820324 - EAE - Efficiency and Energy Audits

Coordinating unit: 295 - EEBE - Barcelona East School of Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6

Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: Roset i Juan, Xavier
Cuadras Tomas, Angel

Opening hours
Timetable: In desk A10-8

Prior skills
Knowledge of thermal and electrical systems
Knowledge of the different ways to generate electricity, transmission and distribution technologies, and energy markets. Know how energy is integrated into different sectors.

Requirements
Electronic systems
Electric energy generation
Energy resources

Degree competences to which the subject contributes

Specific:
3. Design an energy saving system using different processes and technologies.

CEENE-09. Assess and compare technologies in economic terms and in terms of their efficiency and environmental impact.

Transversal:
6. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
9. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
10. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

Teaching methodology
Exhibition classes, participative works, problems, test, working group and external activities

Learning objectives of the subject
Meet the efficiency of energy in all its industrial chain. Know and apply methodologies to improve the energy efficiency in competitive environments. Know certifications and audits energetics, and another regulations and management energy programs.

### 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>Hours medium group:</td>
<td></td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td>Hours small group:</td>
<td></td>
<td>15h</td>
<td>10.00%</td>
</tr>
<tr>
<td>Guided activities:</td>
<td></td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td>Self study:</td>
<td></td>
<td>90h</td>
<td>60.00%</td>
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</tbody>
</table>
## Content

| (ENG) 1-Introduction | Learning time: 9h 40m  
Theory classes: 3h 30m  
Laboratory classes: 0h 10m  
Self study: 6h |
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>The energy management. Basic concepts, energy efficiency, market, supply contracts, among others.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Understand what is meant by energy management</td>
</tr>
</tbody>
</table>

| (ENG) 2. The energy sector and their management | Learning time: 13h 40m  
Theory classes: 5h  
Laboratory classes: 0h 20m  
Self study: 8h 20m |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>The energy sector and its management. The problem of environmental sustainability, the role of energy manager. The standard UNE 21630 and 16000</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Knowing the energy sector from the point of view of management. Meet current standards for energy management.</td>
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| (ENG) 3. Power quality | Learning time: 8h 20m  
Theory classes: 4h  
Laboratory classes: 0h 20m  
Self study: 4h |
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Power Quality. Energy management effects</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Understand what is meant by energy management.</td>
</tr>
</tbody>
</table>
### 4-Energy Efficiency in Buildings

#### Description:
Energy efficiency in buildings. Basic Principles. LIDER and CALENER.

#### Specific objectives:
Knowledge of methodologies that exist to meet energy efficiency in housing. Labelling of building.

#### Learning time:
- Theory classes: 7h
- Laboratory classes: 3h
- Self study: 12h

### 5-Energy Audit

#### Description:
Energy audit. The plan for energy efficiency

#### Specific objectives:
Knowing the tools to identify energy efficiency plan in the industry: energy audit and energy assessment.

#### Learning time:
- Theory classes: 6h 50m
- Laboratory classes: 1h
- Self study: 8h 20m

### 6-Energy Efficiency in Process technology

#### Description:
Energy efficient process technologies, energy efficiency horizontal processes. Examples and Problems.

#### Specific objectives:
Identify opportunities for energy efficiency in industry in both horizontal and technologies in process technologies.

#### Learning time:
- Theory classes: 5h 20m
- Laboratory classes: 0h 30m
- Self study: 3h 20m
### 7-Investment and financial analysis

<table>
<thead>
<tr>
<th>Learning time: 8h 30m</th>
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<tbody>
<tr>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td>Laboratory classes: 0h 30m</td>
</tr>
<tr>
<td>Self study : 5h</td>
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**Description:**
- Investment projects and cash flow
- Static and dynamic methods
- Simple and compound interests
- Examples of application

### 8-Technologies available regarding energy consumption motors and drives

<table>
<thead>
<tr>
<th>Learning time: 10h 40m</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 3h 30m</td>
</tr>
<tr>
<td>Laboratory classes: 0h 30m</td>
</tr>
<tr>
<td>Self study : 6h 40m</td>
</tr>
</tbody>
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**Description:**
- Potential savings and pumping losses
- Losses and efficiency in engines
- Speed control motors and pumps

**Related activities:**
- Examples and application problems

### (ENG) 9-Energy Service Companies

<table>
<thead>
<tr>
<th>Learning time: 14h 10m</th>
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<tbody>
<tr>
<td>Theory classes: 5h 20m</td>
</tr>
<tr>
<td>Laboratory classes: 0h 30m</td>
</tr>
<tr>
<td>Self study : 8h 20m</td>
</tr>
</tbody>
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**Description:**
- The energy service companies. Description and types of contracts.

**Specific objectives:**
- To study the energy service companies and their chance against changes in market players.

### (ENG) 10- Case Work

<table>
<thead>
<tr>
<th>Learning time: 30h 30m</th>
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<tbody>
<tr>
<td>Theory classes: 5h 30m</td>
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<tr>
<td>Laboratory classes: 0h 30m</td>
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<tr>
<td>Self study : 24h 30m</td>
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**Description:**
- Monograph
11. Maintenance strategy to improve energy management

**Learning time:** 7h 10m
- Theory classes: 3h 30m
- Laboratory classes: 0h 10m
- Self study: 3h 30m

**Description:**
- Maintenance strategies CM TBM, CBM and RCM
- Maintenance of steam systems, compressed air, lighting, motors and sensors

Qualification system

Final = 0.2 * partial control + 0.2 * final control + 0.2 * Software application + 0.15 * TEST, Exercises and problems + 0.15 * Work + 0.1 * Activities and visits

Regulations for carrying out activities

Exams, tours and sessions with guests are mandatory presence.
Without reevaluation process
### Bibliography

#### Basic:


#### Complementary:


#### Others resources:

**Hyperlink**

- **Energy Software**
  - Resource for the Work

**Audiovisual material**

- **Transperències de classe**
  - Clasrom documentation

**Computer material**

- **Software HULC, CE3X y VERDE**
  - Software

**Normes d'energia**

- Standarts energy efficiency
Test, Exercicis i Examens anteriors
Resource