

30101 - Physics I

Syllabus Information

Academic Year: 2020/21

Subject: 30101 - Physics I

Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
179 - Centro Universitario de la Defensa - Zaragoza

Degree: 457 - Bachelor's Degree in Industrial Organisational Engineering
563 - Bachelor's Degree in Industrial Organisational Engineering
425 - Bachelor's Degree in Industrial Organisational Engineering

ECTS: 6.0

Year: 1

Semester: First semester

Subject Type: Basic Education

Module: ---

1. General information

1.1. Aims of the course

The subject and its expected results respond to the following approaches and objectives:

Expose the universal nature of physical laws, their inexorable character and the enormous benefits that are obtained from their knowledge in the field of engineering.

1.2. Context and importance of this course in the degree

Physics I is a basic training subject, with 6 ECTS credits that is taught during the first year of the degree in Industrial Organization Engineering.

It aims to provide the student with the basic knowledge of the most relevant phenomena and physical laws of application in the study of engineering; as well as the necessary tools to apply this theoretical knowledge to the resolution of engineering problems. More specifically, it focuses on the study of mechanics and thermodynamics.

1.3. Recommendations to take this course

It is a basic subject that must provide a first contact with the foundations, methods and scientific procedures of Physics. A close relationship is established with other analogous subjects such as Physics II, Mathematics I, II, III inserted within the degree itself.

In order to face the subject with guarantees, it is recommended to have completed physics and mathematics in the second year of high school or equivalent.

2. Learning goals

2.1. Competences

General:

1. Ability to solve problems and take decisions with initiative, creativity and critical reasoning.
2. Ability to continue learning and develop self-learning strategies.

Specific:

3. Mastery of basic concepts about the principles of general mechanics, fields and waves, electromagnetism and its application to solve engineering problems.

2.2.Learning goals

- Knows the fundamental concepts and laws of mechanics and thermodynamics and their application to basic problems in engineering.
- Analyzes problems that integrate different aspects of Physics, recognizing the varied physical foundations that underlie a technical application, device or real system.
- Knows the units, orders of magnitude of the defined physical magnitudes and solves basic engineering problems, expressing the numerical result in the appropriate physical units.
- Correctly uses basic methods of experimental measurement or simulation and treats, presents and interprets the obtained data, relating them to the appropriate physical magnitudes and laws.
- Uses bibliography, by any of the available means at present, and uses a clear and precise language in its explanations on questions of physics.
- Correctly applies the fundamental equations of mechanics to various fields of physics and engineering: rigid solid dynamics, oscillations, elasticity and fluid mechanics.
- Understands the meaning, utility and relationships between magnitudes, modules and fundamental elastic coefficients used in solids and fluids.
- Performs mass and energy balances correctly in fluid movements in the presence of basic devices.
- Uses correctly the concepts of temperature and heat. He/She applies them to calorimetric, dilation and heat transmission problems.
- Applies the first and second principles of thermodynamics to processes, basic cycles and thermal machines.

2.3.Importance of learning goals

The activities carried out in this subject are of high formative content since they encourage the development of the reasoning, analysis and synthesis skills, problem solving and application cases and initiation to laboratory work and to the application of the scientific method.

Due to its condition as a basic training subject, the competences acquired correspond to what is required in every degree in the fields of Engineering and Architecture.

Being a subject taught during the first course, on the one hand it should serve to strengthen and homogenize the knowledge acquired in previous educational stages and, on the other hand, act as a foundation to build on it the most specific technological knowledge that will be addressed in other subjects of the degree. In particular, all those that are related to mechanics, thermodynamics, elasticity and fluid mechanics.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

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The student must demonstrate that they have achieved the expected learning outcomes through the following assessment activities.

There is the possibility of passing the subject through two different routes:

Continuous assessment:

Following the spirit of Bologna, regarding the degree of involvement and continued work of the student throughout the course, the evaluation of the subject considers the continuous evaluation system as the most consistent to be in line with the guidelines set by the new framework. from the EHEA.

To opt for the Continuous Assessment system, you must attend at least 80% of the face-to-face classes. It will consist of:

- **Written Tests:** two partial written tests will be carried out whose grade (NE) will be the average of all of them. To pass this part, it is required to obtain a grade greater than or equal to 4.0 in each partial exam. In addition, NE must be greater than or equal to 5.0. The weight of this mark in the final evaluation of the course will be 80%.
- **Laboratory practices:** 4 laboratory practices will be carried out. They are compulsory face-to-face activities that the student must have carried out to pass the subject and a report on the activity carried out must be prepared. To pass this part, the Practices grade (NP) must be greater than or equal to 5.0. The weight of this mark in the final evaluation of the subject will be 20%.

The final grade for the course will be: **NF = 0.80 NE + 0.20 NP**

To pass the course, the student must obtain an NF grade greater than or equal to 5.0.

Global Assessment

The Global Assessment will consist of:

- **A Written exam:** there will be a final written exam whose grade (NE) must be greater than or equal to 5.0 to pass the course. The weight of this mark in the final evaluation of the course will be 80%.
- **Laboratory practices:** 4 laboratory practices will be carried out. They are compulsory face-to-face activities that the student must have carried out to pass the subject and a report on the activity carried out must be prepared. To pass this part, the Practices grade (NP) must be greater than or equal to 5.0. The weight of this mark in the final evaluation of the subject will be 20%.

The final grade for the course will be: **NF = 0.80 NE + 0.20 NP**

To pass the course, the student must obtain an NF grade greater than or equal to 5.0.

Note: in case the students do not pass the subject through Continuous Assessment, they can do so through Global Assessment. In addition, in the event that the students have passed the subject through Continuous Assessment and want to improve their grade, they may carry on the global exam at 1st call of the Global Assessment without risk of lowering their grade.

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The students will have 2 options to pass the subject and to prove that they reached the expected learning goals.

1. Continuous assessment system.
2. Global assessment system.

The **continuous assessment system** consists of 2 different types of tests having different weight:

a) Written exams (PE): There will be 3 exams throughout the course. Each exam will be held after the end of each contents block (3 in total, as shown below). The weight of each exam is 20%, 35% and 45% respectively. The weighted average of the individual exams is **PE** and the students must obtain a grade equal or greater than 5. No minimum grade is required in each individual exam though.

b) Laboratory practices exams (PL): are compulsory face-to-face activities that the student must complete. At the end of each laboratory practice, the student will do an exam with questions related to it. The average of all the laboratory practices' exams is **PL**, and it has to be equal or higher than 5 to make the final weighted average with the written exams. To pass the subject, students must pass the corresponding part in the evaluation of contents during the laboratory practices and their assessment will be part of the final grade.

The evaluation criteria to pass the subject according to the continuous assessment system will be:

NFEC=0,8·PE + 0,2·PL ≥ 5.0, where PE ≥ 5 and PL ≥ 5.

If the subject is not passed by the continuous assessment system, the student can still choose the **global assessment system**, which consists of:

- **Final exam (PG):** Two global final exams will be held on the two official calls. The student will be examined of all the theoretical-practical contents in one exam. **PG ≥ 5**

- **Final laboratory practices exam (PGL):** Two global final exams will be held on the two official calls. The student will be examined of all the laboratory practical contents. **PGL ≥ 5**

The evaluation criteria to pass the subject according to the global assessment system will be:

NF=0,8·PG + 0,2·PGL ≥ 5.0, where PG ≥ 5 and PGL ≥ 5.

To pass the subject it is necessary that either NFEC or NF is equal to or greater than 5.

Note: If the student has passed the subject by continuous assessment and he or she wants to improve his or her final grade, there will be the possibility to perform the Final exam on the 1st official call, without risking his or her original grade.

Final exam of the second call: The marks obtained in the partial exam or the practices will not be saved, and therefore the student will be examined of all the theoretical-practical contents.

To pass the subject it is necessary that NF is equal to or greater than 5.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

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The learning process that is designed for this subject is based on the following:

The subject consists of 6 ECTS credits, which represents 150 hours of student work on the subject during the semester. 40% of this work (60 h.) Will take place in the classroom, and the rest will be autonomous. One semester consists of 15 teaching weeks. To make the timing is used to measure the school week, in which the student must devote to the study of the subject 10 hours.

If classroom teaching were not possible due to health reasons, it would be carried out on-line.

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If this teaching could not be done in person for health reasons, it would be done telematically.

The course corresponds to 6 ECTS credits which are equivalent to 150 hours of student work. Of these, 60 hours correspond to work in the classroom, where laboratory sessions and evaluation activities are included; the remaining 90 hours are the approximate number of independent learning hours needed to pass the course. It is recommended that students try and solve a problem a day on their own. Problems to solve should be chosen among those proposed.

4.2.Learning tasks

The course includes the following learning tasks:

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- Theoretical classes: theoretical activities so fundamentally expository given by the teacher.
- Practical classes: practical discussion activities and conducting exercises conducted in the classroom and requiring high student participation.
- Laboratory Practice: Practical activities in laboratories.
- Office Group tutorials hours.
- Office individual tutorials hours.

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Classroom teaching: Involves Lectures and sessions on problem-solving. The lectures will provide the means to give a concise, focused presentation of the subject matter of the course.

Laboratories: Laboratory experiments enhance and consolidate the basic principles discussed in the theoretical section of the course. Students will work in small groups of about 2-3 students and complete an experiment during each lab meeting. Procedures for each lab can be accessed via Moodle in the Experiments section and they must be carefully read by the students before attending the lab session. Labs are mandatory and are part of the grade. Students must complete each lab session in order to pass the course. A grading lab writes up for each group should be handed over after the lab session.

Independent study: involves activities such as preparing submitted work (e.g. laboratory reports), working through any worked examples provided by the lecturer or further examples, on problem-solving, on an independent study of the lecture course material and textbooks, and on revision.

Office hours: Lecturers can be reached during Office Hours to answer questions and provide assistance with the course material, homework or other questions about the class. Office hours work best if students have their textbooks, class notes, and lecture tutorials with them. Students are highly encouraged to arrange appointments by email.

4.3.Syllabus

The course will address the following topics:

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- I. Kinematics
- II. Dynamics of one and several particles. Static.
- III. Rigid body dynamics
- IV. Oscillatory movement
- V. Elasticity and fluids
- VI. Thermodynamics

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The program of the subject is divided in 3 blocks as follows:

BLOCK I

1. Kinematics
2. One-body Mechanics

BLOCK II

3. Many-body Mechanics
4. Rigid-body Dynamics.

BLOCK III

6. Oscillations
5. Fluid Mechanics
7. Thermodynamics
- 7.1. Temperature and Heat. Energy transfer
- 7.2. The first law of thermodynamics
- 7.3. The second law of thermodynamics

Labs

Laboratory practical sessions. More details on the practicals will be given at the beginning of the course.

4.4.Course planning and calendar

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Planning for weeks about the subject is as follows:

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Topic	I	I	II	II	III	III	III/IV	IV	IV	V	V	VI	VI	VI	R
Exams				1º					2º						3º

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Timetabled activities will be available on Moodle at the beginning of the term. To access the planning, go to <http://moodle2.unizar.es> with your username and password to log in. To check the school calendar and timetables visit <http://cud.unizar.es/calendarios>.

4.5.Bibliography and recommended resources

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Students will have the Moodle virtual platform where you will find notes, powerpoint slides, corollary of exercise, laboratory practices manuals and any other material.

On the Moodle virtual platform, students will have access to the necessary material for the subject.

Theory and Practice sessions will be held in the classroom set by the center's management, while the laboratory practices will be held in the Physics Laboratory.

Bibliography available in: http://biblos.unizar.es/br/br_citas.php?codigo=30101&year=2020

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Class materials such as copies of PowerPoint slides, lecture notes, electronic versions of handouts, guide notes for each experiment and exam reviews will be available through Moodle <http://moodle2.unizar.es>. Other supplementary texts and audiovisual packages will also be available. These materials may be utilized to reinforce the lecture and lab material or to provide material for independent study by the student.

Bibliography available in http://biblos.unizar.es/br/br_citas.php?codigo=30101&year=2020