Universidad Zaragoza

Year : 2019/20

29901 - Physics I

Syllabus Information

Academic Year: 2019/20
Subject: 29901 - Physics I
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 435 - Bachelor's Degree in Chemical Engineering
ECTS: 6.0
Year: 1
Semester: First semester o Second 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:

The Physics I course is focused on the fundamentals of mechanics and its applications, such as mechanical oscillation, elasticity and fluid mechanics. Also, it provides the basic principles and working hypotheses of Thermodynamics, with emphasis on the study of heat transmission and thermal machines. Being a fundamentally basic discipline, these cncepts are presented as a starting point for subsequent courses of the Chemical Engineering formation.

On the other hand, some aspects of the course, such as those related to the Laws of Conservation (e.g. momentum and energy) the vector nature of physical magnitudes; the use of Differential Calculus and the basic methodology for analyzing Laboratory data constitute an essential methodological basis for the student.

Finally, given the specific character of the Chemical Engineering discipline, those concepts of Physics will be applied to selected problems related to the Degree.

1.2.Context and importance of this course in the degree

The Physics I course constitutes a part of the Basic Formation Unit within the Degree, and represents the first part of the Physics Course that is completed by Physics II Course along the second Semester. It is a course of 6 ECTS that is provided along the first semester of the first year.

The course contains the conceptual basis of Mechanics, Fluid Mechanics, Thermodynamics and constitutes the Physics formation for students of Materials, Materials Engineering, Environmental ENgineering and Automatied Systems Degrees. Additionally, these contents will be necessary for several other courses, optional and mandatory, of this specific Degree orientation

1.3.Recommendations to take this course

It is recommended a prior knowledge of **Physics and Mathematics at High School level**. Continued study and work are critical to pass this course with optimal learning. May doubts arise, it is important to solve them as soon as possible to ensure a smooth progress in this subject. To help answer eventual questions, the students have the advice of the teacher, both during class and, especially, in the tutorials specifically designed to do so

2.Learning goals

2.1.Competences

When approved on this Course, the student will have enhanced competence to:

1. **SPECIFIC SKILLS**:

Comprehension and control of the basic conceptus on the general laws of Mechanics, Thermodynamics, waves and fields, and their application to electromagnetism on typical problems of the field.

2. **General SKILLS**:

2.1 Capacity to solve problems and take decisions with initiative, creativity and critical reasoning.
2.2 Capacity to learn continuously y develop strategies for autonomous learning

2.2.Learning goals

To pass this subject, the student must demonstrate the following results:

1. General learning outcomes:

1. To know the fundamental concepts and laws of mechanics and thermodynamics and their application to basic problems in engineering.
2. To analyze problems that integrate different aspects of physics, recognizing the various physical principles underlying a technical application, device or real system.
3. To know the units, orders of magnitude of the defined physical magnitudes and solve basic engineering problems, expressing the numerical result in appropriate physical units.
4. To correctly use basic methods of experimental measurement or simulation, To present and interpret the data, relating them to the appropriate physical quantities and laws.

5. - To use bibliography and/or any of the available resourses available today and to develop a clear and precise language in its explanations on questions of physics.

2. Specific learning outcomes:

- Correctly applying the fundamental equations of mechanics to various fields of physics and engineering: rigid body dynamics, oscillations, elasticity and fluid.
- Understand the meaning, usefulness and relations between magnitudes, elastic core modules and coefficients used in solids and fluids.
- Performs mass and energy balances correctly applied to fluid movements in the presence of basic devices.
- Correctly use the concepts of temperature and heat. Applies these concepts to calorimetry, expansion and heat transmission problems.
- Apply the first and second law of thermodynamics to processes, basic cycles and thermal machines.

2.3.Importance of learning goals

The learning outcome are crucial since they will provide the student with a set of knowloedges and tools required to solve simplified problems of Machanics and Thermodynamics related to the Chemical Engineering activities. They are, in turn, the starting point for further knowledge in higher year courses in the Degree.

3.Assessment (1st and 2nd call)

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

The student must demonstrate that he has achieved the expected learning outcomes through the following assessment activities:

Throughout the semester two partial tests (written form) will be performed, which will include conceptual and formal development problems related to the contents of the course. The mark obtained in each of these tests will count as a 20% of the final mark.

To promote the continued work of the student, programmed self-assessment activities will be carried out in the corresponding class that ends each content block. This self-evaluation is of a non-obligatory and individual nature, and is offered with the purpose of giving the student the possibility of knowing better his / her performance regarding specific use of the subject before the two partial tests. This will result in a better use of the contents of the subject as they are developed in class.

The learning outcomes 1.1, 1.2 and 1.3 will be evaluated.

At the end of the semester a test will be carried out in the laboratory, related both to the experimental methods and to the analysis of the data obtained. The content of this test will be developed from the activities carried out in the laboratory sessions. This test will constitute 20% of the final grade. It will be of eliminatory character, that is to say, it will have to be approved to be able to surpass the subject, and the minimum note for its approval will be of 5 points.

The learning outcomes 1.3 and 1.4 will be evaluated.

A tutorial work of a practical nature will be proposed that will allow the evaluation of learning outcomes 1.1, 1.2 and 1.3 (occasionally 1.4 and 1.5). This part constitutes 10% of the final mark of the subject. This work will be mandatory and eliminatory, with a minimum grade of 5 points out of 10.

At the end of the semester, according to the center's exam calendar, there will be a global written test of the subject, of a structure analogous to that of intermediate tests, but covering the contents of the whole subject. This test will constitute 30% of the final grade, passing with a minimum score of 5 points out of 10.

The learning outcomes 1.1, 1.2 and 1.3 will be evaluated.

To pass the subject it will be necessary to obtain at least five points in each of the qualifications of the aforementioned tests, which will result in a global average mark equal to or greater than 5 points. However, a global average of 5 points is not a sufficient condition for approval, and the student must pass each individual test with a minimum of 5 points.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

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

Lectures, given to the whole group, in which the teacher will explain the basic principles of the subject and the strategies and procedures for the application of these concepts to real and everyday situations and problems.
Throughout the course, classes will be included to develop the aforementioned strategies for solving problems. In these spaces, the possible ways to use the mathematical concepts and tools will be discussed to solve the problems and analyze the solutions (consistency, reasonableness and approximations in each case). Students' participation in this activity will be enhanced by announcing to students the dates for these activities, also indicating in advance what will be the real situations that will be analyzed in the classroom so that the student can reflect on them previously, and participate in its resolution.
Laboratory practices that are distributed throughout the semester and whose assessment will be part of the final grade of the subject. Groups of two or three students are formed to work on each laboratory assembly, counting with a script previously delivered by the professors and a questionnaire that collects the data are taken and their analysis.
Activities in small groups that can be: seminars that delve into a subject of the subject of interest in the degree, advanced laboratory experiences, supervised work of students, etc.
Autonomous work, studying the subject and applying it to the resolution of exercises. This activity is fundamental in the student's learning process and for overcoming the evaluation activities.
Tutorials, which can be related to any part of the subject and it will be emphasized that the student comes to them with conveniently clear and thoughtful approaches.

4.2.Learning tasks

The course includes the following learning tasks:

- 1. Lectures. Developed throughout the semester by 3 hours of weekly classes on schedule assigned by the centre. It is, therefore, highly recommended for the proper use of the subject face activity.
- 2. Laboratory activities: Will consist of 4 laboratory sessions of two hours each, made in subgroups of the main group of theoretical class. The labs are classroom activities that the student must do to pass the subject; evaluation will be done through a final exam. The time planning will be conducted by the centre and communicated at the beginning of the course.
- 3. Seminar activities. In this classroom activity, it will work on problems presented in lectures. There will be 7 sessions of one hour, in which the critical problem solving is encouraged.
- 4. Study and autonomous work. This is the part of the course requiring no presence in class. It is estimated as about 85 hours necessary for the study of theory, problem-solving and laboratory reviewing scripts.
- 5. Tutoring. The professor will publish a schedule for the student's tutorial sessions so that they can go to make consultations. In order to carry out these consultations in an orderly manner, a personalized order will be established in each schedule, thus avoiding the overlapping of tutorials and improving the use at the individual level. In the cases in which any student is unable to attend within these times, and prior communication to the teacher by the student, a schedule adapted to the student's possibilities will be established.

4.3.Syllabus

The course will address the following topics:
PART I

MECHANICS: FUNDAMENTALS

0. Class Zero. Presentation of the overall course. General information. FAQs about schedule, timetable, contents, evaluation, etc.

1. Kinematics.

? Position. Velocity. Speed. Definition and mathematical use.

? Reference systems. Relative movement.

2. Dynamics of a single particle.
Newton's laws. Inertial and non-inertial systems.
Special forces: friction, spring, gravity.
? Work and energy.
? Linear and angular momentum.

3. Dynamics of a particle system.
? Center of mass. Equation of motion.
? Conservation of linear and angular momentum in particle systems.

4. The rigid body.
? Moment of inertia. Dynamic rotation on a fixed shaft.

PART II
MECHANICS: APPLICATIONS
5. simple mechanical oscillations.
? Harmonic oscillations.
? Free, damped and forced oscillations.
? Resonance.

6. Fluid Mechanics.
? Introduction: ideal fluid, basic concepts.
? Fluid Statics: principles of Pascal and Archimedes.
? Fluid dynamics: Bernoulli equation and applications.

PART III
THERMODYNAMICS
7. Heat and temperature.
? Temperature: thermometers and thermometric scales.
? Heat and heat capacity.
? Heat transfer.

8. The first law of thermodynamics. Thermal processes.
? Internal energy, equilibrium states, variables and equations of state.
? Thermodynamic Processes in an ideal gas.

9. second law of thermodynamics. Thermal machines.
? Introduction: Entropy and second law.
? Carnot cycle. Other thermal machines.

4.4.Course planning and calendar

Schedule sessions and presentation of works
Lectures and problem classes and practice sessions are held in the laboratory according to the schedule set by the centre and published prior to the start date of the course.
Each teacher will inform its hours of tutoring.

The start and end dates of the course and specific delivery times can be found on the website:

http://eina.unizar.es/grados/quimica

Moreover, from the very beginning of the semester students will have a detailed schedule of activities which shall contain the main milestones of the subject:

- Realization of two intermediate written tests

- Delivery of works directed

- Final laboratory test

- The final written exam of the subject.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=29901&year=2019