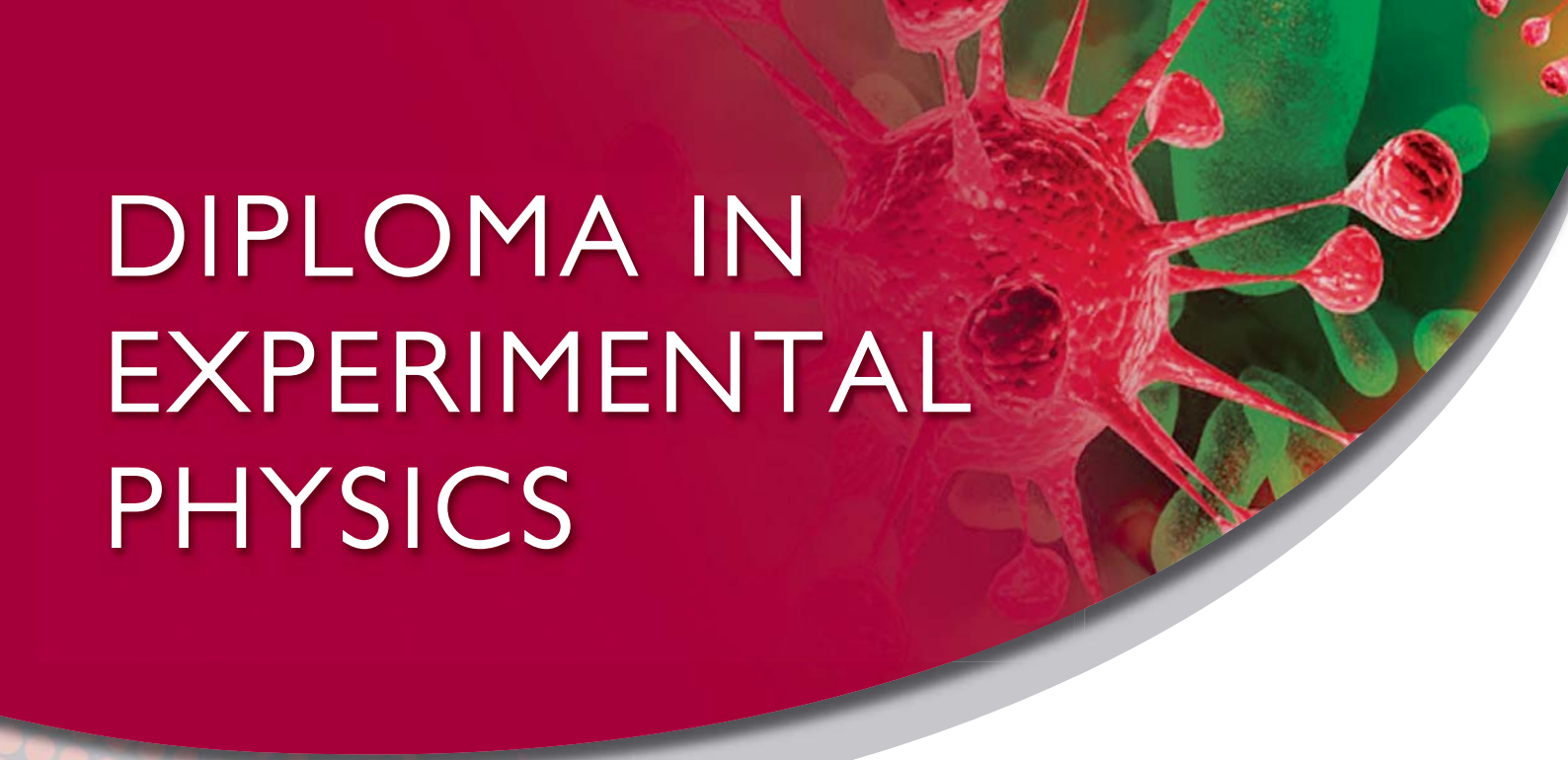

DIPLOMA IN EXPERIMENTAL PHYSICS

General Description

The International Diploma in Experimental Physics of the University of Cantabria is taught in English by the staff of the Faculty of Science, with a wide teaching and research experience in an international context and it is carried out mainly in its teaching and research laboratories. It is open to exchange and visiting students at the UC who are pursuing a scientific or technical Degree in their home University.

The Diploma allows international students to experience education in Spain obtaining academic recognition of the courses contained therein and performing a wide range of mid-to-high level experiments in Physics.

Program details

The Diploma in Experimental Physics consists of 30 ECTS credits distributed in courses with a mainly experimental profile, in disciplines such us Optics and Photonics, Radioactivity, Astronomy, Atomic Physics or Spectroscopy. General teaching will be carried out in small groups, and labwork mainly in pairs.

It is possible to register for individual elective courses or to combine some of these with other regular courses in Spanish. Laboratory work requires a person-to-person communication ideal for language skills development.

All unit courses are taught during Spring Semester (mid-February through June). Grading system is based on continuous evaluation, including midterm and final exams.

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VICERRECTORADO DE RELACIONES INTERNACIONALES. Edificio de las Facultades de Derecho y Ciencias Económicas y Empresariales
Telfn.: 942 20 10 18 / 52 / 51 Fax: 942 20 10 78 e-mail: relint@gestion.unican.es

Unit Courses

Advanced Experimental Techniques

Spring. 6 ECTS credits

In this course, students must carry out three experiments at an advanced level, this being its main objective. The experiments are of a very diverse nature and refer to different fields in physics. The student must acquire laboratory skills, use a variety of laboratory material, either of general or specific purpose and handle experimental data (fits, errors, graphs, etc).

Textbook

The experiment guiding texts and other reference sources will be provided for each of the experiments assigned to the student by the coordinator.

Experimental Optics

Spring. 6 ECTS credits

To Identify several technical objects in the optics lab such as: benches, goniometers, holders, lenses, dispersion and total reflection prisms… etc., and a group of theoretical concepts in optics such as cardinal points, collimated beam, conjugate positions of a converging lens, diffraction law, mono-chromaticity, light dispersion in a prism and its meaning for a particular glass, dependence of refractive parameters,… etc. The course methodology will include optical alignment (linear and angular), beam collimation, goniometer preparation, use of Vernier scales, Polarization analysis procedure, detector calibration, use of Abbe refractometer and Image file handling.

Textbook

Course Guidebook (Spanish and English), Optics, E. Hecht.

Environmental Radioactivity

Spring. 6 ECTS credits

Description of the radio-nuclides of interest present in food and in the environment. Elementary concepts used to describe and characterize radioactive processes. Description of nuclear transitions associated to alpha, beta, gamma, and neutron decay modes. Use of Tables of Isotopes. Description of the production mechanisms of X rays. Order of magnitude of the energies involved in ionizing radiations. Concepts involved in the description of the interaction between ionizing radiations and neutrons with matter. Photoelectric effect, Compton effect and Pair production for gamma rays. Use of the elementary statistical concepts to treat errors in the quantitative measurements in radioactivity. Elementary safety regulations and radioprotection rules applied in a laboratory of radioactivity.

Textbook

Measurement of Radionuclides in Food and the Environment. A. Guidebook; *International Atomic Energy Agency. Principles of Isotope Geology*, (Wiley Ed) Faure; *Measurement of Weak Radioactivity*, P. Theodórsson.

Spectroscopic Techniques

Spring. 6 ECTS credits

To know the basis of Spectroscopic Techniques, and fundamental theoretical models for interpreting optical spectra. To identify different components (lasers, photo-detectors, gratings, scopes) and spectroscopic devices (mono-chromators, fluorometers, spectrophotometers), and know how they work in a given spectroscopic set-up. To handle spectroscopic techniques in order to obtain optical spectra (Raman, Absorption, excitation/emission and lifetime) from different liquids (organic and inorganic solutions) and solid-sate materials (insulating and semiconductors). To know the methodology for spectrum analysis and interpretation. To apply these techniques for analytical procedures. Elemental analysis, molecule and complex identification, as well as for quantitative estimates.

Textbook

Optical Properties of Solids, M. Fox. *Molecular Quantum Mechanics*, W. Atkins. *Solid-state spectroscopy: an introduction,* H. Kuzmany. *Near-infrared spectroscopy: principles, instruments, applications*, H.W. Siesler.

Observational Astronomy

Spring. 6 ECTS credits

Identification of the observational technique most appropriate to solve. The Astrophysical problem at hand. Identification of different types of optical telescopes and cameras. Use of different observational techniques appropriate for different wavelengths. Use of optical telescopes and cameras. Use of common software to reduce and analyze Astronomical data.

Textbook

Astronomy Methods, H. Bradt. *Practical Statistics for Astronomers,* J.V. Wall, C.R. Jenkins. *Observational Astronomy,* D.S. Birney, G. González, D. Oesper. *Observing the Universe*, A.J. Norton. *Fundamental Astronomy,* H. Karttunen, P. Dröger, H. Oja, M. Poutanen & K.J. Donner.

Applied Photonics

Spring. 6 ECTS credits

The course includes both theory (25% of sessions) and laboratory work (75%), distributed in practical illustrative sessions and experiments carried out by the student. The main contents of the course are: Interaction of photons with atoms. Photons in semiconductors. Incoherent and coherent emitters: LED and semiconductor laser. Photodetectors. Noise in photodetectors. Optic fibers. Fiber optic communications.

Textbook

Fundamentals of Photonics, B.A. Saleh, M.C. Teich. *Fiber Optic Communication systems,* G.P. Agrawal.

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