaching unit, the student must be able to:

(ENG) TEMA 5: INTRODUCCIÓ ALS EQUIPS I GENERADORS TÈRMICS

**Description:**
5.2. Fuels and combustion: Classification of fuels. Calorific value of the fuel. Chemical equations of combustion (stoichiometric combustion, combustion with air excess and defect).
5.3. Boilers or steam generators: Classification. Use of the boilers. Mass and energy balance applied to a boiler. Efficiency of a boiler.

**Related activities:**
A5. Problems of introduction to equipment and thermal generators.
A11. Second individual written test.

**Specific objectives:**
At the end of this teaching unit, the student must be able to:

**Qualification system**

The different concepts that make up the continuous assessment are:
- Written individual examinations: 75%
- Submission of resolved problems: 15%
- Laboratory practical and computer simulations, and reports: 10%
Regulations for carrying out activities

- Each of the two individual written exams (Partial Controls) consist of two parts: a test of theory (which may constitute up to 30% of the grade of the exam) and a number of problems (up 100% of note the exam). Both exams have the same evaluative weight (37.5%) being the sum of both the 75% of the final grade.

Bibliography

Basic:

Complementary:

Others resources:
In computer classrooms of EPSEVG, the computer programs (software) used in the course of FENT are installed.