COURSE DATA

Data Subject	
Code	34189
Name	Physics I
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Faculty of Chemistry	1	First term
1934 - Double Degree Program in Chemistry-Chemical Engineering	Faculty of Chemistry	1	First term

Subject-matter

Degree	Subject-matter	Character
1110 - Degree in Chemistry	2 - Physics	Basic Training
1934 - Double Degree Program in Chemistry-Chemical Engineering	1 - Primer curso	Obligatory

Coordination

Name	Department
COLL COMPANY, CESAR	345 - Earth Physics and Thermodynamics

SUMMARY

Physics I is a basic training subject taught in year 1, semester 1, worth 6 ECTS credits. It includes a theory component and a problem-solving practical component, both taught in the classroom. Physics II, taught in the second semester, together with this subject make up the Physics subject area for the Degree in Chemistry. The fundamentals introduced here will be looked at in further detail in the different subjects on physical chemistry taught in the degree. Physics I uses elementary mathematical tools of algebra, geometry, differential and integral calculus, taught in the year-1 subjects Mathematics I and II.

The descriptors proposed in the explanatory report for the Degree in Chemistry establish the following elements:

Magnitudes, units and dimensional analysis. Kinematics and dynamics of particles. Particles systems. Conservation theorems. Rotation dynamics. Gravitation. Fluids: hydrostatics and dynamics of fluids. Oscillatory movement: simple harmonic movement. Oscillatory movement: general characteristics.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

There are no specified enrolment restrictions with other subjects of the curriculum

It is advisable that students have studied mathematics and physics in upper secondary education. It is also important that they consolidate and extend their knowledge on mathematical principles in the subject Mathematics I, taught simultaneously in the first semester.
The most important prior knowledge is: Elementary vectorial algebra. Concept of derivative and integral, with application to elementary functions. Element

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1108 - Degree in Chemistry

- Develop capacity for analysis, synthesis and critical thinking.
- Show inductive and deductive reasoning ability.
- Demonstrate leadership and management skills, entrepreneurship, initiative, creativity, organization, planning, control, leadership, decision making and negotiation.
- Solve problems effectively.
- Demonstrate ability to work in teams both in interdisciplinary teams and in an international context.
- Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate.
- Demonstrate a commitment to ethics, equality values and social responsibility as a citizen and as a professional.
- Learn autonomously.
- Demonstrate the ability to adapt to new situations.
- Acquire a permanent sensitivity to quality, the environment, sustainable development and the prevention of occupational hazards.

- Demonstrate knowledge and understanding of essential facts, concepts, principles and theories related to the areas of chemistry.
- Solve qualitative and quantitative problems following previously developed models.
- Recognise and analyse new problems and plan strategies to solve them.
- Interpret data from observations and measurements in the laboratory in terms of their significance and the theories that underpin them.
- Relate theory and experimentation.
- Develop sustainable and environmentally friendly methods.
- Relate chemistry with other disciplines.
- Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.
- Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.
- Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.
- Students must be able to communicate information, ideas, problems and solutions to both expert and lay audiences.
- Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.
- Express oneself correctly, both orally and in writing, in any of the official languages of the Valencian Community.
- Have basic skills in the use of information and communication technology and properly manage the information obtained.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

The previous section includes the competences contained in the document VERIFICA. This subject addresses part of the learning results of the subject Physics I that allow to acquire both specific knowledge of chemistry, cognitive skills and general skills recommended by the EUROPEAN CHEMISTRY THEMATIC NETWORK (ECTN) for the Chemistry Eurobachelor® Label. The following table lists the learning outcomes acquired in the subject Physics I related to the competences of the degree in Chemistry.

GENERAL COMPETENCES

The learning process should allow the degree graduates to demonstrate:	
	Competences of the subject Physics I that contemplate the learning outcomes EUROBACHELOR®
Ability to apply practical knowledge to solve problems related to qualitative and quantitative information.	Solve problems effectively. (CG4). Solve qualitative and quantitative problems following previously developed models. (CE14). Relate theory and experimentation. (CE22).
Calculation and arithmetic capabilities, including aspects such as analysis error, estimates of orders of magnitude, and correct use of the units.	Develop capacity for analysis, synthesis and critical thinking. (CG1). Show inductive and deductive reasoning ability. (CG2). Solve problems effectively. (CG4).

At the end of the course, the student must:

1. Know the minimum theoretical foundations that allow understanding chemical aspects associated with molecular translational, rotational, and vibrational motion and with atomic and molecular spectroscopy.

2. Know the minimum theoretical foundations that allow understanding chemical aspects related to fluid mechanics (gases and liquids) that are relevant to industrial chemical processes and other aspects of physical chemistry.

3. Be able to explain phenomena and processes related to basic aspects of physics.

4. Be able to perform the tasks assigned as a member of a team effectively and from a gender perspective.

5. Demonstrate skills in interpersonal relations and gender perspective.

6. Be able to relate chemistry with other disciplines and to interpret quantitative data.

7. Be able to write and present one's work correctly in the native language.

Regarding the Sustainable Development Goals (SDGs), it is expected that students will be able to acquire a particular sensitivity to sustainable water management (SDG 6), raw materials and energy sources (SDG 7) as well as sustainable and environmentally compatible development (SDGs 11, 12, 13, 14 and 15).

To design, select and/or develop efficient chemical products and processes (SDG 7) that minimize their impact on the environment (SDGs 14 and 15), use alternative raw materials and generate less waste (SDG 11).

DESCRIPTION OF CONTENTS

1. Introduction

Presentation of the course. Magnitudes and units. Dimensional analysis.

2. Vectors

Concept of vector. Sum of vectors and product by a scalar. Cartesian components. Scalar and vector product.

3. Summary of Kinematics

Reference system. Velocity. Acceleration. Intrinsic components. Rectilinear motion. Circular motion. Parabolic motion.

4. Dynamics of the particle.

Newton's laws. Momentum and force. Angular momentum and moment of a force. Work, power, and energy. Conservation of mechanical energy. Relative motion, inertial and non-inertial reference system.

5. Particle systems

Center of mass. Theorems of conservation of the linear moment, angular moment and energy. Collisions. System of reference of the CM. Theorems of König.

6. Solid Rigid Rotation

Kinetic energy of rotation. Moment of inertia. Fundamental Equation of the dynamics of rotation. Translation and rotation. Rolling.

7. Gravitation

Law of universal gravitation. Kepler's laws. Gravitational potential energy. Earth's gravitational field.

8. Fluids

Hydrostatic pressure and Pascals principle. Theorem of Archimedes. Fluid dynamics. Ideal fluid; Bernoulli equation. Real fluid; viscosity; Poiseuille equation.

9. Oscillatory movement

Hookes law. Simple harmonic motion. Elastic potential energy.

10. Ondulatory Movement

General characteristics. Types of waves. Monodimensional wave equation. Harmonic waves. Spherical waves. Power and intensity. Sound waves. Doppler effect.

11. Properties of the waves

Principle of superposition. Standing waves. Huygenss principle. Reflection and refraction. Wave nature of light. Youngs double slit experiment. Fraunhofer diffraction.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	51,00	100
Tutorials	9,00	100
Study and independent work	45,00	0
Preparation of evaluation activities	15,00	0
Preparation of practical classes and problem	30,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The course will be developed through the following teaching methods:

• Lectures

• Participatory classes

• Problem solving

• Reading/analysis of texts

• Search of information

• Problem-based learning

In the theory-practical classes the basic theoretical content of the subject will be taught, as well as the practical examples of problems and exercises that better illustrate the topics. In combination with discussions and deductions on the board, the lecturer may use graphical tools that include images, videos and animations to illustrate some of the phenomena explained, as well as experimental demonstrations. Although most of the elements in the study programme will be addressed directly in these lessons, some specific or monographic items in the syllabus may be listed for independent study. In fact, students will be encouraged and guided to increase knowledge on these contents through the recommended reading list.

In problem-based classes, arranged into small groups (group tutoring), a booklet with problems and exercises will be made available and programmed to be solved by students in advance of the classes. There, students will need to explain the problems by properly justifying their calculations and may raise questions and ask for clarification of any aspect or difficulty with concepts or calculations. The lecturer will monitor the students' work and progress and may request the problems' solutions in writing for assessment. The lecturer will solve any questions raised by students. During the development of the sessions, students may also be assigned basic exercises that facilitate an understanding of the subject-specific fundamentals.

EVALUATION

Assessment of the subject, both for the first and second examination sittings, will be based on the following sections:

A) Final exam: it will consist of several questions or exercises related to theory concepts (60%) and to problems (40 %). The exam will have a maximum duration of 3 hours and will be the same for all groups of the subject.

B) Continuous assessment: based on the coursework carried out by students in exercises and problems presented and/or submitted or follow-up tests.

The final mark is calculated from the highest of these two:

1) Weighted average of the marks earned in (A) (75%) and B (25%), provided that the mark for A is equal to or greater than 4 points out of 10.

2) Mark for A (out of 10)

The minimum overall mark to pass the subject is 5 points out of 10.

REFERENCES

Basic

- TIPLER, P. A.; MOSCA G. Física para la Ciencia y la Tecnología, Vol. 1. 5a Edición. Barcelona: Reverté, 2005. 604 p. ISBN: 84-291-4411.
- REX, A. F.; WOLFSON, R. Fundamentos de Física. 1a Edición. Madrid: Pearson Educación, S. A., 2011. ISBN: 9788478291250.

Additional

- HALLIDAY, D.; RESNICK, R.; WALKER J. Fundamentals of Physics. 4a Edición. New York: John Wiley and Sons, 1993. 1130 p. ISBN 0-471-52461-1.
- OHANIAN, H. C. Physics. 2a Edición. New York: Norton, 1989. 1148 p. ISBN 0-393-95750-0.
- ALONSO M., FINN E.J. Física. México: Addison-Wesley Iberoamericana, 1995. ISBN: 978-0-201-62565-3