Universidad Zaragoza

Academic Year/course: 2022/23

63242 - Disciplinary Content of Physics

Syllabus Information

Academic Year: 2022/23
Subject: 63242 - Disciplinary Content of Physics
Faculty / School: 107 - Facultad de Educación
Degree: 584 -
590 -
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ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

The general objective of the subject "Disciplinary contents of Physics" is to provide students of branches of Science with degrees other than the degree in Physical Sciences with the knowledge of Physics necessary to carry out in a professional, efficient and up-to-date manner, the teaching of Physics subjects in Secondary Education.

To do this, students must acquire the ability to recognize, analyze and appreciate the Physics concepts involved in natural and experimental phenomena and in technological applications.

Students must be able to obtain, analyze and manage relevant information about all of this and to use the resources available through the Internet both for their own learning throughout their professional career and for the learning of their future students.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the results of Subject learning provides training and competence to contribute to some extent to its achievement:

- Goal 4: Quality education;

- Goal 5: Gender equality;

- Goal 8: Decent work and economic growth;

- Goal 10: Reduction of inequalities;

1.2. Context and importance of this course in the degree

This subject constitutes an essential element in the preparation of teachers with qualifications other than a degree in Physics for their professional practice as a Physics teacher in the field of Secondary Education.

It tries to complete the knowledge of the students so that they obtain the basic skills in the management of the concepts and procedures of Physics from a global perspective in its social, cultural and technological context, basing itself on the historical development of the concepts and theories. fundamentals of physics.

1.3. Recommendations to take this course

The subject "Disciplinary Contents of Physics" is aimed at students of science specialties whose degree is different from the degree in Physical Sciences and aims to complete the knowledge of Physics so that students are able to successfully approach teaching Physics subjects in Secondary Education and Baccalaureate.

It is recommended for those graduates or graduates of specialties qualified for the performance of secondary education teaching positions in Physics and Chemistry that require updating or deepening in the fundamental concepts of Physics.

2. Learning goals

2.1. Competences

BASIC AND GENERAL

CG04 - Plan, design, organize and develop the program and the learning and evaluation activities in the specialties and subjects of their competence

CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context

CB7 - Students would know how to apply the knowledge acquired and their ability to solve problems in new or little-known environments within broader (or multidisciplinary) contexts related to their area of study

CB8 - Students would are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments

CB9 - Students would know how to communicate their conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way

CB10 - Students would have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

TRANSVERSALS

CT01 - Capacity for reflection and decision-making in the personal, intellectual and social spheres

CT02 - Ability to integrate and apply knowledge to form judgments and solve problems

CT03 - Development of self-esteem

CT04 - Capacity for self-control

CT05 - Development of self-motivation

CT06 - Development of autonomous learning capacity

CT07 - Ability to communicate ideas and reasoning to various types of audiences

CT08 - Capacity for empathy

CT09 - Ability to exercise leadership

CT10 - Ability to work cooperatively with colleagues and other people

SPECIFICS

CE39 - Analyze and evaluate what content (information, models, theories or procedures specific to the discipline) are more appropriate and relevant in accordance with the objectives, skills, activities and methodological principles established in the curricular design of the subject and the state of the matter of the scientific discipline. It includes: understanding the specific disciplinary contents of the subject for access to the teaching function; understand and question the most outstanding theoretical lines in the interpretation of the discipline; identify and know how to apply basic information searches for research on the subject; understand and question the educational and cultural value of the subjects corresponding to the specialization and the contents that are studied in the respective teachings; understand and question the curricular history and recent theories on these subjects, as educational knowledge, in order to transmit a dynamic vision of them.

Specifically, by passing the subject, the student will be more competent to:

1. Manage with ease the basic notation and the language used in physics.

2. Enunciate, synthesize, analyze, relate and apply the principles and foundations of the basic laws of Physics.

3. Acquire, develop and exercise the necessary skills for laboratory work and basic instrumentation in Physics of interest for teaching in Secondary Education.

4. Qualitatively and quantitatively interpret the data of an experiment from its physical model.

5. Analyze, synthesize and manage information scientifically.

6. Locate, analyze and manage digital documentary sources for learning Physics throughout future professional practice.

7. Transmit an updated view of Physics through knowledge of cutting-edge theories and experiments in the field of didactics.

2.2. Learning goals

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

1. States, synthesizes, analyzes, relates and applies, based on the historical development of fundamental concepts and theories, the basic principles and fundamentals of Physics: Mechanics, Fluids, Waves, Electricity and Magnetism, Optics and

Modern Physics.

2. Solve physical problems applying models and quantitatively and qualitatively interpret the results obtained.

3. Express adequately in content and form, using scientific notation, units and orders of magnitude, the methods, the results obtained and their analysis in the cases proposed for study.

4. Carry out experiments with an adequate treatment of the experimental data.

2.3. Importance of learning goals

From the point of view of the needs of Physics and Chemistry teachers at Secondary Education levels, this subject provides learning that allows:

* Approach teaching with adequate knowledge of Physics.

* Transmit a global and updated vision of physical phenomena

* Transmit the cultural values of Physics, as well as its historical, technological, social and political implications.

3. Assessment (1st and 2nd call)

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

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

Comprehensive written test.

The global written test will consist of questions that require short answers (limited response or multiple choice tests).

The set of questions will allow both a sampling of the knowledge on the subject, as well as to assess the competences in the management of the various concepts that are dealt with in the subject.

The written test will be based on the program of scheduled learning activities.

In any case, the questions will be related to essential aspects of the subject dealt with in the course. The evaluation and qualification of this test will be carried out using the following criteria:

* Accuracy and adequacy of responses

* Coherence and extension of the answers. Synthesis capacity

* Use of diagrams or illustrations that facilitate the understanding of what is exposed

* Order and clarity in the exposition of the answers

* Use of the language of Physics in the field of Secondary Education

Participation in practical classes.

Class attendance. Participation in the face-to-face sessions of the subject, through interventions in debates and presentations of the results of the proposed activities.

Students who regularly attend the learning activities proposed by the teacher will be able to obtain additional points for solving and defending any of the proposed activities on the blackboard. Participation in this activity is voluntary. Each additional point will add 0.1 points to the final grade.

Tutelated work.

Preparation of an individual portfolio in which the different activities proposed by the teacher in the classroom throughout the classes are reflected.

In accordance with the nature of the aforementioned portfolio, its minimum contents will be specified throughout the development of the subject. In any case, the guidelines for the preparation of the student's personal portfolio will be consistent with the development of the subject sessions and will be aimed at such portfolio including sufficient evidence of the learning acquired through the different activities that are proposed.

The quality in the execution of individual portfolio tasks will be evaluated using the following criteria:

* Clear organization and presentation

* Correct writing and proper use of the language of Physics in the field of Secondary Education.

* Sufficient extension in the development of each task, so that the topics covered constitute self-sufficient elements for reading and understanding.

* Originality

* Diagrams, links, illustrations, etc. that serve as support for the understanding of the exposed subjects.

Calification

a) Continuous assessment pathway.

The recommended way to pass the subject is continuous assessment through attendance and participation in face-to-face sessions and through individual portfolios.

In this case, attendance at at least 85% of the sessions is required.

For students who opt for the continuous assessment pathway, the final mark for the subject will be obtained with the best of the marks given by the following formulas:

Final_Mark = 0,2*CA+0,6*CP+0,2*CPE+0,1*PA

or,

Final_Mark = CPE

where

CA = hours attended/teaching hours

CP = Average portfolio mark

CPE = Final written test mark

PA = Aditional points

The maximum mark that can be obtained will be 10. In the event that with the previous formula a mark greater than 10 is obtained, the excess will be taken into account for the order of assignment of Honors.

b) Global evaluation pathway by means of the final written test.

For students who do not opt for the continuous assessment route, the final mark for the subject will be obtained with the best of the marks given by the following formulas:

Final_Mark = 0,5*CP + 0,5*CPE

or,

Final_Mark = CPE

where

CP = Average portfolio mark

CPE = Final written test mark

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

For each didactic unit, the teacher will begin with a presentation of problems, examples or situations in which the need to use the concepts and procedures to be learned is appreciated. Next, the students will be asked to reflect on it and subsequently present their vision of the subject matter.

After the individual and group analyses, the student will be proposed a set of problems and experiences that allow the student to use the concepts and procedures dealt with for their resolution and development in the portfolio, so that they are a reflection of the skills acquired.

Both the script of the topics covered and the specific materials for monitoring the subject will be made available to students through the subject's website in the teaching digital ring of the University of Zaragoza.

4.2. Learning tasks

The program offered to the student to help him achieve the expected results includes the following activities: Presential activities (60 hours) that will consist of the following activities:

* Exhibitions and demonstrations of physical phenomena directly related to each teaching unit.

* Group discussion and analysis of the phenomena and their application.

? Expositions and convincing demonstrations by the students of the directed works carried out by each student. Depending on the needs and interests detected in the students, experimental sessions in the laboratory or visits may also be included, within the class schedule.

Non-presential activities (40 hours) that will consist of the following activities:

? Preparation of the corresponding learning portfolio that includes the resolution of the proposed problems.

4.3. Syllabus

Syllabus is constituted by the concepts of Physics that are taught in Secondary Education and Baccalaureate:

BLOCK 1: Scientific activity

The scientific method: its stages. Measurement of magnitudes. International System of Units. Scientific notation. Scalar and vectorial magnitudes. Fundamental and derived magnitudes. Dimensional analysis. Measurement errors. Analysis of the experimental data.

BLOCK 2: Kinematics

Average speed, instantaneous speed and acceleration. Uniform rectilinear, uniformly accelerated rectilinear and uniform circular motions. Inertial reference systems. Galileo's principle of relativity. Circular movement. Composition of the movements.

BLOCK 3: Dynamics

Vector nature of forces. Simple machines. Newton's laws. Forces of special interest: weight, normal, friction, centripetal. Pressure. Principles of hydrostatics. Physics of the atmosphere. Dynamics of bound bodies. elastic forces. Dynamic of simple harmonic movement. Two-particle systems. Conservation of linear momentum and mechanical momentum. Dynamics of uniform circular motion. Kinetic and potential energies. Mechanical energy. Conservation principle. Theorem of living forces. Kinetic and potential energy of simple harmonic motion. Forms of energy exchange: work and heat. work and power. Effects of heat on bodies. Thermal machines. Electric power. Energy sources.

BLOCK 4: Gravitational interaction

Kepler's Laws and Law of Universal Gravitation. gravitational field. Conservative force fields. central forces. Intensity of the gravitational field. Representation of the gravitational field: field lines and equipotential surfaces. orbit speed. Potential energy and gravitational potential. Relationship between energy and orbital motion.

BLOCK 5: Electromagnetic interaction

Electrical charge. Coulomb law. Electric field. Field strength. Field lines and equipotential surfaces. Potential energy and electrical potential. Electric flow and Gauss's law. Applications. Magnetic field. Effect of magnetic fields on moving charges. The magnetic field as a non-conservative field. Field created by different current elements. Ampère's law. electromagnetic induction. Magnetic flux. Faraday-Henry and Lenz laws. Electromotive force.

BLOCK 6: Waves

Classification and magnitudes that characterize the waves. Equation of harmonic waves. Energy and intensity. Transverse waves on a string. Wave phenomena: interference and diffraction, reflection and refraction. Doppler effect. Longitudinal waves. Sound. Energy and intensity of sound waves. Noise pollution. Technological applications of sound. Electromagnetic waves. Nature and properties of electromagnetic waves. The electromagnetic spectrum. Dispersion. The color. Communication transmission.

BLOCK 7: Geometric optics

Laws of geometric optics. Optical systems: lenses and mirrors. The human eye. Visual defects. Technological applications: optical instruments and fiber optics.

BLOCK 8: Physics of the 20th century

Introduction to the Special Theory of Relativity. relativistic energy. Total energy and energy at rest. Quantum physics. Insufficiency of Classical Physics. Origins of Quantum Physics. precursor problems. Probabilistic interpretation of Quantum Physics. Applications of Quantum Physics. The laser. Nuclear physics. The radioactivity. Types. The atomic nucleus. Laws of radioactive decay. Nuclear fusion and fission. Fundamental interactions of nature and fundamental particles. The four fundamental interactions of nature: gravitational, electromagnetic, strong nuclear and weak nuclear. Fundamental constituent particles of the atom: electrons and quarks. History and composition of the Universe. Frontiers of Physics.

4.4. Course planning and calendar

The dates of the exams, practice periods and relevant dates will be included in the calendar of activities of the master's degree, accessible through the website of the Faculty of Education, and on the website of the subject in the ADD of the University of Saragossa.

The presentation of the directed works will be carried out throughout the presential sessions.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=63242