22098 - Thermodynamics

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 724 - MMT - Department of Heat Engines
Academic year: 2018
Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6  Teaching languages: Catalan

Teaching staff
Coordinator: John Hutchinson
Others: Yolanda Calventus Solé, Joaquim Rigola Serrano, Frida Roman, Carles Oliet

Degree competences to which the subject contributes

Specific:
2. Understanding and mastery of basic concepts about the general laws of mechanics, thermodynamics and electromagnetism fields and waves and their application to solving problems in engineering.
4. Applied knowledge of thermal engineering

1. An understanding of applied thermodynamics and heat transfer: basic principles and their application to solving engineering problems

Transversal:
7. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Teaching methodology

The course is organized into:
1. Lessons in large groups. In this group theory classes are developed, classes of problems and assessments on the 1st and 2nd partial.
2. Two. - Lessons in middle groups. In these classes will be developed problem solving sessions by the teacher, or the problems proposed to the students resolution and are part of autonomous learning. Whenever deemed necessary may be do some directed activity.
3. Three. - Classes in small groups: This activity develops laboratory practices and generic competition CG6 "Solvent use information resources."

A) Teacher - Student:
1. - Programmer of activities and information
2. - Learning Material
3. - Assessments of the activities
B) Student - Teacher
1. - Delivery of activities
2. - Questions, comments and suggestions regarding the development of the course and learning
C) Student - Student at
1. - Use forums as site for information and discussion

Athena platform can be used as a tool to support both types of classes that have been described. Used as a transmitter and communicating with students.

Learning objectives of the subject
Learning objectives of the course
- Acquire a basis for future studies of heat transfer, Fluid Mechanics and Heat Engines through a rigorous and comprehensive treatment of classical thermodynamics following a methodology
- Acquire the capacity to apply thermodynamics in subjects related
- Acquire the ability to make simplifying assumptions of thermodynamic problems based on real processes
- Acquire skills in handling instrumentation used in the laboratory.
- Relate and apply theoretical concepts to solve problems at the labs.
- Improving the use of quantities and units, tables and equations for the determination of physical quantities, and use software to calculate thermophysical properties.
- Acquire capacity for efficient use of the literature.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>32h</th>
<th>21.33%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>14h</td>
<td>9.33%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>14h</td>
<td>9.33%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
### Content

<table>
<thead>
<tr>
<th>Content</th>
<th>Learning time</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Laboratory classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content 1: Accurate concept of thermodynamic approach</strong></td>
<td>13h</td>
<td>4h</td>
<td>1h</td>
<td>2h</td>
<td>6h</td>
</tr>
<tr>
<td><strong>Content 2: Volumetric Properties of a pure substance, simple and compressible</strong></td>
<td>27h</td>
<td>5h</td>
<td>2h</td>
<td>2h</td>
<td>18h</td>
</tr>
<tr>
<td><strong>Content 3: First law of thermodynamics</strong></td>
<td>50h</td>
<td>10h</td>
<td>5h</td>
<td>5h</td>
<td>30h</td>
</tr>
<tr>
<td><strong>Content 4: Second law of thermodynamics</strong></td>
<td>47h</td>
<td>9h</td>
<td>5h</td>
<td>5h</td>
<td>28h</td>
</tr>
<tr>
<td><strong>Content 5: Thermodynamic cycles</strong></td>
<td>13h</td>
<td>4h</td>
<td>1h</td>
<td>2h</td>
<td>8h</td>
</tr>
</tbody>
</table>
### Planning of activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
<th>Details</th>
</tr>
</thead>
</table>
| 1. THEORY LESSONS               | 68h   | Theory classes: 26h  
Self study: 42h |
| 2. PROBLEM LESSONS              | 40h   | Practical classes: 14h  
Self study: 26h |
| 3. LABORATORY PRACTICE          | 36h   | Laboratory classes: 14h  
Self study: 22h |
| 4. 1 MIDTERM EXAM               | 2h    | Theory classes: 2h |
| 5. 2 MIDTERM EXAM               | 2h    | Theory classes: 2h |
| 6. MID-TERM LEVEL TESTS         | 2h    | Theory classes: 2h |

### Qualification system

- 1st Midterm Exam: 30%
- 2nd Midterm Exam: 40%
- Laboratory work: 20%
- Level Tests: 10%

The course will provide for procedures to recover unsatisfactory results obtained in the first evaluation, inside the final exam (for students with a mark lower than 5 with a degree between 0 and 5).
Regulations for carrying out activities

1. - Respect the 1 and 2 activities (theory classes and problem classes), the self-assessment questionnaires will not be used for purposes of determining a qualification.

2. - Activity 3 (laboratory practice), any lack of assistance is equivalent to a score of zero in the practice without the possibility of recovery. The lack of punctuality at the beginning of the session (maximum 15 minutes) imply the no realization of the practice without the possibility of recovery. The report of internship can be made in group or individual and will be given to the next practice session. If a student has not attended a practice session will not sign the report made by their peers. The exhibition will do in groups, using the appropriate resources, and delivering a copy of the material used at the end of the exhibition. Students who do not attend the session will obtain a rating of zero.

3. - The first midterm exam (activity 4), the second midterm exam (activity 5) and the level tests (activity 6) will be without the use of books, notes or other teaching materials, except tables, graphs and form delivered by the teacher. You can't use a calculator that can be programmed and any mobile device even when not connected. The students have to identify themself by ID or student card. The initial test level will not be evaluable.

4. - The 3 activity will also value generic competition assigned (CG6: effective use of information resources)

Bibliography

Basic:


Complementary:


Others resources:

Audiovisual material

Apunts realitzats pel professorat de l'assignatura