Course guide
240016 - 240016 - Physics I

Last modified: 16/05/2024

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

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Berart Diez, Sergio

Others: Canales Gabriel, Manel
Grossi, Claudia
Levit Valenzuela, Rafael
Salud Puig, Josep
Sánchez Baena, Juan
Sempau Roma, Josep
Talavera Sanchez, Pedro

TEACHING METHODOLOGY

About the middle of the course a mid-term test will hold, which will be used to evaluate and guide each student with respect to the success in acquiring the required competencies and capacities.
During the academic period practical laboratory sessions will take place. Each laboratory session will consist in a first part, where students learn, and a second part, where they will perform experimental measurements and analyse tha data. At the end of the course, a test will take place, in order to evaluate the way they take and analyse experimental data..
Finally, evaluation tests, of those competencies and capacities acquired during the course, will take place at the end of the learning period. These tests have a relative significance as it is detailed in the "Qualification system" section.

LEARNING OBJECTIVES OF THE SUBJECT

· Acquiring the capacity to correctly interpret and apply fundamental laws of mechanics.
· Identifying a common methodology in the description of different mechanical phenomena, no matter if it is a single particle's movement or a solid object
· Efficient use of graphic language to solve and interpret problems.
· Acquiring ability to execute measures and ater treating the obtained data.
· Solving problems on simple mechanical applications.
· Having the capacity to identify each magnitude that appears in different formulas.
· Having the capacity to express magnitudes in the International System units.
· Having the capacity to choose a problem's fastest and simpler resolution option.
· Having the capacity to correctly use vector notation when necessary.

STUDY LOAD

Type	Hours	Percentage
Hours small group	8,0	5.33
Hours large group	52,0	34.67
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Topic 1: Introduction and kinematics of the point

Description:
1) Brief instructions to solve problems in physics.
2) Units, order of magnitude estimation and dimensional analysis.
3) Vectors. Vector fields and geometric approach to vectors.
4) Basic operations with vectors.
5) Experimental data measure and treatment.
6) Unidimensional movement. Translational kinematics.
7) Coordinate Systems. Position, velocity and acceleration.
8) Geometric concepts of the derivative and the integral. Brief review of Integration.

Full-or-part-time: 21h 15m
Theory classes: 5h
Practical classes: 2h 30m
Laboratory classes: 1h
Self study : 12h 45m

Topic 2: Dynamics of a single particle

Description:
1) First and Second Newton's laws.
2) Force and momentum.
3) Torque and angular momentum.
4) Important forces.

Full-or-part-time: 21h 15m
Theory classes: 3h 45m
Practical classes: 3h 45m
Laboratory classes: 1h
Self study : 12h 45m

Tema 3: Work and energy

Description:
1) Work.
2) Kinetic energy.
3) Potential energy.
4) Mechanical energy.
5) Work of non-conservative forces.

Full-or-part-time: 18h 45m
Theory classes: 3h 45m
Practical classes: 3h 45m
Self study : 11h 15m

Topic 4: Dynamics of N particles

Description:
1) Third Newton’s law.
2) Center of mass.
3) Momentum, torque and angular momentum.
4) Energy.
5) Collisions.
6) Bonds and ideal reactions.
7) Conservative systems.

Full-or-part-time: 28h 45m
Theory classes: 6h
Practical classes: 5h 30m
Self study : 17h 15m

Topic 5: The rigid body

Description:
1) The rigid body.
2) Rigid body kinematics.
3) Rigid body Dynamics (2D).
4) Translational and angular kinetic energies.
5) Rigid body statics.

Full-or-part-time: 31h 15m
Theory classes: 4h 30m
Practical classes: 6h
Laboratory classes: 2h
Self study : 18h 45m

Topic 6: Small oscillations

Description:
1) Small oscillations near the equilibrium.
2) Simple harmonic motion.
3) Damped harmonic motion.
4) Forced harmonic motion.

Full-or-part-time: 28h 45m
Theory classes: 4h 30m
Practical classes: 5h
Laboratory classes: 2h
Self study : 17h 15m

GRADING SYSTEM

NTOT = MAX(0,6 NEF + 0,3 NEP+ 0,1 NLAB; 0,9 NEF + 0,1 NLAB)

NTOTR= 0,9 NEFR+ 0,1 NLAB

NTOT: Subject's final mark.
NTOTR: Subject's final mark (re-evaluation).
NEF: Final exam mark.
NEF: Final exam mark (re-evaluation).
NAC: Mid-term exam mark.
NLAB: Laboratory test mark.

EXAMINATION RULES.

Mid-term testl consist of a set of questions, where answers must be reasoned.
Final and re-evaluation exams will consist of questions and longer exercises, where answers must be reasoned .
Laboratoy test will consist of a brief set of qüestions about how to measure and analyse experimental data.

BIBLIOGRAPHY

Basic:
- Jaén, Xavier; Salud, Josep; Serra, Carina; Calaf, Jaume; Khoury, Maria. Mecànica fonamental : mecànica newtoniana per a l'enginyeria [on line]. 2a ed. Barcelona: Iniciativa Digital Politècnica, 2023 [Consultation: 21/03/2024]. Available on: http://hdl.handle.net/2117/381606. ISBN 9788419184627.

RESOURCES

Hyperlink:
- Classes virtuals de Mecànica fonamental (Xavier Jaén). Resource
- Apunts de Mecànica fonamental (Manel Canales). https://upcommons.upc.edu/handle/2117/334815