UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course:	NUCLEAR ENGINEERING	**Code:**	56364
Type:	ELECTIVE	**ECTS credits:**	6
Degree:	353 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING (CR)	**Academic year:**	2022-23
Center:	602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL	**Group(s):**	20
Year:	4	**Duration:**	C2
Main language:	Spanish	**Second language:**	English
Use of additional languages:		**English Friendly:**	Y
Web site:		**Bilingual:**	N

Lecturer: **MANUEL DOMINGO BARRIGA CARRASCO** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Politécnico/2-A26	MECÁNICA ADA. E ING. PROYECTOS	Vía Teams	manueld.barriga@uclm.es	

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
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A03	To have the capability to gather and interpret relevant data (normally within the area of study) to make judgements that include a reflection on themes of a social, scientific or ethical nature.
A04	To be able to transmit information, ideas, problems and solutions to a specialized audience.
A08	Appropriate level of oral and written communication.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
CB05	Have developed the necessary learning abilities to carry on studying autonomously

5. Objectives or Learning Outcomes

Course learning outcomes

Not established.

Additional outcomes

6. Units / Contents

Unit 1: The special theory of relativity

- **Unit 1.1** Introduction
- **Unit 1.2** Relativistic mass and impulse
- **Unit 1.3** Relativistic energy

Unit 2: Nuclear reactions

- **Unit 2.1** Nuclear structure
- **Unit 2.2** Nuclear force and binding energy
- **Unit 2.3** Energy balance in nuclear reactions
- **Unit 2.4** Nuclear reactions
- **Unit 2.5** Cross section of a nuclear reaction
- **Unit 2.6** Rutherford scattering
- **Unit 2.7** Maximum approach distance

Unit 3: Wave properties of particles

- **Unit 3.1** Particles and waves
- **Unit 3.2** Heisenberg uncertainty principle
- **Unit 3.3** Schrodinger's equation

Unit 4: Interaction of particles with matter

Unit 5: Fission

- **Unit 5.1** Introduction
- **Unit 5.2** Controlled nuclear fission
- **Unit 5.3** Neutron reproduction factor calculation

Unit 6: Fusion
Unit 7: Other applications of nuclear engineering

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		1.6	40	N	-	
Class Attendance (practical) [ON-SITE]	Project/Problem Based Learning (PBL)		0.64	16	Y	N	
Study and Exam Preparation [OFF-SITE]			3.6	90	N	-	
Final test [ON-SITE]	Assessment tests		0.16	4	Y	Y	
		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	20.00%	20.00%	
Other methods of assessment	10.00%	10.00%	Attendance at seminars and visits
Final test	70.00%	70.00%	
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:

A part of the percentage of each evaluation system, we will describe more specifically each of these parts. The final test usually consists of a series of theoretical questions to develop and some problems to solve. The problem solving part corresponds to solving and explaining a problem proposed by the teacher to the rest of the class. The last part of the evaluation corresponds to attendance at seminars and visits to nuclear facilities that are proposed during the course.

Non-continuous evaluation:

Only the final test.

Specifications for the resit/retake exam:

The evaluation system is the same. Only a final test is done again and marks of the other parts are kept.

Specifications for the second resit / retake exam:

The evaluation system is the same. Only a final test is done again and marks of the other parts are kept.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**
Final test [PRESENCIAL][Assessment tests]	4
Unit 1 (de 7): The special theory of relativity	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	2
Study and Exam Preparation [AUTÓNOMA][]	10
Unit 2 (de 7): Nuclear reactions	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	10
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	7
Study and Exam Preparation [AUTÓNOMA][]	26
Unit 3 (de 7): Wave properties of particles	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	10
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	7
Study and Exam Preparation [AUTÓNOMA][]	26
Unit 4 (de 7): Interaction of particles with matter	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	6
Study and Exam Preparation [AUTÓNOMA][]	10
Unit 5 (de 7): Fission	
Activities	**Hours**

Class Attendance (theory) [PRESENCIAL][Lectures]	6
Study and Exam Preparation [AUTÓNOMA][]	10

Unit 6 (de 7): Fusion	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][]	4

Unit 7 (de 7): Other applications of nuclear engineering	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Study and Exam Preparation [AUTÓNOMA][]	4

Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	40
Class Attendance (practical) [PRESENCIAL][Project/Problem Based Learning (PBL)]	16
Study and Exam Preparation [AUTÓNOMA][]	90
Final test [PRESENCIAL][Assessment tests]	4
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
John D. McGervey	Introduction to modern physics	Academic Press	USA	9780124835504	1971	
Kenneth Krane	Física moderna	Noriega editores	México	968-18-3860-2	1991	
Kenneth S. Krane	Introductory Nuclear Physics	John Wiley & Sons	New York	0-471-80553-X	1988	
M. Alonso ¿ E. J. Finn	Fundamentos cuánticos y estadísticos	Addison-Wesley Iberoamericana	Mexico		1986	
Ronald Gautreau	Física moderna	Serie Schawn, Ed. Mc Graw-Hill.		978-9701032022	2001	
S. Burbano de Ercilla	Problemas de física	Ed. Tebar, 27 ed.	Madrid	978-8473602402	2006	
W. N. Cottingham ¿ D. A. Greenwood	An introduction to nuclear physics, 2 edition	Cambridge U. Press	Cambridge	978-0521657334	2001	