29901 - Physics I

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Course	1
Period	Half-yearly
Subject Type	Basic Education
Module	---

1.Basic info

1.1.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

1.2.Activities and key dates for the course

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 the 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

- Final written exam of the subject.

2.Initiation

2.1.Learning outcomes that define the subject

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

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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.

2.2.Introduction

Brief presentation of the subject

The goal of the Physics I curse, given during the first semester, is to provide the Chemical Engineering graduate the knowledge and skills related to the physical fundamentals about Mechanics and Thermodynamics. It constitutes the basis for the Physics II course, imparted during the second semester of the first year, as well as for theoretical courses of higher years. Given its generalist approach, the spectrum of contents is wide, and focused on a fundamental approach that will provide the student with solid foundations and technical and scientific thoroughness.

3.Context and competences

3.1.Goals

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The course and its foreseen results are base don the following hypothesis and goals:

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.

3.2.Context and meaning of the subject 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

3.3.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

3.4.Importance of learning outcomes

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.

4.Evaluation

1. Throughout the semester two short written tests, based on short questions and type test will be performed. It aims to promote the continued work of the student. In particular, this will encourage the student to better use the contents of the subject, built on previous ones.

The score on this test will involve 20% of the final grade if the student chooses to incorporate this note to your overall assessment.

Learning outcomes 1.1 and 1.3 will be evaluated.

2. At the end of the semester a test performed in the laboratory, related to both experimental methods, and the analysis of the data obtained. The contents of this test are compiled from activities conducted during the laboratory sessions.

This test will constitute 20% of the final grade. It will be eliminatory, i.e., it must be approved in order to pass the course.

Learning outcomes 1.3 and 1.4 will be evaluated.

3. A supervised practical work that will assess learning outcomes 1.1, 1.2 and 1.3 (occasionally 1.4 and 1.5) will be proposed. This part constitutes 10% of the final grade for the course.

4. At the end of the semester, according to the exam schedule center, a comprehensive written test of the subject will be taken. It will consist of two parts: one based on short questions (as in the intermediate tests) and the other consisting of numerical resolution problems.

This test, which will be between 50% and 70% of the final grade (depending on whether the student uses or not the score on the subtests), will be mandatory.

Learning outcomes 1.1, 1.2 and 1.3 will be evaluated.

To pass the course a minimum score of 4 (four) out of 10 (ten) on the final comprehensive test, as well as 5 (five) out of 10 (ten) in both the laboratory test (described in paragraph 2 above), and in the final score resulting when including all relevant partial scores.

5.Activities and resources

5.1.General methodological presentation

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

1. Lectures, given to the entire group, in which the teacher will explain the basic principles of the subject and solve some problems, selected application subject to the degree. These problems are mainly drawn from the collection that the teacher provides the student at the beginning of the semester. The participation of students in this activity by planning sorts of problems will be strengthened. That is, be indicated prior the problems that are to be discussed in the classroom so that the student can reflect on them and intervene in their resolution.

2. Laboratory practices that are distributed throughout the semester and whose assessment will form part of the final grade for the course. Groups of two or three students to work on each laboratory assembly, counting with a script previously delivered by teachers and a questionnaire that collects data and analysis taken form.

3. Small group activities that include seminars that delves into a topic of interest in the subject of the degree, advanced laboratory experiences, supervised student work, etc.

4. Self-employment, studying the matter and apply it to solving exercises. This activity is essential in the process of student learning and overcoming evaluation activities.

5. Tutoring, who can relate to any part of the subject and emphasize that the student go to them with clear and mulled conveniently approaches.

5.2.Learning activities

The program offered to the student to help him/her achieve the expected results includes the following activities:

1. Lectures
Developed throughout the semester by 3 hours of weekly classes on schedule assigned by the center. It is therefore a highly recommended for the proper use of the subject face activity.

2. Laboratory activities:

Will consist of 4 laboratory sessions of two hour 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 center 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 personal 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
Professor publish a schedule of attention to students so they can attend to queries in an orderly way throughout the semester.

5.3.Program

Contents of the Theoretical Classes

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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. Trajectory.

* Reference systems: Cartesian and polar coordinates. 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.
* Collisions between two particles.
* 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 oscillations, damped and forced oscillations.
* Resonance.
§ 6. Elasticity.
* Stress and strain. Hooke's law.
* Elastic modulus.
§ 7. Fluid Mechanics.
* Introduction: ideal fluid, basic concepts.
* Fluid Statics: principles of Pascal and Archimedes.
* Fluid dynamics: Bernoulli equation and applications.
PART III
THERMODYNAMICS
§ 8. Heat and temperature.
* Temperature: thermometers and thermometric scales.
* Heat and heat capacity.
* Heat transfer.
§ 9. First law of thermodynamics. Thermal processes.
* Internal energy, equilibrium states, variables and equations of state.
* Thermodynamic Processes in an ideal gas.
§ 10. second law of thermodynamics. Thermal machines.
* Introduction: Entropy and second law.
* Carnot cycle. Other thermal machines.

5.4.Planning and scheduling

Schedule sessions and presentation of works

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

5.5.Bibliography and recomended resources

BB	Tipler, Paul A. Física para la ciencia y la tecnología. Vol. 1, Mecánica , oscilaciones y ondas, termodinámica / Paul A. Tipler, Gene Mosca ; [coordinador y traductor José Casas-Vázquez ; traductores Albert Bramon Planas ... et al.]. 6ª ed. Barcelona : Reverté, D.L. 2010
BB	Young, Hugh D. Física universitaria. Volumen 1 / Hugh D. Young, Roger A. Freedman ; con la colaboración de A. Lewis Ford ; traducción Victoria A. Flores Flores. 12ª ed. México [etc.] : Pearson, 2009

LIST OF ADDITIONAL LINKS:

Here you will find some relevant information about the course Fisica I del Grado en Ingeniería Química. This info is complementary to the website ADD - UNIZAR (Moodle2) - [http://www.unizar.es/gfgoya/index_archivos/29901FISICAI.htm]

Página web del profesor Goya - [http://www.unizar.es/gfgoya/]