COURSE DESCRIPTION

COURSE DETAILS

Title (of the course): **FÍSICA NUCLEAR Y DE PARTÍCULAS**
Code: 100512
Degree/Master: **GRADO DE FÍSICA** Year: 4
Name of the module to which it belongs: ESTRUCTURA DE LA MATERIA
Field: NUCLEAR Y PARTÍCULAS
Character: OBLIGATORIA Duration: SECOND TERM
ECTS Credits: 6.0 Classroom hours: 60
Face-to-face classroom percentage: 40.0% Study hours: 90
Online platform: http://moodle.uco.es/moodlemap/

LECTURER INFORMATION

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Department: FÍSICA
Area: FÍSICA ATÓMICA, MOLECULAR Y NUCLEAR
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PREREQUISITES AND RECOMMENDATIONS

Prerequisites established in the study plan

-To have, at least, B1 Level in English to take this course in the bilingual group.
-Math and numerical methods skills up to second course level.
-Quantum Physics knowledge.
-General and specific competences up to this level.

Recommendations

-The student should be familiar with the contents of related courses such as Quantum Physics II, Quantum Mechanics, and Atomic and Molecular Physics.

This is a course aimed for the final year of the Physics Degree. It shares many of the competences with previous courses. This means that a certain level of math and physics knowledge and skill have been attained by the students. Our goal is to fix and improve this level.

INTENDED LEARNING OUTCOMES

CB1	the skills to analyse and summise
CB2	organisational skills
CB3	written and oral communication
CB4	Information management skills
CB5	Problem solving
CB8	Independent Study
CB9	Creativity.
CB11	Sensitivity towards enviromental issues
CE1	Knowledge and understanding of the most importante phenomenons and physics theory

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CE2	Ability to estimate orders of magnitude for interpretting various phenomemons
CE5	The ability to model various phenomenons, changing them from a real problem, to a mathemtical language
CE7	Ability to present information in a clear way, both inside and out of the classroom.

OBJECTIVES

Get to know the ultimate components of matter and their interactions. Understand the basic elements of the models developed for their study, knowing the order of magnitude of the physical quantities involved in the processes between elementary particles.
Get to know the basic nuclear phenomenology, and to understand and use some simple nuclear models.
Get to know the more important properties of the main nuclear decay processes.
Get to know the principles, techniques and measure instruments employed in the study of the structure of matter at the nuclear and subnuclear levels.

CONTENT

1. Theory contents

Unit 1: Nuclear properties
Unit 2: The nucleon-nucleon interaction
Unit 3: Nuclear models and nuclear phenomenology
Unit 4: Radioactive decay and radiological protection
Unit 5: Introduction to the Standard Model
Unit 6: Symmetries and conservation laws
Unit 7: Quark model
Unit 8: Interactions and gauge theories

2. Practical contents

In each subject, both theory and exercises will be worked out. Some proposed problems will be solved in the class sessions. It is expected that the students solve other exercises provided.

More complicated problems will be tackled with the guidance from the course teacher and with the use of some computer codes provided to the students. It will be required to turn in an assignment containing the description of the problem, the necessary steps to obtain the solution, and the results obtained, together with a discussion of these results.

Students are also required to turn in an assignment about a particular item discussed in this course.

METHODOLOGY

Methodological adaptations for part-time students and students with disabilities and special educational needs

Specific methodology for these types of students will be developed and it will be designed in work sesions with the students in order to apply the specific metodology more appropiate to the particular circumstances.

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Face-to-face activities

Activity	Large group	Medium group	Total
Assessment activities	4	-	4
Case study	-	24	24
Lectures	32	-	32
Total hours:	***36***	***24***	***60***

Off-site activities

Activity	Total
Activities	10
Information search	10
Reference search	10
Self-study	60
Total hours	***90***

WORK MATERIALS FOR STUDENTS

Case studies
Exercises and activities

Clarifications

Material will be provided through the moodle web page.

EVALUATION

Intended learnig	Exams	Placement reports	Project
CB1	X	X	X
CB11			X
CB2	X	X	X
CB3	X	X	X
CB4	X		X
CB5	X		
CB8			X

COURSE DESCRIPTION

Intended learnig	Exams	Placement reports	Project
CB9	X	X	X
CE1	X		
CE2	X		
CE5	X		
CE7	X	X	X
Total (100%)	***60%***	***20%***	***20%***
Minimum grade	***4***	***5***	***5***

(*)Minimum grade necessary to pass the course

¿Valora la asistencia?:

No

General clarifications on instruments for evaluation:

On going evaluation is carried out in terms of "Placement Reports" and the "Project", adding up to 40% of the final qualification. The score here will be kept for all exam callings in the current academic year.

The final exam consists on "Essay tests", "Short answer tests" and "Problem solving", providing the remaining 60% of the final qualification.

These criteria hold for all of the students, no matter if it is not the first time that they are taking this course.
When the score in any of the above sections is below the minimum required, the assigned overall qualification will be 4 even when the average is above 5.

Clarifications on the methodology for part-time students and students with disabilities and special educational needs:

For part-time students, students with disabilities, and students with special academic needs, special evaluation tools will be taylored according to the specific teaching methodology selected for them.

Qualifying criteria for obtaining honors:

An overall qualification of 9.0 is required (Artículo 30 del Reglamento de Régimen Académico de la Universidad de Córdoba)

BIBLIOGRAPHY

1. Basic Bibliography

K.S. Krane, Introductory nuclear physics, Wiley 1987.
A. Bettini, Introduction to Elementary Particle Physics, Cambridge, 2014.
D. Griffiths, Introduction to Elementary Particles, Wiley 2008.
B.R. Martin and G. Shaw, Particle Physics, Wiley, 2017.
D.H. Perkins, Introduction to high energy physics. Cambridge, 2000.

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S.S.M. Wong, Introductory nuclear physics, Wiley 1999.
P.E. Hodgson, E. Gadioli and E. Gadioli-Erba, Introductory nuclear physics, Oxford 1997.
W.S.C. Williams, Nuclear and Particle Physics, Clarendon 1991.
W.E. Burcham, M. Jobes, Nuclear and Particle Physics, Prentice Hall 1994.
A. Ferrer Soria, Física Nuclear y de partículas, Universidad de Valencia 2015.

2. Further reading

Particle Data Group, Review of Particle Physics, Phys. Rev. D 98, 030001 (2018).
R.B. Firestone and V.S. Shirley, Table of Isotopes, Vol. I and II. Wiley 1996.
M. Alonso y E.J. Finn, Física Vol. III: Fundamentos cuánticos y estadísticos. Fondo educativo interamericano 1971.

COORDINATION CRITERIA

Common evaluation criteria
Tasks deadlines

SCHEDULE

Period	Assessment activities	Case study	Lectures
1# Week	0.0	0.0	4.0
2# Week	0.0	2.0	2.0
3# Week	0.0	0.0	4.0
4# Week	0.0	2.0	2.0
5# Week	0.0	0.0	4.0
6# Week	0.0	2.0	2.0
7# Week	0.0	2.0	2.0
8# Week	0.0	2.0	2.0
9# Week	0.0	2.0	2.0
10# Week	0.0	2.0	2.0
11# Week	0.0	2.0	2.0
12# Week	0.0	2.0	2.0
13# Week	0.0	2.0	2.0
14# Week	0.0	4.0	0.0
15# Week	4.0	0.0	0.0
Total hours:	***4.0***	***24.0***	***32.0***

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The methodological strategies and the evaluation system contemplated in this Course Description will be adapted according to the needs presented by students with disabilities and special educational needs in the cases that are required.