Course guide
820735 - EQE - Electrical Equipment

Last modified: 08/04/2026

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Compulsory subject).
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2022). (Optional subject).

Academic year: 2026 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: Aragüés Peñalba, Mònica

Others: Aragüés Peñalba, Mònica

PRIOR SKILLS

- Mathematical calculation
- Complex numbers
- Ordinary differential equations

REQUIREMENTS

- Basic physics
- Basic mechanics

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMT-2. Identify and describe the components of electrical systems (production, transportation, distribution, markets, procurement and consumption) and evaluate the technological solutions used in the production of electricity.
CEMT-6. Employ technical and economic criteria to select the most appropriate electrical equipment for a given application, dimension thermal equipment and facilities, and recognise and evaluate the newest technology applications in the field of production, transport, distribution, storage and use of electric energy.

Transversal:
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

Teaching methodology:

The course teaching methodologies are as follows:

- Lectures and conferences: presentation of knowledge by lecturers or guest speakers.
- Participatory sessions: collective resolution of exercises, debates and group dynamics, with the lecturer and other students in the classroom; classroom presentation of an activity individually or in small groups.
- Theoretical/practical supervised work (TD): classroom activity carried out individually or in small groups, with the advice and supervision of the teacher.
- Homework assignment of reduced extension: carry out homework of reduced extension, individually or in groups.
- Homework assignment of broad extension: design, planning and implementation of a project or homework of broad extension by a group of students, and writing a report that should include the approach, results and conclusions.
- Evaluation activities (EV).

Training activities:

The course training activities are as follows:

- Face to face activities
o Lectures and conferences: learning based on understanding and synthesizing the knowledge presented by the teacher or by invited speakers.
o Participatory sessions: learning based on participating in the collective resolution of exercises, as well as in discussions and group dynamics, with the lecturer and other students in the classroom.
o Presentations (PS): learning based on presenting in the classroom an activity individually or in small groups.
o Theoretical/practical supervised work (TD): learning based on performing an activity in the classroom, or a theoretical or practical exercise, individually or in small groups, with the advice of the teacher.

- Study activities
o Homework assignment of reduced extension (PR): learning based on applying knowledge and presenting results.
o Homework assignment of broad extension (PA): learning based on applying and extending knowledge.
o Self-study (EA): learning based on studying or expanding the contents of the learning material, individually or in groups, understanding, assimilating, analysing and synthesizing knowledge.

LEARNING OBJECTIVES OF THE SUBJECT

Objectives
Acquire comprehensive knowledge of the most common electrical equipment.
Learning outcomes
Upon completing the course, the student should:
- Understand the role of electrical equipment in production and service sectors, as well as its importance in the energy chain: processing, transportation, distribution and end use and efficiency of electrical energy.
- Have the knowledge, skills and elements of analysis necessary to select the most appropriate electrical equipment from an energetic standpoint for each application (industrial or service) as well as the ability to analyse the behaviour of computer operation, make a diagnosis on the operating system and establish measures aimed at the improvement of the energy itself.
- Have the knowledge, skills and analytical elements needed to plan a project of basic or fundamental engineering level, related to the design, sizing and/or the use of electrical equipment in different industrial and service sectors.
- Be able to propose transferable results in most electrical equipment by developing novel ideas.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	36.00
Self study	80,0	64.00

Total learning time: 125 h

CONTENTS

Introduction and basic concepts

Description:
Introduction to the course and review of basic concepts necessary for the proper development of the course

Specific objectives:
Basic and general competences:
CG1. Integrate and apply mathematical, analytical, scientific, instrumental, technological and management knowledge acquired in university education, as well as the ability to solve problems in the field of power engineering.
CG3. Intervene in the process of research, development and innovation in energy technologies and the use of energy in production and service sectors, providing new knowledge and technological breakthroughs and innovative solutions in multidisciplinary teams, national or international.
CG4. Critically analyse the regional, national and supranational policies and apply the legislation to energy material in the fields of power engineering and energy management.
CG6. Carry out opinions and technical advice in the field of power engineering.

Related activities:
Specific skills:
CE1. Understand, describe and analyse, in a clear and broad way, the entire chain of energy conversion, from its state as a source of energy to its use as an energy service. Identify, describe and analyse the situation and characteristics of different energy sources and end use of energy in its economic, social and environmental dimensions and make valuable judgments.
CE4. Efficiently obtain data on renewable energy and its statistical treatment and apply knowledge and assessment criteria in the design and evaluation of technological solutions for the use of renewable energy for both grid-connected and isolated systems. Recognise and evaluate new technological applications in the field of the use of renewable energy.
CE6. Apply technical and economic criteria to the selection of electrical equipment best suited for a particular application. Size equipment and electrical installations. Recognise and assess the new technological applications in the fields of production, transport, distribution, storage and use of electricity.
CE7. Analyse the behaviour of equipment and operating facilities in order to develop a diagnostic evaluation on the regime of exploitation and establish measures aimed at improving the energy efficiency of the equipment and operating facilities.

Related competencies :
CEMT-6. Employ technical and economic criteria to select the most appropriate electrical equipment for a given application, dimension thermal equipment and facilities, and recognise and evaluate the newest technology applications in the field of production, transport, distribution, storage and use of electric energy.
CEMT-2. Identify and describe the components of electrical systems (production, transportation, distribution, markets, procurement and consumption) and evaluate the technological solutions used in the production of electricity.
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Full-or-part-time: 4h
Theory classes: 4h

Power system review and main components

Description:
Brief review of the electrical power system: key elements, characteristics and evolution

Specific objectives:
To have an overview of the electrical power system and how it is operated

Full-or-part-time: 4h
Theory classes: 4h

Electric installations and cable selection

Description:
Elements and characterization of electrical installations. ? Sizing an installation and its cables. General criteria, parts and materials involved, Maximum current criterion, maximum voltage drop criterion and maximum short circuit current criterion

Full-or-part-time: 46h
Theory classes: 46h

Faults and protections in electric installations

Description:
content english

Full-or-part-time: 43h
Theory classes: 43h

Transformers

Description:
Operation principles, rated values, tests

Full-or-part-time: 28h
Theory classes: 28h

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**.

Written test (PE). 70%
Work performed individually or in groups (TR). 30%

There is no re-take exam.

During the spring semester of the 2019-2020 academic year, and as a consequence of the health crisis due to Covid19, the evaluation method will be:
Mcourse = 0.6·M_final_exam + 0.1·Msubmission_1 + 0.3·M_report
M_final_exam: final exam mark, that will be held according to the ETSEIB calendar
N_submission_1: mark of the first activity
M_report: mark of the report done individually or in groups throughout the course

EXAMINATION RULES.

Individual. Use of formula sheet and calculator allowed. The assignments cannot be turned in in pencil.

BIBLIOGRAPHY

Complementary:
- Ras Oliva, Enrique. Transformadores de potencia, de medida y de protección. 7ª ed. Barcelona: Marcombo, cop. 1988. ISBN 8426706908.
- Sanjurjo Navarro, Rafael. Máquinas eléctricas. Ed estudiantes (EEES). Madrid: García Maroto, 2011. ISBN 9788415214144.