Course guide
340672 - GEEL - Management and Saving of Electrical Energy

Last modified: 26/06/2023

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Ramon Caumons Sangrà

Others: Ramon Caumons Sangrà

Boada Rafecas, Jordi

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
2. SUSTAINABILITY AND SOCIAL COMMITMENT. Being aware of and understanding the complexity of social and economic phenomena that characterize the welfare society. Having the ability to relate welfare to globalization and sustainability. Being able to make a balanced use of techniques, technology, the economy and sustainability.
3. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

TEACHING METHODOLOGY

- In the lectures will be presented and developed the theoretical foundations of programmed materials. Consist of theoretical explanations complemented by activities to encourage participation, discussion and critical analysis by students.
- In the kinds of problems were raised and solved exercises for the areas covered. Students have to solve, individually or in groups, indicating problems.
- It will realised group work or individual work during the year related to a specific topic of the course.

LEARNING OBJECTIVES OF THE SUBJECT

In the theoretical classes, the theoretical foundations of the scheduled subjects will be presented and developed. They will consist of theoretical explanations complemented by activities aimed at stimulating participation, debate and critical analysis by students.
In the classes of problems, the exercises corresponding to the treated subjects will be posed and solved. Students must solve, individually or in groups, the indicated problems.
Individual or group work will be carried out during the course related to some specific topic of the subject.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

-1: Pricing of electricity.

Description:
• General information about electric energy billing. Liberalization of the electricity sector.
• Billing of the energy company. Invoice optimization.
• Practical considerations on reactive energy compensation.
• Types of compensation: Global, partial and individual.
• Practical determination of a capacitor bank for the compensation of the reactive energy of an installation.
• Counter. Measurement schemes.

Full-or-part-time: 25h
Theory classes: 7h 30m
Laboratory classes: 2h 30m
Self study : 15h

-2: Energy savings.

Description:
• Introduction
• Primary sources of energy
• Energy units.
• Current energy situation.
• Efficiency and energy saving.
• 2030 Agenda.
• Legislative framework. Basic document HE. RITE.
• Almost zero energy buildings.
• CO2 emissions.

Full-or-part-time: 25h
Theory classes: 7h 30m
Laboratory classes: 2h 30m
Self study : 15h

-3 Energy audit.

Description:
• Introduction.
• Regulations: UNE-EN 16247.
• Data collection.
• Energy accounting.
• Examples of audits.
• Energy service companies.
• Investment valuation: VAN, TIR ...

Full-or-part-time: 25h
Theory classes: 7h 30m
Laboratory classes: 2h 30m
Self study : 15h

-4 : Energy certification . Energy label.

Description:
• Introduction.
• Normative.
• Building energy certification.
• Energy label.
• Certification software.
• Examples.

Full-or-part-time: 25h
Theory classes: 7h 30m
Laboratory classes: 2h 30m
Self study : 15h

-6: Energy efficiency in facilities and equipment.

Description:
• Fundamental magnitudes.
• Light generation by electric energy. Led lamps.
• Photometry.
• Interior lighting. Normative.
• Energy efficiency of interior lighting installations.
• Energy efficiency in external lighting.
• Calculation software.

Full-or-part-time: 25h
Theory classes: 7h 30m
Laboratory classes: 2h 30m
Self study : 15h

-6: Energy efficiency in facilities and equipment.

Description:
• Air conditioning. Ventilation.
• Heat pumps: Geothermal and Aero thermal.
• Free cooling.
• Regulation and control systems.
• Maintenance. Types.
• Efficient water management.
• High performance electric drives.
• Home appliances. Energy label.
• Electrical Installation: Economic and ecological section of the cables in BT.

Full-or-part-time: 25h
Theory classes: 7h 30m
Laboratory classes: 2h 30m
Self study : 15h

PRACTICES

Description:
1: Power measurement: The meter and the network analyzer.
2: Energy audit of a building.
3: Energy certification of a building

GRADING SYSTEM

60 % theory.
40 % practices.

REEVALUATION:
If the EPSEVG establishes reevaluation for this subject, it will be done according to its regulations. The re-evaluable part would correspond to the exams (60%).

EXAMINATION RULES.

- The written tests are classroom and individual.

BIBLIOGRAPHY

Basic:
- UNE-EN 16247-2 : Auditorías energéticas. Parte 2: Edificios. Madrid: AENOR, 2014.
- "Parte 1: Requisitos generales". UNE-EN 16247-1:2012. Madrid: AENOR, 2012.
- Espanya. REEA : reglamento de eficiencia energética en instalaciones de alumbrado exterior : y sus instrucciones técnicas complementarias ITC-EA 01 a 07 : Real Decreto 1890/2008 de 14 de noviembre. Madrid: Garceta, 2009. ISBN 9788493720803.
- Sá Lago, Alfred. Aplicaciones del led en diseño de iluminación [on line]. Barcelona: Marcombo, 2015 [Consultation: 21/03/2024]. Available on: https://search-ebscohost-com.recursos.biblioteca.upc.edu/login.aspx?direct=true&AuthType=ip,uid&db=nlebk&AN=2749580&site=ehost-live&ebv=EB&ppid=pp_Cover. ISBN 9788426718051.
- Gago, Alfonso; Fraile, Jorge. Iluminación con tecnología LED. Madrid: Paraninfo, 2012. ISBN 9788428333689.
- Villar Burke, Rafael; Sorribes Gil, Marta; Jiménez González, Daniel; Sobaler Rodríguez, Jesús. DB HE 2019 : guía de aplicación [on line]. Madrid: Centro de Publicaciones, Secretaría General Técnica, Ministerio de Transportes, Movilidad y Agenda Urbana, 2020 [Consultation: 07/03/2022]. Available on: https://www.codigotecnico.org/pdf/GuiasyOtros/Guia_aplicacion_DBHE2019.pdf. ISBN 9788449810466.
- Reglamento de instalaciones térmicas en los edificios. 2a ed. Barcelona: Marcombo, 2018. ISBN 9788426726643.
- Espanya. jurisdicció promulgadora. Código técnico de la edificación. 8a ed. Madrid: Tecnos, 2017. ISBN 9788430971701.