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230452 - FIS1 - Physics 1

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 748 - FIS - Department of Physics
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Teaching unit Compulsory)
ECTS credits: 6 Teaching languages: Catalan

Teaching staff

Coordinator: Pino Gonzalez, David

Others: Trullas Simo, Joaquim

Opening hours

Timetable: By appointment

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.

Generical:

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:

3. EFFECTIVE USE OF INFORMATI0N 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.
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.
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

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Study load

Total learning time: 150h	Hours large group:	65h	43.33%
	Self study:	85h	56.67%

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Content

1. Vectors

Learning time: 8h

Theory classes: 2h
Practical classes: 1h
Self study : 5h

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.
1.3. Derivative and integral of a vectorial function with respect to a scalar variable.

2. Kinematics of one particle

Learning time: 16h

Theory classes: 3h
Practical classes: 3h
Self study : 10h

Description:
2.1. Systems of reference. Position, velocity and acceleration vectors.
2.2. Rectilinear, curvilinear, parabolic and simple harmonic motions.
2.3. Intrinsic components of the acceleration.

3. Forces and equations of motion of a particle

Learning time: 19h 30m

Theory classes: 5h
Practical classes: 3h 30m
Guided activities: 1h
Self study : 10h

Description:
3.1. Newton's laws of motion.
3.2. Contact forces: normal reaction, dry friction, tension of ropes and Hooke's law.
3.3. Velocity dependent forces in fluids.
3.4. Numerical solution of the equations of motion.
3.5. Inertial reference systems, transformation and principle of relativity of Galileo.

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4. Work and mechanical energy: conservation theorems	Learning time: 21h Theory classes: 4h Practical classes: 3h Self study : 14h

Description:
4.1. Impulse of a force and linear momentum: conservation of linear momentum.
4.2. Work, power and kinetic energy.
4.3. Fields of conservative forces and potential energy: conservation of mechanical energy.
4.4. Momentum of a force and angular momentum: conservation of the angular momentum.
4.5. One dimensional motion analyzed by using potential energy.

5. Oscillators	Learning time: 17h Theory classes: 5h Practical classes: 4h Self study : 8h

Description:
5.1. Small oscillations departing from an equilibrium point in one dimension.
5.2. Damped oscillators.
5.3. Forced oscillator: resonance.

6. Gravitational field	Learning time: 20h Theory classes: 6h Practical classes: 4h Self study : 10h

Description:
6.1. Newton's universal law of gravitation.
6.2. Kepler's laws.
6.3. Radial and azimuthal kinetic energy and effective potential energy.
6.4. Orbits in a gravitational field.
6.5. Gravitational field and potential.

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7. Dynamics of a particles system	Learning time: 23h 30m Theory classes: 6h Practical classes: 3h 30m Self study : 14h

Description:
7.1. Discrete and continuous distributions of mass. Center of mass and its motion.
7.2. Linear momentum and its conservation.
7.3. Angular momentum of a system and its conservation.
7.4. Mechanical energy of a system and its conservation.
7.5. Elastic and inelastic collisions, and explosions.
7.6. Systems with variable mass.

8. Rigid body	Learning time: 26h Theory classes: 8h Practical classes: 4h Self study : 14h

Description:
8.1. The rigid body as a system of particles. Statics of the rigid body.
8.2. Translation motion of the rigid body.
8.3. Moment of Inertia. Steiner's Theorem.
8.4. Rotational motion of the rigid body around a fixed axis.
8.5. Kinetic and potential energies. Conservation of energy.
8.6. Rotation of the rigid body about an arbitrary axis in three dimensions.

Qualification system

The qualification system constist of a final exam (FE), a mid term exam (ME) and the presentation of a project (P). The final mark is given by: max {FE, 0.65*FE + 0.35*ME} + 0.1*P

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Bibliography

Basic:

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