Universitat de Lleida

DEGREE CURRICULUM

PHYSICS I

Coordination: CHEMISANA VILLEGAS, DANIEL

Academic year 2022-23

PHYSICS I 2022-23

Subject's general information

<table>
<tr><td>Subject name</td><td>PHYSICS I</td></tr>
<tr><td>Code</td><td>102324</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's degree in Industrial Organization and Logistics Engineering</td><td>1</td><td>COMMON/CORE</td><td>Attendance-based</td></tr>
<tr><td>Common branch in industrial engineering programs - Igualada</td><td>1</td><td>COMMON/CORE</td><td>Attendance-based</td></tr>
<tr><td>Double degree: Bachelor Degree in Industrial Organisation and Logistics Engineering and Business Administration and Management</td><td>2</td><td>COMMON/CORE</td><td>Attendance-based</td></tr>
<tr><td>Not informed</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>1.5</td><td>1.5</td><td>3</td></tr>
<tr><td>Number of groups</td><td>3</td><td>1</td><td>1</td></tr>
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</td></tr>
<tr><td>Coordination</td><td>CHEMISANA VILLEGAS, DANIEL</td></tr>
<tr><td>Department</td><td>ENVIRONMENT AND SOIL SCIENCES</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>1 ECTS = 10 hours in-class + 15 hours of additional work</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>
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Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CHEMISANA VILLEGAS, DANIEL	daniel.chemisana@udl.cat	0	
ESTEBAN DALMAU, BERNAT	bernat.esteban@udl.cat	2	
SOLANS BARON, ALEJANDRO	alejandro.solans@udl.cat	3,5	
TORRA CLOTET, FERRAN	ferran.torra@udl.cat	3,5	

Subject's extra information

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 . This knowledge implies both theoretical and practical knowledge. Theoretical knowledge is necessary to understand the concepts and laws of physics , allowing as well to know how to use the language of physics . Practical knowledge must provide a domain in solving problems of physics.

- To properly use the units system.
- To learn how to think in a scientific and technical context.
- To Properly argue a conclusion based on some assumptions .
- To acquire a sufficient basis to be able to deal with later subjects based on the application of the laws of classical physics .

Physicists are renowned for the power of their problem-solving capabilities. Great emphasis and effort is spent providing students with tools and methods to approach and solve increasingly challenging problems. We hope that these challenges will not only broaden and deepen students' skills but will amplify their drive to participate in discovery.

Essential Science and Mathematical Skills
Students should be able to solve complex and diverse problems by:

- recognizing universal physical laws relevant to the problem,
- applying the relevant laws to the problem,
- applying mathematical and computational techniques,
- using experimental, computational, and/or theoretical methods, and
- evaluating the limitations of their solutions.

Success in just about any environment also requires attention to professional and interpersonal skills reflected in the outcomes below. These skills balance, complement, and strengthen student core science and mathematical skills.

Core Professional Skills
Students should be able to:

- Critically assess their current state of knowledge and expertise, and develop, implement, and refine a plan to acquire new knowledge for specific scientific goals and in pursuit of new intellectual interests
- Communicate effectively via oral, visual, and written formats to diverse STEM audiences.
- Use the appropriate tools and requisite media literacy to acquire, assess, and analyze data and information from diverse sources.

Competences

Basic competences

- **CB2.** That students know how to apply their knowledge to their work or vocation in a professional manner 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

- **CE2.** To conceptualize and commandthe fundamental concepts about the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and theirapplication to solve problems in

engineering.

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Subject contents

1. Physical Quantities

1.1 The concept of physical magnitude

1.2 Structure and Types

1.3 Systems units: International System

1.4 Dimensional Analysis

1.5 Changes of units

1.6 Orders of magnitude

1.7 Significant Figures

2. Motion in one dimension. Rectilinear motion

2.1 Position, displacement, velocity and speed

2.2 Instantaneous Speed and Velocity

2.3 Constant Acceleration

2.4 Free falling of bodies

3. Motion in two dimensions. Motion in a plane

3.1 Position in the plane: Coordinate

3.2 Position, velocity and acceleration vectors: components

3.3 Constant acceleration in the plane

3.4 Parabolic motion

3.5 Circular motion: normal and tangential acceleration

3.6 Relative velocity ??and acceleration

4. Laws of Motion

4.1 The concept of force

4.2 Newton's first law: Inertia

4.3 Newton's second law

4.4 Newton's Third Law

4.5 Momentum and mechanical impulse

4.6 Applications of Newton's laws

4.6.1 Gravity and normal force

4.6.2 Friction

4.6.3 Contact Forces

4.6.4 Tensions

4.6.5 Restoring Forces

4.6.6 Hooke's law

4.6.7 Drag Forces: motion in fluids

4.6.8 Accelerated reference systems: fictitious forces

5. Work and Energy

5.1 System and environment

5.2 The concept of mechanical work

5.3 Work with non constant forces

5.4 Work-energy theorem: kinetic energy

5.5 Power

5.6 Potential energy and conservative forces

5.7 Energy Conservation

5.8 Other forms of energy

6. Many-Particle Systems

6.1 Collisions between particles

6.2 Centre of mass

6.3 Movement of a many-particle system

6.4 Variable mass: jet propulsion

7. Rigid systems

7.1 Mass Distributions

7.2 Traslation of a rigid body

7.3 Rotation around a fix shaft

7.3.1 Kinetic energy of rotation

7.3.2 Moment of inertia

7.3.3 Torque

7.3.4 Work, energy and power in rotation

7.4 Rotation and traslation motion

8. Angular momentum

8.1 Angular momentum of a rigid body

8.2 Conservation of angular momentum

8.3 General motion of a solid

9. Solid Statics

9.1 Equilibrium and static equilibrium

9.2 Center of Gravity

9.3 Elastic properties of solids

Methodology

The development of the subject is done based on 3 actions:
1) Classes "Theory"
Exposition of the concepts, principles and fundamental relationships of each topic. In the classes of "theory" the most important concepts of each subject will be exposed and they will be complemented with some example. The exhibitions are, in some cases, a synthesis of everything that is a subject, which must be complemented from the recommended bibliography. Class time is limited and the extension of the explanations is adapted to its availability, without this being meant to reduce the contents of the syllabus. If, after the personal study, there are concepts that require more explanation, there is weekly tutoring for being able to attend them
Presentation of examples that illustrate its application. In order to clarify some of the concepts, examples of practical application will be presented that will be resolved in class or will have to be resolved at home and the result will be given.
In the cases indicated, you must make prior readings recommended before the classes where the subjects will be exposed

2) Classes "Problems"
Discussion and resolution of problems and applications related to the concepts of each topic
The problems proposed in the collection of problems are basically worked. In the Virtual Campus you can find a set of statements of application problems for each topic. This will be the problems that need to be worked and they are intended to be resolved before the class session. During the classes the difficulties will be solved and the different resolution modes that may be proposed will be discussed.
The statements of the Virtual Campus constitute a minimum collection of statements that all will solve. In no case, they are the only ones that need to be worked, but others must be found in the recommended bibliography. If problems with non-collection problems occur, they will be first attended in tutoring.

3) Laboratory practices
In the weeks indicated in the calendar, there will be three practices in the laboratory on experiments that allow to verify any of the laws seen during the course.
In the Virtual Campus you will find the scripts for each one of the practices. These scripts are compulsory reading and study before coming to the laboratory session.
For each practice, a report of the work done must be submitted, which will be the basis for its evaluation.

The teaching format will be face-to-face. In case of new confinements, all the activities would become online.

Development plan

WEEK	Subject-Activities
1	Introduction Unit 1 Unit 2
2	Unit 2 Unit 3
3	Unit 4
4	Unit 4
5	Unit 4 Unit 5
6	Unit 5
7	Unit 6
8	Unit 6
9	Evaluation: Exam 1st PARTIAL
10	1st Exam resolution (optional activity) Unit 6 Laboratory sesion 1
11	Unit 7 Laboratory session 2
12	Unit 7
13	Unit 7 Unit 8
14	Unit 8 Unit 9
15	Unit 9
16	Evaluation: Exam 2nd PARTIAL
17	
18	
19	Evaluation: Recovery Final Exam

Evaluation

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

- COMPULSORY EVALUATION ACTIVITIES

These activities are required in order to pass the course through the process of continuous assessment. When the student have not done any of the two compulsory activities (PA1, PA2) will get a final maximum of 3.5 points, regardless of the application of percentages can give another result. Therefore, it must be submitted to the Recovery.

1) PA1: 1st Partial Exam Week 9

Content: all topics that have been developed until week 8 included (guidance: items 1,2,3,4,5).

Percentage: 25%

2) PA2: 2nd Partial Exam Week 16-17

Content: all topics

Percentage: 45%

- OPTIONAL Assessment activity (NOT COMPULSORY)

PA3: Laboratory

The following two requirements must be fulfilled:

a) Attendance at three laboratory sessions (scheduled time in weeks 10 and 11)

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 (during, week 14)

Percentage: 10%

PA4 Activities, problems, tests and assesment throughout the semester.

Percentage: 20%

II. RETAKE

PA5 Retake, Week 19

Content: all topics

Grading Criteria:

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

80% Retake Exam PA5

10% Laboratory PA3

10% Activity evaluation PA4

III. Validation of the Laboratory practices

- The students who passed the Laboratory practices last academic courses 20-21 or 21-22 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 20-21 are not validated.

The exams will be face-to-face. In case of new confinements, they may be replaced by online exams.

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Fundamental Bibliography:

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R.A.Serway - J.W.Jewett. *Física para ciencias e ingenierías*, Vol. 1, 6ª edición. Ed. Thomson. México D.F. 2005. ISBN 970-686-423-7

R. Magro, L. Abad, M. Serrano, A.I. Velasco, S. Sánchez, J. Tejedor. Fundamentos de Física I. García-Maroto Editores. Madrid 2010. ISBN 978-84-937509-7-8. (Disponible en edició digital a www.ingebook.com)

Ferran Badia, *Guia de pràctiques*, ISBN 84-689-4338-X

Complementary Bibliography:

S.Burbano de Ercilla, et.al. *Física General,* 32ª edición.Editorial Tébar, Zaragoza 2003. ISBN 84-95447-82-7

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F.J.Bueche. *Física General*. 9ª edición. McGraw-Hill, MéxicoD.F. 2000.Biblografia Complementària:

James KAKALIOS, *La Física de los Superhéroes*, Ediciones Robinbook,Barcelona 2006. ISBN 84-96222-72-1

on-line resources:

Ángel Franco García, Curso Interactivo de Física.

Walter Lewin, Classical Mechanics. 8.01x - MIT Physics I: Classical Mechanics. Videos del curs.

Scientific lectures:

José Muñoz Santonja. *Newton. El umbral de la ciencia moderna*. Editorial Nívola. ISBN 978-84-92493-55-5

Isaac Newton y Eloy Rada García (Traductor). *Principios Matemáticos de Filosofía Natural*, Vol.1. Alianza Editorial. Madrid 1998. ISBN978-84-206-2918-6

Manuel Valera. *Hooke. La ambición de una ciencia sin límites*. Editorial Nívola. ISBN 978-84-95599-86-5

Jorge Wagensberg. *Yo, lo superfluo y el error*. TusquetsEditores. Colección Metatemas nº107. Barcelona 2009. ISBN 978-84-8383-154-0

Jorge Wagensberg. *El Gozo Intelectual.* Tusquets Editores.Colección Metatemas nº97. Barcelona 2007. ISBN 978-84-8310-395-1

Alan F. Chambers. *¿Qué es esa cosa llamada ciencia?*. SigloXXI Editores. Madrid 2006. ISBN 84-323-0426-3

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