COURSE DATA

Data Subject	
Code	34190
Name	Physics II
Cycle	Grade
ECTS Credits	6.0
Academic year	2021 - 2022

Study (s)

Degree	Center	Acad. year	Period
1110 - Degree in Chemistry	Faculty of Chemistry	1	Second term

Subject-matter

Degree	Subject-matter	Character
1110 - Degree in Chemistry	2 - Physics	Basic Training

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 course is supplemented with laboratory sessions, which include experiments in mechanics, fluids and electromagnetism, the main goal being that the students learn the methodology and 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.

OUTCOMES

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

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.

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. Lab 3: Measurement of liquid densities and viscosities

Measuring the density of a liquid with the Mohr-Westphal balance. Measuring the viscosity of a liquid with the Ostwald viscometer.

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 course will consist of four types of classes with different methodologies:

a) Theoretical and practical classes in which the basic theoretical contents of the course will be taught. 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.

b) Seminars in which practical examples will be introduced to illustrate the theoretical contents. Before these classes, the students will be provided with a booklet with problems and exercises, which are to be solved by them before each of these seminars. Students should explain the problems by justifying their calculations properly. Also, in these sessions some specific aspects of the course may be referred for study and discussion. In fact, students will be encouraged to develop and improve such content through recommended readings.

c) Supervised working sessions. Arranged into small groups, students will have the opportunity to raise any questions or ask for clarification of any concept dealt with. The lecturer will monitor the students' work and progress and will solve any questions raised. During the development of the sessions, students may also be assigned basic exercises that facilitate the understanding of fundamental concepts.

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, fitting functions to the data, etc.). An evaluation of the lab notebook will be conducted at the end of each laboratory session. Each pair of students must present a report detailing: introduction, materials and methods, data analysis (with data tables, graphical representations, fitting functions, error calculations), results, conclusions and

bibliography.

The qualification of the laboratory practices is distributed as follows: Exam on theoretical content **30%**, assessment Notebook **10%**, memories of practices **60%**.

Attendance at the laboratory is compulsory. Failure to attend, automatically implies non-completion of the laboratory, being therefore considered in this case a non-recoverable activity on second call.

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.

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
- TIPLER P.A., MOSCA G., Física per a la ciència i la tecnologia, Vol. 2. 6ª edición, Barcelona, Reverté. 2011. 1412 p. ISBN 9788429100000
- TAYLOR J. R., An Introduction to Error Analysis, 2nd edition, Sausalito, University Science Books. 1997. 448 p. ISBN 093570275X

Additional

- HALLIDAY D., RESNIK R., WALTER J., Fundamentos de Física, vol 2, CECSA 3ª ed., 2001. 528 p. ISBN 9789702401759
- ALONSO M., FINN E.J., Física, Pearson Educación, 2000. 451 p. ISBN 9789684442238
- 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

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents

1.- The contents initially indicated in the teaching guide are maintained.

Workload and temporary teaching planning

Regarding the workload:

1.- The different activities described in the Teaching Guide are maintained with the intended dedication.

Regarding the temporary teaching planning:

2.- The material to follow the theory/tutoring/classroom-seminar classes allows to continue the temporary teaching planning both in days and schedule, whether the teaching is face-to-face in the classroom or not, although in some of the activities the student has the freedom to follow the non-face-to-face sessions according to his own planning.

Teaching Methodology

Theory subjects:

Situation of minimal attendance: In theory classes and tutorials the occupation will be, at most, 30% of their usual occupation. Teaching will be online. Students who have a laboratory session before or after theory classes, and the time to travel is longer than the time established in the schedules, will be able to follow the class in person in the classroom assigned in the schedules. When there are students in this situation, classes will be taught by synchronous videoconference in the group classroom.

Maximum face-to-face situation: In theory classes and tutorials, the occupation will respect the sanitary restrictions that limit the capacity of the classrooms. Depending on the capacity of the classroom and the number of students enrolled, it may be necessary that part of the students have to follow the classes synchronously. If this situation arises, the students will attend the group classroom in weekly rotating shifts (preferably in alphabetical order), so as to ensure that the percentage of attendance of all the students enrolled in the subject is the same.

Confinement situation: If for health reasons it is not possible to continue with hybrid teaching, totally or partially affecting the classes of the subject, these will be replaced by synchronous non-face-to-face sessions following the established schedules and using the virtual classroom tools.

Laboratory subjects:

Regarding the laboratory classes, there will be a trend towards maximum attendance, respecting the rules of distance and occupation of spaces set by the academic authorities. In this sense, the "L" type teaching will have 100% attendance and the "U" type teaching will be non-face-to-face and will be taught using the tools offered by the virtual classroom.

In the case of students confined to home due to COVID, to the extent possible, the experimental sessions will be recovered.

Evaluation

2. The evaluation system described in the Teaching Guide of the subject in which the various evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained.

If there is a closure of the facilities for health reasons affecting the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the University of Valencia. The contribution of each evaluable activity to the final grade of the subject will remain unchanged, as set out in this guide.

References

2.- The literature recommended in the Teaching Guide is maintained since it is accessible, and it is complemented by notes, slides and problems uploaded to the Virtual Classroom as material of the course.