

<b>POLI</b> ESCOLA SUPERIOR TECNOLOGIA GESTÃO <b>TÉCNICO</b> <b>GUARDA</b>	<b>SUBJECT DESCRIPTION</b>	<b>MODELO</b> PED.013.03
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Course	Energy and Environment					
Subject	Indoor Environmental Quality					
Academic year	2023-2024	Curricular year	3rd	Study period	1st semester	
Type of subject	Compulsory	Student workload (H)	Total: 140	Contact: 60	ECTS	5
Professor(s)	Rui Pitarma					
<input checked="" type="checkbox"/> Area/Group Coordinator <input type="checkbox"/> Head of Department	(select)		Rui Pitarma (PhD)			

## PLANNED SUBJECT DESCRIPTION

### 1. LEARNING OBJECTIVES

The curricular unit aims to provide students with the basic knowledge of indoor conditions of thermo-hygrometric comfort and air quality. Thus, intends to sensitise students to the various factors that affect the perception of comfort and wellness. At the end, the student should have the basis to interpret and apply the standards and regulations for thermal comfort, air quality and interior lighting, as well as the thermal behaviour of buildings and energy systems.

### 2. PROGRAMME

1. Thermal comfort: Comfort and health; Energy balance of human body; Thermal regulation; Relevant parameters; Indices of thermal evaluation; Thermal stress; Main standards; Experimental techniques. 2. Ventilation and IAQ: Sick building syndrome; Major sources of indoor pollutants; Airflow principles; Local and general ventilation; Ventilation systems; Ventilation efficiency; Air renewal; Tracer-gas techniques; Perception of IAQ; Main standards; Experimental techniques. 3. Visual comfort: Basics of lighting and colour; Visual perception and comfort; Functional Lighting. 4. Standards, measurement and IAQ control: Basics of HVAC Systems; Maintenance of air-conditioning systems and IAQ; Biological control and highest risk equipment; Radon - preventive measures; Main standards and regulations; techniques; Experimental techniques and measurement. 5. Introduction to experimental and computational modelling of indoor climates: practical examples and case studies.

### 3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

The first part of the program, chapters 1, 2 and 3, is aimed at achieving the objective of structuring a curricular unit, that is, providing students with the basic knowledge of the Thermo-hygrometric conditions of comfort and indoor air quality. The subsequent chapter, chapter 4, aims to respond to the supplementary objective of the curricular unit, in particular, to interpret and apply the standards and regulations on thermal comfort and indoor air quality in buildings. It also aims to ensure fundamental knowledge of driving and maintenance of HVAC installations from the IAQ perspective. Finally, the final chapter, chapter 5, is intended to complement the education of students with knowledge of advanced modelling techniques for indoor environments.

### 4. MAIN BIBLIOGRAPHY

- Piedade, A.C., Rodrigues, A.M. e Roriz, L.F., *Climatização em Edifícios, Envolvente e Comportamento Térmico*, Orion, 2009.
- Silva, H., *Ambiente Termico e Ventilação, Avaliações práticas e controlo*, Edições Sílabo, 2013.
- Miguel, Alberto S., *Manual de Higiene e Segurança do Trabalho*, Porto Editora, 2014.
- International Standards (ISO 7726, ISO 7730, ISO 7243, ISO 11079, ASHRAE 62.1, EN 15251, ISO 17772-1).

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*Portuguese standards on energy and buildings (ADENE).*

*-Roriz, L.F., Climatização – Concepção, Instalação e Condução de Sistemas, Orion, 2007.*

*Technical and scientific papers (various)*

*- Pitarma, R.A., Mecânica de Fluidos, IPG. (teacher's notes)*

**5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)**

*Expositive lessons using audiovisual media, case studies, problem-solving, laboratory works and lab demonstrations. The classes are combined with theoretical, practical and laboratory dimensions, encouraging participation, debate and individual/group discussion. Many educational media are used: schemas in tables, multimedia presentations, videos and lab activities. In tutorial orientation sessions will be analysed and clarified the students' questions and suggested studying methods.*

*Continuous assessment regime: attendance (10%), laboratory work (≤20%) and problem-questions (≥80%).*

**6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES**

*The main objective is globally achieved with the following methodologies: expositive and interactive lessons and laboratory sessions. The complementary objective is achieved through experimental and laboratory sessions, problem-solving and case studies encouraging individual/group discussion and debate.*

**7. ATTENDANCE**

*Attendance is strongly recommended, but there is no mandatory minimum to be observed by students.*

**8. CONTACTS AND OFFICE HOURS**

*E-mail: [rpitarma@ipg.pt](mailto:rpitarma@ipg.pt);*

*Office: 14; Laboratory: Air conditioning and Environment.*

*Doubts and questions should be clarified during tutorial hours or service hours.*

**DATE**

**13 de novembro de 2023**

**SIGNATURES**

Professor and Area/Group Coordinator

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(signature)