820326 - TECE - Power Station Technology

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 748 - FIS - Department of Physics
Academic year: 2017
Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6  Teaching languages: Catalan

Teaching staff
Coordinator: Guillem Cortes Rossell
Others: Cortes Rossell, Guillem Pere
Koubychine, Yuri

Opening hours
Timetable: Just after the lectures. Other time frames to be appointed by e-mail.

Prior skills
Those given by the following courses:
- Mechanics of Fluids
- Thermodynamics and Heat Transfer
- Energy Resources
- Thermal and Fluid Dynamic Power Generation I

Requirements
FLUID MECHANICS - Prerequisite
THERMODYNAMICS AND HEAT TRANSFER - Corequisite

Degree competences to which the subject contributes
Specific:
CEENE-200. Measure and design energy production systems based on nuclear power.

Transversal:
05 TEQ N1. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
The subject shows the student the methods that allow to take advantage of many energy sources and understand the physical and technological principles to convert and make use of thermal and fluidodynamic energy.

Also, the subject tries to make the student to know the socioeconomic and environmental implications of the energy transformation and energy use.

**Learning objectives of the subject**

The subject shows to the student the methods that allows to take advantage of many energy sources and understand the physical and technological principles to convert and make use of thermal and fluidodynamic energy.

Also, the subject tries to make the student to know the socioeconomic and environmental implications of the energy transformation and energy use.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>30.00%</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>15h</td>
<td>10.00%</td>
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<tr>
<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>
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</tbody>
</table>

Validation tests will be established to ensure that students have done the activities and have assimilated the concepts.

The digital platform ATENEA will be used to announce the activities to be done and collect the deliveries of each student.
# Content

| Introduction                          | **Learning time:** 1h 30m  
<table>
<thead>
<tr>
<th></th>
<th>Theory classes: 1h 30m</th>
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</thead>
</table>

**Description:**  
Overview of the subject and organization of the course.

| Classical thermal power plants (the coal fired power plant) | **Learning time:** 28h  
|                                                           | Theory classes: 6h  
|                                                           | Laboratory classes: 2h  
<table>
<thead>
<tr>
<th></th>
<th>Self study: 20h</th>
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</thead>
</table>

**Description:**  
Overview. Description of the boiler, burners, heat exchangers, turbine, condenser, and other equipment of a steam-cycle thermal power plant.

**Related activities:**  
There will be a practical session where the main parameters involved in the energy balance in this type of plants will be calculated. In addition, a series of non-contact activities will be programmed to be solved individually or in team.

| Combined cycle power plants | **Learning time:** 23h 30m  
|                            | Theory classes: 4h 30m  
|                            | Laboratory classes: 4h  
<table>
<thead>
<tr>
<th></th>
<th>Self study: 15h</th>
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</table>

**Description:**  
Description of the technology, with the focus on the gas turbine and the recovery boiler.

**Related activities:**  
There will be practical sessions where the main parameters involved in the energy balance in this type of plants will be calculated. In addition, a series of non-contact activities will be programmed to be solved individually or in team.
<table>
<thead>
<tr>
<th>Nuclear power plants</th>
<th>Learning time: 30h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
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<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Self study : 20h</td>
</tr>
</tbody>
</table>

**Description:**
Exposition of the fundamentals underlaying the use of this type of energy. Description of the main technologies.

**Related activities:**
There will be practical sessions where the main parameters involved in the energy balance in this type of plants will be calculated and about the nuclear fuel cycle. In addition, a series of non-contact activities will be programmed to be solved individually or in team.

<table>
<thead>
<tr>
<th>Hydropower</th>
<th>Learning time: 21h 30m</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 4h 30m</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 15h</td>
</tr>
</tbody>
</table>

**Description:**
Description of the resource, siting and technologies. Overview of a plant and its components. Introduction to pumped-storage plants.

**Related activities:**
There will be practical sessions where the main parameters involved in the energy balance of hydroelectric power plants will be calculated, with a focus on the energy accumulation capabilities of some plants. In addition, a series of non-contact activities will be programmed to be solved individually or in team.

<table>
<thead>
<tr>
<th>Cogeneration and trigeneration</th>
<th>Learning time: 21h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 4h 30m</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study : 15h</td>
</tr>
</tbody>
</table>

**Description:**
Analysis of advantages and disadvantages of cogeneration and trigeneration. Description of the technologies. Balance calculations and determination of the efficiency parameters.

**Related activities:**
There will be practical sessions where the main parameters involved in the energy balance in this type of plants will be calculated. In addition, a series of non-contact activities will be programmed to be solved individually or in team.
60% exams. Will be 3 long exams (between 90 minutes and 120 minutes) during the semester, the two first will be related with specific topics and the last one will include the overall topics studied. The weight of each exam will be defined at the beginning of the semester. Each exam will include theory and exercises.

40% class activities. This mark will include the following items:
- The assistance to class sessions
- The evaluation of the activities done at class
- Evaluation of the reports of class activities
- Short exams done at class

At the end of the semester will be a re-evaluation exam. The exam could be done by those students that fits the requirements according the Academic Regulations of EEBE, section 2.2.

**Qualification system**

**Regulations for carrying out activities**

- It is not allowed to do theory exams with any book or class notes but is allowed a scientific calculator not programable
- It is allowed to do problem exams with class notes and additional bibliography and also a scientific calculator not programable
- The detection of an irregular action during the evaluation that could change the mark significantly could imply fail the overall subject.

**Bibliography**

**Complementary:**


**Others resources:**

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