# UNIVERSIDAD DE CASTILLA - LA MANCHA

# GUÍA DOCENTE

## 1. General information

**Course:** ANALYSIS AND OPERATION OF ELECTRICAL SYSTEMS
**Code:** 56423
**Type:** ELECTIVE
**ECTS credits:** 6
**Degree:** 413 - UNDERGRADUATE DEGREE PROGRAMME IN ELECTRICAL ENGINEERING
**Academic year:** 2022-23
**Center:** 605 - SCHOOL OF INDUSTRIAL ENGINEERS. AB
**Group(s):** 10
**Year:** 4
**Duration:** C2
**Main language:** Spanish
**Second language:** English
**Use of additional languages:**
**English Friendly:** Y
**Web site:**
**Bilingual:** N

Lecturer: **EMILIO GOMEZ LAZARO** - Group(s): **10**

| Building/Office | Department | Phone number | Email | Office hours |
|---|---|---|---|---|
| Infante Don Juan Manuel / 0.C9 | INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES | | emilio.gomez@uclm.es | |

Lecturer: **RAQUEL VILLENA RUIZ** - Group(s): **10**

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## 2. Pre-Requisites

Not established

## 3. Justification in the curriculum, relation to other subjects and to the profession

Not established

## 4. Degree competences achieved in this course

**Course competences**

| Code | Description |
|---|---|
| CB01 | Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge. |
| CB02 | Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area. |
| CB03 | Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues. |
| CB04 | Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences. |
| CB05 | Have developed the necessary learning abilities to carry on studying autonomously |
| CEO07 | Applied knowledge of the analysis and operation of electrical power systems. |
| CG01 | Ability to draft, sign and develop projects in the field of Industrial Engineering, in accordance with the knowledge acquired under the provisions of Order CIN/351/2009, for the construction, reform, repair, conservation, demolition, manufacture, installation, assembly or operation of: structures, mechanical equipment, energy installations, electrical and electronic installations, industrial installations and plants, and manufacturing and automation processes. |
| CG02 | Ability to manage activities related to engineering projects in the field of industrial engineering. |
| CG04 | Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of industrial engineering. |
| CG06 | Ability to handle specifications, regulations and mandatory standards. |
| CG07 | Ability to analyse and assess the social and environmental impact of technical solutions. |
| CT02 | Knowledge and application of information and communication technology. |
| CT03 | Ability to communicate correctly in both spoken and written form. |

## 5. Objectives or Learning Outcomes

**Course learning outcomes**

Description

Design and calculation of basic installations and infrastructures of power plants and particularly those based on renewable energy sources.

Design of power plants, particularly those based on renewable energies.

Analysis of the feasibility of projects and procesisng of such projects.

**Additional outcomes**

## 6. Units / Contents

**Unit 1:**

**Unit 2:**

**Unit 3:**
**Unit 4:**
**Unit 5:**
**Unit 6:**
**Unit 7:**
**Unit 8:**
**Unit 9:**

## 7. Activities, Units/Modules and Methodology

| Training Activity | Methodology | Related Competences (only degrees before RD 822/2021) | ECTS | Hours | As | Com | Description |
|---|---|---|---|---|---|---|---|
| Class Attendance (theory) [ON-SITE] | Lectures | CB01 CB02 CB03 CB04 CB05 CEO07 CG01 CG02 CG04 CG06 CG07 CT02 CT03 | 1 | 25 | Y | N | |
| Computer room practice [ON-SITE] | Practical or hands-on activities | CB01 CB02 CB03 CB04 CB05 CEO07 CG01 CG02 CG04 CG06 CG07 CT02 CT03 | 0.6 | 15 | Y | Y | |
| Study and Exam Preparation [OFF-SITE] | Self-study | CB01 CB02 CB03 CB04 CB05 CEO07 CG01 CG02 CG04 CG06 CG07 CT02 CT03 | 3.6 | 90 | N | - | |
| Problem solving and/or case studies [ON-SITE] | Problem solving and exercises | CB01 CB02 CB03 CB04 CB05 CEO07 CG01 CG02 CG04 CG06 CG07 CT02 CT03 | 0.6 | 15 | Y | N | |
| Formative Assessment [ON-SITE] | Individual presentation of projects and reports | CB01 CB02 CB03 CB04 CB05 CEO07 CG01 CG02 CG04 CG06 CG07 CT02 CT03 | 0.2 | 5 | Y | N | |
| | | **Total:** | **6** | **150** | | | |
| | | **Total credits of in-class work: 2.4** | | | | | **Total class time hours: 60** |
| | | **Total credits of out of class work: 3.6** | | | | | **Total hours of out of class work: 90** |

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

## 8. Evaluation criteria and Grading System

| Evaluation System | Continuous assessment | Non-continuous evaluation* | Description |
|---|---|---|---|
| Laboratory sessions | 15.00% | 0.00% | |
| Progress Tests | 15.00% | 0.00% | |
| Final test | 70.00% | 100.00% | |
| **Total:** | **100.00%** | **100.00%** | |

*According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).*

## 9. Assignments, course calendar and important dates

**Not related to the syllabus/contents**

| Hours | hours |
|---|---|
| Class Attendance (theory) [PRESENCIAL][Lectures] | 25 |
| Computer room practice [PRESENCIAL][Practical or hands-on activities] | 15 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 90 |
| Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises] | 15 |
| Formative Assessment [PRESENCIAL][Individual presentation of projects and reports] | 5 |

**Global activity**

| Activities | hours |
|---|---|
| Computer room practice [PRESENCIAL][Practical or hands-on activities] | 15 |
| Class Attendance (theory) [PRESENCIAL][Lectures] | 25 |
| Study and Exam Preparation [AUTÓNOMA][Self-study] | 90 |
| Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises] | 15 |
| Formative Assessment [PRESENCIAL][Individual presentation of projects and reports] | 5 |
| **Total horas:** | 150 |

## 10. Bibliography and Sources

| Author(s) | Title/Link | Publishing house | Citv | ISBN | Year | Description |
|---|---|---|---|---|---|---|
| Jaquelin Cochran, Mackay | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Miller, Michael Milligan, Erik Ela, Douglas Arent, Aaron Bloom, Matthew Futch, Juha Kiviluoma, Hannele Holtinnen, Antje Orths, Emilio Gómez-Lázaro, Sergio Martín-Martínez, Steven Kukoda, Glycon Garcia, Kim Møller Mikkelsen, Zhao Yongqiang, y Kaare Sandholt. | Market Evolution: Wholesale Electricity Market Design for 21st Century Power Systems | 21stCenturyPower.org | | NREL/TP-6A20-57477 | 2013 |
| | http://www.nrel.gov/docs/fy14osti/57477.pdf | | | | |
| John J. Grainger, William D Stevenson | Análisis de sistemas de potencia | MacGraw-Hill | | 9789701009086 | 1999 |
| Power Electronic Converters and Systems: Frontiers and Applications | E. Muljadi and E. Gómez-Lázaro and A. Ginart | The Institution of Engineering and Technology | | 978-1-84919-826-4 | 2015 |
| | http://dx.doi.org/10.1049/PBPO074E | | | | |
| J. M. Adell, J. Canales, M. Gálvez, A. Frossard, J. L. Garda, E. Gómez-Lázaro, N. Goodall, E. Méndez, J. L. Plá, A. Pototschnig, J. C. Ruiz, A. Salem, R. Schaeffer, y J. Verde | Energía: Desarrollos tecnológicos en la protección medioambiental | Thomson Reuters | | 978-84-470-3806-0 | 2011 |
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| A. Orths, H. Abildgaard, F. van Hulle, J. Kiviluoma, B. Lange, M. O¿Malley, D. Flynn, A. Keane, J. Dillon, E. M. Carlini, J. O. Tande, A. Estanqueiro, E. Gómez-Lázaro, L. Söder, M. Milligan, J. C. Smith, y C. Clark. | WIND INTEGRATION STUDIES | Technical Research Centre of Finland VTT | | | 2013 |
| | http://www.ieawind.org/task_25.html | | | | |
| Andrzej M. Trzynadlowski (Editor), Eduard Muljadi, Emilio Gomez-Lazaro, Antonio Ginart | Power Electronic Converters and Systems: Frontiers and Applications | The Institution of Engineering and Technology | | 978-1849198264 | 2015 |
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| Antonio Gomez-Expósito, Claudio Cañizares, Antonio J. Conejo | Electric Energy Systems - Analysis and Operation | CRC | EEUU | 9780849373657 | 2009 |
| Antonio Gómez Expósito y otros | Análisis y operación de sistemas de energía eléctrica | Mc Graw Hill Interamericana S.L | | 978-8448135928 | |
| H. Holttinen, J. Kiviluoma, A. Robitaille, N. A. Cutululis, A. Orths, F. Van Hulle, I. Pineda, B. Lange, M. O¿Malley, J. Dillon, E. M. Carlini, C. Vergine, J. Kondoh, Y. Yasuda, M. Gibescu, J. Olav Tande, A. Estanqueiro, E. Gómez-Lázaro, L. Söder, J. C. Smith, M. Milligan, y D. Lew. | Design and operation of power systems with large amounts of wind power | Julkaisija-Utgivare | Helsinki, Finland | 978-951-38-7308-0 | 2013 |
| | http://www.ieawind.org/task_25.html | | | | |
| J. Duncan Glover, Mulukutla S. Sarma, Thomas Overbye | Power System Analysis and Design | Cengage Learning | | 9781111425791 | 2011 |