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3200031 - F1 - Physics I

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

Teaching unit: 748 - FIS - Department of Physics

Academic year: 2019

Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: M. DEL CARMEN CASAS CASTILLO - RAMON HERRERO SIMÓN - CARME HERVADA SALA - JUANJO FERNÁNDEZ SOLER - JORDI SELLARÈS GONZÁLEZ - JOSÉ FRANCISCO TRULL SILVESTRE

Prior skills

It is considered that the students must have knowledge of General Physics of the level required to the PAU (national university entrance test).

Degree competences to which the subject contributes

Specific:

1. IND_BASIC: Understand the basic concepts behind the general laws of mechanics, thermodynamics, fields and waves, and electromagnetism and understand how they apply to problems encountered in engineering.

Transversal:

2. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
4. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

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Teaching methodology

- Face-to-face lecture sessions
- Lectures are given using digital presentations. The presentations will be made available to students on the virtual campus before classes begin to help them follow them. The assessment will be based on mid-semester examinations (or an optional final examination for students who fail the first one).
- Face-to-face practical work sessions
During practical work sessions, students work individually or in small groups of 2-3 on problems and questions under the lecturer's supervision. A collection of problems will be made available on the virtual campus. Systems for self-assessment (with assessment criteria or rubrics), co-assessment (among students) and delivery of reports, corrected by the teacher and returned, are made available to facilitate independent learning.
Face-to-face laboratory work sessions
Students work in pairs during laboratory sessions. Guidelines for practicals will be made available to students on the virtual campus at the start of the course. Students must hand in a report for each practical. Marks will be based on the work carried out in the laboratory and the reports handed in.

Learning objectives of the subject

On completion of the course, students should be able to:
- Correctly use and interpret the language and basic concepts of Chemistry.
- Recognise the structure of matter and relate it to the physical and chemical properties of organic and inorganic substances.
- Apply stoichiometric calculations to solve problems.
- Recognise the equipment and apply the basic techniques of the chemistry laboratory.

Study load

Total learning time: 150h	Hours large group:	30h	20.00%
	Hours medium group:	15h	10.00%
	Hours small group:	15h	10.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

TOPIC 1: KINEMATICS

Learning time: 13h 30m

Theory classes: 3h
Practical classes: 1h 30m
Self study : 9h

Description:
1.1. Kinematic magnitudes.
1.2. Position, velocity and acceleration.
1.3. Coordinate systems.
1.4. Relative motion.
1.5. Particle motion.

Related activities:
Theory classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

TOPIC 2: DYNAMICS

Learning time: 22h 30m

Theory classes: 5h
Practical classes: 2h 30m
Self study : 15h

Description:
2.1. Newton's laws.
2.2. Forces.
2.3. Fictitious forces.

Related activities:
Theory classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

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TOPIC 3: WORK AND ENERGY

Learning time: 13h 30m

Theory classes: 3h
Practical classes: 1h 30m
Self study : 9h

Description:
3.1. Concept and calculation of work and variation of energy.
3.2. Kinetic, potential and mechanical energy.
3.3. Conservation of energy.

Related activities:
Theory classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

TOPIC 4: PARTICLE SYSTEMS AND COLLISIONS

Learning time: 18h

Theory classes: 4h
Practical classes: 2h
Self study : 12h

Description:
4.1. Conservation of linear momentum.
4.2. Centre of mass and centre of gravity.
4.3. Position and momentum of the centre of mass.
4.4. Centre-of-mass reference frame.
4.5. Kinetic energy of a particle system.
4.6. Impulse and collisions.

Related activities:
Theory classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

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TOPIC 5: RIGID BODIES

Learning time: 27h

Theory classes: 6h
Practical classes: 3h
Self study : 18h

Description:
5.1. Moment of force (3D).
5.2. Angular momentum.
5.3. Moment of inertia and angular acceleration.
5.4. Calculation of moments of inertia.
5.5. Kinetic energy of rotation.
5.6. Mechanical energy, work and power.
5.7. Rolling objects.

Related activities:
Theory classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

TOPIC 6: OSCILLATION (VIBRATION)

Learning time: 18h

Theory classes: 4h
Practical classes: 2h
Self study : 12h

Description:
6.1. Simple harmonic motion.
6.2. Energy in simple harmonic motion.
6.3. Superposition (1D and 2D) of simple harmonic motion.
6.4. Damped and driven oscillation.

Related activities:
Theory classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

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TOPIC 7: WAVE MOTION	Learning time: 22h 30m Theory classes: 5h Practical classes: 2h 30m Self study : 15h

Description:
7.1. Description of wave motion.
7.2. Harmonic waves.
7.3. Transmitted energy.
7.4. Wave interference.
7.5. Standing waves.
7.6. Sound waves.
7.7. Doppler effect.

Related activities:
Theory classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

Planning of activities

ACTIVITY 1: LABORATORY	Hours: 15h Laboratory classes: 15h

Qualification system

- Examinations: 75%
There will be 2 exams at least, each of them with a minimum percentage on the exams grade of 15%.
- Laboratory sessions: 15%
- Application/practicals: 10%
- Retrieval of unsatisfactory results: failed grade for midterm exams with a percentage higher than 25% of the global qualification could be recovered. The final exam cannot be recovered. The grade obtained by the application of the retrieval will replace the initial grade as long as it is higher, with no limitation in the maximum grade that can be obtained. Recovery will be carried out included in the final exam or in a specific recovery exam in class hours.

Regulations for carrying out activities

To pass the subject, students must complete the laboratory practicals and hand in the necessary reports.

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Bibliography

Basic:

Sears, Francis W.; Zemansky, Mark W.; Young, Hugh D. Física universitaria. 6ª ed. México D.F: Addison-Wesley, 1988. ISBN 0201640422.

Tipler, Paul Allen; Mosca, Gene. Física per a la ciència i la tecnologia, vol. 1 [on line]. Barcelona [etc.]: Reverté, 2010 [Consultation: 03/10/2018]. Available on: <http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6536>. ISBN 9788429144321.

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Complementary:

Feynman, Richard Phillips. Física (vol. 1 i 2). Buenos Aires: Addison-Wesley, 1987. ISBN 02010662.

Giró, Antoni; Canales, Manel; Rey, Rossend; Sesé, Gemma; Trullàs, Joquim. Física per a estudiants d'informàtica. Barcelona: Fundació per a la Universitat Oberta de Catalunya, 2005. ISBN 8497881443.

Bloomfield, Louis A. How things work: the physics of everyday life. 2nd ed. New York: John Wiley & Sons, 2001. ISBN 0471381519.

Beer, Ferdinand Pierre [et al.]. Mecánica vectorial para ingenieros, vol. 1, estática [on line]. 10ª ed. México [etc.]: McGraw-Hill, cop. 2013 [Consultation: 04/10/2018]. Available on: <http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4260>. ISBN 9786071509253.

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