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340023 - FIS1-N1O21 - Physics I

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering

Teaching unit: 748 - FIS - Department of Physics

Academic year: 2018

Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: ARCADI PEJUAN ALCOBE

Others: ARCADI PEJUAN ALCOBE - ORIOL GARGALLO VICENTE
Moreno Lupiañez, Manuel
Lebrato González, Alexander

Degree competences to which the subject contributes

Specific:

1. D1. Knowledge of fundamental principals of mechanics of solids rigids and its application of resolving problems concerning engineering (CINEMATICA, statics, dynamics)
2. CE2. Comprehension and containment of basic concepts concerning general rules of mechanic, thermodynamic, field of shafts and electromagnetism; and its diligence to solve engineering problems.

Transversal:

3. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
4. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
5. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

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Teaching methodology

-In the theory classes, the theoretical fundamentals of the scheduled matters shall be explained and developed and some typical problems shall be solved. They will consist of theory explanations complemented with activities intended for stimulating the students' participation, discussion and critical analysis.

- In the practical classes (problem solving), problems about the matters dealt with shall be presented and solved. Students, individually or in groups, have to solve the established problems. A the due time, the solving of problems or other activities to be graded will be proposed. To reach a positive mark, these activities have to be carried out or delivered within the time scheduled.

-In the laboratory classes, students have to carry out the corresponding laboratory activities and simulations. They have to deliver the resulting laboratory report with the calculations and comments asked. At the beginning of each laboratory session, each student has to deliver a previous study or questionnaire (accessible at ATENEA) about the activity to be carried out. Within the laboratory category, some activities to be carried out outside the laboratory may be proposed (reports, simulations, bibliographic research, etc.).

Learning objectives of the subject

-To know the principles and fundamental laws of Mechanics and their application to Dynamics, including the rigid body.
- To know the basic concepts and principles of Thermodynamics, especially the concept of heat as energy transfer and its relationship with temperature changes.
- To know the basic concepts of the oscillatory motion and its modalities as well as the fundamental concepts of the wave phenomena and their applications.
-To be able to determine and to calculate uncertainties ("errors") associated to experimental measurements as well as to justify the results obtained.
-To be able to apply the principles of Physics to the solving of practical situations and problems.

Study load

Total learning time: 150h	Hours large group:	52h 30m	35.00%
	Hours medium group:	0h	0.00%
	Hours small group:	7h 30m	5.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

C1. Basic Concepts

Learning time: 8h

Practical classes: 2h
Laboratory classes: 2h
Self study : 4h

Description:
Scalar and vector quantities. Vector calculus. Measurements and errors or uncertainties.

C2. Particles' Kinematics and Dynamics.

Learning time: 28h

Theory classes: 4h
Practical classes: 4h
Laboratory classes: 2h
Self study : 18h

Description:
Position, velocity and acceleration of a moving body. Uniformly accelerated rectilinear motion. Parabolic motion. Intrinsic components of acceleration. Circular motion. Newton's laws. Applications.

C3. Mecanical Energy Conservation. Particle Systems and Rigid Bodies

Learning time: 40h 30m

Theory classes: 6h 30m
Practical classes: 12h
Self study : 22h

Description:
Concept of work and power. Theorem energy (kinetic). Conservative forces. Potential energy. Conservation of mechanical energy. Center of mass of a system of particles. Static equilibrium. Rigid body: moment of inertia and rotational equation of motion. Kinetic energy of rotation. Conservation of angular momentum.

C4. Thermodynamics basics.

Learning time: 33h 30m

Theory classes: 6h
Practical classes: 6h
Laboratory classes: 1h 30m
Self study : 20h

Description:
Calorimetry. Heat-energy equivalence. Thermodynamic transformations. First law of thermodynamics. Refrigerating machines and heat engines. Second principle. Transfer of thermal energy.

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C5. Oscillations and wave motion.	Learning time: 34h Theory classes: 6h Practical classes: 6h Laboratory classes: 2h Self study : 20h

Description:
Simple harmonic motion. Energy of a simple harmonic motion. Oscillations, damped oscillations, forced oscillations and resonance. Waves: mathematical description. Types of waves. Superposition of waves: interference. Standing waves. Acoustic intensity and intensity level.

C6. Written tests.	Learning time: 6h Guided activities: 6h

Description:
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Qualification system

The mark will be the higher of both following results:

QF1 = 15%·AC + 15%·PL + 35%·EP1 + 35%·EF
QF2 = 15%·AC + 15%·PL + 70%·EF

where the maximum value of every partial mark is 10. The partial marks are:
AC = mark for activities (problem solving, simulations, etc.) carried out along the course.
PL = mark for laboratory activities.
EP1 = mark for a first partial exam approximately at the middle of the semester.
EF = mark for a final exam. Only this exam will be a re-evaluable test, with the established weighing of 70%.
QF1 = mark resulting from partial and final exams and other assessment activities (AC and PL).
QF2 = mark for the final exam and other assessment activities (AC and PL).

Regulations for carrying out activities

Each exam will have two parts: a multi-choice questionnaire of theory questions and brief problems (up to 40% of the exam mark) and some problems to solve (up to completing 100%). To solve the problems, students may use a list of formulas as well as any additional material which the responsible lecturers will establish and announce sufficiently in advance. Only the final exam will be a re-evaluable test, with the established weighing of 70%. The conditions for the re-evaluation are laid down by the general College regulations.
As for the laboratory activities, the previous study or questionnaire as well as the activity report delivered at the end of the laboratory sessions will be graded. These laboratory activities will have 1.5 points over 10 in the final course mark.
During the course, a series of activities will be established which students have to carry out individually or in groups, within the class session or outside it, as well as any other simulation tasks. The maximum mark for these activities will be 1.5 points over 10 in the final course mark.

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Bibliography

Basic:

Tipler, Paul Allen; Mosca, Gene. Física para la ciencia y la tecnología. 6a ed. Barcelona [etc.]: Reverté, 2010. ISBN 9788429144284.

Beer, Ferdinand Pierre; Johnston, E. Russell; Mazurek, David F.; Eisenberg, Elliot R.. Mecánica vectorial para ingenieros. 9a ed. Madrid: McGraw-Hill, 2010. ISBN 9786071502773, 9786071502612.

Alarcón Jordán, Marta [et al.]. Física: problemes resolts. Vol. 1, Mecànica i termodinámica. 2a ed. Barcelona: Edicions UPC, 1995. ISBN 8483010178.

Alarcón Jordán, Marta [et al.]. Física: problemes resolts. Vol. 3, Ones, física quàntica i electrònica. Barcelona: Edicions UPC, 2001. ISBN 8483010194.

Complementary:

Sears, Francis W. [et al.]. Física universitaria. 12a ed. México [etc.]: Pearson Educación, 2004. ISBN 9786074422887, 9786074423044.

Moreno Lupiáñez, Manuel; José Pont, Jordi. Simulacions en física. Barcelona: Edicions UPC, 1995. ISBN 847653504X.

Others resources:

Hyperlink

Curso interactivo de Física en Internet http://www.sc.ehu.es/sbweb/fisica

Conjunt de simulacions de física per ordinador d'accés lliure