

Course Unit	Materials in Mechanical Design		Field of study	Mechanical Constructions	
Bachelor in	Mechanical Engineering		School	School of Technology and Management	
Academic Year	2022/2023	Year of study	2	Level	1-2
Type	Semestral	Semester	1	ECTS credits	6.0
			Code	9123-759-2102-00-22	
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) 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. Acquiring knowledge and understanding the properties of materials used in engineering.
2. Relate structure and properties of materials used in engineering.
3. Acquiring knowledge on the latest materials used in engineering and its applications.
4. Relate the materials and properties in order to propose new materials and new applications.

### Prerequisites

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

### Course contents

Steels, properties, microstructure and processing. Stainless steel. Iron. Non-ferrous alloys. Thermoplastics. Resins Composites. Ceramic. Biomaterials.

### Course contents (extended version)

1. Part A: Metals
  - Steel
  - Cast Iron
  - nonferrous alloys
  - Manufacturing
2. Part B: Technical ceramics
  - Preparation of raw material; Conformation
  - Manufacture of ceramics; Thermal Treatments
  - Introduction to Glass Study
  - Ceramic properties
3. Part C: Polymer
  - Thermoplastics; Thermosetting; Elastomers; Natural Polymers
  - Thermoplastic transformation processes
  - Thermosetting transformation processes
  - Mechanical behavior of polymers
4. Part D: Composites
  - Reinforcements and matrices
  - Composites Manufacturing
  - Composites reinforced with fibers and composites reinforced with particles
  - Other Composites
5. Part E: Biomaterials
  - The contribution of mechanical engineering in the development and application of biomaterials.

### Recommended reading

1. De Lucas Filipe Martins da Silva, Fernando Jorge Lino Alves e António Torres Marques, Materiais de Construção, Engenbook, 2014
2. Pinto Soares, Aços Características e Tratamentos, Pinto Soares
3. RWK Honeycombe, Aços micro estrutura e propriedades, Fundação C. Gulbenkian
4. ASM International Handbook Committee; Engineered materials handbook
5. Orfice, Biomateriais - Fundamentos & Aplicações, Nova Guanabara, 2012

### Teaching and learning methods

Theoretical-practic classroom. Laboratory work and reporting. In no presence environmental, resolution of problems and practical work.

### Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
  - Practical Work - 10%
  - Intermediate Written Test - 60% (Minimum score 7 points)
  - Experimental Work - 10%
  - Laboratory Work - 10%
  - Case Studies - 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

João da Rocha e Silva	João Eduardo Pinto Castro Ribeiro	Paulo Alexandre Vara Alves
29-09-2022	06-10-2022	07-11-2022