UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: POWER ENGINEERING
Code: 56439
Type: ELECTIVE
ECTS credits: 6
Degree: 412 - UNDERGRADUATE DEGREE PROGRAMME IN ELECTRICAL ENGINEERING
Academic year: 2022-23
Center: 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING
Group(s): 55
Year: 4
Duration: C2
Main language: Spanish
Second language:
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **RAFAEL ZARATE MIÑANO** - Group(s): **55**

Building/Office	Department	Phone number	Email	Office hours
Edificio Störr, 3º planta, Dpto. IEEAC	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	926264007 ext:6051	rafael.zarate@uclm.es	They will be published at the beginning of the teaching period of the course.

2. Pre-Requisites

In order to take full advantage of this course, it is recommended that the student possesses skills related to mathematical problem solving, physics and electromagnetism problem solving, circuit theory, electric power lines, as well as high voltage engineering.

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

In Order CIN/351/2009, of February 9, 2009, Spanish legislation establishes the requirements for the verification of official university degrees that enable the exercise of the profession of Industrial Technical Engineer. This order specifies that the graduate in Electrical Engineering must acquire knowledge about power systems and their applications. The course Power Engineering contributes to the acquisition of this competence by the student.

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
CEE06	Knowledge of electrical power systems and their applications.
CG03	Knowledge of basic and technological subjects to facilitate learning of new methods and theories, and provide versatility to adapt to new situations.
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.
CG05	Knowledge required to carry out measurements, calculations, valuations, appraisals, valuations, surveys, studies, reports, work plans and other similar work.
CG06	Ability to handle specifications, regulations and mandatory standards.
CG07	Ability to analyse and assess the social and environmental impact of technical solutions.
CG09	Organisational and planning skills in the field of companies and other institutions and organisations.
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

Ability to formulate a state estimation problem.

Ability to solve the optimal load flow problem in an electrical system and analyse its results.

Knowledge of the methodologies required to decide on the participation of generators, traders and consumers in electricity markets.

Acquisition of the basic knowledge to model and solve the power plant scheduling problem.

6. Units / Contents

Unit 1: Fundamentals of power systems.

Unit 2: Mathematical and computational tools.

Unit 3: Operation in a non-competitive environment. Unit commitment and economic dispatch.
Unit 4: Operation in a competitive environment. Market clearing procedures.

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]	Combination of methods	CB01 CB02 CB03 CB04 CB05 CEE06 CG03 CG04 CG05 CG06 CG07 CG09 CT02 CT03	1.44	36	N	-	Presentation in the classroom of the fundamental contents of the course and resolution of practical examples in a collaborative approach.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CEE06 CG03 CG04 CG06 CT02	0.16	4	N	-	Collaborative resolution of exercises and problems in the classroom.
Computer room practice [ON-SITE]	Combination of methods	CG03 CG04 CT02	0.6	15	N	-	Training on computer tools for the resolution of studies and practical cases related to the contents of the course.
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 CEE06 CG03 CG04 CG05 CG06 CG07 CG09 CT02 CT03	3.6	90	N	-	Personal study and preparation of reports.
Formative Assessment [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 CEE06 CG03 CG04 CG05 CG06 CG07 CG09 CT02 CT03	0.2	5	N	-	Group sessions for evaluation and monitoring of the work progress on the case studies proposed to the students.
		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
Assessment of problem solving and/or case studies	50.00%	50.00%	The report that the student must deliver with the solution of the proposed case studies related to the technical operation of power systems will be assessed. The students who follow the continuous evaluation will have to deliver the report on a date agreed during the course. Students who do not follow the continuous evaluation will have the deadline for the delivery of this report on the day of the regular exam.
Assessment of activities done in the computer labs	50.00%	50.00%	The report that the student must deliver with the solution of the practical cases proposed during the course in relation to the economic operation of power systems will be valued. The students who follow the continuous evaluation will have to deliver the report on a date agreed during the course. Students who do not follow the continuous evaluation will have the deadline for the delivery of this report on the day of the regular exam.
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).

Evaluation criteria for the final exam:

Continuous assessment:

The grade of each delivery will consist of a numerical value between 0 and 10. In order to pass the course in this call, the student must obtain a final score equal or higher than 5.0. The determination of the final score will be made according to the following calculation system:
- Grade obtained in the report submitted with the solution of the case studies related to the technical operation of power systems. This grade must be higher or equal to 4.0 and will represent 50% of the final score of the course. If this grade is lower than 4.0, the student will be able to make a new delivery on the day of the regular and/or special exam of the course.
- Grade obtained in the report submitted with the solution of the practical cases related to the economic operation of power systems. This grade must be higher or equal to 4.0 and will represent 50% of the final score of the course. If this grade is lower than 4.0, the student will be able to make a new delivery on the day of the regular and/or special exam of the course.

Non-continuous evaluation:

The grade for each delivery will consist of a numerical value between 0 and 10. In order to pass the course in this call, the student must obtain a final score equal to or higher than 5.0. The determination of the final score will be made according to the following calculation system:
- Grade obtained in the report submitted with the solution of the case studies related to the technical operation of power systems. This grade must be higher or equal to 4.0 and will represent 50% of the final score of the course. If this grade is lower than 4.0, the student will be able to make a new delivery the day of the special exam of the course.
- Grade obtained in the report submitted with the solution of the practical cases related to the economic operation of power systems. This grade must be higher or equal to 4.0 and will represent 50% of the final score of the course. If this grade is lower than 4.0, the student will be able to make a new delivery on the day of the special exam of the course.

Specifications for the resit/retake exam:

The grade for each delivery will consist of a numerical value between 0 and 10. In order to pass the course in this call, the student must obtain a final score equal to or higher than 5.0. The determination of the final score will be made according to the following calculation system:
- Grade obtained in the report submitted with the solution of the case studies related to the technical operation of power systems. This grade must be higher or equal to 4.0 and will represent 50% of the final score of the course.
- Grade obtained in the report submitted with the solution of the practical cases related to the economic operation of power systems. This grade must be higher or equal to 4.0 and will represent 50% of the final score of the course.

Specifications for the second resit / retake exam:

The evaluation criteria in this call will be the same as those applied in the special exam.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Class Attendance (theory) [PRESENCIAL][Combination of methods]	36
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Computer room practice [PRESENCIAL][Combination of methods]	15
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Formative Assessment [PRESENCIAL][Assessment tests]	5

Global activity

Activities	**hours**
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Formative Assessment [PRESENCIAL][Assessment tests]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Class Attendance (theory) [PRESENCIAL][Combination of methods]	36
Computer room practice [PRESENCIAL][Combination of methods]	15
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
B03. Barrero, Fermín	Sistemas de Energía Eléctrica	Paraninfo		978-8497322836	2010	Bibliografía complementaria
B04. Conejo, Antonio J.; Baringo, Luis	Power Systems Operations	Springer		978-3-319-69406-1	2018	Bibliografía complementaria
B02. Gómez Expósito, Antonio (Coord.)	Análisis y Operación de Sistemas de Energía Eléctrica	McGraw-Hill		978-8448135928	2002	Bibliografía complementaria
B00. Zárate Miñano, Rafael	Apuntes de la asignatura					Referencia básica
B01. Gómez-Expósito, Antonio; Conejo, Antonio J.; Cañizares, Claudio (Coord.)	Electric Energy Systems: Analysis and Operation	Taylor & Francis, CRC Press		978-1-138-72479-2	2018	Bibliografía complementaria