

## Course guide

### 820324 - EAE - Efficiency and Energy Audits

**Last modified:** 08/08/2024

**Unit in charge:** Barcelona East School of Engineering  
**Teaching unit:** 710 - EEL - Department of Electronic Engineering.

**Degree:** BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Compulsory subject).

**Academic year:** 2024    **ECTS Credits:** 6.0    **Languages:** Catalan

#### LECTURER

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**Coordinating lecturer:** FRANCESC XAVIER ROSET JUAN - ANGEL CUADRAS TOMAS

**Others:** Primer quadrimestre:  
ANGEL CUADRAS TOMAS - Grup: M11, Grup: M12

#### PRIOR SKILLS

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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

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##### 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

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Expositive classes, participative activities, problems, quizz, 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 environments.

Know certifications and energy audits along with another regulations and energy management energy softwares.

## STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours large group	45,0	30.00

**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

### 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

### (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.

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

## BIBLIOGRAPHY

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### Basic:

- Sans Rovira, Ramon. La darrera oportunitat : la transició energètica del segle XXI (TE21). Barcelona: Octaedro, 2015. ISBN 9788499217963.
- Doty, Steve; Turner, Wayne C. Energy management handbook. 8th ed. Lilburn, GA: Taylor & Francis, 2013. ISBN 9781466578289.
- Sans Rovira, Ramon; Pulla Escobar, Elisa. El Col·lapse és evitable : la transició energètica del segle XXI (TE21). Barcelona: Octaedro, 2014. ISBN 9788499214535.
- Al-Shemmeri, Tarik. Energy audits : a workbook for energy management in buildings. 2011. Chichester: Wiley-Blackwell, 2011. ISBN 9780470656082.
- Carretero, Antonio ; García Sánchez, Manuel. Gestión de la eficiencia energética : cálculo del consumo, indicadores y mejora. 2015. Madrid: Aenor, 2015. ISBN 9788481438840.

### Complementary:

- U.S. Energy Information Administration. International energy outlook [on line]. Washington: U.S. Energy Information Administration, 2011 [Consultation: 28/04/2020]. Available on: <http://www.eia.gov/forecasts/ieo/>.
- Kreith, Frank [ed.]; West, Ronald E. [ed.]. CRC handbook of energy efficiency. Florida: CRC press, 1997. ISBN 0849325145.
- Asociación Española de Normalización y Certificación. UNE-EN ISO 50001 : sistemas de gestión de la energía : requisitos con orientación para su uso. Madrid: AENOR, 2011.
- Asociación Española de Normalización y Certificación. UNE 216501 : auditorías energéticas : requisitos generales. Madrid: AENOR, DL 2009.
- International Energy Agency. Energy technology perspectives 2010 : escenarios & strategies to 2050. París: OECD/IEA, 2010. ISBN 9789264085978.
- Ministerio de Industria, Turismo y Comercio. La Energía en España 2010 [on line]. Madrid: Ministerio de Industria, Turismo y Comercio, 2011 [Consultation: 28/04/2020]. Available on: [http://www.minetur.gob.es/energia/balances/balances/librosenergia/energia\\_espana\\_2010\\_2ed.pdf](http://www.minetur.gob.es/energia/balances/balances/librosenergia/energia_espana_2010_2ed.pdf).

## RESOURCES

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### Audiovisual material:

- Transparències de classe. Clasrom documentation

### Computer material:

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

### Hyperlink:

- Energy Software. Resource for the Work