COURSE DATA

DATA SUBJECT

Code: 34252
Name: Electromagnetism laboratory
Cycle: Undergraduate Studies
ECTS Credits: 5
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1105 - Degree in Physics	Facultat de Física	3	Annual
1928 - Double Degree Program Physics-Mathematics	Facultat de Ciències Matemàtiques	3	Second quarter
1929 - Double Degree Program in Physics and Chemistry	Facultat de Física	4	Annual

SUBJECT-MATTER

Degree	Subject-matter	Character
1105 - Degree in Physics	Experimental physics laboratory	COMPULSORY
1928 - Double Degree Program Physics-Mathematics	Tercer Curso (Obligatorio)	COMPULSORY
1929 - Double Degree Program in Physics and Chemistry	Cuarto Curso (Obligatorio)	COMPULSORY

COORDINATION

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DELGADO PINAR MARTINA

SUMMARY

The Electromagnetism Laboratory course is a compulsory subject, which lasts the full academic year or one semester (four months), with 5 ECTS. This subject is complementary to the subjects Electromagnetism I and II. The descriptors proposed in the document Curriculum Degree in Physics establish the following contents: Electromagnetism, with static and dynamic fields in vacuum and in material media, electromagnetic waves and electric circuits.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

- Basic knowledge about data processing and error analysis as acquired in the subjects taken previously related to the Physics Laboratories.
- Fundamentals of the electromagnetic theory as acquired in the subject General Physics III of the first course of the degree.

COMPETENCES / LEARNING OUTCOMES

1105 - Degree in Physics

Ability to collect and interpret relevant data in order to make judgements.

Basic & applied Research: acquire an understanding of the nature and ways of physics research and of how physics research is applicable to many fields other than physics, e.g. engineering; be able to design experimental and/or theoretical procedures for: (i) solving current problems in academic or industrial research; (ii) improving the existing results.

Communication Skills (written and oral): Being able to communicate information, ideas, problems and solutions through argumentation and reasoning which are characteristic of the scientific activity, using basic concepts and tools of physics.

Foreign Language skills: Have improved command of English (or other foreign languages of interest) through: use of the basic literature, written and oral communication (scientific and technical English), participation in courses, study abroad via exchange programmes, and recognition of credits at foreign universities or research centres.

Have become familiar with most important experimental methods and be able to perform experiments independently, estimate uncertainties, as well as to describe, analyse and critically evaluate experimental data according to the physical models involved. Know how to use basic instrumentation.

Knowledge and understanding of the fundamentals of physics in theoretical and experimental aspects, and the mathematical background needed for its formulation.

Learning ability: be able to enter new fields through independent study, in physics and science and technology in general.

Literature Search: be able to search for and use physical and other technical literature, as well as any other sources of information relevant to research work and technical project development.

Physics general culture: Be familiar with the most important areas of physics and with those approaches which span many areas in physics, or connections of physics with other sciences.

Prob. solving and computer skills: be able to perform calculations independently, even when a small PC or a large computer is needed, including the development of software programmes.

Problem solving: be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems .

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

To know how to apply the knowledge acquired to professional activity, to know how to solve problems and develop and defend arguments, relying on this knowledge.

DESCRIPTION OF CONTENTS

1. Theory

- Direct current measurements
- Alternating current measurements
- Materials properties I
- Materials properties I

2. Laboratory sessions (part I)

- Multimeter: measurements of direct and alternating current
- Oscilloscope: measurements of amplitude and phase
- RLC series and parallel resonant circuits
- RC, RL and RLC transients

3. Laboratory sessions (part II)

- Experiment I
- Experiment II

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	10,00
Laboratory	40,00
Total hours	**50,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	32,00
Independent study and work	27,00
Preparation of lessons	0,00
Preparation for assessment activities	16,00
Resolution of case studies	0,00
Total hours	**75,00**

TEACHING METHODOLOGY

It is necessary for each student to have a lab notebook in which he/she records in handwritten form all his/her work in the course.
On-site teaching 40%:
- Theoretical and practical classes, that deal with aspects related to the measurement instrumentation and techniques specific to each laboratory.
- Laboratory sessions in small groups, in which students conduct experimental work, taking measurements in experimental setups, recording data in the laboratory notebook and making a preliminary analysis.
Student's personal work 60%:
- Preparation of the experimental sessions and study of theoretical aspects.
- Personal work needed for the study and interpretation of the observed phenomenology and data processing, graphics, basic statistics, results, interpretations, and conclusions, all of this must be recorded in the laboratory notebook, which must be kept up to date throughout the course. In the same course and in a complementary manner, the corresponding theoretical subjects will be developed.

EVALUATION

The evaluation of the subject will have three parts, being compulsory the attendance to the laboratory and the realization of the experiments (these activities can not be made up) and the delivery of the laboratory notebook, and will follow the following criteria: A) 20 points: written questions about the contents taught in the lecture classes. B) 40 points: a practical laboratory exam of part I of the laboratory sessions, in which the realization of an experimental setup and the taking of basic measurements will be assessed. C) 40 points: report (30 points) and oral presentation (10 points) of the results of one of the two experiments carried out in part II. The report of part C will be delivered handwritten in the laboratory notebook.
The qualification necessary to pass the course will be 50 points. In the second call, part A will be evaluated by means of a written exam and parts B and C by the same type of test as in the first call, being possible to keep the marks of some of the parts A, B and C obtained in the first call.

REFERENCES

- Cooper, W.D., Helfric, A. D.; *Instrumentación electrónica moderna y técnicas de medición*, Prentice-Hall Hispanoamericana, 1991.

- Wolf, S. y Smith, R.F.M.; *Guía para mediciones electrónicas y prácticas de laboratorio*, Prentice-Hall Hispanoamericana, 1992.

- L.M. Thompson; *Electrical Measurements and calibration: fundamentals and applications*, Instrument Society of America, 1994.