Course guide
230484 - NTECH - Nanotechnology

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.
713 - EQ - Department of Chemical Engineering.

Degree: BACHELOR’S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Optional subject).

Academic year: 2022 ECTS Credits: 6.0 Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: Consultar aquí / See here:
https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/responsables-assignatura

Others: Consultar aquí / See here:
https://telecos.upc.edu/ca/estudis/curs-actual/professorat-responsables-coordinadors/professorat-assignat-idioma

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

General:
3. 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.

Transversal:
1. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

Lectures are provided by the course professors, who presents the essential course contents to the students. Not all course contents will be taught in the lecture sessions, so autonomous study is required.

LEARNING OBJECTIVES OF THE SUBJECT

Introduction to Principles, Fabrication Methods, and Applications of Nanotechnology
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Self study</td>
<td>85.0</td>
<td>56.67</td>
</tr>
<tr>
<td>Hours large group</td>
<td>65.0</td>
<td>43.33</td>
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</tbody>
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Total learning time: 150 h

CONTENTS

1 Nanomaterials

Description:
- Nanomaterials
  - 1.1. Introducció
  - 1.2. Preparation Techniques
    - 1.2.1. Gas phase
    - 1.2.2. Liquid phase
    - 1.2.3. Microfluidics
    - 1.2.4. Carbon Nanotubes

Full-or-part-time: 11h 40m
Theory classes: 3h 05m
Practical classes: 1h 55m
Self study: 6h 40m

2 Characterization Techniques

Description:
- 2.1. UV-Vis and Fluorescence Spectroscopy
- 2.2. X-Ray Diffraction
- 2.3. Transmission Electron Microscopy
- 2.4. AFM/STM
- 2.5. X-Ray Photoelectron Spectroscopy

Full-or-part-time: 11h 40m
Theory classes: 3h 05m
Practical classes: 1h 55m
Self study: 6h 40m

3. Reactivity of surfaces

Description:
- 3. Reactivity
  - 3.1. Catalysis
  - 3.2. Photonic properties

Full-or-part-time: 23h 20m
Theory classes: 6h 10m
Practical classes: 3h 50m
Self study: 13h 20m
4 Fabrication and preparation

Description:
- Top-down and bottom-up.
- Lithographies: Optical (UV, DUV), e-beam litho, AFM based litho, Nanoimprint.
- Growth of films.

Full-or-part-time: 17h 30m
Theory classes: 4h 35m
Practical classes: 2h 55m
Self study: 10h

5 Molecular devices

Description:
1. Why electrons flow
2. Solar cells
3. Thin-Film Transistors (TFTs)
4. Quantum Dot conductivity

Full-or-part-time: 29h 10m
Theory classes: 7h 40m
Practical classes: 4h 50m
Self study: 16h 40m

GRADING SYSTEM

Written exam
Partial exam (EP) (50%) + Final Exam (EF) (50%) + Presentation of the report (PT) (10%)
In case you need to recover the partial exam, the grade will be Max (+0.5 0.4EF EP; 0.9EF) +0.1 Report (PT)

BIBLIOGRAPHY

Basic: