DEGREE CURRICULUM

MATERIALS SCIENCE

Coordination: Jordi Casanovas

Academic year 2015-16

MATERIALS SCIENCE 2015-16

Subject's general information

Subject name	Materials Science
Code	102113
Semester	2n Q Continuous assessment
Typology	Obligatòria
ECTS credits	6
Groups	2 Big Groups , 4 Middle Groups
Theoretical credits	0
Practical credits	0
Coordination	Jordi Casanovas
Office and hour of attention	Jordi Casanovas Thursday 16h-18h / Office 2.14 (EPS) Josep Monné Thursday 17-18h i Dv. 18-19h / Office 2.14 (EPS)
Department	Chemistry
Teaching load distribution between lectures and independent student work	(40%) 60 h lectures (60%) 90 h student work
Modality	Presencial
Important information on data processing	Consult this link for more information.
Language	Català
Degree	Degree in Automation and Industrial Electronic Engineering Degree in Mechanical Engineering
Office and hour of attention	Jordi Casanovas Thursday 16h-18h / Office 2.14 (EPS) Josep Monné Thursday 17-18h i Dv. 18-19h / Office 2.14 (EPS)
E-mail addresses	jcasanovas@quimica.udl.cat jmonne@quimica.udl.cat

MATERIALS SCIENCE 2015-16

Jordi Casanovas Salas (morning groups)
Josep Monne Esquerda (afternoon groups)

Subject's extra information

It is advisable continuous work of students throughout the semester, reading basic references and solving exercises. Visit the Virtual Campus frequently, since there will be uploading useful material: backup of the theoretical presentations, collections of exercises, instructions for the practices ... Take advantage of office hours / tutoring with teachers.

There are not prerequisites for this course.

Learning objectives

see competences

Competences

Degree-specific competences

- Knowledge and use of the principles of the resistance of materials.

  Goals

  - Knowing the mechanical behavior -in particular the mechanical strength- of metals, ceramics and polymers.
  - Knowing how to evaluate the main mechanical properties

- Knowledge of the principles of science, technology and the chemistry of materials. Understanding of the relationship between microstructure, synthesis or processing and properties of materials.

  Goals

  - Knowing the main characteristics of metals (and metal alloys), ceramics, polymers, semiconductors and composite materials
  - Improve the knowledge of their crystal and non-crystalline structures, as well as of their structural defects and atomic diffusion phenomenon.
  - Understand the physical and chemical properties (mechanical, electrical, magnetic, thermal, optical, corrosion) of different types of materials available to an engineer. Learn to evaluate some parametres to characterize the properties.
  - Understanding the relationship between internal structure and material properties

Degree-transversal competences

- Ability to work under pressure and/or in situations where there is a lack of information.

  Goals

  - Learn to find and choose, in a limited time, the necessary information to solve a problem of Materials Science.

- Ability to resolve problems and elaborate and defend arguments inside their field of study

  Goals

  - Learning to think, solve and explain correctly a problem of Materials Science.

Subject contents

4.2.2. Plastic deformation

4.2.3. Hardness

4.3. Mechanical and thermomechanical properties of polymers

4.4. Reinforcement techniques

4.5. Fracture and Fatigue

5. Electrical properties

5.1. Introduction

5.2. Band Theory

5.3. Metallic conductivity

5.4. Semiconductors

5.4.1. Intrinsic semiconductors

5.4.2. Extrinsic

semiconductors

5.5. Conductivity in ceramics, polymers and composites

6. Magnetic properties

6.1. General concepts

6.2. Non-cooperative magnetic behavior: diamagnetism and paramagnetism

6.3. Cooperative magnetic behavior: ferro-, antiferro-and ferrimagnetism

6.4. Influence of temperature

6.5. Magnetic hysteresis cycle

6.6. Magnetically hard and soft materials

6.7. Superconductors

7. Optical and thermal properties

7.1. Thermal properties: heat capacity, thermal expansion, thermal conductivity

7.2. Thermal properties of polymers

7.3. Optical properties

7.4. Applications of optical phenomena: luminescence, photodegradation, laser and fiber optics

8. Corrosion of Materials

8.1. Introduction

8.2. Atmospheric attack: oxidation

8.3. Electrochemical attack

8.3.1. Ion concentration batteries

8.3.2. Galvanic batteries

8.3.3. Gaseous reduction

8.4. Methods to prevent corrosion

Evaluation

Evaluation Activity 1 (AA1). Written exam, Topics 1-4, Final score percentage: 25%

Evaluation Activity 2 (AA2). Written exam, Topics 1-8, Final score percentage: 50%

Laboratory Activities. Final score percentage: 10%

Other Activities. Multiple choice Tests (initially scheduled , at the end of each topic) . Final score percentage: 15%

Recovery evaluation activity. It allows to recover 75% of the Final score (equivalent to AA1+AA2)

Bibliography

Recommended bibliography

- J.C.Anderson, K.D. Leaver, R.D. Rawlings y J.M. Alexander, "*Ciencia de losMateriales"*, 2ª ed., Ed.Limusa, México, 1998
- D.R.Askeland, "*Ciencia e Ingeniería de los Materiales"*, InternationalThomson Editores, México, 1998
- W.D.Callister Jr., "*Introducción a la Ciencia e Ingeniería de los Materiales"*, 3ª ed., Ed.Reverté S.A.,Barcelona, 1995
- J.Casanovas y C. Alemán, *"Introducción a la Ciencia de los Materiales"*, CálamoProducciones Editoriales,Colección Manuales Básicos, Barcelona, 2002
- J.F.Shackelford, "*Introducción a la Ciencia de Materiales para Ingenieros"*, 4ª ed., PrenticeHall Iberia, Madrid, 1998
- W.F. Smith, "*Fundamentos de la Ciencia e Ingeniería deMateriales"*, 3ª ed., McGraw-Hill, Madrid, 1998

Other didactic material s'aniràpenjant al Campus Virtual: http://cv.udl.cat