

**COURSE DATA****DATA SUBJECT****Code:** 34250**Name:** Mechanics laboratory**Cycle:** Undergraduate Studies**ECTS Credits:** 5**Academic year:** 2025-26**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 Ciències Matemàtiques	3	First quarter, Second quarter
1929 - Double Degree Program in Physics and Chemistry	Facultat de Física	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

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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

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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	0,00
Independent study and work	75,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	75,00

TEACHING METHODOLOGY

The subject has two very different parts: 1) Data collection in the laboratory, 2) Analysis of the results as individual guided non-presential work.

The course is structured in 12 sessions lasting 4h10min each. Attendance at these sessions is mandatory, non-recoverable, and necessary condition to pass the subject. These practical sessions can have different types: 1) sessions of data collection and their analysis, 2) sessions to resolve doubts and collect data that had been revealed to be erroneous, and 3) sessions for evaluation. In all of them the student will be assisted by the teacher. Each session is attended by groups of about 16 students, who are distributed in pairs for data collection. Each member of the couple will have to participate equitatively in the development of practice. The analysis, results and interpretation of the data, together with a critical evaluation of the practice and the conclusions, will have to be reflected in a report. At the start of the next laboratory session, the student will have to deliver the report of the previous practice to the teacher. It is not allowed to attend sessions at the times corresponding to other subgroups.

EVALUATION

In the first call, the evaluation will consist of the following parts:

1) Continuous assessment based on written reports: this will account for between 30% and 50% of the final grade. Students will submit individual reports for the practical sessions as specified by the professor. Each report will have a limit of, approximately, 4 pages. Reports must follow the guidelines outlined in the



Laboratory Guide for the First Cycle of the Physics Degree (see bibliography).

2) Oral presentation and submission of an extended report on one of the practical sessions: this will account for between 50% and 70% of the final grade. The methodology and results of one practical session, selected by the professor, will be presented throughout an extended report (maximum 20 pages) and an oral presentation. The student will have 15 minutes for the presentation, followed by a 15-minute question and answer session.

The specific weighting of each part of the evaluation will be determined by the professor at the beginning of the course.

Additionally, the professor may conduct a practical test in the laboratory, consisting of carrying out one (or part) of the practical sessions, as well as solving questions and/or problems related to the theoretical contents. This test will contribute a maximum of 20% to the final grade.

In the second call, the evaluation will consist of: 1) an oral presentation and submission of an extended report on the results of one of the practicals (50% of the final grade), 2) a practical test under the conditions described above (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
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- The Journal of Undergraduate Research in Physcs <http://www.jurp.org/>
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