Course guides
295569 - 295EQ241 - Advanced Materials

Last modified: 04/06/2021

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). (Optional subject).

Academic year: 2021 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: Carlos Alemán

Others: Jordi Puiggalí

PRIOR SKILLS

Basic knowledge of materials acquired during undergraduate studies. Having studied the subject "Biotechnological Processes and Polymer Industry"

REQUIREMENTS

Degree in Chemical Engineering or equivalent

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Generical:
CGMUEQ-04. To carry out the appropriate research, undertake the design and manage the development of engineering solutions, in new or little known environments, relating creativity, originality, innovation and technology transfer
CGMUEQ-10. Adapt to changes, being able to apply new and advanced technologies and other relevant developments, with initiative and entrepreneurial spirit

Transversal:
06 URI. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
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

Acquire basic knowledge about advanced materials based on technical polymers. Acquire the theoretical foundations that allow to understand and to design advanced materials. Learn to reason about structure-property relationships. Learn the reasoning schemes that are applied in the fields of research in advanced materials and their industrial use.

STUDY LOAD

Type	Hours	Percentage
Hours large group	28,0	18.67
Self study	102,0	68.00
Guided activities	6,0	4.00
Hours small group	14,0	9.33

Total learning time: 150 h

CONTENTS

Composite and hybrid materials based on polymers

Description:
Advanced polymer composites. Combination of polymer with inorganic materials for Applications related with energy and biomedicine. Mineralization and biomineralization. Polymer-peptide and polymer-protein conjugates. Functionalization of inorganic and metallic particles. The formation of new materials through self-coupling. Energy and the conditions for the self-coupling process. Self-coupled nanostructures. The applications of self-assembled materials: hydrogels and systems drug administration. Hybrid materials for energy storage.

Specific objectives:
Acquire basic knowledge and theoretical foundations about polymer composites and hybrid materials.

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

Full-or-part-time: 12h
Theory classes: 12h

Conducting polymers

Description:
General concepts. Properties of conducting polymers. Electroactivity and electrostability. Application of conducting polymers to biomedicine. Organic supercapacitors. Conducting polymers as anticorrosive additives.

Specific objectives:
Acquire basic knowledge and theoretical foundations about conducting polymers.

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

Full-or-part-time: 12h
Theory classes: 12h

Colloids, surfactants and emulsions

Description:
General concepts. Preparation of colloids and emulsions. Stability of emulsions and dispersions. Applications to energy storage and biomedicine.

Specific objectives:
Acquire basic knowledge and theoretical foundations about colloids, surfactants and emulsions.

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

Full-or-part-time: 9h
Theory classes: 9h

Surfaces

Description:
General concepts. Properties of organic and inorganic surfaces: comparison. Chemical and physical functionalization of surfaces. Superhydrophobicity and superhydrophilicity. Applications to biomedicine and catalysis.

Specific objectives:
Acquire basic knowledge and theoretical foundations about the chemistry of surfaces.

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

Full-or-part-time: 9h
Theory classes: 9h

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.

BIBLIOGRAPHY

Basic:
- Nou llibre.

RESOURCES

Other resources:
Supplied by the teaching staff.