

Course Unit	Graphic Representation and Digitalization in Construction		Field of study	Planning and Urbanism	
Bachelor in	Civil Engineering		School	School of Technology and Management	
Academic Year	2025/2026	Year of study	1	Level	1-1
Type	Semestral	Semester	1	ECTS credits	6.0
Code	9089-849-1105-00-25				
Workload (hours)	162	Contact hours	T -	TP 52	PL 8
			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) **António Jorge Ferreira Vaz**

### Learning outcomes and competences

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

1. Draw and understand two-dimensional and three-dimensional space;
2. Understand and apply the system of orthographic multiview projections or views of solids, particularly the use of European and American methods and axonometric perspectives system;
3. Interpret and perform written and drawn elements of construction projects;
4. ISO 19650 - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)
5. Interoperability in the design process.
6. Three-dimensional modeling using BIM software.

### Prerequisites

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

1. Informatic knowledge from user point of view;
2. Basic concepts of technical drawing and graphic representation;
3. Recognize English words associated with digital drawing tools.

### Course contents

Graphic Design Concepts; Orthogonal Projection System or Views; Axonometric System; Architectural Drawing; Introduction to Building Information Modeling (BIM); ISO 19650 Standard; Interoperability in the Design Process; Two- and three-dimensional digital modeling using CAD and BIM software.

### Course contents (extended version)

1. Graphic concepts:
  - Introduction to Technical drawing;
  - Standardization in Technical drawing;
  - Technical Design tools for Computer Aided Design.
2. System of Orthogonal Projections or Views
  - European Method;
  - American Method.
3. Axonometric Perspective System
  - Orthogonal Axonometries;
  - Understanding the Conic perspective.
4. Architectural Design:
  - Analysis and interpretation of architecture drawing projects;
  - Written documents: descriptions and other written elements;
  - Architectural drawing - plans, elevations and sections;
  - The detailed drawings of various components of construction; dimensions in drawings;
  - Drawings of span maps and finishing maps;
  - Drawings of concrete, wooden and metallic structures;
  - Water supply networks, drainage and waste, electricity and others;
5. Introduction to Information Modeling in Construction – BIM
  - ISO 19650 Standard - BIM;
  - Interoperability in the design process.
6. Three-dimensional modeling using BIM software
  - Introduction to modeling;
  - Modeling rules;
  - Georeferencing;
  - Federation of models;
  - Export to IFC;
  - Automatic production of 2D drawings;
  - Modeling according to BIM purposes;
  - BIM information management: Common Data Environment (CDE).

### Recommended reading

1. Neufert, Ernest, Arte de Projectar em Arquitectura. Editorial Gustavo Gili, S. A.
2. Vaz, Jorge; Sebenta BIM Tutorial - 1º ano Engenharia Civil - IPB
3. Silva, Arlindo, Dias, João, Sousa, Luís e Tavares Ribeiro, Carlos; Desenho Técnico Moderno (11ª edição). Lidel, Lisboa, 2004
4. Norma ISO 19650 - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM);
5. Eichler, Christoph Carl, BIMcert Handbook Basic Knowledge openBIM Edition 2024, buildingSMART International

### Teaching and learning methods

Theoretical/practical lessons based on theoretical explanation, using expose, demonstration and interrogative methods, as well as the active method in the practical component. In the theoretical component is given the concepts about different subjects to teach. In the practical component is made the consolidation of the knowledge gained by conducting exercises and practical work.

**Assessment methods**

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
- Final Written Exam - 25%
- Practical Work - 75% (2 practical works: TP1 (25%), TP2 (50%).)

**Language of instruction**

Portuguese, with additional English support for foreign students.

**Electronic validation**

António Jorge Ferreira Vaz	Flora Cristina Meireles Silva	António Miguel Verdelho Paula	José Carlos Rufino Amaro
07-10-2025	08-10-2025	09-10-2025	01-11-2025