



IDENTIFYING DATA

Physics: Fundamentals of Mechanics and Thermodynamics

Subject	Physics: Fundamentals of Mechanics and Thermodynamics			
Code	V05G301V01103			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Schiussi , Stefano			
Lecturers	Fernández Doval, Ángel Manuel Schiussi , Stefano			
E-mail	schiussi@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	Introduction to the basic concepts on the general laws of Mechanics and Thermodynamics as well as to their application to the resolution of problems in engineering.			
	"English Friendly" subject. International students may request from the lecturers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) tests and assessments in English.			

Training and Learning Results

Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
B5	CG5: The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
C3	CE3/FB3: Comprehension and command of basic concepts about the general laws of mechanics, thermodynamics, electromagnetic fields and waves and electromagnetism and their application to solve Engineering problems.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
Understanding and mastering of the basic concepts on the general laws of Mechanics and of Thermodynamics.	B3	C3	
Ability to use the basic instrumentation to measure physical quantities.	B3 B5 B6	C3	D3
Ability to evaluate experimental data.	B3 B5	C3	
Ability to solve the elementary technical problems in engineering.	B3	C3	

Contents

Topic
1.- Physical quantities and units. The International(*) System.

2.- Vectorial tools for Mechanics.	(*)
3.- Point Kinematics.	(*)
4.- Point Kinetics.	(*)
5.- Statics.	(*)
6.- Oscillations.	(*)
7.- Wave motion.	(*)
8.- Zero principle of Thermodynamics. Temperature.	(*)
9.- First principle of Thermodynamics.	(*)
10.- Second principle of Thermodynamics.	(*)
Lab 1.- Measurement instruments. Error and uncertainty. Estimation of uncertainties in direct measurements.	(*)
Lab 2.- Measurement of the reaction time to a given stimulus. Measurement of the gravitational acceleration by means of a pendulum. Estimation of uncertainty in indirect measurements.	(*)
Lab 3.- Verification of Hooke's Law. Linear fit.	(*)
Lab 4.- Longitudinal and transversal standing waves. Measurements by linearization of non-linear relations and linear fit. Graphical representation of measurement results.	(*)
Lab 5.- Simple harmonic motion. Free standing oscillation of a spring. Measurements by linearization of non-linear relations and linear fit. Graphical representation of measurement results.	(*)

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	34	62
Problem solving	21	40	61
Laboratory practical	9	13	22
Essay questions exam	0.5	0	0.5
Problem and/or exercise solving	3.5	0	3.5
Report of practices, practicum and external practices 1		0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	<p>Prior personal work:</p> <ul style="list-style-type: none"> -Preliminary reading of the proposed bibliography on the subject. <p>During the lectures:</p> <ul style="list-style-type: none"> -Presentation of theoretical concepts. -Application of the theoretical concepts to simple cases and situations. -Experimental demonstrations. -Audiovisual presentations. <p>Ulterior personal work:</p> <ul style="list-style-type: none"> -Revision of theoretical concepts. -Solving of questions and exercises from the bibliography. -Consult the bibliography. -Identification of weak points which require tutorial aid. <p>Through this methodology, competencies B3, C3, B5, B6 are worked out.</p>
Problem solving	<p>Solving of average-difficulty problems involving one or more theoretical concepts.</p> <p>During the lectures:</p> <ul style="list-style-type: none"> -Presentation of solving strategies and techniques by solving example-problems. <p>Personal work:</p> <ul style="list-style-type: none"> -Solving of problems from the bibliography. -Identification of weak points which require tutorial aid. <p>Through this methodology, competencies B3, C3, B5, B6 are worked out.</p>

Laboratory practical	<p>Prior personal work:</p> <ul style="list-style-type: none"> -Preparation of the practical session by studying the corresponding guide and reviewing the theory. <p>During the practical session:</p> <ul style="list-style-type: none"> -Description of the experiment highlighting which theoretical concepts are involved. -Training on material and instrumentation handling. -Execution of the experiment. -Preliminary result processing. <p>Ulterior personal work:</p> <ul style="list-style-type: none"> -Processing and analysis of the results. -Weak-point identification. -Consult the bibliography. <p style="text-align: center;">Through this methodology, competencies B3, C3, B5, B6 and D3 are worked out.</p>
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Personalized assistance

Methodologies	Description
Lecturing	Questions will be solved by the lecturers in their respective tutorial-aid time. Tutoring sessions will be held: individually or in small groups (typically of two or three students), by appointment to the corresponding lecturer (unless stated otherwise) and, preferably, in the place and timetable of the corresponding lecturer which will be published at the beginning of the semester. The appointment shall be arranged either by e-mail (see https://moovi.uvigo.gal) or in person at the beginning or end of a lecture.
Problem solving	Questions will be solved by the lecturers in their respective tutorial-aid time. Tutoring sessions will be held: individually or in small groups (typically of two or three students), by appointment to the corresponding lecturer (unless stated otherwise) and, preferably, in the place and timetable of the corresponding lecturer which will be published at the beginning of the semester. The appointment shall be arranged either by e-mail (see https://moovi.uvigo.gal) or in person at the beginning or end of a lecture.
Laboratory practical	Questions will be solved by the lecturers in their respective tutorial-aid time. Tutoring sessions will be held: individually or in small groups (typically of two or three students), by appointment to the corresponding lecturer (unless stated otherwise) and, preferably, in the place and timetable of the corresponding lecturer which will be published at the beginning of the semester. The appointment shall be arranged either by e-mail (see https://moovi.uvigo.gal) or in person at the beginning or end of a lecture.

Assessment

	Description	Qualification	Training and Learning Results
Essay questions exam	Solving of questions related to the theoretical concepts of the topics in both the classroom and laboratory syllabi.	10	B3 B5 B6
Problem and/or exercise solving	(Problem solving) Solving of simple exercises related to the theoretical concepts of the topics in the syllabus. Solving of problems involving one or more theoretical topics.	70	B3 C3 B5 B6
Report of practices, practicum and external practices	Execution of real and simulated measurements. Real- and simulated-measurement result processing.	20	B3 D3 B5 B6

Other comments on the Evaluation

(This is a translation, in case of any discrepancy or dispute, the original Spanish version shall prevail.)

The common assessment and grading rules of the University of Vigo are established in:

[RAUV] "Regulamento sobre a avaliación, a cualificación e a calidade da docencia e do proceso de aprendizaxe do estudantado" (available only in Galician language at <https://secretaria.uvigo.gal/uv/web/normativa/public/show/565>).

Each student summoned to an assessment test must appear with an original official document proving their identity (DNI, NIE, passport, university card or Spanish driving licence). [RAUV Art.28.4].

In the event that a fraudulent action is detected in the performance or revision of any of the assessment tests (copying, plagiarism, impersonation, introduction or use of means not permitted by the rules and instructions of the exercises and

assessment tests, alteration, subtraction or destruction of the same, etc.) [RAUV Art.42]:

- The person(s) involved shall be identified and immediately expelled from the assessment test.
- A final grade of zero points (fail) will be assigned to the person(s) involved.
- A report will be submitted to the school management for disciplinary action to be taken.

1. ORDINARY ASSESSMENT OPPORTUNITY

1.1. INTERMEDIATE CONTINUOUS ASSESSMENT TESTS

The schedule of the intermediate assessment tests will be made available by the beginning of the semester in which this subject is taught. These intermediate tests are not recoverable, i.e., they can be only taken in the scheduled dates.

The assessment tests that the student has not taken will be graded with 0 (zero points).

The corrected exercises may be revised, by requesting a tutoring session from the corresponding lecturer, during the fourteen days following the date of publication of the marks.

There will be four intermediate tests:

1.1.1 CONTINUOUS ASSESSMENT EXAMS (EC1 and EC2)

Written exams with questions, exercises and problems (marks EC1 and EC2 between 0 and 2,5 points for each exam).
Duration: nominally 1 hour in one lecture on theory or problems.

1.1.2 EVALUATED LABORATORY PRACTICES (LC1 and LC2)

Experimental laboratory exercises comprising the execution of actual measurements and the processing of the results, consisting in taking an experimental laboratory class, individually processing (during the last 30 minutes) the assessable results which will be specified in the corresponding experiments guide and handing them in at the end of the class (marks LC1 and LC2 between 0 and 1 point for each of the exercises).

1.2. FINAL EXAMINATION

Written exam with three optional parts:

E12F)

- Questions, exercises and problems corresponding to the contents of EC1 and EC2 (mark E12F between 0 and 4 points).
- If a student does not take this part, the E12F mark will be assigned the sum of the EC1 and EC2 marks.

E3F)

- Questions, exercises and problems (E3F mark between 0 and 4 points).
- If a student does not take this part, it will be graded with 0 (zero points).

LF)

- Laboratory problem comprising the execution of real or simulated measurements and the processing of the results (LF mark between 0 and 2 points).
- If a student does not take this part, the LF mark will be assigned the sum of the LC1 and LC2 marks.

Duration 4 hours on the place and date officially assigned for the subject in the examinations schedule of the Centre.

1.3. FINAL GRADING OF THE ORDINARY ASSESSMENT OPPORTUNITY

A student who does not take any of the three parts of the final examination (§1.2) will be regarded as "not presented" to the ordinary assessment opportunity.

A combined mark CCF will be calculated as the sum of the marks of the three parts of the final examination (§1.2).

The final grade FINAL_F will be the lower of 10 points and CCF.

$$CCF = E12F + E3F + LF$$

$$FINAL_F = \min\{CCF, 10\}$$

2. EXTRAORDINARY ASSESSMENT OPPORTUNITY

2.1. RESIT EXAMINATION

Written exam with three optional parts:

E12R)

-Questions, exercises and problems corresponding to the contents of E12F (mark E12R between 0 and 4 points).

-If a student does not take this part, the E12R mark will be assigned the E12F mark.

E3R)

-Questions, exercises and problems (E3R mark between 0 and 4 points).

-If a student does not take this part, the E3R mark will be assigned the mark obtained in E3F.

LR)

-Laboratory problem comprising the execution of real or simulated measurements and the processing of the results (LR mark between 0 and 2 points).

-If a student does not take this part, the LR mark will be assigned the LF mark.

Duration 4 hours on the place and date officially assigned for the subject in the examinations schedule of the Centre.

2.2. FINAL GRADING OF THE EXTRAORDINARY ASSESSMENT OPPORTUNITY

A student who does not take any of the three parts of the resit examination (§2.1) will be regarded as "not presented" to the extraordinary assessment opportunity.

A combined mark CCR will be calculated as the sum of the marks of the three parts of the resit examination (§2.1).

The final grade FINAL_R will be the lower of 10 points and CCR.

$$CCR = E12R + E3R + LR$$

$$FINAL_R = \min\{CCR, 10\}$$

3. END-OF-PROGRAM CALL

3.1. END-OF-PROGRAM EXAMINATION

Written exam with:

-Questions

-Exercises

-Problems

-Laboratory problems (with real or simulated measurements and processing of the results)

FINAL_E mark between 0 and 10 points.

Duration 3 hours on the place and date officially assigned for the subject in the examinations schedule of the Centre.

3.2. FINAL GRADING OF THE END-OF-PROGRAM CALL

The final grade FINAL_E will be the one obtained in the end-of-program examination (§3.1).

4. CALCULATIONS AND ROUNDING:

I) All of the aforesaid calculations to obtain the marks will be performed with a resolution equal to or better than one hundredth of a point (0,01 point).

II) The final marks will be rounded to the nearest multiple of 0,1 point (one tenth of a point); if the two nearest multiples of 0,1 point are equidistant, the overall grade will be rounded to the higher of them.

III) The minimum final grade required to pass the course is 5,0 points. [RAUV Art.31]

Sources of information

Basic Bibliography

H.D. Young y R.A. Freedman, **Sears-Zemansky. Física Universitaria**, 9, 11, 12 o 13, Addison-Wesley,

H.D. Young y R.A. Freedman, **University Physics**, 9, 11, 12 or 13, Addison-Wesley,

Present and past lecturers of this subject, **Laboratory Notes for the practical sessions of**, 2023-2024, 2023

Profesorado presente y pasado de la asignatura., **Guiones de las prácticas de «Física Fundamentos de Mecánica y Termodinámica»**, 2022-2024, 2023

Bureau Internationale des Poids et Mesures (BIPM), **SI Brochure: The International System of Units (SI)**, 9, Bureau Internationale des Poids et Mesures (BIPM), 2019

Oficina Internacional de Pesas y Medidas (BIPM), **Sistema Internacional de Unidades SI**, 9, Centro Español de Metrología, 2019

Complementary Bibliography

I.N. Bronshtein, K.A. Semendiaev, **Manual de Matemáticas para Ingenieros y Estudiantes**, (cualquier edición), MIR,

Raymond A. Serway, John W. Jewett, **Física, Tomo 1**, 3, Thomson, 2003

Paul A. Tipler, **Física, Tomo 1**, 5, Reverté, 2005

W. Edward Gettys, et al., **Física Clásica y Moderna**, Mc Graw-Hill, 1991

Douglas C. Giancoli, **Física para universitarios, Tomo 1**, 3, Prentice-Hall, 2002

Marcelo Alonso, Edward J. Finn, **Física**, Addison-Wesley, 1995

Susan M. Lea, John R. Burke, **Física. La naturaleza de las cosas, Tomo 1**, Paraninfo, 2001

Ambler Thompson, Barry N. Taylor, **NIST Special Publication 811, «Guide for the Use of the International System of Units (SI)»**, 2008, National Institute of Standards and Technology, 2008

Comité Conjunto para las Guías en Metrología (JCGM), **Vocabulario Internacional de Metrología (VIM)**, 3, Centro Español de Metrología, 2012

Joint Committee for Guides in Metrology (JCGM), **International vocabulary of metrology (VIM)**, 3, Bureau International des Poids et Mesures, 2012

Recommendations

Subjects that are recommended to be taken simultaneously

Mathematics: Linear algebra/V05G301V01102

Mathematics: Calculus 1/V05G301V01101

Other comments

To adequately follow this subject, it is highly advisable to master the contents of high-school subjects on Mathematics and Physics.