

Experimental Nuclear Physics (Academic Year 26/27)

Objectives:

The primary objective of the Experimental Nuclear Physics course is to provide students with comprehensive theoretical knowledge and practical hands-on experience in modern nuclear physics instrumentation, measurement techniques, and numerical tools. Specifically, the subject aims to:

- Introduce the student to basic experimental methods for measuring properties related to atomic nucleus structure.
- Introduce students to the main schemes and approximations for studying nuclear reactions.
- Familiarize students with the most common instrumentation and setups in a Nuclear Physics laboratory.
- Understand data acquisition and processing systems in a Nuclear Physics experiment.
- Plan and carry out an experiment.
- Learn numerical simulation methods.

Online Theoretical Lessons:

- Radiation-matter interaction
- Nuclear Electronics
- Gas Detectors
- Semiconductor Detectors
- Scintillation Detectors
- Simulations in Nuclear Physics
- Neutrons: Interaction and detection

In-Person Laboratory Sessions

- High-resolution α/β spectrometry using silicon detectors.
- Gamma-ray spectroscopy using HPGe and NaI(Tl) detectors.
- Neutron detection: digitizers and n/γ discrimination.
- $\gamma - \gamma$ coincidence using NaI(Tl) detectors.
- Non-Rutherford scattering near the 1.734 MeV resonance of $^{12}\text{C}(p,p)^{12}\text{C}$.
- Data Analysis

Schedule & Locations

The course will consist of a theoretical section conducted **ONLINE** via Teams during the week of November 16–20, and an in-person practical section held in Seville at both the US Faculty of Physics and the National Accelerators Center (CNA) during the week of November 23–27. The detailed schedules for online lessons and laboratory sessions are provided below:

Online lessons via TEAMS @EV					
	Monday (16/11)	Tuesday (17/11)	Wednesday (18/11)	Thursday (19/11)	Friday (20/11)
9:30-10:00	Intro (B. Fernández)	Particle Accelerators (M. García León)	Gas Detectors (M. García-León)	Nud. Phys. Simulations (M.A. Cortés)	Neutrons: Inter. & Detec. (C. Guerrero)
10:00-10:30	Rad.-Mat . Inter. & Detectors (M. Respaldiza)				
10:30-11:00					
11:00-11:30	Coffee	Coffee	Coffee	Coffee	
11:30-12:00	Coffee	Nuclear Electronics (J. García)	Semicond. Det (J. Espino)	Scillators Detec. (C. Guerrero)	Laboratory Intro(B. Fernández)
12:00-12:30	Rad-Mat Exercises (B. Fernández)				Q&A
12:30-13:00					
13:00 - 13:30					

	Monday (23/11)	Tuesday (24/11)	Wednesday (25/11)	Thursday (26/11)	Friday (27/11)
9:30-13:30	α - β (M. Alvarez)	HPGe (M. García León) (CNA)	Neutrons (C. Guerrero) (CNA)	Coincid. (B. Fernández)	9:00 a 11:00 Tándem CNA
	Coincid. (B. Fernández)	α -b (M. Alvarez)	HPGe (M. García León) (CNA)	Neutrons (C. Guerrero) (CNA seminario)	(J. García)
	Neutrons (C. Guerrero) (CNA)	Coincid. (B. Fernández)	α - β (M. Alvarez)	HPGe (M. García León) (CNA)	Election of the group representative.
	HPGe (M. García León) (CNA)	Neutrons (C. Guerrero) (CNA)	Coincid. (B. Fernández)	α - β (M. Alvarez)	11:15 a 13:15 Tándem CNA
					(J. García)
15:00-16:00	Data Analysis (T. Rodríguez y C. Guerrero) (CRAI TIC)	Supervised analysis of lab. sessions.	Supervised analysis of lab. sessions.	Supervised analysis of lab. sessions.	13:30 Test
16:00-17:00					
17:00-18:00					

Teaching Staff & Contact Information

- **Begoña Fernández Martínez (Coordinator):** bfernand@us.es
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Assessment Method:

To pass the course, students are required to:

- Complete all laboratory practicals in person.
- Pass a test at the end of the practical week.
- Prepare a report for each practical session in presentation format.
- The final grade (100%) will be assigned based on an oral evaluation consisting of a presentation of one randomly selected practical.