Teaching Guide				
Identifying Data				2016/17
Subject (*)	Centrais Eléctricas		Code	770G02024
Study programme	Grao en Enxeñaría Eléctrica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Third	Obligatoria	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Casteleiro Roca, José Luis	E-mail	jose.luis.casteleiro@udc.es	
Lecturers	Casteleiro Roca, José Luis	E-mail	jose.luis.casteleiro@udc.es	
Web				
General description	This subject aims to give students theoretical knowledge of various types of the power stations, and its operation ways, in order to achieve the necessary knowledge for their manage, analysis and design.			

Study programme competences / results	
Code	Study programme competences / results
A1	Capacidade para planificar, presupostar, organizar, dirixir e controlar tarefas, persoas e recursos.
A2	Capacidade para a redacción, firma, desenvolvemento e dirección de proxectos no ámbito da enxeñaría industrial, e en concreto da especialidade de electricidade.
A4	Capacidade de xestión da información, manexo e aplicación das especificacións técnicas e da lexislación necesarias no exercicio da profesión.
A5	Capacidade para analizar e valorar o impacto social e medioambiental das solucións técnicas actuando con ética, responsabilidade profesional e compromiso social, e buscando sempre a calidade e mellora continua.
A32	Capacidade para o deseño de centrais eléctricas.
B1	Capacidade de resolver problemas con iniciativa, toma de decisións, creatividade e razoamento crítico.
B2	Capacidade de comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial.
B4	Capacidade de traballar e aprender de forma autónoma e con iniciativa.
B5	Capacidade para empregar as técnicas, habilidades e ferramentas da enxeñaría necesarias para a práctica desta.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Knowing the different energy systems that can be used in power stations	A1 A4	B1	
Understanding the processes of power generation from traditional energy sources	A2 A5	B4	C6
Knowing the selection and resize of the elements of the generation system of the power stations	A1 A5 A32	B1 B5	
Knowing the selection and resize of the auxiliary systems of the power stations	A5 A32	B1 B5	
Knowing the principles of operation of the electricity market	A4	B2	
Knowing the principles of operation of energy markets	A4	B2	

Contents

Topic	Sub-topic
Topic 1: Energy resources and electricity production	1.1. Reservations and energy resources 1.2. Classification and types of power plants 1.3. Study of different types of primary energy sources
Topic 2: Electric energy and sustainable development. Environmental impact	2.1. Introduction to sustainable development 2.2. CO2 emission costs 2.3. Combustion processes 2.4. Environmental impact of different technologies
Topic 3: More efficient technologies electricity production	3.1. Techniques improved efficiency 3.2. New technologies of coal use 3.3. Technology coal gasification 3.4. CO2 capture and storage
Topic 4: Coverage of the electricity demand	4.1. Study of the electricity demand 4.2. Power System configuration 4.3. Configuration and operation of the Spanish electricity market 4.4. Rates, prices and costs of electricity 4.5. Generation scheduling 4.6. Parameters related to production
Topic 5: Coal power plants	5.1. Water-steam circuit. Steam turbines 5.2. Air-gas circuit 5.3. Fuel-ash circuit 5.4. Cooling water circuit 5.5. Regulation of the power station
Topic 6: Nuclear power plants	6.1. Nuclear fission 6.2. Elements of a nuclear reactor 6.3. Nuclear reactor control 6.4. Types of nuclear reactors
Topic 7: Wiring diagrams. Auxiliary services	7.1. Study of different electrical diagrams 7.2. Auxiliary services of the power stations. Energy consumption 7.3. Reserve supply
Topic 8: Gas power plants. Combined cycle. cogeneration	8.1. Brayton thermodynamic cycle 8.2. Gas turbines. Components 8.3. Otto-Diesel thermodynamic cycle 8.4. Internal combustion engines 8.5. Combined cycle. Heat Recovery Steam Generator 8.6. Regulation and control of a combined cycle 8.7. Cogeneration
Topic 9: Conventional and pumping hydroelectric plants	9.1. Description of the components of a hydroelectric plant 9.2. Hydraulic turbines. Control and regulation 9.3. Reversible hydroelectric power plants. Types
Topic 10: Introduction to power plants with renewable sources	10.1. Wind, thermal, photovoltaic, biomass, marine, geothermal and mini hydro power stations

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A2 A4 A5 A32 B4 B2	31	40	71
Problem solving	A32 A4 B1 B5 C6	20	16	36
Supervised projects	A1 A4 A32 B1 B2 B4 C6	0	20	20

Objective test	A4 A5 A32 B1 B5	3	15	18
Personalized attention		5	0	5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**
Guest lecture / keynote speech	Keynote speech complemented with the use of audiovisual media and the introduction of some questions to students, in order to transmit knowledge and facilitate learning. The order of the topics covered will not have to be the one described in the teaching guide. In addition, there will be topics that can be seen together on the development of others, and the division between them may not be strict.
Problem solving	Solving exercises and specific problems in the classroom, from the knowledge explained.
Supervised projects	Performing a bulletin individual character problems, similar to those solved in the classroom exercises.
Objective test	It consists in carrying out an objective test of approximately 3 hours, in which the acquired knowledge will be evaluated.

Personalized attention	
Methodologies	**Description**
Problem solving Supervised projects	The student has the relevant meetings of personalized tutorials, to resolve the concerns arising from the matter. The realization of the problems set is individual, and each student may attend the tutoring sessions it deems appropriate to resolve the doubts that arise.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Objective test	A4 A5 A32 B1 B5	Exam type objective test	75
Supervised projects	A1 A4 A32 B1 B2 B4 C6	Some tasks established in the subject, within the framework of this methodology	25

Assessment comments
As part of the "Supervised projects" may include aspects such as attendance, personal work, proposed personal work, attitude, etc., to help to pass the subject. The "Objective test" will be divided into a theoretical and practical part. The grade obtained by the student with the "Supervised projects" will be weighted with the mark obtained in the practical part of the "Objective test" It is necessary to exceed 50% of the score in the theoretical part of the "Objective test" to approve, as well as having made and approved the work proposed in the "Supervised projects".

Sources of information	
Basic	- Sanz Feito, J. (1990). Centrales Eléctricas. UPM - Orille Fernández, Á. L. (1993). Centrales Eléctricas I, II y III. UPC - Rojas Rodríguez, S. (1997). Centrales hidroeléctricas teoría y problemas. UNEX - Barrero, F. (2004). Sistemas de energía eléctrica. Thomson - Sabugal García, S. (2006). Centrales térmicas de ciclo combinado: teoría y proyecto. Díaz de Santos
Complementary	- Lapuerta Amigo, M. (1998). Tecnologías de la combustión. Universidad de Castilla-La Mancha - García Ybarra, P. L. (2001). Tecnologías energéticas e impacto ambiental. McGraw-Hill - Gómez Expósito, A. (2003). Sistemas eléctricos de potencia problemas y ejercicios resueltos. Prentice Hall

Recommendations

Subjects that it is recommended to have taken before
Termodinámica/770G02012
Mecánica de Fluídos/770G02016
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Instalacións de Enerxías Renovables/770G02033
Técnicas de adquisición de medidas eléctricas/770G02030
Xestión Eficiente da Enerxía Eléctrica/770G02040
Mantemento Industrial/770G02041
Instrumentación Industrial/770G02042
Comunicacións Industriais/770G02043
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.