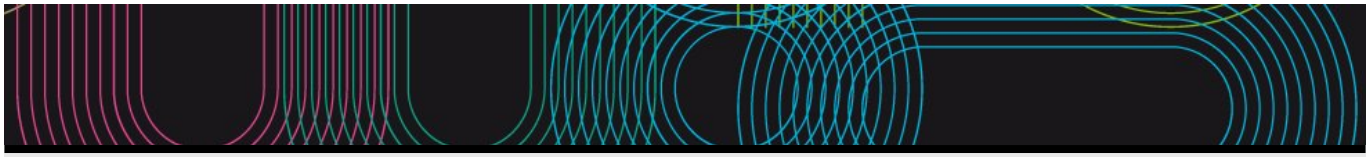

IDENTIFYING DATA				
Physics: Physics 1				
Subject	Physics: Physics 1			
Code	P52G382V01106			
Study programme	Grado en Ingeniería Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Vázquez Carpentier, Alicia			
Lecturers	Eiras Barca, Jorge Vázquez Carpentier, Alicia			
E-mail	avcarpentier@cud.uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The fundamental objectives shared by both this subject and its successor Physics II are, on the one hand, the consolidation with the adequate conceptual and formal rigor of previously acquired knowledge and, on the other hand, the establishment of the necessary bases for the further study of other disciplines of a basic or fundamental nature. All this, so that the final objective is not mere theoretical speculation but the application of the acquired knowledge to technology through the appropriate physical-mathematical models and schemes. The aptitudes and skills necessary for the resolution of technical problems related to Physics will be developed, practicing the analytical-deductive methodology of this science. The program of the Physics I course of the Mechanical Engineering Bachelor Degree is divided into five main blocks: Introduction, Kinematics, Dynamics, Fluids and Vibrations and Waves, which will be developed in eleven topics as detailed in the course syllabus. This subject is key for a better understanding of other subjects that will be studied later, such as Strength of Materials, Fluid Mechanics or Mechanisms and Machines Theory.			

Training and Learning Results	
Code	
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C2	Understanding and mastering the basics of the general laws of mechanics, thermodynamics, waves and electromagnetic fields, and their application for solving engineering problems.
D2	Problems resolution.
D9	Apply knowledge.
D10	Self learning and work.

Expected results from this subject	Training and Learning Results		
Know the basic instrumentation to measure physical magnitudes.	B3	C2	D2 D9 D10
To know the basic techniques for the evaluation of experimental data.	B3	C2	D2 D9 D10
Develop practical solutions to elementary technical problems of the engineering in the fields of the mechanics and of fields and waves.	B3	C2	D2 D9 D10
ENAEE LEARNING OUTCOME: KNOWLEDGE And UNDERSTANDING: 1.1 Knowledge and understanding of mathematics and other basic sciences inherent to their engineering specialty, at a level that allows them to acquire the rest of the competencies of the degree.Level of development (basic(1), intermediate(2) or advanced(3)): Intermediate(2)].	B3	C2	

ENAEE LEARNING OUTCOME: ANALYSIS IN ENGINEERING: 2.2. The ability to identify, formulate and solve engineering problems in their specialty; to choose and properly apply established analytical, computational and experimental methods; to recognize the importance of social, health and safety, environmental, economic and industrial constraints (Basic(1)).	C2	D2 D9
ENAEE LEARNING OUTCOME: INVESTIGATION And INNOVATION: 4.3. Ability and skill to design and carry out experimental investigations, interpret results and reach conclusions in their field of study (Basic(1)).	C2	D9
ENAEE LEARNING OUTCOME: COMMUNICATION And TEAM WORKING: 7.2. Ability to function effectively in national and international contexts, individually and in teams, and to cooperate both with engineers and people from other disciplines (Basic(1)).		D10

Contents

Topic	
1.- Physical quantities and measurement	1.1 Magnitudes, quantities, units and measurements. 1.2 Dimensional homogeneity. 1.3 The International System. Universal constants and characteristics. 1.4 Theory of errors.
2.- Vector Calculus	2.1 Vectors. Types. 2.2 Coordinate Systems. 2.3 Operations with vectors. 2.4 Scalar and vector fields. 2.5 Central fields. Newtonian fields. 2.6 Integral theorems of vector analysis.
3.- Particle kinematics	3.1 Fundamental concepts: position vector, velocity, acceleration. 3.2 Study of some types of motion. 3.3 Relative motion.
4.- Particle dynamics	4.1 Forces and interactions. 4.2 Fundamental principles of mechanics: Newton's Laws. 4.3 Conservation principles. 4.4 Diagrams of the free solid. 4.5 Applications of Newton's Laws.
5.- Work and energy	5.1 Work and power. 5.2 Kinetic energy. 5.3 Gravitational and elastic potential energy. 5.4 Conservative and non-conservative forces. Law of conservation of energy. 5.5 Principle of least action.
6.- Dynamics of a particle system	6.1 Center of masses. Equation of motion of the center of masses. 6.2 Linear momentum of a particle system. Conservation theorem. Impulse. 6.3 Angular momentum of a particle system. 6.4 Kinetic energy of a particle system. Conservation theorem. 6.5 Law of conservation of energy of a particle system. 6.6 Collisions.
7.- Rotation and dynamics of a rigid body	7.1 Kinematics of rotation. 7.2 Energy in rotational motion. 7.3 Moment of inertia. Steiner's theorem. 7.4 Rotational dynamics of a solid. 7.5 Angular momentum. Conservation theorem. 7.6 Gyroscopes.
8.- Static equilibrium and elasticity	8.1 Equilibrium conditions. Ligatures. Center of gravity. 8.2 Examples of static equilibrium in rigid solids. 8.3 Stresses, deformation and modulus of elasticity. 8.4 Elasticity and plasticity.
9.- Fluid mechanics	9.1 Density. 9.2 Pressure in a fluid. 9.3 Fundamental principles of Fluidostatics. Archimedes principle. 9.4 Continuity equation. 9.5 Bernoulli's equation.
10.- Vibrations	10.1 Periodic motions. 10.2 Simple harmonic motion (s.h.m.). 10.3 Force and energy of a simple harmonic oscillator. 10.4 The simple physical pendulum. 10.5 Damped free oscillations. 10.6 Forced oscillations. Resonance.

11.- Wave motion	11.1 Concept of wave. 11.2 Wave motion. General study. 11.3 Energy of wave motion. 11.4 Wave interference. 11.5 Standing waves.
PRACTICES OF LABORATORY	P1 Measure and calculation of errors. P2 Resolution of problems. Cinematics. P3 Dynamics. P4 Centre of masses and dynamic of a system of particles. P5 Dynamics of the rigid solid. P6 Resolution of problems. Static balance. P7 Vibrations and waves.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	28	28	56
Seminars	14	0	14
Laboratory practical	14	14	28
Mentored work	15	11	26
Essay questions exam	13	13	26

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

Methodologies

	Description
Lecturing	In these sessions the basic theoretical contents of the program will be explained in detail, exposing explanatory examples with which to deepen the understanding of the subject. Presentations and the blackboard will be used in combination. The paper reproductions of the slides should never be considered as substitutes for the texts or notes, but as complementary material.
Seminars	There are sessions of problem solving and exercises where the student must solve, individually or under supervision, a series of problems and practical exercises addressing the theoretical contents of the subject. The didactic method to be followed in the teaching of the seminars is that the lecturer supervises the work done by the students solving problems and practical exercises.
Laboratory practical	They correspond to laboratory sessions, and problem and exercise solving sessions. In the laboratory sessions, in order to contribute to the acquisition of the basic competence CB3 (A3) and the transversal competence CT10 (D10), the evaluation of the practical sessions is considered with the preparation of individual reports or by means of questionnaires related to the work derived from the laboratory session. In the problem and exercise solving sessions and in order to acquire the competences CT2 (D2) and CT9 (D9) the student must solve, individually or under supervision, a series of practical problems and exercises dealing with the theoretical contents of the subject.
Mentored work	They correspond to sessions of the intensive course of preparation for the extraordinary exam, where the lecturer will propose complementary problems and activities to review the contents of the course and will answer the questions raised by the students.

Personalized assistance

Methodologies	Description
Lecturing	In the field of tutorial action, the students will have at their disposal hours of tutorials in which they can ask any question related to the contents, organization and planning of the subject, etc. In the personalized tutorials, each individual student will be able to discuss with the lecturer any problem that is preventing him/her from following the subject properly, in order to find some kind of solution between both of them.
Laboratory practical	In the sessions destined to the realization of laboratory practices, the professor will answer in a personalized way the questions raised by the students.
Seminars	In the group tutorials, the lecturer will personally answer the student's questions, suggesting complementary exercises or other types of activities that will help the students to make the best use of the classes.

Mentored work	During the reinforcement course, students will have at their disposal hours of tutorials in which they can ask any question related to the subject. The lecturers of the course will personally answer the questions of the students in the schedule that will be published in the center website, as well as through e-mail or through other telematic means (use of the virtual office by appointment, videoconference, use of Moovi forums, etc.).

Assessment

	Description	Qualification	Training and Learning Results		
Lecturing	Evaluation by means of complementary activities consisting of the resolution of problems proposed by the lecturer of the subject or any other activity that may be established. The student may be asked to present the resolution of the problems in class	15	B3	C2	D2 D9 D10
Laboratory practical	Reports or questionnaires on the practices and the work derived from them.	15	B3	C2	D2 D9 D10
Essay questions exam	Two intermediate written tests and the final evaluation test.	70	B3	C2	D2 D9 D10

Other comments on the Evaluation

Next we show the percentage that each of the parts represents in the student's final grade.

- Intermediate test 1 (PI1)=15%
- Intermediate test 2 (PI2)=15%
- Laboratory practices evaluation test (EP)=15%
- Complementary Activities (AC)=15%
- Final test (PF)=40%

The student's final evaluation will be based on the sum of the score given to each of the above mentioned parts, being the continuous evaluation grade (NEC):

$NEC = 0,15 \cdot PI1 + 0,15 \cdot PI2 + 0,15 \cdot EP + 0,15 \cdot AC + 0,4 \cdot PF$

However, minimum requirements and conditions will be demanded in some of the sections to ensure a balance between all types of competencies.

The student must take the regular exam of all the contents of the course, which will account for 100% of the grade, when the NEC grade is less than 5 or obtains a grade lower than 4 points out of 10 in the final exam of continuous evaluation. In this last case, the grade of the continuous evaluation will be the minimum of the continuous evaluation grade calculated with the previous formula and 4 points.

In any case, the student who has passed the continuous evaluation will be offered the opportunity to take the regular exam to raise the grade.

ACADEMIC INTEGRITY: Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo*, as well as point 6 of the fifth rule of *Order DEF/711/2022, of July 18th, which establishes the requirements for evaluation, progress, and ongoing enrolment in military educational training centres for incorporation into the ranks of the Armed Forces,* **any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity**, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

Sources of information

Basic Bibliography

W. Sears, M.W. Zemansky, H.D. Young, R.A. Freedman, **Física Universitaria, V1**, 12,

Complementary Bibliography

S. Burbano, **Física General: Problemas**, 27,

F.A. González, **Problemas de Física**,

J.A. Fidalgo, M.R. Rodriguez, **1000 Problemas de Física General**, 5,

Recommendations

Subjects that it is recommended to have taken before

Mathematics: Calculus 1/P52G382V01103

Other comments

In order to successfully complete this course the student must follow the following recommendations and possess the following skills:
1. Active attendance to classes, both theoretical and practical.
2. Maintain a minimum daily or weekly study.
3. Cultivate reasoning and ingenuity in the learning of the subject, rather than simple memorization procedures.
4. Ability to learn to solve physical problems based on a good theoretical foundation and sufficient practice in the use of basic mathematical tools. It is essential that the student masters the basic aspects of integral and differential calculus to pass the course.