Universidad Zaragoza

Academic Year/course: 2021/22

30107 - Physics II

Syllabus Information

Academic Year: 2021/22
Subject: 30107 - Physics II
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: Second semester
Subject Type: Basic Education
Module:

1. General information

1.1. Aims of the course

This course is aiming to explore the universal nature of physical laws, their inexorable nature and the benefits that come from their knowledge in the field of engineering.

1.2. Context and importance of this course in the degree

Physics II is part of the basic training block of the degree program in Engineering Studies. It is a subject of 6 ECTS, compulsory an taught in the first year of the Degree. It provides students with background knowledge about the physical laws relevant for solving problems in engineering, in particular those related to wave motion, electrostatic, magnetism or optics. Being a subject of basic training, the knowledge and abilities acquired should serve as a basis for subjects of later courses of the degree.

1.3. Recommendations to take this course

Previous knowledge on vector field analysis and calculus is a fundamental prerequisite. Knowledge on Newton kinematics and dynamics is also required.

2. Learning goals

2.1. Competences

Generic:

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:

1. Mastery of basic concepts about the principles of general mechanics, fields and waves, electromagnetism and its applicacion to solve engineering problems.

2.2. Learning goals

1. To know the concepts and basic physical laws relevant for solving problems in engineering, in particular those related to wave motion, electrostatic, magnetism or optics.
2. To be able to recognize the fundamental physics underlying in a technical application or real system.
3. To know the units and orders of magnitude of the physical magnitudes and to solve the basic problems in

engineering being able to present the results in the appropriate units.

4. To properly apply the basic experimental or simulation methods and to present, analyze and interpret the obtained data being able to associate them to the appropriate physical laws.
5. Appropriate use of bibliography, taking advantage of the currently resources and to use a clear and accurate language.
6. To be able to recognize the underlying physics in a technical application, device or real system.
7. To identify and experiment in practical sessions the concepts learned in the theoretical sessions.
8. Appropriate use of bibliography in the practical works.
9. To communicate clearly and accurately their knowledge of the subject. To know and properly apply the different basic mathematical tools to allow to establish a correct result.
10. To solve problems associated to the contents, individually and as a part of a team, applying the theoretical concepts of the subject in practical situations.
11. To apply adequately the concepts and basic laws of electromagnetism, wave motion and optics to the different fields of Physics and Engineering.
12. To know the fundamentals of the magnetic and electric field and the meaning and the experimental fundamentals of the laws that describe and relate them.
13. To know and apply the concepts related to capacitance, electrical current, magnetic induction, self-inductance and the basic electric and magnetic properties of the materials.
14. To know the wave equation and the characteristic parameters which describe its basic solution and their energetic aspects.

2.3. Importance of learning goals

This course provides the basis of scientific and technological knowledge and application of scientific method. Therefore, the activities carried out are oriented to the development of reasoning, analysis and synthesis, problem solving capacities and introduction to lab work.

Being a basic course, the acquired competences are common with other Engineering and Architecture degrees.

Being a first year course, on the one hand it aims to consolidate school physics and on the other hand, it aims to provide a firm foundation, which should serve as a basis for technical subjects of higher courses of the degree. In particular, those related to electromagnetism, wave propagation and optics.

3. Assessment (1st and 2nd call)

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

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There is the possibility of passing the subject through two different routes:

1. Continuous evaluation.
2. Global Test.

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 contemplates the continuous assessment system as the most appropriate to be in line with the guidelines set by the new framework of the EHEA.

- Partial exams: Three partial exams will be carried out within the class schedule. You have to get at least a 4 out of 10 in each one so that this part can be overcome. The exams are composed of a part of problems and another of theory (Total partial: 70%)
- Laboratory practices: 4 laboratory practices will be carried out. For each of them, the student must prepare a report about the activity carried out. Each of these reports will weigh 5% on the final grade. Assistance is mandatory. (Total practices: 20%)
- Participation in class: It will be valued: the attendance to class, the participation and involvement in the subject, the assistance to tutorials and the realization of exercises on the blackboard that the teacher will propose. (Total participation in class 10%) To qualify for the Continuous Assessment system, you must attend at least 80% of the face-to-face classes.

Global Test:

The student must opt ??for this modality when, due to his / her personal situation, he / she can not adapt to the rhythm of work required in the continuous evaluation system, he / she has suspended or would like to upload a grade, having

participated in said evaluation methodology. As in the previous evaluation methodology, the final test of the final evaluation must have the purpose of checking if the learning results have been achieved, as well as contributing to the acquisition of the different competences, and should be carried out through more objective activities if fits.

- Final written test: On the date indicated by the University, a global examination of the subject will be carried out. It will have a weight of 70% of the final grade. The exam will consist of a part of problems and another of theory.
- Laboratory practices: 4 laboratory practices will be carried out. For each of them, the student must prepare a report about the activity carried out. Each of these reports will weigh 5% on the final grade. Assistance is mandatory. (Total practices: 20%).
- Participation in class: It will be valued: the attendance to class, the participation and involvement in the subject, the assistance to tutorials and the realization of exercises on the blackboard that the teacher will propose. (Total participation in class 10%).

In those unforeseen circumstances in which the Continuous Assessment and its proposed activities can no longer be developed, such as the midterm exams and the laboratory practices, due to well justified motives by the University of Zaragoza or the center, these activities are going to be replaced by:

- Two midterm exams for the Continuous Assessment, and
- Research assignments related to practical applications of this subject for the Laboratory practices.

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Three exams will be performed on the course: one midterm exam and two final examinations (first and second call global exams).

Laboratory sessions are mandatory for the students to pass the subject. Students will:

1. Write and hand in a report summarising the experimental results and the responses to questions.
2. Pass an exam on the contents of the laboratory sessions.

All activities will be evaluated over 10.

Midterm exams: One midterm exam will be carried out during the semester in which theoretical and practical contents of units MECHANICAL WAVES and ELECTROSTATICS will be evaluated. Together these two units constitute part A of the subject.

Final exam first call: A written exam will cover the theoretical and practical contents of the subject at the end of the term. It will be composed of two parts: Part A (MECHANICAL WAVES and ELECTROSTATICS) and Part B (contents not evaluated yet).

exam on the contents of the laboratory sessions: A written exam on the contents of the lab sessions will be carried out on the same date of the first call final exam.

The final mark corresponding to the exams will be worked out as follows:

NEF = NPA*0,5 + NPB*0,5,

As long as the marks of of Part A (NPA) and Part B (NPB) are both equal or greater than 4.0. If either NPA or NPB are lower tan 4.0 or NEF is lower tan 5.0 the student will not pass the exam.

The students with a mark equal or greater than 4.0 in the average of midterm exam marks (obtained as reflected in expression presented above) have the option of completing only part B in the final exam. Nevertheless, they can also complete again part A if they want to increase their marks. In these cases the final mark of part A will be taken as the highest of the two obtained.

The final mark (NF) on the first call will be obtained as follows:

NF = NPR*0,2+NEF*0,8,

As long as NPR and NEF are equal or greater than 5.0.

NPR will be computed in the following way:

NPR=0.9*NEL+0.1*NAL,

Where NEL=Mark of the laboratory exam and NAL=Mark obtained by the implementation of the laboratory session and the completion of a brief report.

To overcome the course in the first call it is needed to obtain a NF equal or greater than 5.0.

Second call exam: A written exam will be realised on the theoretical and practical contents of the entire subject (the marks of part A or part B in the first call will not be kept for the second call. Neither the mark of the laboratory mark). The final mark will be obtained identically as in the first call (80% weight exam, 20% weight laboratory works).

To overcome the course in the second call it is needed to obtain a mark equal or greater tan 5.0.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

If this teaching could not be done in person for health reasons, it would be done telematically.

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

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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 posssible due to health reasons, it would be carried out on-line.

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This is a general physics course on electromagnetism and optics. It provides students with background knowledge about the physical laws relevant for solving problems in engineering, in particular, those related to wave motion, electrostatic, magnetism or optics. Previous knowledge of vector field analysis and calculus is a fundamental prerequisite. Overall, Physics II helps to develop technical skills necessary to overcome some of the subjects in higher courses like Fundamentals of Electrical Engineering and Fundamentals of Electronics.

This course provides the basis of scientific and technological knowledge and application of the scientific method. Therefore, the activities and methodology are oriented to the development of critical thinking, analysis, and synthesis. A wide range of teaching and learning tasks are implemented, such as theory sessions, laboratory sessions, and assignments.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

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.
- Group tutorials.
- Individual tutoring.

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This is a 6 ECTS course organized as follows:

- **Lectures.** Lecture notes and a set of problems (and their corresponding solutions) will be available for the students. At the end of each topic, some of the problems will be solved in the class by the teacher and the rest will be done individually.
- **Laboratory sessions.** Two-hour sessions that take place in the Physics Lab. Students are provided in advance with task guidelines for each session.
- **Autonomous work:** involves activities such as homework provided by the teacher, lab reports?
- **Office hours for assistance**: either individually or in small groups of students.

4.3. Syllabus

The course will address the following topics:

- I. Electrostatics field
- II. Capacity, dielectrics and electric current
- III. Magnetic field
- IV. Electromagnetic field: Maxwell's equations
- V. Wave motion
- VI. Optics

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The course will address the following topics:

1 Mechanical waves.

- 1.1 Wave equation.
- 1.2 Speed of elastic waves.
- 1.3 Properties of acoustic waves.
- 1.4 Superposition, interference and beating.
- 1.5 Doppler?s effect.

2 Electrostatics.

- 2.1 Charge and electric Field (Coulomb?s law).
- 2.2 Gauss?s law.
- 2.3 Electric potential.
- 2.4 Electrostatics with conductors.
- 2.5 Capacitance.
- 2.6 Dielectrics.

3 Electric circuits.

- 3.1 Ohm?s law.
- 3.2 Resistance and resistivity.
- 3.3 Steady-state direct current circuits with batteries and resistors only.
- 3.4 Electromotive force.

4 Magnetic fields.

- 4.1 Lorentz?s force.
- 4.2 Biot-Savart?s law.
- 4.3 Forces on current-carrying wires in magnetic fields.
- 4.4 Ampère?s law.

5 Electromagnetic induction.

- 5.1 Faraday?s law and Lenz?s law.
- 5.2 Ampère-Maxwell?s law.
- 5.3 Maxwell?s equations of electromagnetism.

6 Electromagnetic waves.

- 6.1 Wave equation and properties of electromagnetic waves.
- 6.2 Poynting?s vector and energy density.

7 Optics.

- 7.1 Reflection, refraction. Snell?s law.
- 7.2 Optical elements.

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	I	I	II	II	II	II	III	III	III	IV	IV	IV	R
Exams	1º								2º					3º	

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Provisional course planning:

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Topic	1	1	1	2	2	2	2	3	4	4	5	5	6	7	R

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Moodle platform http://moodle.unizar.es

To check the school calendar and timetable visit http://cud.unizar.es/calendarios

4.5. Bibliography and recommended resources

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http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30107

Resources:

Students will have the Moodle virtual platform where you will find notes, powerponit slides, corollary of exercise, laboratoy practices manuals and any other material.

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http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30107