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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FIRST CALL

Continuous assessment

The students will be able to pass the total of the subject by the continuous evaluation procedure. To do this, they must demonstrate that they have achieved the expected learning outcomes by passing the evaluation instruments indicated below and which will be carried out throughout the semester.

1. A first written exam corresponding to topics 1 (Oscillations and waves) and 2 (Electrostatics). Its specific weight in the final grade will be 40%
2. A second written exam corresponding to the rest of the syllabus not evaluated in the first test. Its specific weight in the final grade will be 40%
3. An evaluation of the laboratory sessions performed by answering a questionnaire at the end of each session. Its specific weight in the final grade will be 20%.

Each of the three evaluation instruments will be scored out of 10. The final grade of the continuous assessment (100%) will be calculated according to the specific weight of each of the three evaluation instruments. To pass the subject, the students must obtain a final grade greater than or equal to 5 and also meet the following conditions: a grade greater than or equal to 4 in each of the two written exams and an average grade of both written exams higher or equal to 5. No minimum grade will be required in the evaluation of the laboratory sessions, although they will be compulsory. If the above conditions are not met, the final grade will not be calculated as a weighted average of the three evaluation instruments, but rather it will be the lower grade of the two written exams.

Final examination test:

Students who do not pass the subject by continuous assessment or who would like to improve their grade will have the right to take the final examination test set in the academic calendar. This final examination will consist of three written exams, each corresponding to one of the continuous assessment evaluation instruments described above and with the same specific weight. For each of the three exams, the best grade obtained will prevail, either in the continuous assessment or in the final evaluation. In correspondence to two written exams, two written exams will be carried out with the same syllabus. In correspondence to the evaluation of laboratory sessions, another written exam will be carried out about the laboratory sessions.

As in the continuous assessment, each of the three exams will be scored out of 10 and the final grade (100%) will be calculated according to the specific weight of each of them. To pass the subject, the student must obtain a final grade greater than or equal to 5 and also meet the following conditions: a mark greater than or equal to 4 in each of the exams corresponding to the written exams of the continuous assessment and an average grade of both exams greater than or equal to 5. If the above conditions are not met, the final grade will not be calculated as a weighted average of the three exams, but rather it will be the lower grade of the two exams corresponding to the written exams of the evaluation assessment.

SECOND CALL

Global test:

Students who do not pass the subject in the first call may take a global test set in the academic calendar for the second call. This global test will consist of a written exam that will cover both the syllabus of the subject and the laboratory sessions and will have a weight of 100% of the final grade. To pass the subject, the student must obtain a final grade greater than or equal to 5 out of 10 points.

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