

**1. General information****Course:** ALTERNATIVE ENERGY**Type:** ELECTIVE**Degree:** 421 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING**Center:** 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL**Year:** 4**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 56366**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 20**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** ANTOINE CLAUDE BRET . - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Politécnico/2-D13	MECÁNICA ADA. E ING. PROYECTOS	Via Teams	antoineclaud.bret@uclm.es	In order to guarantee the correct individualized attention to the student, the tutoring schedule will be arranged with the student by e-mail.

2. Pre-Requisites

The student is required to have a basic knowledge of Mathematics and Physics acquired in the first 3 years of the degree.

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

The energy/climate problem is one of the most important challenges facing mankind. Due to its many technological aspects, engineers must play an important role in overcoming it. It is therefore essential that they have a good understanding of the problem and of its various scientific aspects.

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
CEO36	Ability to manage, analyse and design alternative power plants and sources, nuclear power plants and power installations in general.
CEO37	Gaining an overview of the energy/climate problem.
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.
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**

Global knowledge of energy/climate issues.

Additional outcomes

Acquire a global view of the energy/climate problem. Learn how to find reliable information and calculate orders of magnitude. Understand the physical basis of climate change and the limitations of fossil fuels. Understand the physical basis of energy storage techniques. Know how to assess the potential of alternative energies from their physical basis. Develop energy scenarios for the future. Study historical precedents.

6. Units / Contents**Unit 1: Introduction: what is the problem?****Unit 2: Fossil Fuels**

Unit 3: Climate Science
 Unit 4: Energy storage, hydrogen
 Unit 5: Wind Energy
 Unit 6: Solar Energy
 Unit 7: Biomass, hydroelectricity, geothermal energy
 Unit 8: Nuclear Energy - Fission
 Unit 9: Nuclear Energy - Fusion
 Unit 10: Constraints and Hazards
 Unit 11: Lessons from History

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 CEO36 CEO37 CG03 CG04 CG05 CG06 CG07 CT02 CT03	1	25	N		- Expository method/lecture - - Exercises and problem solving - - Group tutorials
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB01 CB02 CB03 CB04 CB05 CEO36 CEO37 CG03 CG04 CG05 CG06 CG07 CT02 CT03	0.6	15	N		- Exercises and problem solving - - Learning based on assignments, comments and reports - Learning based on assignments, comments and reports
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB01 CB02 CB03 CB04 CB05 CEO36 CEO37 CG03 CG04 CG05 CG06 CG07 CT02 CT03	0.6	15	Y	N	- Practices
Formative Assessment [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 CEO36 CEO37 CG03 CG04 CG05 CG06 CG07 CT02 CT03	0.2	5	Y	Y	- Assessment tests - Learning based on assignments, comments and reports
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 CEO36 CEO37 CG03 CG04 CG05 CG06 CG07 CT02 CT03	3.6	90	N		- Autonomous work - Group work
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	45.00%	45.00%	Continuous evaluation consists of the resolution of theoretical and practical exercises similar to those performed in the training activities throughout the course. In non-continuous evaluation, it will consist of the resolution of the same exercises as the continuous evaluation.
Assessment of problem solving and/or case studies	10.00%	10.00%	In continuous evaluation, oral presentation (in group of 2) of a topic of free choice. In non-continuous evaluation, the oral presentation will be done on the days of the ordinary and extraordinary exams.
Assessment of activities done in the computer labs	45.00%	45.00%	In continuous evaluation, 3 reports of group practices. Each report counts for 15%. In non-continuous evaluation, the practice reports will be replaced by an additional practical test on the days of the ordinary and extraordinary exams.
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:

Those indicated in the table above, description column.

Non-continuous evaluation:

Those indicated in the table above, description column.

Specifications for the resit/retake exam:

These exams are the same as the ordinary exams, there are no special features. In order for the student to be able to achieve the maximum mark, the marks of

the extraordinary exam replace all the previous marks.

Specifications for the second resit / retake exam:

These exams are the same as the ordinary exams, there are no special features. In order for the student to be able to achieve the maximum mark, the marks of the extraordinary exam replace all the previous marks.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	25
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	15
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Global activity	
Activities	hours
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][Assessment tests]	5
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Joseph Tainter	The Collapse of Complex Societies	Cambridge Press		052138673X	1990	
Jared Diamond	Collapse: How Societies Choose to Fail or Survive	Penguin		0241958687	2011	
Antoine Bret	The Energy-Climate Continuum. Lessons from Basic Science and History	Springer		9783319079196	2014	Libro del curso
K. McGuffie, A. Henderson- Sellers	A Climate Modelling Primer	John Wiley & Sons		047085751X	2005	