Course guide
295556 - 295EQ032 - Nanotechnology

Last modified: 09/08/2024

Unit in charge: Barcelona East School of Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering.

Degree: MASTER'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2019). (Compulsory subject).

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

LECTURER

Coordinating lecturer: CARLOS ENRIQUE ALEMAN LLANSO

Others: Primer quadrimestre:
CARLOS ENRIQUE ALEMAN LLANSO - Grup: T1
VICTOR CASTREJON COMAS - Grup: T1
JORDI SANS MILA - Grup: T1

PRIOR SKILLS

Nanotechnology

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEMUEQ-02. To design products, processes, systems and services of the chemical industry, as well as the optimization of others already developed, taking as a technological base the various areas of chemical engineering, including processes and transport phenomena, separation operations and engineering of chemical, nuclear, electrochemical and biochemical reactions
CEMUEQ-04. Ability to solve problems that are unfamiliar, ill-defined, and have opposed specifications, considering the possible solution methods, including the most innovative, selecting the most appropriate, and being able to correct the implementation, evaluating the different design solutions

Generical:
CGMUEQ-10. Adapt to changes, being able to apply new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit

Transversal:
03 TLG. 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.

TEACHING METHODOLOGY

Classes and presentation of works.

LEARNING OBJECTIVES OF THE SUBJECT

Learn basic knowledge related to the use of polymers and biopolymers in nanotechnology. Learn the concepts that relate the structure and properties of nanostructured materials for their technological application and biotechnology

STUDY LOAD

Type	Hours	Percentage
Hours large group	40,5	27.00
Hours small group	13,5	9.00
Self study	96,0	64.00

Total learning time: 150 h

CONTENTS

Introduction

Description:
Nanometric couplings. Specific docking interactions. Simple nanometric structures of molecules: geometric relationships. Hierarchical structure. Nanostructure characterization methods.

Full-or-part-time: 3h
Theory classes: 3h

Polimeric nanoparticles

Description:
Types of nanoparticles, synthesis of nanoparticles, characterization of nanoparticles, applications of nanoparticles.

Full-or-part-time: 11h
Theory classes: 11h

Polymeric nanomembranes

Description:
The materials for the manufacture of ultra-fine membranes. Preparation of ultra-fine membranes. Giant nanomembranes The functionalization of ultra-fine membranes. Applications of ultra-fine membranes in Electronics and Biomedicine.

Specific objectives:

Related activities:
Development and presentation of specific works on topics selected by the teaching staff.

Full-or-part-time: 11h
Theory classes: 11h

Polymeric nanofibers

Description:
Polymeric materials for the manufacture of nanofibres. Preparation of nanofibres. The functionalization of nanofibres. Applications of nanofibres.

Specific objectives:
Acquire basic knowledge and theoretical foundations about polymeric nanofibers.

Full-or-part-time: 11h
Theory classes: 11h

Polymeric nanogels

Description:
Hydrogels and nanogels. Properties and types. Applications of nanogels.

Full-or-part-time: 11h
Theory classes: 11h

Nanocomposites based on nanotubes, nanofibres, nanoparticles and nanosheets

Description:
NTC-polymer nanocomposites. Manufacture, structure and properties of NTC. Optimization of dispersions. Natural and synthetic nanofibres. Dispersal strategies: surface modifications and grafting. Silica and gold nanoparticles. Magnetic nanoparticles. Silicate-polymer nanocomposites. Laminated silicates. Interface effects: nanostructuring. Modification of organic silicate. Methods for preparing nanocomposites. Modification of properties. Laminar-polymer nanocomposite double hydroxides. Graphene nanocomposites.

Full-or-part-time: 11h
Theory classes: 11h

3D printing

Description:
3D printing methods. Bioprinting Applications to nanotechnology.

Full-or-part-time: 5h
Theory classes: 5h

Applications of nanotechnology

Description:
Applications in catalysis, energy, biomedicine, biotechnology and sustainability.

Full-or-part-time: 55h
Theory classes: 55h

GRADING SYSTEM

NC= (NP1+NP2+NP3+NP4+2·E)/6
where NC is the course mark, NP1-NP4 are the notes of the for parts in which the subject is divided and E is the mark of the exam.

EXAMINATION RULES.

Works and presentations drawn up by teams of two-three students depending on the number of students enrolled.
The written exam will be held individually at the end of the semester. It has a minimum of 70% attendance at the classes, in order to be able to reflect the preparation of the different Works assigned to teams.

RESOURCES

Other resources:
Supplied by the teaching staff.