820326 - TECE - Power Station Technology

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 748 - FIS - Department of Physics
Academic year: 2018
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 is based on classroom sessions (lectures and exercises) and non-contact student work, with individual activities and activities to do in cooperative teams.

As part of the exhibition Professor classroom sessions illustrate the contents with numerical exercises on the blackboard.

In classroom sessions the teacher illustrates the contents with numerical exercises on the blackboard.

In the practical sessions the students solve a numerical exercise under the teacher supervision.

Individual activities solved out of class include solve various exercises to prepare in advance the practical sessions or to settle the concepts of the lectures. The resolution of these activities will weigh on the assessment of the subject. Delivery of reports of practices (both what students have done in class and what they do outside the classroom later) also have a weight in the evaluation.

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.

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.

<table>
<thead>
<tr>
<th>Study load</th>
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<tbody>
<tr>
<td><strong>Total learning time:</strong> 150h</td>
<td></td>
</tr>
<tr>
<td>Hours large group:</td>
<td>45h</td>
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<tr>
<td>Hours medium group:</td>
<td>0h</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>15h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
</tr>
<tr>
<td>Self study:</td>
<td>90h</td>
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<tr>
<td><strong>Content</strong></td>
<td><strong>Learning time:</strong> 1h 30m</td>
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</tr>
<tr>
<td><strong>Introduction</strong></td>
<td>Theory classes: 1h 30m</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Overview of the subject and organization of the course.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Classical thermal power plants (the coal fired power plant)</strong></th>
<th><strong>Learning time:</strong> 28h</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Overview. Description of the boiler, burners, heat exchangers, turbine, condenser, and other equipment of a steam-cycle thermal power plant.</td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td>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.</td>
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<table>
<thead>
<tr>
<th><strong>Combined cycle power plants</strong></th>
<th><strong>Learning time:</strong> 23h 30m</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Description of the technology, with the focus on the gas turbine and the recovery boiler.</td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td>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.</td>
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</table>
## Nuclear power plants

**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.

### Learning time:
- **30h**
  - Theory classes: 6h
  - Laboratory classes: 4h
  - Self study: 20h

## Hydropower

**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.

### Learning time:
- **21h 30m**
  - Theory classes: 4h 30m
  - Laboratory classes: 2h
  - Self study: 15h

## Cogeneration and trigeneration

**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.

### Learning time:
- **21h 30m**
  - Theory classes: 4h 30m
  - Laboratory classes: 2h
  - Self study: 15h
Closing sessions

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 6h 30m</th>
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<tbody>
<tr>
<td>Resume sessions where all the studied technologies are placed in context.</td>
<td>Theory classes: 1h 30m</td>
</tr>
<tr>
<td>Related activities:</td>
<td>Self study: 5h</td>
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<tr>
<td>A series of non-contact activities will be programmed to be solved individually or in team.</td>
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Qualification system

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 students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations (https://eebe.upc.edu/ca/estudis/normatives-academiques/documents/eebe-normativa-avaluacio-i-permanencia-18-19-aprovat-je-2018-06-13.pdf)

Regulations for carrying out activities

- Is not allowed to do theory exams with any book or class notes but is allowed a scientific calculator not programable
- Is allowed to do problem exams with class notes and additional bibliography and also a scientific calculator not programable
- The detection of and 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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