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3200032 - F2 - Physics II

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 DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MECHANICAL 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)

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 - M. DEL CARMEN TORRENT SERRA - JOSÉ FRANCISCO TRULL SILVESTRE

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.

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.

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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: ELECTROSTATICS

Learning time: 63h

Theory classes: 7h
Practical classes: 42h
Self study : 14h

Description:

1.1. Electric field:
1.1.1. Electric charges and the electric structure of matter. Conducting and insulating materials.
1.1.2. Electric forces: Coulomb's law.
1.1.3. Electric field. Electric dipole.
1.1.4. Electric field lines.
1.1.5. Electric flux. Gauss's law.
1.1.6. Electric fields for different charge distributions (discrete and continuous).
1.1.7. Field and charges in a conductor in electrostatic equilibrium.
1.2. Electric potential:
1.2.1. Potential electrostatic energy of a point charge.
1.2.2. Electric potential. Voltage.
1.2.3. Equipotential surfaces.
1.2.4. Potential of a conductor in electrostatic equilibrium.
1.3. Capacity and dielectric:
1.3.1. Polarisation of a dielectric.
1.3.2. Forces between charges in a dielectric.
1.3.3. Capacity of a conductor.
1.3.4. Capacitors. Capacity of capacitors.
1.3.5. Energy of a charged capacitor.
1.3.6. Energy density of an electric field.
1.3.7. Networks of capacitors.

Related activities:

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

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TOPIC 2: MAGNETOSTATICS

Learning time: 36h

Theory classes: 8h
Practical classes: 4h
Self study : 24h

Description:

2.1. Magnetic field:
2.1.1. Force exerted by a magnetic field.
2.1.2. Motion of a point charge in a uniform magnetic field.
2.1.3. Lorentz force and its applications.
2.1.4. Action of a magnetic field on a current element, a current loop and a magnet coil.
2.1.5. The Hall effect.
2.2. Sources of magnetic fields:
2.2.1. Magnetic fields produced by current elements. Biot-Savart law.
2.2.2. Magnetic field produced by a point charge in motion along an indefinite rectilinear current and along the axis of a circular loop.
2.2.3. Magnetic force between two parallel conductors. Definition of ampere and coulomb.
2.2.4. Ampère's law.
2.2.5. Magnetic field created by a coil.
2.3. Magnetic properties of matter.

Related activities:

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

TOPIC 3: ELECTROMAGNETIC INDUCTION

Learning time: 18h

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

Description:

3.1. Magnetic flux.
3.2. Induced electromotive force and the Faraday-Lenz law.
3.3. Motional electromotive force.
3.4. Current sources.
3.5. Eddy current.
3.6. Self-induction and mutual induction.
3.7. Magnetic energy.
3.8. Energy density of the electromagnetic field.

Related activities:

Theory and problem classes.
Problem-solving classes.
Practical laboratory sessions in which knowledge of the topic is applied.

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TOPIC 4: ELECTROMAGNETIC WAVES	Learning time: 18h Theory classes: 4h Practical classes: 2h Self study : 12h

Description:
4.1. Generalisation of Ampère's law. Displacement current.
4.2. Maxwell's equations in a vacuum.
4.3. Electromagnetic waves in a vacuum. Propagation speed.
4.4. Polarisation
4.5. Energy of an electromagnetic wave.
4.6. Electromagnetic spectrum.

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

Planning of activities

LABORATORY	Hours: 15h Laboratory classes: 15h

Qualification system

- Examinations: 75%
- 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. Recovery will be carried out included in the final exam or in a specific recovery exam in class hours.
- Reevaluation for failed students who have obtained at least 3.5 on the final grade of the examinations. The maximum grade that can be obtained by reevaluation is 5.

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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