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.

CEEENE1. Apply knowledge and valoration criteria on the design and evaluation of technological solutions for a good use of the renewable sources of energy, both in stand-alone systems as the ones connected to the network. Recognise and value the most innovative technological applications in the field of making a good use of the renewable source of energy.

CEMEI01. Knowledge and ability to analyse and design the generation, transport and distribution systems in electric energy.

CEMEI06. Knowledge and abilities which allow to understand, analyse, operate and manage the different sources of energy.

Teaching methodology

The course is organised in theoretical lectures and practical sessions. The practical sessions are sessions of group-working where the students will carry out the main work load, under the supervision of the teacher. Besides this, students will work on a project in group (if possible, the same group as for the practical sessions).

Learning objectives of the subject
To show to the student the current and developing techniques that allow the generation of energy. To give the understanding of the physical and technological principles of conversion, storage and transportation of energy, as well as its usage. To get awareness of the socio-economical and environmental implications of the transformation and use of energy (energy management)

<table>
<thead>
<tr>
<th>Study load</th>
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<tbody>
<tr>
<td><strong>Total learning time</strong>: 75h</td>
<td></td>
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<tr>
<td>Hours medium group:</td>
<td>27h</td>
<td>36.00%</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td>Self study:</td>
<td>48h</td>
<td>64.00%</td>
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</tbody>
</table>
# 240EI031 - Energy Technology

| Content |
|-----------------|-----------------|
| **Topic 1: Introduction to the energy problem** | **Learning time:** 2h  
Theory classes: 2h |
| **Description:** | Description of fundamental concepts of the energy topic: resources, reserves, primary, secondary, final and useful energy, energy system, energy intensity...  
Description of the present energy situation. |
| **Specific objectives:** | To reason about the unsustainability of the present energy system. |

| **Topic 2: Coal-fired thermal power plants** | **Learning time:** 5h  
Theory classes: 2h  
Laboratory classes: 2h  
Guided activities: 1h |
| **Description:** | The combustion reaction and the thermodynamic Rankine cycle (steam cycle) are reviewed before describing the technology of coal-fired thermal power plants. Application of the acquired knowledge to the study of practical cases. |
| **Related activities:** | Resolution of practical cases on steam cycle plants. Students will have to work individually and in group. |
| **Specific objectives:** | Students will be able to describe the technology and the basic physical principles of coal-fired thermal power plants and to solve realistic practical exercises. |

| **Topic 3: Combined cycle power plants.** | **Learning time:** 8h  
Theory classes: 2h  
Laboratory classes: 4h  
Self study : 2h |
| **Description:** | Review of the gas cycle (Brayton cycle). Description of the combined cycle plants technology: present situation, physical principles, operation, equipment...Resolution of practical cases. |
| **Related activities:** | Resolution of practical exercises in group in the classroom.  
Individual or group work out of the classroom. |
| **Specific objectives:** | Students will be able to describe the technology of combined cycle thermal power plants.  
He will be able to solve practical exercises on gas cycle and combined cycle. |
### Topic 4: Cogeneration

**Description:**
Combined heat and power generation. Description of the present situation.

**Related activities:**
Work in group in the classroom. Individual or in group work out of the classroom.

**Specific objectives:**
To describe the fundamentals of combined heat and power generation (cogeneration) and to justify its interest from an energy-saving point of view.

Resolution of practical exercises.

**Learning time:** 3h
- Theory classes: 0h 30m
- Laboratory classes: 1h 30m
- Self study: 1h

### Topic 5: Nuclear Power Plants.

**Description:**
Radioactivity and nuclear reactions. Fundamental principles of the nuclear reactor. Nuclear power plants with pressurized water reactor.

**Related activities:**
In the classroom: work in group.
Out of the classroom: work in group or individually.

**Specific objectives:**
- Describe the nuclear reactions that can be useful in order to obtain energy
- Describe the fission reaction, its main characteristics and reason about the importance of the fission reaction in order to obtain energy.
- Define radioactivity, its main processes and its impact within the nuclear plant technology (residual power, waste products)
- Compare a conventional thermal power plant and a nuclear power plant
- Solve practical exercises about nuclear power plants

**Learning time:** 6h
- Theory classes: 2h
- Laboratory classes: 2h
- Self study: 2h
### Topic 6: Renewable Technologies.

**Learning time:** 11h  
Theory classes: 4h  
Laboratory classes: 4h  
Self study: 3h

**Description:**  
Hydraulic energy, solar thermal energy, solar photovoltaic energy and wind energy. Basic principles and associated technologies. Resolution of exercises.

**Related activities:**  
In the classroom: work in group.  
Out of the classroom: individual work or in group.

**Specific objectives:**  
To describe the possible locations, applications and layout of the elements of a hydroelectric, solar or wind facility, and to describe the main characteristics of these elements.  
To solve practical exercises on systems using renewable energy sources.  
To appreciate the importance of these sources from both an economic and an environmental point of view.

**Qualification system**

The continuous assessment is the recommended option, as it is the best way to learn and take advantage of the knowledge that the course offers. This way of evaluating includes:
- the mid term exam mark (N1)  
- the final exam mark (N2)  
- the course activities (Nc), which have been completed in the classroom and/or at home, in groups or as individual work.
- Evaluation of a tutorized project in group (NT)

The final mark will be the best of the following two options:

1. \((0.2 \times N1 + 0.6 \times N2 + 0.2 \times NT) + 0.06 \times Nc\)
2. \(0.2 \times NT + 0.8 \times N2\)

The retake exam replaces the final exam.

**Bibliography**

**Audiovisual material**

*Transparencies dels temes 1 a 6*

Students will have a collection of slides accessible through the intranet of the course (ATENEA).