

Course Unit	Chemistry and materials	Field of study	Mechanical Constructions
Bachelor in	Mechanical Engineering	School	School of Technology and Management
Academic Year	2022/2023	Year of study	1
Type	Semestral	Semester	1
Level	1-1	ECTS credits	6.0
Code	9123-759-1105-00-22		
Workload (hours)	162	Contact hours	T - TP 60 PL - TC - S - E - OT - O -

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Alexandra Sofia Rosa Jeronimo, João da Rocha e Silva

#### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. acquire knowledge and understanding about several properties of materials engineering,
2. correlate properties and structure of materials,
3. gain knowledge on new materials and its applications,
4. correlate materials and properties in order to propose new materials and new applications in engineering.

#### Prerequisites

Before the course unit the learner is expected to be able to:  
Not applicable

#### Course contents

Introduction to materials science and engineering. Atomic structure and bonding. Crystal structures and crystal geometry. Solidification, crystalline imperfections of metals. Mechanical properties of metals. Applications of polymeric materials. Phase diagrams. Engineering alloys. Ceramics and composite of materials. Corrosion and degradation of materials. Electrical properties of materials. Optical properties and superconductive materials.

#### Course contents (extended version)

1. Introduction to materials science and engineering.
2. Atomic structure and bonding.
3. Crystal structures and crystal geometry.
4. Mechanical properties of metals.
5. Electrical Properties and Optical Properties of Materials.
6. Phase diagrams.
7. Corrosion and degradation of materials.
8. Metals and Metal Alloys.
9. Polymeric materials.
10. Ceramics materials.
11. Composite of materials.

#### Recommended reading

1. Smith, William F. Princípios de Ciência e Engenharia de Materiais, 3ª Edição, McGraw-Hill, 1996.
2. Chang, R. Química, 5ª Edição, McGraw-Hill.
3. Pinto Soares, Aços Características e Tratamentos, Pinto Soares, 1992.
4. ASM International Handbook Committee; Engineered materials handbook.
5. Apontamentos do docente

#### Teaching and learning methods

The unit will be taught using a combination of lectures such as: theoretical exposition, discussion, practical classes, self guided learnig, and laboratory assignments. A study guide and support material will be provided to the students. The practical assignments will be performed with groups of maximum two students.

#### Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
  - Intermediate Written Test - 30%
  - Intermediate Written Test - 30%
  - Intermediate Written Test - 30%
  - Practical Work - 10%
2. Alternative 2 - (Regular, Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 100%

#### Language of instruction

1. Portuguese, with additional English support for foreign students.
2. Spanish

#### Electronic validation

Alexandra Sofia Rosa Jeronimo, João da Rocha e Silva	João Eduardo Pinto Castro Ribeiro	Paulo Alexandre Vara Alves
12-10-2022	12-10-2022	24-10-2022