Universitat de Lleida

DEGREE CURRICULUM

PHYSICS II

Coordination: CARRERA VILANOVA, MIQUEL

Academic year 2023-24

PHYSICS II 2023-24

Subject's general information

Subject name	PHYSICS II
Code	102105
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION
Typology	

Degree	Course	Character	Modality
Bachelor's Degree in Automation and Industrial Electronic Engineering	1	COMMON/CORE	Attendance-based
Bachelor's Degree in Energy and Sustainability Engineering	1	COMMON/CORE	Attendance-based
Bachelor's Degree in Mechanical Engineering	1	COMMON/CORE	Attendance-based
Common branch in industrial engineering programs - Lleida	1	COMMON/CORE	Attendance-based
Double bachelor's degree: Degree in Mechanical Engineering and Degree in Energy and Sustainability Engineering	1	COMMON/CORE	Attendance-based
Programa Acadèmic de Recorregut Successiu - Enginyeries Industrials	1	COMMON/CORE	Attendance-based

Course number of credits (ECTS)	6

Type of activity, credits, and groups

Activity type	PRALAB	PRAULA	TEORIA
Number of credits	0.4	2.6	3
Number of groups	12	3	3

Coordination	CARRERA VILANOVA, MIQUEL
Department	ENVIRONMENT AND SOIL SCIENCES AND CHEMISTRY
Teaching load distribution between lectures and independent student work	1 ECTS = 10 hours lectures + 15 hours independent student work

PHYSICS II 2023-24

Important information on data processing	Consult this link for more information.
Language	Catalan
Distribution of credits	Miquel Carrera 12 Joan I Rosell 6 Francesc Perelló 3,6

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CARRERA VILANOVA, MIQUEL	miquel.carrera@udl.cat	9	
CERESUELA TORRES, JESUS MIGUEL	jesusmiguel.ceresuela@udl.cat	3	
PERELLO SANS, FRANCESC	francesc.perello@udl.cat	3,6	
ROSELL URRUTIA, JOAN IGNASI	joan.rosell@udl.cat	6	

Subject's extra information

Subject taken in the second semester of the 1st course of the degree. It belongs to the "Basic training" module.

- A constant weekly work is recommended for the satisfactory follow-up of the subject.
- Problem preparation before each problem class session is important.
- The course material will be available on the Virtual Campus, which will be the communication channel.
- **To communicate with each teacher**, the **Virtual Campus** must be used, always checking the option to send a **copy of the message to the teacher's personal email.**

SECURITY RULES IN THE LABORATORY

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Blue laboratory gown from UdL (unisex)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:
C/ Jaume II, 67 baixos
Centre the Cultures i Cooperació Transfronterera
http://www.publicacions.udl.cat/

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI. Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the consequences in the evaluation of the subject that are described in this course guide.

GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.

- Keep the laboratoy gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.
- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following document of the Servei de Prevenció de Riscos Laborals de la UdL: http://www.sprl.udl.cat/alumnes/index.html

Learning objectives

General objectives:

Acquire basic knowledge about the concepts and methods of General Physics. These are both theoretical and practical knowledge. Theoretical knowledge is necessary to understand the concepts and laws of physics, while also allowing know how to use the scientific language . Practical knowledge must provide a domain in solving problems of physics.

Use adequated systems units.

Arguing in a properly scientific and technical context.

Properly argue a conclusion based on some assumptions.

To acquire a sufficient basis to deal with normal subjects later based on the application of the laws of classical physics.

Specific objectives:

Understanding the fundamental principles of thermodynamics and apply them to simple physical systems analysis

Understand the principles and fundamental laws of electromagnetism

Apply basic laws for calculating electric field and potential distributions of electric charge point and continuous distributions with simple geometries

Apply basic laws for calculating magnetic systems and magnetic forces or loads drivers running simple geometry

Understand and apply the principle of electromagnetic induction

Competences

General competences

- CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

Specific competences

- GEM2/GEEIA2/CG2. Understanding and commanding basic concepts of the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and their application to solve problems in engineering.

Transversal competences

- EPS1. Capacity to solve problems and prepare and defence arguments inside the area of studies.
- EPS5. Capacity of abstraction and of critical, logical and mathematical thinking.
- EPS6. Capacity of analysis and synthesis.
- EPS8. Capacity of planning and organizing the personal work.
- CT5. To acquire essential notions of scientific thinking.

Subject contents

Thermodynamics:

1. Temperature

1.1. Thermal balance

1.2. Principle zero of Thermodynamics

1.3. Measuring temperatura.Escales. Thermometers.

1.4. Thermometers gas. Absolute temperature scale.

1.5. The ideal gas law

1.6. Thermal expansion of solids and liquids

2. First law of thermodynamics

2.1. Introduction of a system state, equation of state, thermodynamic diagrams

2.2. Heat capacity and specific heat

2.3. Phase change. Latent heat

2.4. First law of thermodynamics

2.5. Working in a gas. PV diagram

2.6. Internal energy of an ideal gas

2.7. Heat capacity of gases

2.8. Heat capacity of solids

2.9. Quasi-static adiabatic processes in a gas

3. Heat Engines, Entropy and Second Law of thermodynamics

3.1. Introduction: Irreversible Processes

3.2. The thermal machines: second law of thermodynamics

3.3. Refrigerators: second law of thermodynamics

3.4. Equivalence between the statements of the thermal machine and refrigerator

3.5. Machine Carnot

3.6. Scale absolute or thermodynamic temperature

3.7. Irreversibility and disorder

3.8. Entropia

Electromagnetism:

4. Electric field. Electric potential.

4.1. Electric charge. Coulomb's law.

4.2. Electric field.

4.3. Calculation of electric field by Coulomb's law.

4.4. Flux electric field. Gauss' law.

4.5. Calculation of the electric field by Gauss's law.

4.6. Electrostatic potential energy and electric potential.

4.7. Potential of a system of charges.

4.8. Potential of continuous charge distributions.

4.9. Relationship between general electric field and potential.

4.10. Equipotential surfaces

5. Conductors and dielectrics. Capacitors.

5.1. Capacitors. Capacity.

5.2. Electric energy stored in a capacitor.

5.3. Energy density of an electrostatic field.

5.4. Capacitors with dielectric

6. Magnetic Field. Magnetic forces. Sources of the magnetic field.

6-I. Magnetic field and magnetic forces

6-I.1. Definition and properties of the magnetic field. Magnetic force.

6-I.2. Magnetic force on a load cell.

6-I.3. Magnetic force on a current element and conductor

6-I.4. Magnets inside a magnetic field. Magnetic moment.

6-I.5. Effect of a uniform magnetic field on a current loop.

6-I.6. Movement of loads inside a magnetic field. Applications.

6-I.7. Hall effect. Magnetic Field Sensors

6-II. Generation of magnetic field

6-II.1. Magnetic field created by mobile point charges.

6-II.2. Biot and Savart Law. Field created by a current.

6-II.3. Calculation of magnetic field using the Biot-Savart law.

6-II.4. Magnetic forces between parallel conductors.

6-II.5. Ampere law. Application to the calculation of the magnetic field.

6-II.6. Magnetic flux.

7. Electromagnetic induction.

7.1. Phenomena of magnetic induction

7.2. Lenz-Faraday law. Electromotive force induced.

7.3. Electromotive force of motion

7.4. Foucault currents.

7.5. Generators and motors. Operating principles.

7.6. Mutual induction and self-induction.

7.7. Magnetic energy.

Methodology

The development of the course is based on three activities:

1) Classes of **Theory**

Exposition of the concepts, principles and fundamental relations of each subject.

Approach of examples illustrating the application.

2) Solving **problems** classes

Discussion and resolution of problems and applications related concepts for each topic.

3) **Laboratory experiences**

The practices are carried out in 2 laboratory sessions and the subsequent work of preparing the practice report from the experimental data obtained in the laboratory.

Development plan

Week	Methodology	Subject	Hours lectures work	Hours personal work
1	Master class Problem resolution	Introduction. Unit 1 Unit 1	2 2	3 3

Week	Methodology	Subject	Hours lectures work	Hours personal work
2	Master class Problem resolution	Unit 2 Unit 1, Unit 2	2 1h+1h	3 3
3	Master class Problem resolution	Unit 2 Unit 2	2 2	3 3
4	Master class Problem resolution	Unit 3 Unit 2	2 2	3 3
5	Master class Problem resolution	Unit 3 Unit 3	2 2	3 3
6	Master class Problem resolution Laboratory	Unit 4 Unit 3 Thermodynamics	2 2 2	3 3 4
7	Master class Problem resolution	Unit 4 Unit 4	2 2	3 3
8	Master class Problem resolution	Unit 4, Unit 5 Unit 4	1h+1h 2	3 3
9	Evaluation: EXAM 1st Part PA1	Units: 1, 2, 3	2	
10	Master class Problem resolution	Unit 5 Unit 4	2 2	3 3
11	Master class Problem resolution	Unit 6-I Unit 5	2 2	3 3
12	Master class Problem resolution Laboratory	Unit 6-II Unit 6 Electromagnetism	2 2 2	3 3 4
13	Master class Problem resolution	Unit 6-II Unit 6	2 2	3 3
14	Master class Problem resolution	Unit 7 Unit 6, Unit 7	2 1h+1h	3 3
15	Master class Problem resolution	Unit 7 Unit 7	2 2	3 3
16-17	Evaluation: EXAM 2nd Part PA2	Units: 4, 5, 6, 7	2	
18	Tutorials at the request of the student			
19	Evaluation: Retake EXAM PA5	PA1 / PA2	2h 30 min	

Evaluation

Evaluation

I. Activities that constitute the continuous evaluation throughout the semester:

- CORE ACTIVITIES EVALUATION

Compulsory activities in order to pass the course through the continuous assessment process. The student who has not completed any of the compulsory activities (PA1, PA2) will obtain a provisional final grade of “Not Presented” and must make the Recovery. The student who, being in this situation, does not take the recovery exam, will have a final grade of “Not Presented”.

1) PA1: 1st Partial Exam, Week 9 (date set by the Grade exam calendar).

Content: units 1, 2, 3. (Thermodynamics)

Percentage: **37%**

2) PA2: 2nd Partial Exam, Week 16-17 (date set by the Grade exam calendar)

Content: units 4, 5, 6, 7. (Electromagnetism)

Percentage: **42%**

- OPTIONAL ASSESSMENT ACTIVITIES (NOT COMPULSORY)

3) PA3: Laboratory practices

Percentage: **16%**

Suppose:

a) Attendance at two laboratory sessions (scheduled time in weeks 6 and 12-13, to confirm the start of the semester)

Warning: Being a lab, there is no possibility of recovering them out of traineeships established. Any incident affecting attendance at the meeting that has not been communicated promptly to the teacher will NOT be attended.

b) Presentation of a report of the laboratory work (the date of presentation of the report is published together with the laboratory schedule).

4) PA4: Class activities

The possible activities of this section can be problem deliveries, classroom tests (or virtual room), problem solving (classroom or virtual). Throughout the course, the activities that will form part of this evaluation will be specified, which may be different for the different groups.

Each student must carry out this activity in the PraAula group that is officially assigned.

Percentage: **5%**

II. Final mark resulting of continuous assessment throughout the semester.

The student who has not completed any of the compulsory activities (PA1, PA2) will obtain a provisional final grade of “Not Presented” and must make the Recovery. The student who, being in this situation, does not take the recovery exam, will have a final grade of “Not Presented”.

The final grade is obtained by applying the percentages established with the following condition: **a minimum grade of 3 points must be obtained in each partial exam (PA1 and PA2**). Students who do not meet this condition must take the recovery exam (PA5). In case of not making the recovery, they will finish the course with a maximum grade of 4.9 points, although the application of the percentages could result in a higher grade. In accordance with what is established in the UdL evaluation regulations (article 4.5).

III. RETAKE

PA5 Retake exam, Week 19-20 (date set by the Grade exam calendar)

Content:

The retake is an exam in which the parts corresponding to each partial will be separated.

1st Partial retake: topics included in the first partial exam.

2nd Partial retake: topics included in the second partial exam.

Grading Criteria:

- The final mark of the students who make the retake is given by:

PA5 (1st Partial): 37%

PA5 (2nd Partial): 42%

- The final grade is obtained by applying the percentages established with the following condition: **a minimum grade of 3 points must be obtained in each partial submitted to retake exam**. If the condition is not satisfied, they will finish the course with a maximum grade of 4.9 points, although the application of the percentages could result in a higher grade. In accordance with what is established in the UdL evaluation regulations (article 4.5).

- Laboratory practices and midterm exams passed (or with a grade higher than 3 and not submitted to recovery) maintain their percentage of final grade, as well as activity PA4:

PA1: 37 %

PA2: 42 %

Lab PA3: 16 %

Activity PA4: 5 %

- In the partial exams presented for a retake exam, the valid grade will be the one obtained in this retake exam.

IV. Validation of the Laboratory practices

- The students who passed the laboratory practices last academic course 22-23, will validate laboratory and maintain their laboratory mark for this current course.

- The laboratory practices passed in previous years to 22-23 are not validated.

V. Alternative evaluation

The student who formally accepts the alternative evaluation procedure may choose between two evaluation options for the subject.

The student must inform the coordinating professor of the subject of the chosen evaluation option within 5 days from the publication of the laboratory practice schedules.

Option 1. For the student who is available to carry out laboratory practices at the assigned dates.

The final grade will consist of:

85 % Final exam. Content: all the topics.

It will take place on the date and time set for the Recovery exam in the Degree exam calendar.

15 % Laboratory

Option 2. For the student who renounces laboratory practices.

The final grade will be given by:

100% Final exam. Content: all the topics.

It will take place on the date and time set for the Recovery exam in the Degree exam calendar.

Recovery in the alternative evaluation

The student who does not pass the subject may take a final recovery exam that will be done within 7-12 days from the publication of the final grades.

The conditions corresponding to the chosen evaluation option will be maintained.

VI. About the use of material in exams

The use of programmable calculators that allow online connection and reading of pdf documents is prohibited.

Bibliography

Resources

- Exercices

- Laboratory guide

References

TIPLER,P.A, MOSCA, G. *Física para la Ciencia y la Tecnología (6ª ed.).Termodinàmica en Vol. I* (ISBN-978-84-291-4429-1)*i Electromagnetisme en* Vol.II (ISBN-978-84-291-4430-7) del'edicióen 3 volums, Ed. Reverté, Barcelona, 2010.

RAYMONDA. SERWAY, JOHN W. JEWETT . Física, 6a Ed., Ed. Thomson, 2005. Part de Termodinàmica:Vol. 1 (ISBN 970-686-423-7). Part d'Electromagnetisme: Vol. II (ISBN 970-686-425-3)

S.BURBANOde ERCILLA, *et.al.*, Física General 32ª Ed., Editorial Tébar, 2003, (ISBN 84-95447-82-7)

J.M.DE JUANA, Física General, Prentice Hall, 2003. ISBN 84-205-3342-4.

S.M.LEAy J.R.BURKE. Física. La Naturaleza de las Cosas, vol. 1 i 2. Ed. Paraninfo-Thomson. Madrid2001.

P.A.TIPLERG: MOSCA. Física 5ª Ed., Ed. Reverté. (Es troba també dividit en volums) SEARS,ZEMANSKY, YOUNG, FREEDMAN, Física Universitaria 11ª Ed., Prentice Hall, 2004.

S.BURBANO de ERCILLA, et.al.. Problemas de Fisica 27ª Ed.. Editorial Tébar. 2004.ISBN: 84-95447-27-4

F.J.BUECHE, Física General, 9ª edición.McGraw-Hill, México D.F. 2000.

Online resources

- Sèries del MIT, moltes aplegades en l'eina MIT OpenCourseWare,

http://ocw.mit.edu/

- Walter Lewin, té diferents blocs temàtics també en el repositori del MIT, per ex:

Physics II "Electricity and Magnetism" MITOpenCourseWare

- Angel Franco García, Curso Interactivo de Física

- Online resources proposed in each unit.