COURSE DATA

DATA SUBJECT

Code: 34250
Name: Mechanics 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	2	Second quarter, First quarter
1928 - Double Degree Program Physics-Mathematics	Facultat de Física	3	First quarter, Second quarter
1929 - Double Degree Program in Physics and Chemistry	Facultat de Química	2	Second quarter, First quarter

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	Segundo Curso (Obligatorio)	COMPULSORY

COORDINATION

GUIRADO PUERTA JOSE CARLOS

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SUMMARY

The Mechanics Laboratory subject is compulsory. Its contents are taught during the first semester of the double Physics and Mathematics (DGFM), second semester of the second year of the Degree in Physics (GF) and the double Degree in Physics and Chemistry (DGFQ) through 5 ECTS credits. It is related to the subject Mechanics and Waves, whose contents will be taught simultaneously in the second year of both grades through the subjects "Mechanics" and "Oscillations and Waves".

It is an experimental subject that illustrates in a practical way the theoretical contents of this subject. It requires the use of the knowledge acquired in the subject Introduction to "Physics Experimental" (GF),

"Basic Physics Laboratory" (DGFQ) or "General Physics Lab" (DGFM) taught in the first year, as well as study skills statistics of the data, skill acquired in the subject "Mathematical Methods" or "Numerical and Statistical Methods", also in the second year, which broadens and deepens the part of the statistical treatment of the experimental data. In this subject, the experimental analysis of several physical laws regarding the dynamics of systems, kinematics and waves is carried out, favoring the methodological aspects of laboratory work and developing a critical attitude towards the results obtained. This training continues in more advanced courses when other experimental laboratories of Electromagnetism, Optics and Quantum Physics are addressed.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

It is recommended that the students have already acquired knowledge on the development of experimental work in the laboratory and the treatment of the acquired data. That's why this course stresses, in particular, in the critical analysis of the results, the synthesis of the issues and their understanding as well as in the development of physical arguments and intuition.

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. Agenda of lab activities

1. Conservation of momentum. Dynamic of collisions.
2. Coupled oscillations. Oscillation modes in one dimension.
3. Standing waves in strings with different boundary conditions.
4. The simple and compound pendulum.
5. Analysis of gyroscopic precession and nutation.
6. Kundt tube: formation of harmonics in a closed and open tube.
7. Torsion balance: measurement of gravitational constant.

8. Measurement of the speed of light.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	0,00
Laboratory	50,00
Total hours	**50,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	30,00
Independent study and work	20,00
Preparation of lessons	10,00
Preparation for assessment activities	15,00
Resolution of case studies	0,00
Total hours	**75,00**

TEACHING METHODOLOGY

The course has two distinct parts: 1) Data collection in the laboratory, and 2) Analysis of results as a guided, independent, non-classroom-based individual project.

The course is structured around a 2-hour theoretical introduction and 12 practical sessions of 4 hours each. Attendance at these sessions is mandatory, non-recoverable, and a prerequisite for passing the course. These practical sessions may take different forms: 1) data collection and analysis sessions, 2) sessions for resolving doubts and collecting data that had been found to be erroneous, and 3) evaluation sessions. Students will be assisted by the instructor in all sessions. Each session is attended by groups of approximately 16 students, who are paired up for data collection. Each member of the pair must participate equally in the practical exercise. The analysis, results, and interpretation of the data, along with a critical evaluation of the practical exercise and conclusions, must be included in a report. At the start of the next lab session, students must submit their report from the previous lab to the instructor. Attending labs during other subgroups' scheduled times is not permitted.

EVALUATION

In the first examination period, the assessment will consist of the following parts:

1. Continuous assessment based on report writing: This will account for 40% of the final grade. Students will submit reports (brief summaries of the paired lab sessions) for the labs assigned by the instructors. This assessment will consider both the quality of the reports and the work carried out in the laboratory. The

guidelines outlined in the Laboratory Guide for the first cycle of the Physics Degree (see bibliography) will be followed for preparing these reports.

2. Oral presentation and extended report of the results of the labs assigned by the instructors: This will account for 60% of the final grade. The results of a lab session will be presented in an extended report. The results of a lab session (which may correspond to the same lab or to different labs, as determined by the instructors) will be presented orally and followed by a question and answer session related to the lab sessions and the theoretical content of the course.

In the second examination period, the assessment will consist of:

1. An oral presentation and an expanded report on the results of one of the practical exercises (50% of the final grade).

2. A practical test in the laboratory consisting of performing one (or part) of the practical exercises, as well as solving questions and/or problems related to the theoretical content (50% of the final grade).

REFERENCES

Basic

- Guía de laboratorio del Grado en Física, Universitat de València (2010)
- Guiones de Prácticas del Laboratorio de Mecánica (http://pizarra.uv.es)
- J.B. Marion, Dinámica clásica de partículas y sistemas, Ed. Reverte, 1975

Additional

- C. Kittel, N. D. Knight, M. A. Ruderman, Mecánica. Berkeley Physics Course, Vol. I, Ed. Reverté, 1973
- LIDE, D.R. (2001). Handbook of Chemistry and Physics. 82nd edition (2001). CRC - Press, Inc. London
- SÁNCHEZ DEL RIO, C (1989): Análisis de errores. Eudema, Madrid 1989
- TAYLOR, J R. (1997) An Introduction to Error Analysis. 2nd ed., University Science Books, Sausalito, California
- Física re-creativa. Experimentos de física usando nuevas tecnologías. Ed. Prentice Práctica. Salvador Gil, Eduardo Rodríguez. http://www.fisicarecreativa.com/
- The Journal of Undergraduate Research in Physcs http://www.jurp.org/
- The Physics Teacher http://scitation.aip.org/tpt/
- European Journal of Physics http://www.iop.org/EJ/journal/EJP
- American Journal of Physics, http://scitation.aip.org/ajp/