Universidad Zaragoza

**Academic Year/course: 2021/22**

# 30101 - Physics I

## Syllabus Information

**Academic Year:** 2021/22
**Subject:** 30101 - Physics I
**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia
179 - Centro Universitario de la Defensa - Zaragoza
**Degree:** 425 - Bachelor's Degree in Industrial Organisational Engineering
563 - 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.

Specialization in Defense:

This subject contributes to the training of Army Officers, providing the capacity for scientific reasoning and analytical thinking they need to perform their mission and meet the present and future challenges of the Army.

## 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 probe 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) Exercises of assessment and laboratory practices:** Along the course, an exercise of assessment (EV) with a weight of 10% of the total grade will be heald. Laboratory practices are mandatory activities for ***every registered student*** to pass the subject. In the assessment of laboratory practices (NP) it will take into account the student skills as well as acquired capacities that will be shown in a written examn at the end of the course. The practice grade (NP) has a weight of 10% of the total grade.

**b) Written exams (PE):** Two written examns will be held (PE1 and PE2) along the course. Theese examns could be contain theoretical content as well as laboratory related and the resolution of practical exercises. The weight of each examn is 40% of the total grade of the course.

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

**NFEC = 0.1 EV + 0.1 NP + 0.4 PE1 + 0.4 PE2. To pass the subject by the continous assessment system is needed to achieve NFEC ? 5.** Where each contributions EV, NP, PE1 y PE2 will be scored between 0 and 10.

Student has also the possibility to pass the subject by***global assessment system*** by:

- **Final exam (NF):** Two global final exams will be held on the two official calls. The student will be examined of all the theoretical-practical contents (80%) and laboratory related (20%) in one exam. **NF ? 5** to pass the subject.

**To pass the subject it is necessary that either NFEC or 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 as follows:

1. Kinematics

2 .One-body Mechanics

3. Many-body Mechanics

4. Rigid-body Dynamics.

5. Oscillations

6. 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://moodle.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, powerponit slides, corollary of exercise, laboratoy 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://moodle.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** avaliable in http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30101