Guia docent
240722 - 240722 - Física II

Última modificació: 17/07/2020

Unitat responsable: Escola Tècnica Superior d'Enginyeria Industrial de Barcelona
Unitat que imparteix: 748 - FIS - Departament de Física.

Titulació: GRAU EN TECNOLOGIES INDUSTRIALS I ANÀLISI ECONÒMICA (Pla 2018). (Assignatura obligatòria).

Curs: 2020 **Crèdits ECTS:** 6.0 **Idiomes:** Anglès

PROFESSORAT

Professorat responsable: Sempau, Josep

Altres: Koubychine Merkulov, Youri Alexandrovich

METODOLOGIES DOCENTS

The teaching methodology is based on four elements: (i) theory sessions, aimed at increasing the student's knowledge of the topics presented; (ii) practice sessions, devoted to provide students with problem-solving skills; (iii) laboratory sessions, oriented towards experimental and data-analysis abilities; and (iv) self-study, which involves studying without direct supervision in the classroom. This structure is intended to supply half of the knowledge, skills and competences expected from a freshman's physics course for engineers -the first half being covered in the "Physics 1" course.

During the theory sessions the fundamental concepts, together with some illustrative examples and relevant applications, will be presented. These sessions are expected to cover 20% of the total learning time.

Practice sessions will be used to learn solving numerical problems and exercises, encouraging students to actively participate with an inquiring attitude. This part is expected to cover 15% of the total learning time.

In the laboratory students will have the opportunity to gain hands-on experience about the application of the scientific method to solve practical problems. They will use experimental and data analysis techniques to take measurements, analyze the data generated and draw conclusions. The experimental work will take, including the preparatory steps in the classroom, 5% of the total learning time.

Finally, during self-study time students will be strongly encouraged to use some of these techniques: (i) read additional material suggested by the teacher, since reading from different authors with different viewpoints is a highly effective way to increase understanding of new concepts; (ii) work through practice questions to reinforce skills that are learned at the classroom; (iii) watch educational videos suggested by the teacher, or those found by students themselves, since this is a powerful way to keep students actively engaged in a concept; and (iv) discuss with your classmates about theoretical and practical aspects of the presented material.

Addendum:

As a result of the public health emergency declared for the COVID-19 epidemic of 2020, the methodology will be adapted to the new situation. This includes, but may not be limited to, teaching remotely using virtual meeting software platforms, cancellation of face-to-face experimental laboratory sessions, increase in the number of asynchronous assignments to be submitted by students (both individually and in small groups), etc.

These changes will be in place only during the spring semester of 2020.

OBJECTIUS D'APRENENTATGE DE L'ASSIGNATURA

The main objective of this course is to provide basic knowledge, skills and competences in the fields of electromagnetism and wave motion so that students are capable of using their principles and methods in a variety of applications in engineering.

HORES TOTALS DE DEDICACIÓ DE L'ESTUDIANTAT

Tipus	Hores	Percentatge
Hores aprenentatge autònom	90,0	60.00
Hores grup petit	8,0	5.33
Hores grup gran	52,0	34.67

Dedicació total: 150 h

CONTINGUTS

1. Wave motion

Descripció:
Simple harmonic motion
Wave phenomena
Wave equation
Plane waves
Energy of a wave
The principle of superposition
Interference
Standing waves

Dedicació: 19h
Grup gran/Teoria: 4h
Grup mitjà/Pràctiques: 3h
Aprenentatge autònom: 12h

2. Electric interaction

Descripció:
Electric charges
Coulomb's law
Electric field & lines
Gauss' law
Electric potential
Work and electric potential energy
Electric dipoles

Dedicació: 19h
Grup gran/Teoria: 4h
Grup mitjà/Pràctiques: 3h
Aprenentatge autònom: 12h

3. Capacitance

Descripció:
Conductors and capacitance
Capacitors and their association
Energy and energy density
Polarization & electric susceptibility
Capacitors with dielectrics

Dedicació: 19h
Grup gran/Teoria: 4h
Grup mitjà/Pràctiques: 3h
Aprenentatge autònom: 12h

4. Current & direct-current circuits

Descripció:
Electric current, current density & continuity eq.
Electric resistance & Ohm's law
Conductors and insulators
Resistors and their association
Energy dissipation: Joule's law
Electromotive force & internal resistance
Kirchhoff's laws
RC circuits

Dedicació: 23h
Grup gran/Teoria: 4h
Grup mitjà/Pràctiques: 3h
Grup petit/Laboratori: 4h
Aprenentatge autònom: 12h

5. Magnetic interaction

Descripció:
Magnetic field and lines
Force on a moving charge. Trajectories
Hall effect
Magnetic force on current-carrying wires
Magnetic dipole moment. Force, torque and energy
The Hall effect
Biot-Savart & Ampere's laws
Magnetism in matter: magnetic susceptibility and permeability
Diamagnetism, paramagnetism and ferromagnetism

Dedicació: 19h
Grup gran/Teoria: 4h
Grup mitjà/Pràctiques: 3h
Aprenentatge autònom: 12h

6. Electromagnetic induction

Descripció:
Faraday's & Lenz's laws
Eddy (a.k.a. Foucault) currents
Electric generators
Mutual inductance, self-inductance & inductors
Magnetic energy and density
RL circuits
RLC circuits

Dedicació: 23h
Grup gran/Teoria: 4h
Grup mitjà/Pràctiques: 3h
Grup petit/Laboratori: 4h
Aprenentatge autònom: 12h

7. Alternating-current circuits

Descripció:
AC sources
RLC circuit with AC
Reactance, impedance and phase difference
Phasors and complex notation
Power in AC circuits
Resonance
Transformers

Dedicació: 19h
Grup gran/Teoria: 4h
Grup mitjà/Pràctiques: 3h
Aprenentatge autònom: 12h

8. Maxwell eqs & EM waves

Descripció:
Displacement current
Maxwell eqs
EM wave eq
Speed of light and EM spectrum
Energy flux and Poynting vector

Dedicació: 9h
Grup gran/Teoria: 2h
Grup mitjà/Pràctiques: 1h
Aprenentatge autònom: 6h

SISTEMA DE QUALIFICACIÓ

The overall course grade is calculated as:

Grade = max(Grade_A,Grade_B)

with

Grade_A = 0.30 Probs + 0.30 Test + 0.20 Lab + 0.20 Midterm
Grade_B = 0.40 Probs + 0.40 Test + 0.20 Lab

where,
Grade: Final grade of the course.
Probs: Mark obtained in the problems exam.
Test : Mark obtained in the test exam.
Lab: Average mark of the laboratory reports delivered at the end of each lab session.
Midterm: Mark obtained in the midterm exam.

Students that fail the course will be given the opportunity to take a second-chance exam ("re-evaluation"). The final grade will then be:

Grade = 0.8 Exam2 + 0.2 Lab

where
Exam2: Mark obtained in the second-chance exam.

Note that the laboratory sessions will not be repeated and, therefore, the corresponding mark in the previous formula is the same value used for the first evaluation.

Addendum:

As a result of the public health emergency declared for the COVID-19 epidemic of 2020, the assessment method will be adapted to the new situation. This implies that: (i) Exams will be held remotely using the technical resources provided by the UPC such as, e.g., the virtual campus; and (ii) lab sessions will be replaced by asynchronous exercises to be performed in groups and submitted for grading. The weight on the final mark of the corresponding marks obtained in point (ii) remains the same as that used for the lab sessions in the formulas above.

This change will be in place only during the spring semester of 2020.

BIBLIOGRAFIA

Bàsica:
- Ling, Samuel J; Sanny, Jeff; Moebs, Bill. University physics. Houston, Texas: Rice University, [2017]. ISBN 9781680920437.

Complementària:
- Halliday, David; Resnick, Robert; Walker, Jearl. Fundamentals of physics [Recurs electrònic] [en línia]. 10th ed. Hoboken, NJ: John Wiley & Sons, cop. 2013 [Consulta: 12/09/2018]. Disponible a: http://site.ebrary.com/lib/upcatalunya/detail.action?docID=10912884. ISBN 9781118473818.
- Alonso, Marcelo; Finn, Edward J. Fundamental university physics. 2nd ed. Reading, MA [etc.]: Addison-Wesley, 1980-. ISBN 0201001624.