820121 - CHTEE - Hydraulic and Thermal Power Plants

**Coordinating unit:** 295 - EEBE - Barcelona East School of Engineering  
**Teaching unit:** 729 - MF - Department of Fluid Mechanics  
**Academic year:** 2017  
**Degree:** BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)  
**ECTS credits:** 6  
**Teaching languages:** Catalan

### Teaching staff

**Coordinator:** Fontanals Garcia, Alfred  
**Others:** Grau Barceló, Joan  
Rufes Martinez, Pedro

### Requirements

Prerequisite: Fluid Mechanics (MF) and Thermodynamics and Heat Transfer (TTC)

### Degree competences to which the subject contributes

**Specific:**  
1. Design power stations.

**Transversal:**  
4. 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

The course content will develop a methodology and participatory exhibits when taught the theoretical content. Students will work individually to make the understanding, analysis and synthesis of theory. In addition, teamwork will be necessary to address complex problems (theoretical and laboratory).

### Learning objectives of the subject

Conocer las diferentes tipologías de centrales de producción eléctrica. Conocer la fuente energética y la tecnología utilizable para su aprovechamiento en una central eléctrica

### Study load

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>Hours medium group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>150h</td>
<td>45h</td>
<td>15h</td>
<td>0h</td>
<td>90h</td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>30.00%</td>
<td>0.00%</td>
<td>10.00%</td>
<td>0.00%</td>
<td>60.00%</td>
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</tbody>
</table>
# Content

<table>
<thead>
<tr>
<th>1. Hydraulic and thermal power plants</th>
<th>Learning time: 20h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Self study: 12h</td>
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</tbody>
</table>

**Description:**
Characteristics of hydroelectric plants. Constituent elements, types. Characteristics of power plants. Constituent elements, types. Sea power, wind farms and solar power

**Related activities:**
Laboratory: Hydraulic transients

**Specific objectives:**
Understand the different types of power plants, both thermal and hydro. Identifying the constituent elements. Knowing the different energy sources used in power plants.

<table>
<thead>
<tr>
<th>2. Hydraulics machines. Turbomachines and volumetrics machines</th>
<th>Learning time: 30h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study: 18h</td>
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</tbody>
</table>

**Description:**

**Related activities:**
Laboratory: Pelton turbine

**Specific objectives:**
Get classification criteria of the hydraulic machines. Knowing the kinematics of flow in the impeller of turbomachines and their influence on energy transfer in the impeller. Understand the different types of pumps, their essential functional elements and their application areas. Understand the different types of turbines, their essential functional elements and their operating environments. Knowing how to use the similarity to redesign pumps and turbines similar to other existing

**Learning time:** 27h 30m  
Theory classes: 9h  
Laboratory classes: 2h  
Self study: 16h 30m

**Description:**  

**Related activities:**  
Laboratory: Solar Thermal Installation

**Specific objectives:**  
After completing this section, the student will recognize different heat generation systems, including the use of fuels and solar radiation in thermal systems. The student will also be able to perform basic design tasks for heat generation systems.


**Learning time:** 27h 30m  
Theory classes: 9h  
Laboratory classes: 2h  
Self study: 16h 30m

**Description:**  

**Related activities:**  
Laboratory: Heat exchanger, experimental and numerical study (2 sessions)

**Specific objectives:**  
After completing this section the student will understand the operation and basic design principles of heat exchangers, the thermodynamics of moist air and its application to the design of cooling towers.

<table>
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<tr>
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</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Self study: 12h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
Laboratory: alternative compressor

**Specific objectives:**
After completing this section, the student will recognize different gas power generation cycles and equipments and the required criteria to perform basic design tasks.

6. **Steam power generation cycles. Steam turbines. Cogeneration**

<table>
<thead>
<tr>
<th>Learning time: 25h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td>Self study: 15h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
Laboratory: Thermal power plant I and II (2 sessions)

**Specific objectives:**
After completing this section, the student will recognize different steam power generation cycles and equipment and the required criteria to perform basic design tasks.

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**Qualification system**

The evaluation will be conducted through written tests in the partials and final tests. The exercises and problems will be assessed from the delivery of material by students. Practices will be assessed based on attendance and activity performed in the laboratory together with the preparation and delivery of practice reports. To pass the course will have completed and passed the practice. There will test reassessment.

- First tests: 35%
- Second tests: 35%
- Exercises / problems: 10%
- Practices: 15%
- Generical competence: 5%
Bibliography

Basic:


Complementary: