VNIVERSITAT DE VALÈNCIA

Course Guide
34250 Mechanics laboratory

COURSE DATA

Data Subject	
Code	34250
Name	Mechanics laboratory
Cycle	Grade
ECTS Credits	5.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1105 - Degree in Physics	Faculty of Physics	2	Second term

Subject-matter

Degree	Subject-matter	Character
1105 - Degree in Physics	10 - Experimental physics laboratory	Obligatory

Coordination

Name	Department
FONT RODA, JOSE ANTONIO	16 - Astronomy and Astrophysics
MUÑOZ LOZANO, JOSE ANTONIO	16 - Astronomy and Astrophysics
ROS IBARRA, EDUARDO	16 - Astronomy and Astrophysics

SUMMARY

The subject of Mechanics and Waves Laboratory is mandatory and belongs, together with the Laboratory of Thermodynamics, which are also courses in Year 2, the field of Experimental Physics Laboratory. Its contents are held during the second half of the second degree course in physics through 5 ECTS. Matter is related to Mechanics and Waves, whose contents are held simultaneously in the second degree courses across subjects Mechanics I, Mechanics II, and Oscillations and Waves.

This is an experimental subject in a practical way to illustrate the theoretical content of this field. Requires the use of the knowledge acquired in the course Introduction to Experimental Physics, taught at first in regard to development work in the laboratory and the statistical analysis of data acquired, as well as taught in the course "Numerical Methods and statistics", also the second year, which broadens and deepens the statistical treatment of experimental data. This subject performed the experimental analysis of various physical laws about the system dynamics, kinematics and wave, favoring the methodological aspects of laboratory work and develop a critical attitude towards the results. This training continues in the third grade when dealing with other experimental laboratories Electromagnetism, Optics and

Quantum Physics.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

Before facing this course, 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.

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.
- Capacity to communicate information, ideas, problems and solutions to a specialist and a general audience.
- Developing learning skills so as to undertake further studies with a high degree of autonomy.
- 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.
- 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.
- Resolución de problemas y destrezas informáticas: Ser capaz de interpretar cálculos de forma independiente, incluso cuando sea necesario un pequeño PC o un gran ordenador, incluyendo el desarrollo de programas de software. En el contexto de esta materia, dominio de, al menos, un programa de análisis de datos de carácter científico.

- Investigación básica y aplicada: Adquirir una comprensión de la naturaleza de la investigación Física, de las formas en que se lleva a cabo, y de cómo la investigación en Física es aplicable a muchos campos diferentes, por ejemplo la ingeniería; habilidad para diseñar procedimientos experimentales.
- Destrezas generales y específicas en lenguas extranjeras: Mejorar el dominio del inglés y, específicamente, del inglés científico-técnico a través del acceso a la bibliografía básica o a la presentación de trabajos en este idioma.
- Búsqueda de bibliografía: Ser capaz de buscar y utilizar bibliografía en Física y otra bibliografía técnica, así como cualquier fuente de información relevante para trabajos experimentales.
- Ser capaz de proseguir con el estudio de otras materias de la física gracias al bagaje adquirido en el contexto de esta materia.
- Cultura General en Física: Haberse familiarizado con las áreas más importantes de la mecánica en relación con la Física en general, y con enfoques que abarcan y relacionan diferentes áreas de la Física.

LEARNING OUTCOMES

-Develop physical intuition from the observation of experimental results.
-Determine relevant variables in the analysis of a natural phenomenon.
-Distinguish between real phenomenon and physical model.
-Distinguish a possible result from an erroneous result. Analyze the possible causes of the latter.
-Decide which experimental data are relevant and how many evidences should be taken to describe a physical phenomenon.
-How to present the experimental data describing a physical phenomenon.
-Develop deductive reasoning and experimentally test the results of certain assumptions.
-Develop teamwork.
-To acquire skill in the use of measuring instruments.
-Learn to use software applications and data processing equipment to analyse data.
-Develop a laboratory notebook.
-Develop reports.

DESCRIPTION OF CONTENTS

1. Agenda of lab activities

1. Formation of harmonics in a rope.
2. The simple pendulum (large amplitudes) and the variable g pendulum.
3. Gyroscope. Analysis of gyroscopic precession and nutation.
4. Kundt tube. Formation of harmonics in a closed and open tube.
5. Coupled oscillations. Oscillation modes in one dimension for systems of one, two and three masses.
6. Measures of ambient noise. Analysis of instantaneous noise and equivalent noise at different locations on campus.
7. Atwood machine. Motion of a sphere in water.
8. Conservation of momentum. Energy conservation. Dynamic of collisions.

9. Coyote Falling. Free fall and parabolic shot.
10. The inclined plane. Dynamics of a mobile in a plane at different angles of inclination. Friction Study.
11. Standing waves in strings with different boundary conditions.

WORKLOAD

ACTIVITY	Hours	% To be attended
Laboratory practices	50,00	100
Study and independent work	75,00	0
TOTAL	**125,00**	

TEACHING METHODOLOGY

Contact teaching 40%

Theoretical and practical classes: These are aspects of measurement instrumentation and techniques specific to each laboratory as well as monographic themes provide a culture of experimental physics on topics of interest, current or relevant technology.

Laboratory sessions in small groups, in which students conduct experimental work in groups and individually, taking measurements in experimental devices and the recording of data and preliminary analysis.

Student's personal work 60%

- Preparation of the experimental sessions and study of theoretical aspects.

- Working staff needed for the study and interpretation of the observed phenomenology and data processing, basic statistics, results, interpretations, conclusions and communication.

In the same way and with laboratory materials are developed for theoretical training.

EVALUATION

The assessment consists of four parts: 1) Continuous assessment of attitude proved in the lab sessions, preparation and documentation skills, including the development of laboratory notebooks. 2) Evaluation of the reports for each practice. 3) Practical test in the laboratory, along with a critical analysis of the results and the resolution of issues and/or problems related to the theoretical. 4) Oral communication of the results of one of the practices.

1) Continuous assessment based on interaction with students (15%)

Evaluation of laboratory notebooks, along with the attitude and demonstrated in laboratory skills sessions.

2) Continuous assessment reports based processing (35%)

Students submit two individual memories of the practices indicated by the teacher. There will be a limit of 12 pages for the report. For processing the guidelines in the Guide for Laboratory first cycle degree in Physics (see bibliography) will be followed.

3) Practical test and analysis in the laboratory (30%)

The student's ability to perform individual practices and their ability to draw conclusions from the data collected will be evaluated through interviews in the last lab session. In this session the teacher will assign each student a part of a practice already performed by him. Each student, individually, should take the necessary measures to characterize the physical magnitude indicated by the teacher. The student may not use the script of the practice, but may use his own notebook and laboratory reports. The data should be analyzed in the lab, answering questions that the teacher deems appropriate in relation to the operation of the apparatus used. The result of these measures, together with its analysis and response to appropriate theoretical issues will be submitted to the teacher at the end of the alloted time for each practice.

4) Oral presentation of the contents of a practice (20%)

The results of a practice, determined by the teacher, will be presented orally and individually. The student will have 10 minutes for this presentation.

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/

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

English version is not available