COURSE DATA

Data Subject	
Code	34190
Name	Physics II
Cycle	Grade
ECTS Credits	6.0
Academic year	2015 - 2016

Study (s)

Degree	Center	Acad. year	Period
1108 - Degree in Chemistry	Faculty of Chemistry	1	Second term

Subject-matter

Degree	Subject-matter	Character
1108 - Degree in Chemistry	2 - Physics	Basic Training

Coordination

Name	Department
CASES RUIZ, MANUEL RAMON	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

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. (CE13)
2. Be able to apply measurement techniques in physics. (CE22, CE26)
3. Be able to explain phenomena and processes related to basic aspects of physics. (CG1, CG2)
4. Know how to properly prepare a report of practicals. (CT1, CG7, CE20)
5. Be able to perform the tasks assigned as a member of a team effectively and from a gender perspective. (NG5)
6. Demonstrate skills in interpersonal relations and gender perspective. (NG6)
7. Be able to relate the chemistry with other disciplines and to interpret quantitative data. (CE13, CE22)
8. Be able to write and present one's work correctly in the native language. (CT1, CT3)

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.

EVALUATION

Assessment of the course is based on the following sections:

A) Final exam: It will consist of several questions or exercises related to theory concepts (50%) and problems (50%). The examination will take a maximum of 3 hours.

B) Continuous assessment: Based on the coursework carried out by students in relation to the tutoring sessions: exercises and problems solved on the board and/or submitted or follow-up tests.

C) Evaluation of laboratory practice: An examination on the theoretical content taught in the laboratory will be administered. An assessment of the laboratory notebook after each lab session will be performed. At the discretion of the lecturer, each pair of students must submit either a brief report including the collection of experimental data, their processing (errors, graphics, settings, etc.), and the results obtained together with the relevant conclusions, or either, a more substantiated report including: introduction, theoretical aspects, instruments, methodology, data, calculations, results and conclusions. The mark of 100 points is distributed as follows:

Test on laboratory theoretical contents = 30; notebook = 10; reports = 60.

The final course mark will be obtained from the weighted average of the marks earned for sections A (60%), B (15%) and C (25%), provided that both A and C get a minimum mark of 4 out of 10.

The overall mark required to pass the course is 5 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