

## COURSE INFORMATION

### PHYSICS I

Code number: 606310102

Degree in Electrical Engineering

Academic Year: 2017-2018

Foundational course. 1<sup>st</sup> year

First semester: 3 hours a week, 2 days a week

6 ECTS

Link to Spanish counterpart: <http://www.uhu.es/etsi/guia-de-asignatura/?codigo=606310102>

## TEACHING STAFF

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First Semester: To be specified according to the schedule.

Second Semester: To be specified according to the schedule.

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First Semester: To be specified according to the schedule.

Second Semester: To be specified according to the schedule.

## SYLLABUS

### 1. DESCRIPTION

Physics I is a first-year, first-semester course that provides basic and applied knowledge on the fundamental principles in Physics, including basic concepts of Classical Mechanics and Waves. This course is specially intended for students in the first year of an Electrical Engineering degree.

### 2. PREREQUISITES

It is recommended that students have studied Physics and Mathematics at high school, as well as the introductory subjects on Physics and Mathematics at the Escuela Técnica Superior de Ingeniería (School of Engineering).

### 3. OBJECTIVES/LEARNING OUTCOMES

On completion of this course, students should be able to:

- demonstrate understanding of the scientific method and basic experimental techniques in Physics
- apply basic principles of Physics
- solve problems involving classical mechanics, including motion in one and two dimensions
- solve problems involving dynamics, oscillations and wave motion

### 4. COMPETENCES

**B02; CB1; CB2; CB3; G01, G04; G07**

### 5. TEACHING METHODOLOGY

- Theory classes
- Laboratory Sessions
- Supervised resolution of exercises
- Individual and group tutorials
- Exams

### 6. CONTENTS

Chapter 1. Physical magnitudes, units and vectorial analysis

- 1.1 Standards and Units
- 1.2 Unit Consistency and Conversions
- 1.3 Uncertainty and Significant Figures
- 1.4 Estimates and Orders of Magnitude
- 1.5 Vectors and Vector Addition
- 1.6 Components of Vectors
- 1.7 Unit Vectors
- 1.8 Products of Vectors

Chapter 2. Kinematics and dynamics of a particle

- 2.1 Motion along a straight line
- 2.2 Motion in two or three dimensions
- 2.3 Force and Interactions
- 2.4 Newton's laws of motion
- 2.5 Mass and Weight
- 2.6 Free-Body Diagrams
- 2.7 Frictional Forces
- 2.8 Dynamics of Circular Motion
- 2.9 The Fundamental Forces of Nature

Chapter 3. Work and Energy

- 6.1 Work
- 6.2 Kinetic Energy and the Work–Energy Theorem
- 6.3 Work and Energy with Varying Forces

- 6.4 Power
- 6.5 Gravitational Potential Energy
- 6.6 Elastic Potential Energy
- 6.7 Conservative and Nonconservative Forces
- 6.8 Force and Potential Energy
- 6.9 Energy Diagrams

#### Chapter 4. Momentum, impulse, and collisions

- 4.1 Momentum and Impulse
- 4.2 Conservation of Momentum
- 4.3 Momentum Conservation and Collisions
- 4.4 Elastic Collisions
- 4.5 Center of Mass
- 4.6 Rocket Propulsion

#### Chapter 5. Rotation of rigid bodies

- 5.1 Angular Velocity and Acceleration
- 5.2 Energy in Rotational Motion
- 5.3 Torque and Angular Acceleration for a Rigid Body
- 5.4 Rigid-Body Rotation About a Moving Axis
- 5.5 Work and Power in Rotational Motion
- 5.6 Angular Momentum
- 5.7 Conservation of Angular Momentum
- 5.8 Gyroscopes and Precession

#### Chapter 6. Static Equilibrium and Elasticity

- 6.1 Conditions for Equilibrium
- 6.2 Center of Gravity
- 6.3 Solving Rigid-Body Equilibrium Problems
- 6.4 Stress, Strain, and Elastic Moduli
- 6.5 Elasticity and Plasticity

#### Chapter 7. Oscillations and Mechanical Waves

- 7.1 Simple Harmonic Motion
- 7.2 Energy in Simple Harmonic Motion
- 7.3 The Simple Pendulum
- 7.4 The Physical Pendulum
- 7.5 Damped, Forced Oscillations and Resonance
- 7.6 Types of Mechanical Waves
- 7.7 Periodic Waves
- 7.8 Energy in Wave Motion
- 7.9 Wave Interference, and Superposition
- 7.10 Standing Waves on a String
- 7.11 Normal Modes of a String

#### **7. BIBLIOGRAPHY**

- Sears, Zemansky, Young, Freedman. University Physics with Modern Physics. 13<sup>th</sup> Ed. Pearson 2012.

- R. Serway, J.W Jewett. Physics for Scientists and Engineers. Brooks Cole Pub Co. 2013
- P. A. Tipler, G. Mosca. Physics for scientist and engineers: with modern physics. New York : W.H. Freeman and Company, 2008.

## 8. ASSESSMENT

Written exam (theory and problems)... 80%

Laboratory...10%

Solving exercises...10%

Final results will be given in terms of a numerical scale between 0 and 10 (including tenths), with the corresponding qualitative ratings below:

- $\leq 4.9$ : Fail (D)
- 5.0 - 6.9: Pass (C)
- 7.0 - 8.9: Pass with Merit (B)
- 9.0 - 10: Distinction (A)

The total number of distinctions cannot exceed 5% of the students enrolled in the subject in the academic year (unless the number of students enrolled is lower to 20, in which case one distinction can be awarded)

The grading system is subject to the Bachelor's Degree Exam Regulations of the University of Huelva (Normativa de Evaluación para las Titulaciones de Grado de la Universidad de Huelva). Please refer to:

<[http://www.uhu.es/sec.general/Normativa/Texto\\_Normativa/Normativa\\_de\\_Evaluacion\\_grados.pdf](http://www.uhu.es/sec.general/Normativa/Texto_Normativa/Normativa_de_Evaluacion_grados.pdf)>.

In particular, please note that make-up exams and other special circumstances will be subject to article 19 of these regulations