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
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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.

<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> 150h</td>
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<tr>
<td>Hours large group:</td>
<td>45h</td>
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<tr>
<td>Hours medium group:</td>
<td>0h</td>
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<tr>
<td>Hours small group:</td>
<td>15h</td>
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<td></td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
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<tr>
<td>Self study:</td>
<td>90h</td>
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</table>

Study load: 30.00% for large group, 10.00% for small group, and 60.00% for self study.
## Content

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

<table>
<thead>
<tr>
<th>(ENG) 2. The energy sector and their management</th>
<th>Learning time: 13h 40m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: The energy sector and its management. The problem of environmental sustainability, the role of energy manager. The standard UNE 21630 and 16000</td>
<td>Theory classes: 5h</td>
</tr>
<tr>
<td>Specific objectives: Knowing the energy sector from the point of view of management. Meet current standards for energy management.</td>
<td>Laboratory classes: 0h 20m</td>
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<td></td>
<td>Self study : 8h 20m</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>(ENG) 3. Power quality</th>
<th>Learning time: 8h 20m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: Power Quality. Energy management effects</td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Specific objectives: Understand what is meant by energy management.</td>
<td>Laboratory classes: 0h 20m</td>
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<td>Self study : 4h</td>
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</tbody>
</table>
### (ENG) 4-Energy Efficiency in Buildings

<table>
<thead>
<tr>
<th>Learning time: 22h</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 7h</td>
</tr>
<tr>
<td>Laboratory classes: 3h</td>
</tr>
<tr>
<td>Self study: 12h</td>
</tr>
</tbody>
</table>

**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.

### (ENG) 5-Energy Audit

<table>
<thead>
<tr>
<th>Learning time: 16h 10m</th>
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<tbody>
<tr>
<td>Theory classes: 6h 50m</td>
</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Self study: 8h 20m</td>
</tr>
</tbody>
</table>

**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.

### (ENG) 6-Energy Efficiency in Process technology

<table>
<thead>
<tr>
<th>Learning time: 9h 10m</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 5h 20m</td>
</tr>
<tr>
<td>Laboratory classes: 0h 30m</td>
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<tr>
<td>Self study: 3h 20m</td>
</tr>
</tbody>
</table>

**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.
### 7-Investment and financial analysis

**Learning time:** 8h 30m  
- Theory classes: 3h  
- Laboratory classes: 0h 30m  
- Self study: 5h  

**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

**Learning time:** 10h 40m  
- Theory classes: 3h 30m  
- Laboratory classes: 0h 30m  
- Self study: 6h 40m  

**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

**Learning time:** 14h 10m  
- Theory classes: 5h 20m  
- Laboratory classes: 0h 30m  
- Self study: 8h 20m  

**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

**Learning time:** 30h 30m  
- Theory classes: 5h 30m  
- Laboratory classes: 0h 30m  
- Self study: 24h 30m  

**Description:**  
Monograph
11- Maintenance strategy to improve energy management

<table>
<thead>
<tr>
<th>Description:</th>
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<tbody>
<tr>
<td>Maintenance strategies CM TBM, CBM and RCM</td>
</tr>
<tr>
<td>Maintenance of steam systems, compressed air, lighting, motors and sensors</td>
</tr>
</tbody>
</table>

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

**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
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Bibliography

Basic:

Complementary:

Others resources:

Hyperlink

Energy Software
Resource for the Work

Audiovisual material

Transparències de classe
Classroom documentation

Computer material

Software HULC, CE3X y VERDE
Software

Normes d’energia
Standarts energy efficiency
Test, Exercicis i Examens anteriors
Resource