

**1. General information****Course:** RENEWABLE ENERGY AND ENERGY ASSESSMENT OF CHEMICAL**Type:** ELECTIVE**Degree:** 344 - CHEMICAL ENGINEERING**Center:** 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY**Year:** 4**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 57739**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 21**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** ANA MARIA BORREGUERO SIMON - Group(s): 21

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2. Pre-Requisites

Not established

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

This subject is taught the second semester of the fourth year of the Degree in Chemical Engineering. At this moment the student knows in depth the most relevant operations and processes of the chemical industry and it is now intended that he can analyze them and optimize them from the energy point of view. Likewise, it is intended to deepen the knowledge of renewable energy sources, to be able to provide different solutions to improve the energy efficiency of industrial

4. Degree competences achieved in this course**Course competences**

Code	Description
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.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
E26	Knowledge and capacity of management and specification of the main industrial equipment in the area of knowledge of chemical engineering
E42	Knowledge about the mode of operation and capacity for the design of the main unit operations used in the pharmaceutical and food industries, in particular mechanical separation operations and membrane processes
G10	Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer
G12	Knowledge of Information and Communication Technologies (ICT).
G13	Proper oral and written communication
G14	ethical commitment and professional ethics
G16	Capacity for critical thinking and decision making
G17	Synthesis capacity
G18	Capacity for teamwork
G19	Ability to analyze and solve problems
G20	Ability to learn and work autonomously
G21	Ability to apply theoretical knowledge to practice
G22	Creativity and initiative
G23	Leadership
G24	Recognition of diversity, multiculturalism and gender equality

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

To know the integration of processes and operations.

To know the possibilities of energy savings and economic benefits that involve processes such as cogeneration.

To understand the development of energies and the relevance they have in the conservation of the environment.

To know the different technological solutions to improve the efficiency of industrial processes.

To have applied knowledge on nuclear energy, renewable energy sources and capacity for energy assessment and optimization of chemical processes.

To analyze the influence of ecological, social, political and ethical factors on the development of each of the energy sources.

6. Units / Contents

Unit 1: Energy
Unit 2: Thermoelectric plants
Unit 3: Nuclear energy
Unit 4: Renewable energy
Unit 5: Hydroelectric plant
Unit 6: Small size hydroelectric plants
Unit 7: Solar energy
Unit 8: Wind energy
Unit 9: Biomass energy
Unit 10: The electricity
Unit 11: The spanish energy renewable plan
Unit 12: Cogeneration systems
Unit 13: Efficiency of chemical process

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	CB02 CB03 CB05 E26 E42 G10 G12 G16 G17 G18 G20 G21 G22 G23	1.5	37.5	N	-	
Workshops or seminars [ON-SITE]	project-based learning	CB02 CB03 CB05 E26 E42 G10 G13 G16 G17 G20 G21 G22 G23 G24	0.5	12.5	Y	Y	
Group tutoring sessions [ON-SITE]	Project/Problem Based Learning (PBL)	CB02 CB03 CB05 E42 G10 G12 G13 G16 G17 G18 G20 G21 G22 G23	0.3	7.5	N	-	
Mid-term test [ON-SITE]	Assessment tests	CB02 CB03 CB05 E42 G10 G12 G14 G16 G17 G18 G20 G21 G22 G23	0.1	2.5	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB05 E42 G10 G12 G13 G14 G16 G17 G18 G20 G21 G22 G23	3.6	90	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
Final test	0.00%	100.00%	
Mid-term tests	70.00%	0.00%	
Assessment of problem solving and/or case studies	30.00%	0.00%	
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).

Evaluation criteria for the final exam:

Continuous assessment:

To pass the subject a minimum mark of 4/10 in each part should be obtained by the student and an average mark above 5/10.

Non-continuous evaluation:

All the contents will be evaluated only through a written exam where a minimum grade of 5 must be obtained

Specifications for the resit/retake exam:

To pass the subject a minimum mark of 5/10 should be obtained in a final exam

Specifications for the second resit / retake exam:

To pass the subject a minimum mark of 5/10 should be obtained in a final exam

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	37.5
Workshops or seminars [PRESENCIAL][project-based learning]	12.5
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	7.5

Mid-term test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Global activity	
Activities	hours
Workshops or seminars [PRESENCIAL][project-based learning]	12.5
Mid-term test [PRESENCIAL][Assessment tests]	2.5
Class Attendance (theory) [PRESENCIAL][Lectures]	37.5
Group tutoring sessions [PRESENCIAL][Project/Problem Based Learning (PBL)]	7.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Hoeneisen, B.	La situación energética mundial (con números)	Universidad S. Francisco de Quito	Quito		2006	
IDAE	Energía de la Biomasa	Biblioteca Cinco Días	Madrid	84-8036-414-9	1996	
IDAE	Plan de Acción Nacional de Energías Renovables de España (Paner) 2011-2020		Madrid		2010	
Jarabo, F. y Otros	El libro de las Energías Renovables	SAPT	Madrid	84-8691301-2	1988	
Lucas, A. y Ramos, M.	Análisis del Binomio Energía-Medioambiente	Ediciones de la Universidad de Castilla-La Mancha	Cuenca	84-89958-85-8	1999	
Madrid, A.	Guía Completa de las Energías Renovables	AMV EDICIONES		978-84-96709-77-5	2012	
Orille, A.L.	Centrales Eléctricas I.	UPC	Barcelona		1993	
Ortega, M.	Energías Renovables	Paraninfo	Madrid	84-283-2582-0	1999	
Ramírez, J.	Centrales Eléctricas. Enciclopedia CEAC de la electricidad	CEAC	Barcelona	84-329-6006-3	1995	
Seider W.D., Seader J., Lewin D.	Process Design Principles	John Wiley		0-471-24312-4	1999	
Azcarate, B. y Mingoranz, A.	Energías e Impacto Ambiental	Equipo Sirius	Madrid	978-84-92509-54-6	2007	
Castro M. y Sánchez C.	Energía Hidráulica	PROGENSA			1997	