GENERAL CHARACTERISTICS*

Type: ☐Basic formation, ☑Compulsory, ☐Optional

☐Master Thesis, ☐External practices

Duration: Semester **Semester / s**: 2
Number of ECTS credits: 4
Languages: English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION

The behavior of the materials at nanometric scale may be different than at a macroscopic scale. The main models and theories that explain nanometric phenomena are presented, with special emphasis on the difference of properties as a function of the mass of the material.

Likewise, numerous applications, new materials and highly tup-to-date systems are shown, whose functionality is explained by the presented models. These chemical systems are the result of constant evolution and new requirements of society and industry.

COMPETENCES

- E14 - Have knowledge of the most relevant techniques of preparation and processing of nanomaterials, as well as the techniques of characterization and management of advanced experimental equipment related to nanotechnology, to develop new products and devices.
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- E15 – Ability to understand the different behavior of nanometric structures with respect to conventional situations based on the models presented
- CG2 - The ability to perform a responsible practice of the profession.
- T1 - Ability to communicate in English and to use English as a working language.
- T3 -Ability to assess the impact of the use of materials on the sustainable development of society

PREREQUISITES*

The corresponding to access master studies

CONTENTS

1. The energy at the nanoscale.
2. Properties nano vs. micro or continuous medium.
3. Nanometric structures: top-down and bottom-up strategies.
4. Nanometric characterization: microscopy and other techniques.
5. Nanomaterials and their applications: carbon-based (clusters, wires, nanotubes, fullerene and graphene), nanoparticles, nanostructured continuous materials, organic compounds and polymers, nanocomposites and others.
6. Nanotechnology: nanometric devices, nanomachines, nanofabrication and nanobiological applications.

METHODOLOGY

LEARNING ACTIVITIES *

Learning Activities	ECTS credits	Competences
Lectures	0,93	E14, E15, T1, T3, CG2
Seminars	0,07	E14, E15, T1, T3, CG2
Case and Problem-Solving Sessions	0,11	E14, E15, T1, T3, CG2
Personal study	2,67	E14, E15, T1, T3, CG2
Presentations	0,11	E14, E15, T1, T3, CG2
Assessment Tasks (Exams, Continuous Assessment...)	0,11	E14, E15, T3, CG2
TOTAL	**4**	

TEACHING METHODOLOGY

The teaching methodology used in this course is based on lectures and Case and Problem-Solving Sessions. Seminars are also programmed to solve doubts. The student is provided with the complete course documentation with theory and case documents for personal study.

Problem-Solving Sessions constitute a complement to the lectures and allow the development of the critical capacity and the practice to solve, independently, other problems. In these sessions we propose the accomplishment of projects or problems.

The students themselves prepare group presentations or individually on specific topics, which become part of the study material

ASSESSMENT

ASSESSMENT METHODS *

* These features should not be modified without the approval of the bodies responsible for academic higher-level structures (field, module and / or system).

Assessment methods	Weight	Competences
Final exam	50%	E14, E15, T3
Reports and Presentations	20%	E14, E15, T1
Follow-up activities	25%	E14, E15, T1
Participation	5%	CG2

LEARNING OUTCOMES

- The student must know the most relevant techniques of preparation and processing of nanomaterials, as well as their practical applications. (E14, CG2, T1)
- The student must know a set of techniques for characterizing nanomaterials and the management of advanced experimental equipment. (E14)
- The student will be able to understand the different behavior of nanometric structures compared to conventional situations based on the presented models. (E15)
- The student must demonstrate knowledge of the properties of nanomaterials and nanotechnology in relation to the consequences derived from their misuse (T3)

QUALIFICATION

The evaluation of the course will consider all aspects listed in the evaluation table with its corresponding weight. The main weight of the grade lies in the final examination (50%). The reports and Presentations include classroom presentations and specific monographs that students prepare (20%). Follow-up activities include midterm exams or other deliverables (15%). Participation (5%) includes attitude, attendance and initiative shown by the student in the subject.

ASSESSMENT OF THE COMPETENCES (Define calculation expressions for each competency based assessment activities related.)

The grades of the final exam, the reports and presentations and the follow-up activities will be used as an indicator for the evaluation of the E14 and E15 competences.

The participation grade will be used as an indicator for the evaluation of CG2 competence

The grades of the reports and presentations and the follow-up activities will be used as an indicator for the evaluation of the T1 competence.

The grades of the final exam will be used as an indicator for the evaluation of the T3 competence.

BIBLIOGRAPHY (Recommended and accessible to students.)

- Nanoscale Science and Technology, Eds. R. W. Kelsall, I. W. Hamley, M. Geoghegan, Wiley, 2005, West Sussex (England). ISBN 0-470-85086-8.

DOCUMENT HISTORY

PREVIOUS CHANGES
September 20, 2016, Carles Colominas i Guardia
September 15, 2014, Carles Colominas i Guardia

CURRENT REVISION
6 marzo de 2019, Carles Colominas i Guardia