

SCIENCE AND TECHNOLOGY OF THE MATERIALS

Code: 322019

Main Scientific Area: Mechanics and industrial processes

Lecturer: José António Guimarães Vaz da Costa

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 105h

ECTS: 6,0

Objectives

1. To know the different material classes and its generic properties. Study the most important materials, specific properties and applications within each class of materials.
2. Understand the basic relationships between the structure and the (physical, mechanical / electric / ...) material properties.
3. To know (and apply) some of the typical manufacture processes for each material class. Several classes of materials are studied during the Materials Science and Technology unit : Metals, Ceramics (including glasses and mineral rocks), Wood, Polymers, Composites and Biomaterials.

Learning Outcomes

Students shall acquire competencies in material science and the different materials properties, namely: - To know the atomic and molecular structure, inter-atomic forces, different periodic table elements and their energetic level; - 2/9 Distinguish the different crystalline structures for each material; - To know the different measure tests and equipments for mechanical, chemical, electric, optical and other properties; - Distinguish Metallic materials, Ceramics, Polymers, Woods, Composites and Biomaterials also its processing and manufacture processes available and thermal treatments with its effects; - Integrate the knowledge of the atomic and molecular structures over the properties of the different materials;

Course Contents

The "Materials science and engineering fundamental principles" will be presented in this curricular unit, namely: - Materials Science basic principles: atoms, atomic forces, crystalline structures; - Metallic Materials: structure, properties, classification, manufacture and applications - Woods: structure, properties, classification and applications - Ceramics: structure, properties, classification, manufacture and applications -Polymers: structure, properties, classification, manufacture and applications -Composites: matrix, properties, classification, manufacture and applications; - Biomaterials: properties, classification, manufacture and applications.

Recommended Bibliography

William F. Smith, "Princípios de Ciência e Engenharia dos Materiais", 3ªEd., McGraw-Hill, Lisboa, 2000, ISBN 9728298684 · Pinto Soares "Aços – características e tratamentos" Edição do Autor – 1970.

Learning and Teaching Methods

Theory and practical classes allows to expose the contents that are explored in works and exams. Materials science is known with the basic principles of physics and chemistry. Materials characterizations is shown with the primary concepts of mechanical testing, being complemented with the materials classification. Different manufacture processes and applications are also studied.

Assessment Methods

Evaluation will take into account: 20% - Job Assignment I (Material Mechanics) + 20% - Job Assignment II (Materials and Production) + 20% - (Material Science and Metallic Materials) + 20% (Ceramics, glass and polymers) +20% (Ceramics and Composites).