POLI ESCOLA SUPERIOR TECNOLOGIA GESTÃO TÉCNICO GUARDA	**SUBJECT DESCRIPTION**	**MODELO** PED.013.03

Course	**Master of Civil Constructions**					
Subject	**Thermal and Acoustic Project**					
Academic year	2023 - 2024	*Curricular year*	1st	*Study period*	1st semester	
Type of subject	Compulsory	*Student workload (H)*	Total: 168	Contact: 60	*ECTS*	6
Professor(s)	Ph.D. Rui Pitarma Sabino Ferreira Expert Carlos Aquino Monteiro					
☒ *Area/Group Coordinator* ☐ *Head of Department* *(select)*	Ph.D. José Carlos Almeida					

PLANNED SUBJECT DESCRIPTION

1. LEARNING OBJECTIVES

It is intended that students develop technical-professional skills placing them in hypothetical situations of real exercise of the design profession in areas such as thermal and acoustics of buildings, acquiring skills in the area of design, development of solutions and applied design.

The Curricular Unit will work in a system of two modules where the contents of the discipline in the scientific domains of thermal and acoustics will be introduced. In each of the modules students will develop a concept and applied project which will be assessed at the end of the respective lecture.

2. PROGRAMME

I) Thermal Module

Introduction to the thermal building. General concepts of thermo-hygrometric comfort. Thermal evaluation indices. Normative standards, experimental techniques, and measurement. General concepts of indoor air quality. Main ventilation systems. Guidelines for ventilation requirements and ventilation efficiency. Normative standards, experimental techniques, and measurement. Heat transfer phenomena in building elements. General concepts of thermal buildings. Buildings Energy Certification System in Portugal. The National Certification System for Energy and Indoor Air Quality in Buildings (SCE). General statements on buildings energy rehabilitation. Improving measures for energy performance and indoor air quality.

II) Acoustics module

Introduction to building acoustics. Nature and characteristics of sound. Sound properties. Types of sounds. Basic sound parameters. Noise Signal Types. Type of sources and sound fields. Measuring equipment. Sound analysis. Pressure analysis and frequency analysis. Sound pressure, intensity and power levels. Sound perception. Weighting scales. Disadvantages of noise. Human discomfort. Analysis in time and space.

Acoustic conditioning of interior spaces. Historical introduction. Sound energy balance. Sound absorption. Sound fields. Sound behavior. Acoustic accidents. Characteristics of the rooms.

Reverberation. Reverb times. Acoustic reflectors. Other representative factors of the acoustic quality of a room. Word intelligibility. Absorbent materials. Sound diffusers. Principles of acoustic conditioning. Regulatory aspects.

Sound transmission. Transmission to aerial sounds. Theoretical models for single and multiple networks. Simplified models and experimental models. Mixed models. Transmission through heterogeneous surface walls. Sound isolation to aerial sounds of construction elements. Insulation between the exterior and interior of a building. Experimental determination of sound reduction and corrected sound insulation indices. The procedure for determining the sound isolation indices for air conduction sounds based on the adjustment of a reference curve.

Criteria for quantifying air sound isolation. Analytical determination of the sound isolation index to air sounds. Marginal transmission. Sound transmission of percussion noises. Determination of the effective level of percussion noise and the corrected level. Comparison method. Measurements made by frequency bands. Sound insulation index to percussion noises. Analytical determination of the sound isolation index to percussion sounds. Simplified method. Invariant method. Ways to control percussion noise. Other types of percussion noise.

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

This curricular unit, through the syllabus developed, aims to contribute to the integral formation of the student as a person and future professional in an area with great specificity such as civil engineering. It is intended that students obtain knowledge to develop operational and instrumental competence. In the end, the student should be able to independently participate and develop their activity, namely in terms of the project, execution or technical monitoring.

4. MAIN BIBLIOGRAPHY

Discipline support texts.

Graphic and written elements to support the subject taught or project elements to be presented, provided by the teachers.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

The teaching of the subject will be carried out through classroom teaching so that students can become familiar with the methodologies and analysis processes. Classes will be fundamentally:

- Of a more theoretical character, with exposure of the matter using audiovisual support, analysis and discussion of the syllabus.

- Of a more practical nature, with the development of practical exercises and group work, concrete analysis of questions that complement the topics covered, in relation to which it is intended that students learn how to apply them to concrete situations.

Student assessment will be carried out continuously by frequency, through a theoretical-practical test and practical research and development work, or alternatively through a final exam.

Thermal Module: Theoretical component 50% + Practical component (problem) 50%; (Attendance above 90% with a bonus of 1 value).

Acoustics Module: Theoretical component 40% + Practical assignments 60%

The final classification will correspond to the weighted average according to the weight of each module (ie, the workload).

In order to pass the Curricular Unit, students will necessarily have to pass both modules.

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

In order to achieve the proposed objectives, the methodology in the curricular unit is based on theoretical and practical training principles and on the study and analysis of real cases. The pedagogical methods and techniques to be applied during the sessions will be: (a) Affirmative method with interconnection between expository and demonstrative techniques; (b) Method of group interaction using the role play technique, with the teacher being responsible for reinforcing learning and coordinating the various actions and tasks of simulation of the operational and professional technique. The methodology intends to provide the opportunity for learning and developing the technique and professional skill for the exercise of the activity of civil engineer.

7. ATTENDANCE

Mandatory presence in more than 50% of the classes actually taught. Attendance will only influence the continuous assessment of students and the completion of the curricular unit by frequency.

DATE

20 de novembro de 2023

SIGNATURES

Professor

(signature)

Area/Group Coordinator

(signature)