

Course Unit	Construction Materials		Field of study	Technology and Construction Materials	
Bachelor in	Civil Engineering		School	School of Technology and Management	
Academic Year	2023/2024	Year of study	2	Level	1-2
Type	Semestral	Semester	1	ECTS credits	6.0
Workload (hours)		162	Contact hours	T 30 TP 24 PL 6 TC - S - E - OT - O -	
Code 9089-322-2103-00-23					

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) Manuel Joaquim da Costa Minhoto

Learning outcomes and competences

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

1. Understand and recognize the material requirements and planning on the construction site;
2. Classify the different building materials, understand its basic structure and limitations of use;
3. Execute the control of quality of some of the most important building materials and promote conformity criteria;

Prerequisites

Before the course unit the learner is expected to be able to:

1. Execute basic calculus of mathematics and statistics;
2. Understand general concepts of mechanics of materials (tensile and compressive strengths, etc.)
3. Convert units on the international system.

Course contents

Classification and behaviour of building materials: Natural stone; Aggregates; Timber; Steel; Binders; Mixing water; Additives; Mortars; Concrete; Ceramic materials, Polymers, Paints and Varnishes.

Course contents (extended version)

1. CLASSIFICATION AND BEHAVIOUR OF BUILDING MATERIALS
 - Building materials - general approach;
 - Behaviour and classification of building materials;
 - Mechanics of Materials revision.
2. NATURAL STONE
 - Classification, physical and mechanical properties;
 - Laboratory tests;
3. AGGREGATES
 - Classification, physical and mechanical properties;
 - Determination of particle size distribution (sieving method) and mixture of aggregates;
 - Laboratory tests: Los Angeles, Particle size distribution, etc. Standard NP EN 12620.
4. TIMBER
 - Composition and main properties;
 - Laboratory tests: Portuguese and European standardisation - EC5;
 - Defects and anomalies;
 - Wood-based materials and their properties.
5. STEEL
 - Types and manufacturing of steel;
 - Physical and mechanical properties;
 - Protection against oxidation and fire;
 - Other metals (aluminum, lead, zinc and copper).
6. BINDERS
 - Classification;
 - Manufacturing and main properties;
 - Laboratory tests: Standards ENV 459, EN 196, NP 2064, NP 2065, ENV 197.
7. MIXING WATER, ADDITIVES AND ADMIXTURES
 - Determination of mixing water for mortars and concrete, using Expedito, Bolomey and Faury Methods.
 - Study of the various additives and admixtures.
 - Testing standards. Requirements and conformity criteria.
8. MORTARS
 - Composition and properties.
9. CONCRETE
 - Composition and manufacture of concrete;
 - Concrete composition: Faury, Valette and Leclerc du Sablon Methods;
 - Types and classification of concrete;
 - Main pathologies of simple concrete and reinforced concrete;
 - Standards tests: NP EN 206-1, NP EN 13670-1, EN 12350, etc.
10. COMPOSIT AND AGGLOMERATED MATERIALS, POLYMERS AND PAINTS
 - Composition and properties.
11. CERAMIC MATERIALS
 - Manufacture, properties and applications;
 - Testing standards: NP 80, NP 52, NP 308, etc.

Recommended reading

1. Bauer F. , 1994 – Materiais de Construção, Volumes I e II, Livros Técnicos e Científicos Editora, Rio de Janeiro, Brasil.
2. Hirt Manfred A. , 1994 – Construction Métallique, Traité de Génie Civil de l'Ecole Polytechnique Fédérale de Lausanne, Volume 10.
3. Sebenta de Materiais de Construção, Autor: Eduarda Luso, Escola Superior de Tecnologia e Gestão do Instituto Politécnico de Bragança.
4. Natterer et al. , 1987 – Construire en Bois, Presses Polytechniques Romandes.
5. Coutinho, A. Sousa, 1994 – Composição e Fabrico do Betão, Volumes I, II e III, Lisboa, LNEC.

Teaching and learning methods

The unit will be taught using a combination of expository lectures, practice lessons, laboratory tests and self guided learning.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)

- Experimental Work - 20%

- Final Written Exam - 80%

2. Alternative 2 - (Student Worker) (Final, Supplementary, Special)

- Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation			
Manuel Joaquim da Costa Minhoto	Flora Cristina Meireles Silva	António Miguel Verdelho Paula	José Carlos Rufino Amaro
10-10-2023	11-10-2023	16-10-2023	31-10-2023