COURSE DATA

Data Subject	
Code	34190
Name	Physics II
Cycle	Grade
ECTS Credits	6.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Faculty of Chemistry	1	Second term
1934 - Double Degree Program in Chemistry-Chemical Engineering	Faculty of Chemistry	1	Second 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
YAHLALI HADDOU, NADIA	180 - Atomic, Molecular and Nuclear Physics

SUMMARY

Physics II is a basic training course taught in the second semester of year 1. It is worth 6 credits, 4.5 of which are theoretical-practical and the remaining 1.5 correspond to laboratory practice. This course is the natural continuation of Physics I, taught in the first semester, and both together make up the Physics subject area of the degree.

The theoretical contents of Physics II, according to the document “Plan de estudios del Grado en Química” are: electric field, electric potential energy, electric circuits, magnetic field, motion of charges in magnetic fields, magnetic induction and electromagnetic radiation. The rest of the contents included in this document are delivered in Physics I (mechanics, fluids, waves and optics).

The subject is complemented with laboratory sessions which include experiments in mechanics and electromagnetism, with the aim of helping the student understand the concepts explained in the Physics-II course and learn the basic measurement techniques used in Physics.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

To take this course it is advisable that students have previously studied Physics and Chemistry in secondary education and Mathematics II and Physics in upper secondary education. It is also important that they have successfully completed the subjects Mathematics I and Physics I studied in the first semester.

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 II 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 Física II 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 Física II 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).
Competences in information management, in relation to primary and secondary sources, including information retrieval through on-line searches.	Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate.(CG6). Have basic skills in the use of information and communication technology and properly manage the information obtained.(CT2).
Skills related to information technology such as word processing, spreadsheet, recording and storage of data, internet use related to the subjects.	Demonstrate ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences and using information technology, as appropriate. (CG6). Have basic skills in the use of information and communication technology and properly manage the information obtained.(CT2).

At the end of this course, students must:

1. Know the minimum theoretical foundations that allow understanding the chemical aspects associated with electrostatic intermolecular forces between ions and dipoles.
2. Be able to apply measurement techniques in physics.
3. Be able to explain phenomena and processes related to basic aspects of physics.
4. Know how to properly prepare a report of practicals.
5. Be able to perform the tasks assigned as a member of a team effectively and from a gender perspective.
6. Demonstrate skills in interpersonal relations and gender perspective.

7. Be able to relate the chemistry with other disciplines and to interpret quantitative data.
8. 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 special sensitivity for sustainable management of water (SDG 6), raw materials and energy sources (SDG 7), as well as for an environmentally friendly and sustainable development (SDGs 11, 12, 13, 14 and 15).

DESCRIPTION OF CONTENTS

1. Electric field

Electric interaction: electric charge. Force between charges: Coulomb's law. Electric field. Field lines. Flow of electric field: Gausss theorem.

2. Electric potencial

Electrostatic potential. Equipotential surfaces. Conductors. Capacity. Capacitors. Electrostatic energy. Electric dipole. Dielectrics.

3. Electric current

Electric current and resistance. Ohm's law. Combinations of resistors. Energy in electrical circuits: power. Kirchhoffs rules. Balance of powers. RC circuits: charge and discharge of a capacitor.

4. Magnetic field

Introduction to magnetic phenomena. Force exerted by a magnetic field. Charged particle motion in a magnetic field: examples. Action of a magnetic field on a loop.

5. Sources of the magnetic field

Sources of field: Biot-Savart law, examples. Force between two wires: definition of ampere. Ampère's theorem. Magnetic flux, Gauss' law in magnetism. Magnetism in matter: dia-, para-and ferromagnetism.

6. Magnetic induction and electromagnetic waves

Magnetic induction. Faraday-Lenz law: examples. Inductance. Magnetic energy. AC circuits. Generators and transformers. Induced fields and electromagnetic waves.

7. Error theory I

Measurement and uncertainties. Random and systematic errors. Absolute and relative error. Significant figures. Uncertainties in direct measurements. Statistical analysis of uncertainties. Error propagation. Construction of graphs. Linear fit.

8. Lab I: Elastic properties of a spring.

Determining the elastic constant of a spring by applying Hooke's law. Determination of the elastic constant from harmonic oscillations. Comparison of results.

9. Lab 2: Electrical measurements and Ohms law.

Handling of polymeters. Performance and installation of basic electrical circuits. Study of Ohm's law.

10. Laboratory Practice 3: Measurement of the magnetic induction and the transformer

Measurement of the electromotive force induced in a coil, measurement of the magnetic field in the centre of a coil, study of the transformer.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	41,00	100
Laboratory practices	12,00	100
Tutorials	7,00	100
Attendance at events and external activities	5,00	0
Development of group work	10,00	0
Development of individual work	5,00	0
Study and independent work	10,00	0
Readings supplementary material	10,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	10,00	0
Preparation of practical classes and problem	10,00	0
Resolution of case studies	10,00	0
Resolution of online questionnaires	10,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The subject will consist of four types of classes with differentiated methodology:

a) Theoretical classes in which the basic theoretical contents of the subject will be taught. In combination with discussions and deductions on the blackboard, graphic tools can be used that include images, videos and animations to illustrate some of the phenomena explained, as well as experimental demonstrations.

b) Theoretical-practical classes, where practical examples that illustrate the theoretical contents will be worked on. In these classes, a bulletin with problems and exercises will be made available to the students that will be scheduled to be solved by them before each of these classes. Students must explain the problems, adequately justifying the calculations made. Also, some specific or monographic aspects of the subject may be indicated for study and discussion in these sessions. In fact, the student will be encouraged and guided in expanding these contents through the recommended bibliography, as well as the possibility of expanding knowledge in future subjects.

c) Tutored work sessions. In these classes in small groups, the student will have the opportunity to raise any doubts that have arisen or the aspects that present conceptual difficulties of the subject previously worked on. The exercises and problems of the bulletin that have not been solved in the theoretical-practical classes will be addressed. The teachers will monitor the work and progress of the students, in addition to resolving the doubts raised and facilitating the understanding of the fundamentals of the subject.

d) Laboratory sessions. 4 sessions of 3 hours each will be conducted. The first one will explain the theoretical contents related to the laboratory. Small groups will attend these sessions. Students are distributed in pairs for carrying out the practicals. Attendance at these sessions is mandatory and a necessary condition for passing the module. Students must attend the lab having carefully read the information regarding the experiment they are to perform in each session (previously known). At the beginning of the session, the lecturer will monitor their understanding of the script and guide them on conceptual and technical aspects necessary for students to begin acquiring data correctly. Each student will use a laboratory notebook to write the data collected in the laboratory. This notebook will also be used to include preliminary estimates of various figures, graphs, and any relevant comments on the implementation of the practice. This notebook will be supervised by the lecturer at the end of the session. Students will be supervised during the practical session by lecturers, who will correct errors and poor work habits, if any.

e) Conference attendance: Attendance atOne of the conferences organized by the Faculty of Physics, to be determined by theteacher. This conference will deal with general aspects, complementary to their training inPhysical. To carry out this activity, students must attend the event andAnswer a questionnaire prepared by the teacher, or provide a summary of the content of the conference.

EVALUATION

The evaluation of the subject will be based on the following sections:

A) Final exam. It will consist of several questions or exercises related to conceptual aspects of theory (50%), as well as problems (50%).

B) Continuous evaluation. It is based on the control, throughout the course, of the work developed by the students, related both to the acquisition of the conceptual aspects of the subject, as well as to calculation and problem solving skills. The evaluation will be carried out through tests, online questionnaires and / or assignments to be delivered. Continuous assessment is a follow-up activity for student learning that cannot be recovered on second call.

C) Evaluation of laboratory practices: a test will be carried out on the theoretical contents of the laboratory (scientific writing of the results, calculation of uncertainties, fits to the data, etc.). The laboratory notebook will be checked, but not graded, at the end of each lab session. Each pair of students must present a report detailing: introduction, materials and methods, data analysis (with data tables, graphic representations, fits, error calculations), results, conclusions, and bibliography.

The qualification of the laboratory practices is distributed as follows: test on theoretical content **30%**, memories of practices **70%.**

Laboratory attendance is mandatory. Non-attendance automatically implies failure to pass the laboratory, this being non-recoverable in the second call. Failure in the laboratory implies failure in the subject.

The final grade for the course will be obtained from the weighted average of the grades in sections **A (45%), B (30%) and C (25%),** provided that both A and C have a minimum 5 points out of 10.

In total, the necessary grade to pass the course is 5 points out of 10.

Final warning

Copying or plagiarism of any assignment that is part of the evaluation will make it impossible to pass the course, and the student will be subject to the appropriate disciplinary procedures.

Please note that, according to Article 13 d) of the University Student Statute (RD 1791/2010, December 30), "*it is the duty of a student to refrain from using or cooperating in fraudulent procedures in evaluation tests, in the work performed or in official University documents*".

REFERENCES

Basic

- TIPLER P.A., MOSCA G., Física para la ciencia y la tecnología, Vol. 2. 5ª edición, Barcelona, Reverté. 2010. 1412 p. ISBN 9788429144116
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Additional

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- Guía del Laboratorio para el primer ciclo del Grado en Física. Universidad de Valencia Valencia (2010). Disponible en http://www.uv.es/piefisic/w3pie/castellano/serv/laboratorios/index.htm