Course guide
230477 - PEF2 - Projects of Engineering Physics 2

Last modified: 24/05/2024

Unit in charge: 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.

Degree: BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: PERE BRUNA ESCUER

Others: Segon quadrimestre:
ALBERTO AGUASCA SOLE - 13, 15
DOMINGO BIEL SOLE - 14, 17, 23
PERE BRUNA ESCUER - 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23
CRINA MARIA COJOCARU - 14, 16, 19
MARIA DEL BARRIO CASADO - 11, 15, 16, 18, 19, 22
RICARDO GONZALEZ CINCA - 11, 12, 15, 16, 18, 21
NÚRIA JIMÉNEZ DIVINS - 17, 18, 21
JOSE ANTONIO LAZARO VILLA - 13, 14, 15, 17, 22, 23
JORDI LLORCA PIQUE - 11, 13, 22
MIREIA MAS I MÉNDEZ - 11, 13, 19, 21, 23
ROSANNA PEREZ PUEYO - 13, 14, 15, 17, 18
JUAN PEREZ TORRES - 11, 12, 14, 16, 21, 22
TRINITAT PRADELL CARA - 12, 16, 17, 19, 21, 23
JOAQUIN PUIGDOLLERS GONZALEZ - 12, 14, 18, 19, 22, 23
VÍCTOR REPECHO DEL CORRAL - 16, 19, 22
JOSE FRANCISCO TRULL SILVESTRE - 11, 12, 13

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.
2. Knowledge of experimental data analysis techniques. Knowledge of statistical methods for experimental data treatment. Ability to process, analyze and graphically present experimental data.

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:
1. ENTREPRENEURSHIP AND INNOVATION - Level 3. Using knowledge and strategic skills to set up and manage projects. Applying systemic solutions to complex problems. Devising and managing innovation in organizations.
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 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

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.
- Kknow 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

Type	Hours	Percentage
Hours large group	13,0	8.67
Hours small group	30,0	20.00
Guided activities	6,0	4.00
Self study	101,0	67.33

Total learning time: 150 h

CONTENTS

0. Physical Engineering Projects

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

Full-or-part-time: 10h
Theory classes: 10h

1. Thermodynamical, cristalographic and dielectric characterization of amorphous materials

Description:
Location: GCM laboratory in EEBE
Person in charge: Maria del Barrio

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

2. Optical and surface characterization of materials

Description:
Location: GCM laboratory in EEBE
Person in charge: Trinitat Pradell

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

3. Infrared Spectroscopy

Description:
Location: Barcelona Research Centre in Multiscale Science and Engineering (EEBE)
Person in charge: Jordi Llorca

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

4. Organic Thin-Film Transistors (TFT)

Description:
Location: Laboratory of the micro and nano-Technologies group (Campus Nord)
Person in charge: Joaquim Puigdollers

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

5. Maxwell at Work. The Doppler Radar

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

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

6. My first graphene transistor

Description:
Location: ICFO (Castelldefels)
Persons in charge: David Artigas

Full-or-part-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 and Joan Gené

Full-or-part-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 and Joan Gené

Full-or-part-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 Jose Trull

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

10. Line tracker robot

Description:
Location Laboratori IOC (ETSEIB)
Person in charge: Domingo Biel, Arnau Dòria, Josep Maria Olm i Víctor Repecho

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

8B. Nd:Y AG-Laser

Description:
Location: DONLL laboratory in Terrassa Campus.
Persons in charge: Crina Cojocaru and Jose Trull

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

9. Fluid physics in microgravity

Description:
Location: Laboratori de microgravetat a Castelldefels (EETAC)
Person in charge: Ricard González

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

11. Mössbauer spectroscopy of disordered materials.

Description:
Location: Laboratory of particle acceleration (EEBE)
Person in charge: Pere Bruna

Full-or-part-time: 12h
Laboratory classes: 6h
Self study : 6h

12. Projects

Description:
The students can choose between several projects that change from academic year to academic year and they can propose own projects if they are choherent with the subject aims. Some project may be developed in collaboration with the ICFO with the assistance of students at the Research Center

Some of the most done projects in the past years (in parenthesis the person in charge):

a) Design and aerodinamics measures of objects (Jordi Gutierrez)
b) Electronic plastics. Fabrication of organic devices (Joaquim Puigdollers)
c) Design, constructions and application of an Erbium-fiber laser for the study of carcinogenic cells (José Antonio Lázaro)
d) Extragalactic nova explosions (Glòria Sala)
e) Design, simulation and measures of a microwave circuit (Maria Concepción Santos)

You can find all the past projects in the web:
https://enginyeriafisica.etsetb.upc.edu/ca/estudis/pla-estudis/pef2

Full-or-part-time: 68h
Guided activities: 6h
Self study : 62h

GRADING SYSTEM

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 (Prn where n=1,2,...,6) and from the Physical Engineering Project (PEF) according to the following expression:
N=0.5*(Pr1+Pr2+Pr3+Pr4+Pr5+Pr6)/6+0.5*PEF

None of these activities is reevaluable.

BIBLIOGRAPHY

Basic:
- Kirkup, L. Experimental methods : an introduction to the analysis and presentation of data. Brisbane: Wiley, 1994. ISBN 0471335797.

Complementary:
- Isaacson, E. St. Q. Dimensional methods in engineering and physics. Edward Arnold, 1975. ISBN 047042866X.