Course guide
820324 - EAE - Efficiency and Energy Audits

Unit in charge: Barcelona East School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.
Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Compulsory subject).
Academic year: 2022  ECTS Credits: 6.0  Languages: Catalan

LECTURER
Coordinating lecturer: ANGEL CUADRAS TOMAS
                      FRANCESC XAVIER ROSET I JUAN
Others: Primer quadrimestre:
        ANGEL CUADRAS TOMAS
        Segon quadrimestre:
        ANGEL CUADRAS TOMAS

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.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
3. Design an energy saving system using different processes and technologies.
CEENE-16. Formulate energy balances and identify losses.
CEENE-07. Knowledge of the sustainability and social and environmental commitment criteria that are applicable to energy sectors.
CEENE-09. Assess and compare technologies in economic terms and in terms of their efficiency and environmental impact.

Generical:
CGEN-13. (ENG) Sensibilización energética económica y medioambiental.

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
Expositive classes, participative activities, problems, quiz, working group and external activities
LEARNING OBJECTIVES OF THE SUBJECT

Know the energy energy in buildings, industry and transport.
Know and apply methodologies to improve the energy efficiency in competitive environements.
Know certificactions and energy aaudits along with another regulations and energy management energy softwares.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

(ENG) 1-Introduction

Description:
The energy management. Basic concepts, energy efficiency, market, supply contracts, among others.

Specific objectives:
Understand what is meant by energy management

Related competencies:
CEENE-25. Design an energy saving system using different processes and technologies.
07 AAT N3. 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.

Full-or-part-time: 9h 40m
Theory classes: 3h 30m
Laboratory classes: 0h 10m
Self study : 6h

(ENG) 2. The energy sector and their management

Description:
The energy sector and its management. The problem of environmental sustainability, the role of energy manager. Introduction of significant standards related to energy management.

Specific objectives:
Knowing the energy sector from the point of view of management. Meet current standards for energy management.

Related competencies:
07 AAT N3. 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.

Full-or-part-time: 13h 40m
Theory classes: 5h
Laboratory classes: 0h 20m
Self study : 8h 20m
### (ENG) 3-Energy Efficiency in Buildings

**Description:**
Energy efficiency in buildings. Basic Principles. Certification software

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

**Related competencies:**
07 AAT N3. 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.

**Full-or-part-time:** 22h
- Theory classes: 7h
- Laboratory classes: 3h
- Self study: 12h

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### 4-Investment and financial analysis

**Description:**
Investment projects and cash flow
Static and dynamic methods
Simple and compound interests
Environmental costs
Examples of application

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

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

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### (ENG) 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.

**Related competencies:**
CEENE-25. Design an energy saving system using different processes and technologies.
07 AAT N3. 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.

**Full-or-part-time:** 16h 10m
- Theory classes: 6h 50m
- Laboratory classes: 1h
- Self study: 8h 20m
(ENG) 6-Energy Service Companies

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.

Related competencies:
07 AAT N3. 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.

Full-or-part-time: 14h 10m
Theory classes: 5h 20m
Laboratory classes: 0h 30m
Self study: 8h 20m

(ENG) 7-Power quality

Description:
Power Quality. Energy management effects

Specific objectives:
Understand what is meant by energy management in the energy quality.

Related competencies:
07 AAT N3. 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.

Full-or-part-time: 8h 20m
Theory classes: 4h
Laboratory classes: 0h 20m
Self study: 4h

(ENG) 8-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.

Related competencies:
07 AAT N3. 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.

Full-or-part-time: 9h 10m
Theory classes: 5h 20m
Laboratory classes: 0h 30m
Self study: 3h 20m
9-Technologies available regarding energy consumption motors and drives

**Description:**
Potential savings and pumping losses  
Losses and efficiency in engines  
Speed control motors and pumps

**Related activities:**  
Examples and application problems

**Related competencies:**  
CEENE-25. Design an energy saving system using different processes and technologies.

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

10-Maintenance strategy to improve energy management

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

**Related competencies:**  
CEENE-25. Design an energy saving system using different processes and technologies.

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

(ENG) 11- Case Work

**Description:**  
Monograph

**Related competencies:**  
CEENE-25. Design an energy saving system using different processes and technologies.  
05 TEQ N2. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

**Full-or-part-time:**  
30h 30m  
Theory classes: 5h 30m  
Laboratory classes: 0h 30m  
Self study : 24h 30m

**GRADING SYSTEM**

Final grade= 0.2*partial control+ 0.2* final control + 0.2*Software application (lab)+ 0.15 test, Exercises and problems + 0.15 Work outside classroom (TNP) + 0.1*Participation activities
**EXAMINATION RULES.**

Exams, participative sessions and sessions with guests are mandatory presence.
Without reevaluation process

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**BIBLIOGRAPHY**

**Basic:**

**Complementary:**

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**RESOURCES**

**Audiovisual material:**
- Transparències de classe. Clasrom documentation

**Computer material:**
- Normes d'energia. Standarts energy efficiency
- Test, Exercicis i Examens anteriors. Resource
- Software HULC, CE3X y VERDE. Software

**Hyperlink:**
- Energy Software. Resource for the Work