

30024 - Materials: Technology

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	436 - Bachelor's Degree in Industrial Engineering Technology 330 - Complementos de formación Máster/Doctorado
ECTS	6.0
Course	XX
Period	Half-yearly
Subject Type	ENG/Complementos de Formación, Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The learning process that is designed for this subject is based on the following:

The methodology designed seeks that students acquire a habit of continuous work, since it was considered that it is essential in a subject like this. For this reason are scheduled lectures, exercise classes, problems and cases, laboratory practice sessions, course work and questionnaires.

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5.2. Learning activities

Classroom theory lessons (30 h) are based on the exposition of basic concepts of each subject by the teacher. Before each theoretical lesson the student will do a previous reading of some texts related with the lesson contents. Other sessions (15 h) are dedicated to solve practical exercises and problems.

Laboratory practices (4 sessions of 3 hours each)

- Materials selection with the Cambridge Engineer Selector (from Granta Ltd.)
- Powder methods: Apparent density, powder compressibility, compacting problems.
- Manufacture of polymer fibers by extrusion. Non newtonian behavior. Determination of apparent viscosity.
- Brittle fracture of glasses. Application of the Weibull approach to cantilever tests on different glasses.
- Electrochemical corrosion. Metallization. Galvanic couples. Pasivation of aluminum.
- Non destructive tests: ultrasound technique, observation of industrial radiographs and identification of common defects, magnetic particles and dye penetrant test.

5.3. Program

Brief course syllabus

Classroom lessons

Metals and alloys: Extractive metallurgy, solidification, casting methods, rolling and controlled rolling, sheet forming, superplastic forming, powder metallurgy, metal powder injection molding. Exercises and problems.

Polymers and polymer based composites: Rheology, Extrusion and materials' properties for extrusion, Injection, thermoforming, blow forming, properties of fibers and matrices, pultrusion, open mould forming, RIM, etc. Exercises and problems.

Ceramics and glasses: Brittleness and statistical treatment of fracture of ceramics and glasses (Weibull approach), traditional and advanced ceramics, their properties and applications, powder methods, liquid sintering, glass forming methods. Exercises and problems.

Oxidation and corrosion of metals and alloys, oxidation laws, protective systems. Physical and chemical degradation of polymers and ceramics. Exercises and problems.

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Mechanical degradation of metals and alloys, fatigue, creep, creep-fatigue interaction, friction and wear. Exercises and problems.

Non destructive tests for inspection and maintenance: ultrasounds, magnetic particles, liquid penetrant, radiography and gammagraphy, other techniques. Exercises and problems.

Surface engineering: Surface treatments and coatings. Physical and chemical vapor deposition, ion implantation, thermal spray, carburization and nitration, electrolytic and chemical metallization, hot dip galvanizing, anodizing, surface characterization, etc. Exercises and problems.

Joining technologies: Welding and adhesive bonding. Metallurgy of the weld zone: weld metal, heat affected zone. Thermal cycles, predicted microstructures, concept of weldability in steels: equivalent carbon, time to cool from 800 to 500 °C, welding defects (cracking); other welding methods, Adhesive forces, adhesive materials, adhesive testing, applications. Exercises and problems.

5.4.Planning and scheduling

5.5.Bibliography and recommended resources