UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Course guide
230452 - FIS1 - Physics 1

Last modified: 25/05/2023

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: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura
Others:	Consultar aquí / See here: https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

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:
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 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.
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

Type	Hours	Percentage
Hours large group	65,0	43.33
Self study	85,0	56.67

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:
4.1. Conservation of linear momentum.
4.2. Work, power and kinetic energy.
4.3. 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.

Full-or-part-time: 21h
Theory classes: 4h
Practical classes: 3h
Self study : 14h

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

6. Gravitational field

Description:
6.1. Central forces: conservation of energy and angular momentum.
6.2. Newton's law of universal gravitation. Kepler's laws.
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

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.
8.3. Kinetic energies of translation and rotation. Energy conservation.
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 evaluation constists of a final exam (FE), and a mid term exam (ME). The final grade is calculated as follows: max {FE, 0.65*FE + 0.35*ME}

In the reevalaution of the course all the previous evaluations are included

BIBLIOGRAPHY

Basic:
- Tipler, P.A.; Mosca, G. Física per a la ciència i la tecnologia: vol. I [on line]. Barcelona: Reverté, 2010 [Consultation: 30/11/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_Browser_Pre?codigo_libro=6536. ISBN 9788429144321.
- Burbano, S.; Burbano, E.; Gracia, C. Problemas de física. 27a ed. Madrid: Tébar, 2006. ISBN 8473602374.
- Gettys, W. E., Keller, F. J, Scove, M.J.. Física Clásica y Moderna. McGraw Hill, 1991. ISBN 8476156359.

Complementary:
- Alonso, M.; Finn, E.J. Física. México: Addison Wesley Longman, 2000. ISBN 9684444265.
- Ortega Girón, M.R. Problemas de física: resueltos y explicados. Córdoba: Manuel R. Ortega Girón, 2011.
- Ortega, M.R. Lecciones de física, vol. 1, Mecánica-1. 8a ed. Córdoba: Departamento de Física Aplicada, Universidad de Córdoba, 1995. ISBN 8440442904.
- Ortega, M.R. Lecciones de física, vol. 2, Mecánica-2. 8a ed. Córdoba: Departamento de Física Aplicada, Universidad de Córdoba, 1995. ISBN 8440442904.
- Taylor, J. R.. Mecánica clasica. Barcelona: Reverté, 2013. ISBN 9788429143126.