Course guide
820324 - EAE - Efficiency and Energy Audits

Last modified: 04/06/2026

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: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: FRANCESC XAVIER ROSET JUAN - ANGEL CUADRAS TOMAS

Others:

Primer quadrimestre:
ANGEL CUADRAS TOMAS - Grup: M11, Grup: M12, Grup: M13
AGNÈS LOMASCOLO PUJADÓ - Grup: M11, Grup: M12, Grup: M13

Segon quadrimestre:
ANGEL CUADRAS TOMAS - Grup: T11
JOSE ANTONIO FERNANDEZ VARO - Grup: T11

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 INFORMATI0N 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, 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 eficiency in competitive environements.
Know certificactions and energy aaudits 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

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

Final grade= 0.2*partial control+ 0.2* final control + 0.2* (lab)+ 0.15 test, Exercises and problems + 0.125 Work outside classroom (TNP) + 0,125*Participation activities

EXAMINATION RULES.

Exams and participative sessions are mandatory presence.
Without reevaluation process

BIBLIOGRAPHY

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 : requisistos 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 : scenarios & 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.

RESOURCES

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