295024 - TERM - Thermodynamics

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 748 - FIS - Department of Physics
Academic year: 2018
Degree: BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6

Teaching staff
Coordinator: Tamarit Mur, Jose Luis

Degree competences to which the subject contributes

Specific:
CEI-07. Understand applied thermodynamics and heat transfer, their basic principles and their application to engineering problems.

Transversal:
07 AAT N2. 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.

Teaching methodology

Theory (2 sessions per week, 3 ECTS): the teacher presents the fundamental concepts and some demonstrations, complementing key examples and discussion of some applications.

Problems and Guided activities (2 sessions per week, 3 ECTS): the teacher presents representative solving problems; students review the basic concepts and solve some problems under the supervision of the teacher. In efforts to consolidate the concepts students and their magnitudes

Learning objectives of the subject

After completing the course the student must be able to:
- Know the basic concepts and principles explicitly and understand reasonably the thermal phenomena.
- Feeling comfortable in addressing particular problems in the field of materials engineering.
- Expressing magnitudes in SI units and conversion factors known to other systems of units

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</th>
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<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>15h</td>
<td>10.00%</td>
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<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Unit 1: Fundamental Concepts</th>
<th>Learning time: 4h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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**Description:**
Unit 1. Fundamental concepts
Introduction to thermodynamics. thermodynamic system, thermodynamic variable, state of equilibrium thermodynamic transformation. Zero Temperature principle. Thermometers and empirical thermometric scales

**Specific objectives:**
To know the basic terms of the thermodynamics

<table>
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<tr>
<th>Unit 2: Single and Simple Systems</th>
<th>Learning time: 10h</th>
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<tr>
<td></td>
<td>Theory classes: 10h</td>
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**Description:**

**Related activities:**
Laboratory works

**Specific objectives:**
To know the fundamental behaviour of the thermodynamic systems

<table>
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<tr>
<th>Unit 3. Calorimetry and Heat Propagation</th>
<th>Learning time: 9h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
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**Description:**

**Related activities:**
Laboratory works

**Specific objectives:**
To know the fundamental concepts of heat and its propagation
### First law of thermodynamics

**Description:**
Expansion work in simple PVT systems. Dissipative work. Conjugate variables and configuration work on other simple systems: surface work, work torsion work electric and magnetic polarization. First Law of thermodynamics. 
Internal energy. Enthalpy

**Related activities:**
Laboratory works

**Specific objectives:**
To know the 1st law of thermodynamics

**Learning time:** 6h  
Theory classes: 6h

### Unit 5: First law of thermodynamics. energy properties and applications

**Description:**

**Specific objectives:**
Know how to apply the 1st law of thermodynamics

**Learning time:** 7h  
Theory classes: 7h

### Unit 6: Second law of thermodynamics: Heat Engines

**Description:**

**Related activities:**
Laboratory works

**Specific objectives:**
To know the basic operation of the heat engines and its relation with the 2nd law of thermodynamics

**Learning time:** 7h  
Theory classes: 7h
The final grade for each student is calculated by a weighted average of the marks obtained in partial and final exams, as well as activities aimed at the laboratory. Detailed below the relative weight of each note in the final:

- Half-semester exam (multiple choice questions): 20%
- Laboratory works: 15%

According to the EEBE academic regulations, students that failed ordinary assessment and have obtained a mark, $N$, calculated as 65% of the final exam plus 35% of the half-semester exam, $3<N<5$, will have a re-assessment test during the period specified in the academic calendar.

**Bibliography**

**Basic:**