DEGREE CURRICULUM

PHYSICS I

Coordination: Group Morning: Ferran Badia
Group Afternoon: Miquel Carrera

Academic year 2014-15

PHYSICS I 2014-15

Subject's general information

Subject name	PHYSICS I
Code	102104
Semester	1
Typology	Core subjects
ECTS credits	6
Theoretical credits	0
Practical credits	0
Coordination	Group Morning: Ferran Badia Group Afternoon: Miquel Carrera
Office and hour of attention	Ferran Badia Tuesday: 13:15 - 14:15h We recommend to send mail to the corresponding professor for an appointment by mutual agreement. Please indicate in the message header: GEM-GEEIA Physics I
Department	Medi Ambient i Ciències del Sòl
Modality	Presencial
Important information on data processing	Consult this link for more information.
Language	Catalan
Degree	Degree in Mechanical Engineering, Degree in Automation and Industrial Electronic Engineering
Distribution of credits	Ferran Badia 6 Jordi Barrufet Barque 6 Francesc Perello Sans 3 Joan Ignasi Rosell Urrutia 3 Miquel Carrera 3
Office and hour of attention	Ferran Badia Tuesday: 13:15 - 14:15h We recommend to send mail to the corresponding professor for an appointment by mutual agreement. Please indicate in the message header: GEM-GEEIA Physics I
E-mail addresses	Group Morning: fbadia@macs.udl.cat rosell@macs.udl.cat Group Afternoon: mcarrera@macs.udl.cat jbarrufet@macs.udl.cat Laboratory: fperello@macs.udl.cat

PHYSICS I 2014-15

Morning: Ferran Badia, Joan Ignasi Rosell Urrutia
Afternoon: Miquel Carrera, Jordi Barrufet Barque
Lab: Francesc Perello Sans

Learning 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 .

Competences

Degree-specific competences

- GEM 2 GEEIA2. 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..

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.
- EPS6. Capacity of analysis and synthesis.
- EPS8. Capacity of planning and organizing the personal work.

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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 course is based on three activities:

1) Classes GG

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

Approach of examples illustrating the application

2) Group classes GM

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

3) Laboratory experiences

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 three compulsory activities (PA1, PA2, PA3) 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: 30% Group Morning, Afternoon Group 25%

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

Content: all topics

Percentage: 50%

3) PA3: Laboratory

All the following must be fulfilled:

a) Attendance at two 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: 15%

- OPTIONAL Assessment activity (NOT COMPULSORY)

A) For Group Morning:

PA4: Participation in class (teachers specified valuation methodology)

Percentage: 5%

B) For Group Afternoon:

PA4 written test 1 (problem solving) Week 7 (including items made until week 6) Written test 2 (problem solving) Week 14 (including items made until week 13)

Percentage: 10% (4% Test 1, Test 2% 6)

II. RETAKE

PA5 Retake, Week 19

Content: all topics

Grading Criteria:

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

80% Retake Exam PA5

15% Laboratory PA3

5% Activity evaluation PA4

b) Having done the Retake exam but without having done the Laboratory practices PA3, the final mark will be a maximum of 4, regardless of the result obtained applying the percentages referred in (a).

III. Validation of the Laboratory practices

- The students who passed the Laboratory practices last academic course 13-14, 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 13-14 are not validated.

Bibliography

Fundamental Bibliography:

P.A.Tipler - G.Mosca. *Física para la ciencia y la tecnología*, Vol. 1, 6ª edición. Ed. Reverté. Barcelona 2010. ISBN 978-84-291-4429-1. Editat també en català.

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

S.Burbano de Ercilla, et.al. *Problemas de Física*, 27ªedición. Editorial Tébar, Zaragoza 2004. ISBN 84-95447-27-4

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. Projecte Open CourseWare del Massachussets Institute of Technology. Videos del curs.

Other resources:

Yenka. Laboratori virtual que permet crear simulacions de sistemes mecànics per ajudar a comprendreles lleis del moviment.

WM2D. Working Model 2D és un simulador virtual de moviments virtuals que permet l'estudi de sistemesmecànics.

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