230477 - PEF2 - Projects of Engineering Physics 2

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 739 - TSC - Department of Signal Theory and Communications
748 - FIS - Department of Physics
710 - EEL - Department of Electronic Engineering
713 - EQ - Department of Chemical Engineering

Academic year: 2018
Degree: BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: PERE BRUNA ESCUER

Opening hours
Timetable: To be arranged.

Degree competences to which the subject contributes

Specific:
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.

Generical:
5. 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.
6. 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:
4. 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.
2. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
5. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its
After the course Physical Engineering Projects 2, the student should be able to:
- Work with various professional laboratory equipment.
- Know the basics of experimental data treatment and extract reasoned conclusions based on these data.
- Consider experimental problems, design experiments appropriate for their resolution and analyze the results thereof.
- Teamwork.

Teaching methodology

There will be six practical sessions in research laboratories (to choose between several options). To perform these laboratory experiments, that will be carried out in small groups, the students will have a working script with all the necessary information prior to the correct understanding and implementation of the practice.

Also in small groups, each one will carry out a different project (to choose from the list) during six weeks in which it should work independently.

Learning objectives of the subject

After the course Physical Engineering Projects 2, the student should be able to:
- Work with various professional laboratory equipment.
- Know the basics of experimental data treatment and extract reasoned conclusions based on these data.
- Consider experimental problems, design experiments appropriate for their resolution and analyze the results thereof.
- Teamwork.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group:</th>
<th>13h</th>
<th>8.67%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>30h</td>
<td>20.00%</td>
</tr>
</tbody>
</table>
|                          | Guided activities:| 6h  | 4.00% |%
|                          | Self study:       | 101h| 67.33%|
## Content

<table>
<thead>
<tr>
<th>0. Physical Engineering Projects</th>
<th>Learning time: 10h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
</tr>
</tbody>
</table>

**Description:**
Course presentation, working groups formation and group distribution between the several experiments in laboratories.

<table>
<thead>
<tr>
<th>1. Thermodynamical, cristallographic and dielectric characterization of amorphous materials</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study : 6h</td>
</tr>
</tbody>
</table>

**Description:**
Location: GCM laboratory in Barcelona (ETSEIB)  
Person in charge: Maria del Barrio

<table>
<thead>
<tr>
<th>2. Mechanical and surface characterization of materials</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study : 6h</td>
</tr>
</tbody>
</table>

**Description:**
Location: GCM laboratory in Castelldefels (EETAC)  
Person in charge: Pere Bruna

<table>
<thead>
<tr>
<th>3A. Infrared Spectroscopy</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study : 6h</td>
</tr>
</tbody>
</table>

**Description:**
Location: CRnE in Campus Sud  
Person in charge: Jordi Llorca
<table>
<thead>
<tr>
<th>Project Title</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Laboratory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

### 3B. X-Ray Photoelectron Spectroscopy

**Description:**
- Location: CRnE in Campus Sud
- Person in charge: Jordi Llorca

### 4. Organic Thin-Film Transistors (TFT)

**Description:**
- Location: CRnE in Campus Nord
- Person in charge: Joaquim Puigdollers

### 5A. Coffee can radar

**Description:**
- Location: RSLab laboratory in Campus Nord
- Persons in charge: Albert Aguasca and Jordi Romeu

### 5B. Radiometry and radiotelescopes

**Description:**
- Location: RSLab laboratory in Campus Nord
- Persons in charge: Albert Aguasca and Jordi Romeu
### 6. High and super-high Resolution Fluorescence Microscopy

**Description:**
- Location: ICFO in Castelldefels
- Persons in charge: David Artigas and Pablo Loza

**Learning time:** 12h
- Laboratory classes: 6h
- Self study: 6h

### 7A. Photonics in fiber telecommunications

**Description:**
- Location: GCO laboratory in Campus Nord
- Person in charge: José Antonio Lázaro

**Learning time:** 12h
- Laboratory classes: 6h
- Self study: 6h

### 7B. From quantized energy levels to a telecommunications revolution

**Description:**
- Location: GCO laboratory in Campus Nord
- Person in charge: José Antonio Lázaro

**Learning time:** 18h
- Theory classes: 6h
- Laboratory classes: 6h
- Self study: 6h

### 8A. Laser Range Finder

**Description:**
- Location: DONLL laboratory in Terrassa Campus.
- Persons in charge: Crina Cojocaru and José Trull

**Learning time:** 12h
- Laboratory classes: 6h
- Self study: 6h
The six laboratory experiments have a weight of 50% on the final mark while the project will have the remaining 50%.

The final score \( N \) will be obtained from each of the 6 laboratory experiments \( \text{Pr}_n \) where \( n=1,2,\ldots,6 \) and from the Physical Engineering Project (PEF) according to the following expression:

\[
N = 0.5 \times (\text{Pr}_1 + \text{Pr}_2 + \text{Pr}_3 + \text{Pr}_4 + \text{Pr}_5 + \text{Pr}_6)/6 + 0.5 \times \text{PEF}
\]
Bibliography

**Basic:**


**Complementary:**