VNIVERSITAT DE VALÈNCIA

Course Guide
34252 Electromagnetism laboratory

COURSE DATA

Data Subject	
Code	34252
Name	Electromagnetism laboratory
Cycle	Grade
ECTS Credits	5.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1105 - Degree in Physics	Faculty of Physics	3	Annual
1928 - D.D. in Physics-Mathematics	Double Degree Program Physics and Mathematics	3	Second term

Subject-matter

Degree	Subject-matter	Character
1105 - Degree in Physics	10 - Experimental physics laboratory	Obligatory
1928 - D.D. in Physics-Mathematics	3 - Tercer Curso (Obligatorio)	Obligatory

Coordination

Name	Department
ANDRES BOU, MIGUEL VICENTE	175 - Applied Physics and Electromagnetism
MARTINEZ GARCIA, DOMINGO	175 - Applied Physics and Electromagnetism

SUMMARY

The Electromagnetism Laboratory course is a compulsory subject in the third year, which lasts the full academic year or one semester (depending on the degree), with 5 ECTS. This subject is complementary to the subjects Electromagnetism I and II, also taught in third year. 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.

OUTCOMES

1105 - Degree in Physics

- Knowledge and understanding of the fundamentals of physics in theoretical and experimental aspects, and the mathematical background needed for its formulation.
- 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.
- Ability to collect and interpret relevant data in order to make judgements.
- 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 .
- 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.
- 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.
- 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.
- 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.
- 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.

- Learning ability: be able to enter new fields through independent study, in physics and science and technology in general.
- 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.
- 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 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 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.
- Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.
- Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

LEARNING OUTCOMES

- To know the principles, techniques, measurement instruments and relevant phenomena in Electromagnetism.
- To interpret the measurements taken in the laboratory and to perform the necessary analyses to obtain the final results and the physical magnitudes under study.
- To develop physical intuition, by making first guesses of the magnitudes from the measurements, in order to separate the relevant from the contingent aspects.
- To learn to keep a laboratory book that includes descriptions of the measurement process, setup scheme, scales and magnitudes used, graphical representations and the analysis and interpretation of the results.
- To evaluate the limitations of the different measurement methods, in connection with the accuracy of the measurement devices and simplifications in the applied models.
- To be able to present the experimental work done by means of a brief oral presentation, that transmits the information, ideas, problems and solutions by means of a proper scientific reasoning.

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

ACTIVITY	Hours	% To be attended
Laboratory practices	40,00	100
Theory classes	10,00	100
Development of group work	32,00	0
Study and independent work	27,00	0
Preparation of evaluation activities	16,00	0
TOTAL	**125,00**	

TEACHING METHODOLOGY

Contact 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 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, basic statistics, results, interpretations, conclusions and their communication.

EVALUATION

The evaluation of the subject will be carried out in its entirety through continuous evaluation, being compulsory the attendance to the laboratory and the realization of the experiments, 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 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, part B by the same type of test as in the first call, and part C by submitting a report. A Virtual Classroom Task may be defined to ask students to confirm which parts A, B and C are to be examined, with a deadline for delivery 48 hours before the exam date. The answer to this task will allow defining the group of students "Exam assistants" parts A, B and C. The grade obtained in the course of the parts to which the student does not request to appear will be saved.

REFERENCES

Basic

- 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.