Universitat de Lleida

DEGREE CURRICULUM

PHYSICS

Coordination: CARRERA VILANOVA, MIQUEL

Academic year 2023-24

PHYSICS 2023-24

Subject's general information

<table>
<tr><td>Subject name</td><td>PHYSICS</td></tr>
<tr><td>Code</td><td>102008</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
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<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Computer Engineering</td><td>1</td><td>COMMON/CORE</td><td>Attendance-based</td></tr>
<tr><td>Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management</td><td>2</td><td>COMMON/CORE</td><td>Attendance-based</td></tr>
<tr><td>Programa Acadèmic de Recorregut Successiu - Enginyeria Informàtica</td><td>1</td><td>COMMON/CORE</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><th>PRALAB</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>0.4</td><td>2.6</td><td>3</td></tr>
<tr><td>Number of groups</td><td>6</td><td>3</td><td>2</td></tr>
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</td></tr>
<tr><td>Coordination</td><td>CARRERA VILANOVA, MIQUEL</td></tr>
<tr><td>Department</td><td>ENVIRONMENT AND SOIL SCIENCES AND CHEMISTRY</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan</td></tr>
<tr><td>Distribution of credits</td><td>Miquel Carrera 12
Francesc Perelló 4,2</td></tr>
</table>

PHYSICS 2023-24

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CARRERA VILANOVA, MIQUEL	miquel.carrera@udl.cat	10,4	
CERESUELA TORRES, JESUS MIGUEL	jesusmiguel.ceresuela@udl.cat	1,6	
PERELLO SANS, FRANCESC	francesc.perello@udl.cat	4,2	

Subject's extra information

Physics is a subject that corresponds to Common module in the Degree curriculum.

1st semester of the 1st curs.

Learning objectives

The course aims to introducing the fundamental principles and basic laws of physics that will enable a better understanding of how works the technologies related to computer science and communications networks. Knowledge that allow, for example, understand the technical conditions of a computer installation according to actual regulations, etc.

For this reason, the program has the following specific objectives:

• Understanding and application of basic principles of electromagnetism related to the concepts of electric and magnetic field.

• The introduction of the basic techniques for analyze electrical circuits

• Determination of currents, voltages and power in DC circuits and AC sinusoidal circuits.

• Determination of currents and voltages in simple circuits containing diodes or transistors.

• Description of an harmonic electromagnetic wave and understanding of the parameters that identify it and determine their properties.
• Determination of the intensity of energy carried by an harmonic electromagnetic wave.

• Knowing the properties of light propagation.

• Understanding the operating principle of the optical fiber and laser.

See also the section "Competences" to have an overview of the context in which these objectives are located.

Competences

Strategic competences of the UdL

- CT5. Acquire knowledge in scientific thinking.

Degree-specific competences

- GII-FB2. Understanding and commanding basic concepts of fields and waves and electromagnetism, theory of electrical circuits, electronic circuits, physical principle of the semiconductors and logical families, electronic and photonic devices, and his application for the resolution of problems in the engineering.

Degree-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.

Subject contents

1. Electrostatic.
1.1. Electric charge. Coulomb's Law.
1.2. Electric field.
1.3. Electrostatic potential energy and electric potential.
1.4. Capacitors. Capacity. Stored energy.

2. Circuit Analysis I: DC circuits.
2.1. Electric current.
2.2. Resistance. Ohm's Law.
2.3. Power.
2.4. Basic elements of a circuit.
2.5. Kirchhoff's laws.
2.6. General methods of circuit analysis: method of node voltages and method of network currents.

3. Circuit Analysis II: AC circuits (sinusoidal alternating current)

3.1. Transient state: RL and RC circuits.

3.2. Elements R, L, C in AC circuits: relationship voltage-intensity. Phasors.
3.3. R-L-C circuit with generator. Stationary state.
3.4. Complex impedance. Ohm's Law in AC.

3.5. Series and parallel circuits. Impedance association. Admittance.

3.6. Ohm's Law applications. Examples.

3.7. Power in AC circuits.

3.8. Resonance in series circuits R-L-C.

3.9. Transformers.
3.10. Signals superposition. Bandwidth.
3.11. Filters.

4. Introduction to Electronics and logic gates.
4.1. p-n junction diode.
4.2. Light emitting diode (LED).
4.3. MOSFET transistor.
4.4. CMOS inverter.

5. Waves

5-I. Harmonic wave motion.

1. General concepts of wave motion.

2. Harmonic wave motion.

    2.1. Formal description of wave motion: wave function.

    2.2. Characteristic parameters of the harmonic wave.

    2.3. Harmonic wave function.

3. Energy and intensity of the harmonic wave.

4. Superposition of harmonic waves of the same characteristics.

5. Phase displacement produced by path difference.

5-II. Harmonic electromagnetic waves (HEW).

1. Introduction.

2. Properties of the HEW.

3. Harmonic electromagnetic wave function.

4. Energy of the HEW.

5. Generation and detection: electric dipole radiation.

6. Electromagnetic spectrum.

7. Propagation properties of light.

    7.1. Law of reflection.

    7.2. Refraction. Snell's Law.

8. Optical fiber.

9. Polarization of light.

10. Laser

Methodology

The development of the course is based on three activities:

1) Classes Theory

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

Approach of examples illustrating the application.

2) Group classes PraAula

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

3) Laboratory experiences

Laboratory sessions that are developed in smaller groups. Group distribution and schedules will be announced in advance.

Development plan

Week	Subjects/Activities
1	Introduction Unit 1
2	U 1
3	U 2
4	U 2
5	U 3
6	U 3
7	U 3 U 4
8	U 3
9	**Evaluation PA1**
10	U 4
11	U4
12	U 5 **Laboratory: Oscilloscope**
13	U 5 **Laboratory: circuits RC and RLC**
14	U 5
15	U 5
16-17	**Evaluation PA2**
18	
19	**Evaluation: Retake exam**

Evaluation

I. Activities that constitute the continuous evaluation throughout the semester

- COMPULSORY EVALUATION ACTIVITIES

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 (to be confirmed depending on the development carried out): electrostatics and DC circuits. Units: 1, 2.

Percentage: **40 %**

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

Content (to be confirmed depending on the development carried out): alternating current (AC), electronic devices and waves. Units: 3, 4, 5.

Percentage: **44 %**

- OPTIONAL Assessment activities (NOT COMPULSORY)

3) PA3: **Laboratory**

Percentage: **16 %**

All the following must be fulfilled:

a) Attendance at 2 laboratory sessions

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

b) Presentation of a laboratory work report

II. Final mark resulting from the continuous evaluation 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 (PA4). 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): 40 %

PA5 (2nd Partial): 44 %

- 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:

PA1: 40 %

PA2: 44 %

Lab PA3: 16 %

- 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, as far as their final mark was not a NP.

- 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:

84% 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.

16% 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 work guides

References:

Basic references

(*) TIPLER,P.A, MOSCA, G. *Física para la Ciencia y la Tecnología (6ª ed.).* Vol.II de l'edició en 3 volums (ISBN-978-84-291-4430-7), Ed. Reverté, Barcelona, 2010.

(*) Edicions anteriors d'aquesta obra són igualment vàlides. Per exemple: TIPLER, P.A. *Física.* Vol.II. Traducció al català de la 3a edició original. Ed. Reverté, 1994.

SERWAY, R.A. *Electricidad y Magnetismo*. 4ª edición. Mc.Graw-Hill, 1999.

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Complementary references

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ALCARAZ, 0., LÓPEZ, J., LÓPEZ, V. Física: problemas y ejercicios resueltos. Pearson Educación, 2006.

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