Course guide
295325 - 295SE022 - Processing and Electronic Management of Electrical Energy

Last modified: 13/06/2025

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

Degree: MASTER'S DEGREE IN INTERDISCIPLINARY AND INNOVATIVE ENGINEERING (Syllabus 2019). (Optional subject).
MASTER'S DEGREE IN TECHNOLOGIES FOR DISTRIBUTED ENERGY SYSTEMS (Syllabus 2025). (Compulsory subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: Casellas Beneyto, Francisco

Others: Casellas Beneyto, Francisco
Millan Blasco, Oliver

PRIOR SKILLS

- See the version in spanish of the teaching guide of the subject.

REQUIREMENTS

- See the version in spanish of the teaching guide of the subject.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMUEII-11. Design and manage processing and management systems for the production, storage, conversion and distribution of electrical energy using different technologies. (Specific competence of the Efficient Systems specialty)

Generical:
CGMUEII-01. Participate in technological innovation projects in multidisciplinary problems, applying mathematical, analytical, scientific, instrumental, technological and management knowledge.
CGMUEII-05. To communicate hypotheses, procedures and results to specialized and non-specialized audiences in a clear and unambiguous way, both orally and through reports and diagrams, in the context of the development of technical solutions for problems of an interdisciplinary nature.

Transversal:
05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
06 URI. 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.
03 TLG. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

LEARNING RESULTS

Knowledges:
K1. Identify renewable resources as sources of electrical energy.
K2. Identify the structural and functional particularities and applicable regulations of decentralised electrical systems.
K3. Recognise and compare the electronic subsystems used in processing and managing electrical energy in distributed electrical systems.

Skills:
S1. Analyse, design and evaluate the reliability and life cycle of decentralised electrical systems based on renewable energy sources. Assess the reliability and life cycle of a distributed system for energy generation from renewable resources.
S3. Assess the impact and needs of new electricity consumption models and relate them to the change in energy model resulting from the decarbonisation of energy sources.
S2. Analyse the electronic subsystems required in a renewable energy plant and evaluate automation and control technologies for energy management of smart electrical grids and microgrids in a decentralised energy system.

Competences:
C4. Apply the knowledge acquired and appropriate methodologies to analysis and design in the field of decentralised electrical systems with renewable sources.
C2. Identify and analyse problems that require making autonomous, informed and reasoned decisions in order to act with social responsibility following ethical values and principles.

TEACHING METHODOLOGY

- Master classes: 15%.
- Lab sessions: 70%.
- Presentation of works: 15%.

LEARNING OBJECTIVES OF THE SUBJECT

- See the version in spanish of the teaching guide of the subject.

STUDY LOAD

Type	Hours	Percentage
Self study	94,0	62.67
Hours large group	28,0	18.67
Hours small group	28,0	18.67

Total learning time: 150 h

CONTENTS

Theoretical content

Description:
- See the version in spanish of the teaching guide of the subject.

Full-or-part-time: 8h
Theory classes: 8h

Practical Content

Description:
- See the version in spanish of the teaching guide of the subject.

Specific objectives:

Full-or-part-time: 40h
Practical classes: 40h

Self-learning

Description:
- See the version in spanish of the teaching guide of the subject.

Full-or-part-time: 8h
Self study : 8h

Proposal of individual works on the design of electronic systems

Description:
- See the version in spanish of the teaching guide of the subject.

Full-or-part-time: 8h
Practical classes: 8h

GRADING SYSTEM

The evaluation of the subject will be weighted as follows, with the weights indicated on the final grade:
- Activities, tests and laboratory sessions: 40%
- Evaluation of the generic competence of the subject: 20%
- Work on the design of an electronic system for a micro-grid of electrical energy in DC: 20%
- Individual test of knowledge acquired: 20%

Since it is a course with continuous (ongoing) assessment, there is not final re-assessment test.

EXAMINATION RULES.

It will be published during the first week of the course.

BIBLIOGRAPHY

Basic:
- Wentworth, Peter; Elkner, Jeffrey; Downey, Allen B.; Meyers, Chris. How to think like a computer scientist : learning with Python 3 [on line]. [els autors], October 2012 [Consultation: 22/07/2025]. Available on: https://openbookproject.net/thinkcs/python/english3e/.
- Iyer, Shivkumar V. Simulating Nonlinear Circuits with Python Power Electronics : An Open-Source Simulator, Based on Python™ [on line]. Cham: Springer International Publishing, 2018 [Consultation: 22/07/2025]. Available on: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-319-73984-7. ISBN 3319739840.

Complementary:
- Curso de experto profesional en energía fotovoltaica. Sevilla: PROGENSA, cop. 2009. ISBN 9788495693495.
- Chauhan, Rajeev Kumar; Chauhan, Kalpana; Singh, Sri Niwas. Microgrids for rural areas : research and case studies [on line].

Stevenage: The Institution of Engineering and Technology, 2020 [Consultation: 22/07/2025]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=6225843. ISBN 9781785619991.

RESOURCES

Audiovisual material:
- Nombre recurso. Resource

Other resources:
The material of the subject, which will serve for the correct follow-up of this, such as: class notes, slides, exercises, articles of charcuterie, manuals of laboratory practices and catalogs of manufacturers, among other information.
They are available in a repository in the virtual campus of the subject.