

230466 - PEF1 - Projects of Engineering Physics 1

Coordinating unit:	230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit:	710 - EEL - Department of Electronic Engineering 748 - FIS - Department of Physics 739 - TSC - Department of Signal Theory and Communications
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Teaching unit Compulsory)
ECTS credits:	6
Teaching languages:	Catalan, Spanish

Teaching staff

Coordinator:	VICENTE JIMENEZ SERRES
Others:	JOSEP ALTET SANAHUJES - CRINA MARIA COJOCARU - JOSE FRANCISCO TRULL SILVESTRE - MARÍA CONCEPCIÓN SANTOS BLANCO

Degree competences to which the subject contributes

Specific:

2. Knowledge of experimental data analysis techniques. Knowledge of statistical methods for experimental data treatment. Ability to process, analyze and graphically present experimental data.
1. Knowledge of experimental techniques and procedures in the field of physics, engineering and nanotechnology. Ability to design experiments using the scientific method and criteria of efficiency, rationality and cost.

General:

6. ABILITY TO IDENTIFY, FORMULATE, AND SOLVE PHYSICAL ENGINEERING PROBLEMS. Planning and solving physical engineering problems with initiative, making decisions and with creativity. Developing methods of analysis and problem solving in a systematic and creative way.
7. ABILITY TO CONCEIVE, DESIGN, IMPLEMENT, AND OPERATE COMPLEX PHYSICAL ENGINEERING SYSTEMS. Ability to conceive, design, implement, and operate complex systems in the fields of micro and nano technology, electronics, advanced materials, photonics, biotechnology, and space and nuclear sciences.
3. They will have acquired knowledge related to experiments and laboratory instruments and will be competent in a laboratory environment in the ICC field. They will know how to use the instruments and tools of telecommunications and electronic engineering and how to interpret manuals and specifications. They will be able to evaluate the errors and limitations associated with simulation measures and results.

Transversal:

1. ENTREPRENEURSHIP AND INNOVATION - Level 2. Taking initiatives that give rise to opportunities and to new products and solutions, doing so with a vision of process implementation and market understanding, and involving others in projects that have to be carried out.
4. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
5. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

230466 - PEF1 - Projects of Engineering Physics 1

Teaching methodology

Lectures.
Individual work.
Team assignments (at home).
Laboratory sessions.

Learning objectives of the subject

Understand the problems associated with measurements and security in a lab environment.
Learn to analyze, measure and design basic analog circuits.
Be able to plan and develop a low complexity electronics project.
Understand light phenomena in geometric and wave optics.
Understand and analyze phenomena related to polarization, interference and diffraction.
Be able to build and analyze simple optics systems.

Study load

Total learning time: 150h	Hours large group:	26h	17.33%
	Hours small group:	39h	26.00%
	Self study:	85h	56.67%

230466 - PEF1 - Projects of Engineering Physics 1

Content

<p>1. Introduction to laboratory</p>	<p>Learning time: 1h 30m Theory classes: 1h Self study : 0h 30m</p>
<p>Description: Lab organization. Schedule. General lab rules. Final project description.</p>	
<p>2. Security, errors and data processing</p>	<p>Learning time: 9h Theory classes: 5h Self study : 4h</p>
<p>Description: Electrical security. Connections and grounding. Errors. Basic data processing.</p>	
<p>3. Optical theory</p>	<p>Learning time: 18h 30m Theory classes: 10h Self study : 8h 30m</p>
<p>Description: 1. Light: Introduction, light sources and electromagnetic waves. 2. Geometric optics: Basic concepts, devices and aberrations. 3. Wave optics: Interference, diffraction and polarization.</p>	
<p>4. Basic start-up notions</p>	<p>Learning time: 8h 30m Theory classes: 6h Self study : 2h 30m</p>

230466 - PEF1 - Projects of Engineering Physics 1

<p>5. Electronics lab sessions</p>	<p>Learning time: 48h 30m Laboratory classes: 18h Self study : 30h 30m</p>
<p>Description: A1: Static measurements. A2: Dynamic measurements. A3: Amplifiers. A4: Sensors. D1: Introduction to MCUs D2: Serial port. D3: Analog signals. D4: Interrupts. D5: Stepper motor control.</p>	
<p>6. Optic lab sessions</p>	<p>Learning time: 32h 30m Laboratory classes: 12h Self study : 20h 30m</p>
<p>Description: 1: Refraction index measurement. 2 & 3: Light polarization. 4: Optical systems and image formation. 5: Interference and optical diffraction. 6: Interference and microwave diffraction.</p>	
<p>7. Development of an electronics project</p>	<p>Learning time: 31h 30m Guided activities: 14h Self study : 17h 30m</p>
<p>Description: Development of an electronic project following a sequence of phases: - Project proposal and schedule. - Project development. - Project assessment and presentation. The project can be selected from a pool of options or can be a new proposal. In any event the professors will check that its complexity is adequate.</p>	

230466 - PEF1 - Projects of Engineering Physics 1

Qualification system

The final assessment will be a weighted mean between Optics (35%) and Electronics (65%).

Electronics assessment:

- Laboratory (60%)
 - Calculations prior to class (10%)
 - Lab work (20%)
 - Final report (30%)
- Project (40%)
 - Complexity (10%)
 - Project plan (10%)
 - Final report (20%)

Optics lab assessment:

- Calculations prior to class (20%)
- Lab work (20%)
- Final report (60%)

Bibliography

Basic:

Hecht, E. Optics. 4th ed. San Francisco: Addison-Wesley, 2002. ISBN 0321188780.

Wolf, S.; Smith, R.F.M. Student reference manual for electronic instrumentation laboratories. 2nd ed. Upper Saddle River: Pearson Education, 2004. ISBN 0130421820.

Complementary:

Margolis, M. Arduino cookbook [on line]. 2nd ed. Farnham: O'Reilly, 2011 [Consultation: 09/02/2018]. Available on: <<http://site.ebrary.com/lib/upcatalunya/detail.action?docID=10759048>>. ISBN 9781449313876.