Course guides
230452 - FIS1 - Physics 1

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 748 - FIS - Department of Physics.

Degree: BACHELOR’S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Compulsory subject).

Academic year: 2021 ECTS Credits: 6.0 Languages: Catalan

LECTURER

Coordinating lecturer: Pino Gonzalez, David
Others: Trullas Simo, Joaquim

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of the scientific method and its applications in physics and engineering. Ability to formulate hypotheses and make critical analysis of scientific problems in the field of physics and engineering. Ability to relate the physical reality with their mathematical models and vice versa.
2. Ability to solve basic problems in mechanics, elasticity, thermodynamics, fluids, waves, electromagnetism and modern physics, and its application in solving engineering problems.

General:
1. ABILITY TO IDENTIFY, FORMULATE, AND SOLVE PHYSICAL ENGINEERING PROBLEMS. Planning and solving physical engineering problems with initiative, making decisions and with creativity. Developing methods of analysis and problem solving in a systematic and creative way.

Transversal:
2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 1. Analyzing the world's situation critically and systemically, while taking an interdisciplinary approach to sustainability and adhering to the principles of sustainable human development. Recognizing the social and environmental implications of a particular professional activity.
3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
4. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

TEACHING METHODOLOGY

- In classroom
  Blackboard classes (theory + problems) with participation of the students. Practical work, individually or in team.

- Outside the classroom:
  Exercises and theoretical or practical projects. Preparation of evaluated activities.

LEARNING OBJECTIVES OF THE SUBJECT

Knowledge of the basic concepts on the classical mechanics laws
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>65.0</td>
<td>43.33</td>
</tr>
<tr>
<td>Self study</td>
<td>85.0</td>
<td>56.67</td>
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</tbody>
</table>

Total learning time: 150 h

CONTENTS

1. Vectors

Description:
1.1. Elementary operations with scalars and vectors: addition of vectors and multiplication by a scalar.
1.2. Scalar and vectorial product of two vectors.

Full-or-part-time: 8h
Theory classes: 2h
Practical classes: 1h
Self study: 5h

2. Kinematics of one particle

Description:
2.1. Rectilinear motion.
2.2. Vectors position, speed and acceleration: Parabolic motion.
2.3. Curvilinear motions and intrinsic components of acceleration.
2.4. Circular motion and simple harmonic motion.

Full-or-part-time: 16h
Theory classes: 3h
Practical classes: 3h
Self study: 10h

3. Forces and equations of motion of a particle

Description:
3.1. Newton's laws of motion.
3.2. Contact forces: normal reaction, dry friction, tension of ropes.
3.3. Velocity dependent forces in fluids.

Full-or-part-time: 19h 30m
Theory classes: 5h
Practical classes: 3h 30m
Guided activities: 1h
Self study: 10h
# 4. Work and mechanical energy: conservation theorems

**Description:**
- 4.2. Work, power and kinetic energy.
- 4.3. Conservative forces and potential energy: conservation of mechanical energy.
- 4.5. One dimensional motion analyzed by using potential energy.

**Full-or-part-time:** 21h

Theory classes: 4h  
Practical classes: 3h  
Self study : 14h

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# 5. Oscillators

**Description:**
- 5.1. Hooke’s law and simple harmonic motion.
- 5.2. Small oscillations around a point of equilibrium in a one-dimensional motion.
- 5.3. Damped oscillators.
- 5.4. Forced oscillator: resonance. Resonance

**Full-or-part-time:** 17h

Theory classes: 5h  
Practical classes: 4h  
Self study : 8h

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# 6. Gravitational field

**Description:**
- 6.1. Central forces: conservation of energy and angular momentum.
- 6.3. Radial and transverse kinetic energies. Effective potential.
- 6.4. Orbits in a gravitational field.

**Full-or-part-time:** 20h

Theory classes: 6h  
Practical classes: 4h  
Self study : 10h

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# 7. Dynamics of a particles system

**Description:**
- 7.1. Linear momentum of a system and its conservation: center of mass
- 7.2. Inelastic and elastic shocks, and explosions.
- 7.3. Mechanical energy of a system and its conservation.

**Full-or-part-time:** 23h 30m

Theory classes: 6h  
Practical classes: 3h 30m  
Self study : 14h
8. Rigid body dynamics

Description:
8.1. Moment of inertia. Perpendicular and Steiner axis theorems.
8.2. Rotational movement of the rigid solid about a fixed axis.
8.4. Rotation of the rigid solid around an arbitrary axis in three dimensions.

**Full-or-part-time:** 26h
- Theory classes: 8h
- Practical classes: 4h
- Self study: 14h

**GRADING SYSTEM**

The qualification system consist of a final exam (FE), a mid term exam (ME). The final mark is given by: \[ \max \{ \text{FE}, 0.65 \times \text{FE} + 0.35 \times \text{ME} \} \]

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**