Last update: 12-04-2019

340027 - FIS2-N2O21 - Physics II

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

Teaching unit: 748 - FIS - Department of Physics

Academic year: 2019

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

ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: JAVIER NAVARRO BOSQUE

Others: MANUEL MORENO LUPIAÑEZ - ARCADI PEJUAN ALCOBE - XAVIER NAVARRO BOSQUE

Degree competences to which the subject contributes

Specific:

1. 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.
2. D11. Knowledge of beginning of electric and electronic systems and its application to resolve engineering problems.

Transversal:

3. EFFECTIVE USE OF INFORMATI0N 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. 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.
5. 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.
6. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

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.).
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Learning objectives of the subject

-Understand the basic principles of electromagnetism.
-To acquire the ability to analyze electrical and magnetic fields and learn to solve simple electrical circuits.
-Recognize the different electrical and magnetic behaviors of matter.
-To know and know how to use the fundamental concepts of waves and, in particular, the electromagnetic ones, as well as the associated phenomena.
-To learn to use measuring devices.
-Determine the experimental errors.
-Perform simple experiments, analyze their results and justify them.
-Use the computer as a tool for calculating and simulating physical processes

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. Electric field and electric potential

Learning time: 33h

Theory classes: 6h
Practical classes: 8h
Self study : 19h

Description:
Electric charge. Coulomb law. Field intensity. Electric field for discrete charge distributions
Electric field flow. Gauss's theorem. Electric field for continuous charge distributions.
Electric potential energy. Electric potential. Electric potential for continuous charge distributions. Energy of a load distribution

C2. Conductors and dielectrics. Capacity and capacitors. Electric current

Learning time: 36h

Theory classes: 6h
Practical classes: 8h
Laboratory classes: 2h
Self study : 20h

Description:
Conductors and dielectrics. Field and potential of a conductor in electrostatic equilibrium; electrostatic influence; effects and applications.
Capacity of an isolated conductor. Capacitors; capacity of a capacitor. Energy of a capacitor. Capacitor association.
The electric current; current intensity. Ohm's law. Electric resistance; Resistance association. Generators; electromotive force. Motor, f.c.e.m. Ohm's Law for a circuit. Kirchhoff's laws. RC circuit.

C3. Magnetism. Electromagnetic induction

Learning time: 40h

Theory classes: 6h
Practical classes: 8h
Laboratory classes: 2h
Self study : 24h

Description:
Magnetic induction. Lorentz force. Flow of the magnetic field. Electric charges moving in a magnetic field; applications.
Magnetic induction generated by a current element; Law of Biot and Savart. Ampère's theorem. Magnetic field due to current distributions.
Magnetic Force on a Current-Carrying Conductor. Action of the magnetic field on a loop; magnetic moment. Force between parallel conductors; definition of Ampere.

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C4. Electromagnetic waves - Optics	Learning time: 30h 30m Theory classes: 6h Practical classes: 4h 30m Laboratory classes: 2h Self study : 18h

Description:
Electromagnetic waves: structure and propagation. Energy of electromagnetic waves; intensity; radiation pressure. The electromagnetic spectrum.
The light. Fundamentals of geometric optics: reflection and refraction. Polarization. Wave optics: interference, diffraction. Doppler effect. Applications: mirrors and lenses, optical instruments, separation power.

C5. Written tests. Simulation	Learning time: 10h 30m Laboratory classes: 1h 30m Guided activities: 6h Self study : 3h

Description:
Verification of the level of achievement of the knowledge and skills acquired until the completion of the test.

Qualification system

The mark will be the higher of both following results:

15%AC + 15%PL + 35%EP + 35%EF
15%AC + 15%PL + 70%EF

where the maximum value of every partial mark (AC, PL, EP i EF) is 10. The partial marks are:
AC = mark for activities (problem solving, simulations, etc.) carried out along the course (**)
PL = mark for laboratory activities (**)
EP = mark for a first partial exam approximately at the middle of the semester.
EF = mark for a final exam.
Only this exam (EF) will be a re-evaluable test, with the established weighing of 70%. The students who can do the re-evaluation are those established by the general regulations of the School.

(**) These qualifications may be VALIDED for a series of test questions (usually no more than three) that will be made to the final exam and in an extraordinary way that of re-evaluation in sections that can be independent of the exam or form part of it. Once the qualification (AC and PL) has been obtained, it will be affected by a factor that will be proportional to the qualification of the validation questions of each of the parties. The type of proportionality and validation will be established by the teachers each year.

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Regulations for carrying out activities

Each of the two tests, EP and EF, will consist of two parts: a theory test and/or very simple problems (which can be up to a maximum of 30% of the note) and a certain number of exercises (up to complete 100%). For the completion of the exercises, a list of formulas, and possibly other material that, as the case may be, responsible teachers will be established and announced sufficiently in advance. Only the final exam will be re-evaluable, with the established weighting of 70%. In laboratory practices, the previous questionnaire will be scored, as appropriate, together with the results of the laboratory practice. All the practices will have the same weight within the 1.5 points corresponding to the laboratory note. During the course, problems will be proposed to solve individually (or in group) in the same session in or out of the classroom and/or other activities. The total of these activities represents 15% of the final grade of the course.

Bibliography

Basic:

Tipler, Paul Allen; Mosca, Gene. Física para la ciencia y la tecnología, Vol 2. 6a ed. Barcelona [etc.]: Reverté, 2010. ISBN 8429144102.

Sears, Francis W... [et al.]. Física universitaria con Física Moderna, Vol. 2. 13a ed. México [etc.]: Pearson Educación, 2014. ISBN 9786074422887, 9786074423044.

Complementary:

Alarcón Jordán, Marta [et al.]. Física: problemes resolts. Vol. 2, Electricitat i magnetisme. 3a ed. Barcelona: Edicions UPC, 2000. ISBN 8483014157.

Rodríguez, Raül; Casas, M. Carmen; Navarro, Xavier; Soler, Joan. Electricitat, magnetisme i ones : tests d'avaluació [on line]. Barcelona: Edicions UPC, 2001 [Consultation: 01/11/2012]. Available on: <http://hdl.handle.net/2099.3/36430>. ISBN 8483014882.

Alarcón Jordán, Marta [et al.]. Física problemes resolts. Vol. 3, Ones, física quàntica i electrònica. Barcelona: Edicions UPC, 1997. ISBN 8483010194.

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

Bloomfield, Louis A. How things work : the physics of everyday life. 6th ed. Hoboken, N.J: John Wiley & Sons, 2016. ISBN 9781119188568.

Others resources:

Hyperlink

Curso Interactivo de física en internet http:/www.sc.ehu.es/sbweb/fisica

Simulacions de física per ordinador d'accés lliure