240IEN31 - Management and Energy Efficiency

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 724 - MMT - Department of Heat Engines
Academic year: 2019
Degree: MASTER’S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 4,5
Teaching languages: Catalan

Teaching staff
Coordinator: José Luis Martín Godoy
Others: Fernandez Francos, Xavier

Requirements
thermodynamics, Thermal Engineering and Fluid Mechanics.

Degree competences to which the subject contributes
Specific:
CEEENE2. Manage the energetic chain (generation, transformation and use) to obtain the highest energetic efficiency in a process or product.

Teaching methodology
B. Students will not face different activities scheduled throughout the year chronologically
1. Study the documentation provided on each topic
2. It promotes continuous work throughout the year with the proposal and collection problems.
3. Resolution of the Digital Campus exercises on the subject you are trying to classe (weekly)

Learning objectives of the subject
Understanding and interpreting energy as a vector consisting of several components: thermodynamic, economic, environmental, affecting some thermal energy transformation processes.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group: 27h</th>
<th>24.00%</th>
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</thead>
<tbody>
<tr>
<td>Hours small group: 13h 30m</td>
<td>12.00%</td>
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<tr>
<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 72h</td>
<td>64.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>Industrial energy management (audit)</strong></td>
<td>2h</td>
<td>Theory classes: 2h &lt;br&gt; Energy accounting. Specific consumption. Energy cost. energy audits.</td>
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<tr>
<td><strong>Use of residual heat</strong></td>
<td>3h</td>
<td>Theory classes: 3h &lt;br&gt; Basic operations. Heat treatment: various types. Technological potential recovery. Heat exchange networks (Pinch).</td>
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</tbody>
</table>
| **District heating and cooling networks** | **Learning time:** 1h 30m  
Theory classes: 1h 30m |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>District heating and cooling networks will be discussed, and their advantages and costs will be analyzed.</td>
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| **Boilers and combustion**               | **Learning time:** 3h  
Theory classes: 3h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>The energy efficiency in boilers will be discussed. Their efficiency, costs and environmental impact will be compared with those of other systems for the supply of thermal energy.</td>
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| **cogeneration**                        | **Learning time:** 2h  
Theory classes: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Definition and justification. Different systems. Legal framework. REE and examples. Tariff framework. Design criteria. Modes of operation</td>
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| **Heat pumps**                          | **Learning time:** 4h  
Theory classes: 4h |
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<tr>
<td><strong>Description:</strong></td>
<td>Heat pumps: type. Instantaneous and seasonal COP. Applications. Management of heat pumps</td>
</tr>
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</table>

| **Renewable energy sources**             | **Learning time:** 4h  
Theory classes: 4h |
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<tr>
<td><strong>Description:</strong></td>
<td>Technologies to convert energy such as solar, wind, or organic waste into useful energy (usually electricity).</td>
</tr>
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</table>
The qualification of the student will be

\[ N_{\text{final}} = 0.45N_{\text{ef}} + 0.20N_{\text{prof}} + 0.35N_{\text{proj}} \]

RETAKE: the retake exam replace the final exam + Nprof

\[ N_{\text{final}} \]

\[ N_{\text{ef}} \]

\[ N_{\text{proj}} \]

\[ N_{\text{prof}} \]

Qualification system

The final exam, about 3h approximately consist of short questions and problems are.

During the short questions will not be allowed to consult any material, whereas the resolution of the problems must be take notes because occasionally conducting an exercise could be allowed to consult additional material which communicates the same

Energy storage systems

| Description: |
| We describe some electrical energy storage systems such as compressed air tanks, reversible hydroelectric power stations, hydrogen production and fuel cells, batteries, ... |

Project

| Description: |
| In the development of the subject, active learning methodologies based on projects (PBL) and cooperative work will be employed. |

Learning time:

- Energy storage systems: 2h
- Project: 13h 30m

Theory classes:

- Energy storage systems: 2h
- Project: 13h 30m

Learning time:

- Theory classes: 2h
- Project: 13h 30m
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Bibliography

Basic:


Complementary:
