

<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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<i>Course</i>	<b>Computer Engineering</b>					
<i>Subject</i>	<b>Home and building automation systems</b>					
<i>Academic year</i>	2023/2024	<i>Curricular year</i>	2nd/3rd	<i>Study period</i>	2nd sem	
<i>Type of subject</i>	Elective	<i>Student workload (H)</i>	Total: 112	Contact: 45	<i>ECTS</i>	4
<i>Professor(s)</i>	Fernando Melo Rodrigues					
<input checked="" type="checkbox"/> <i>Area/Group Coordinator</i> <input type="checkbox"/> <i>Head of Department</i>	(select)		<b>Fernando Melo Rodrigues</b>			

## PLANNED SUBJECT DESCRIPTION

### 1. LEARNING OBJECTIVES

With this subject students get knowledge of home and building automation systems. In particular, the student must:

- O1. Discuss the growing importance and impact of home and building automation systems;
- O2. Compare and characterized home and building automation systems on the market;
- O3. Describe, in detail, EIB / KNX technology, as well their application fields;
- O4. Project planning and Design KNX installations with interaction of multiple systems;
- O5. Equipment parameterization and Commissioning of KNX installations.

### 2. PROGRAMME

P1. Introduction to home and building automation

- a. Home and building automation concepts
- b. Functions and application fields
- c. Home and building automation architectures

P2. Home and building automation protocols

- d. Application scope
- e. Communication process, wired and wireless media
- f. Protocol characterization (X10, LonWorks, KNX, BACnet, ZigBee, Z-Wave, and EnOcean)

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g. IoT systems and protocols and integrations, MQTT & HomeAssistant

P3. EIB/KNX technologies

h. KNX transmission means

i. Communication means

j. Communication addresses and objects

k. KNX Devices

P4. ETS (*Engineering Tool Software*) configuration Tool

l. User Interface

m. Device Configuration and parameterization

n. KNX Troubleshooting

P5. Case Studies

o. Home example

p. Industrial example

**3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES**

Objective 1 (O1) will be achieved with the contents programmer 1 (P1). Will introduce the building automation concepts (P1a); application fields (lighting, shading, energy efficiency, security, audio-video control, etc) (P1b), and systems architectures (P1c). Finally, difference between conventional electrical installations and those with building automation systems will be establish (P1d).

O2, will be applied by presenting and characterize main commercial building automation protocols available (P2c). Previously will be established the transmission means (P2b), and characterize the scope of these (P2a).

The O3 is supported by KNX protocol characterization (P3 and P4). KNX technology will be addressed in P3a/b/c and the parameterization KNX devices (P3e and P4a/b).

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Goals O4 and O5 will be achieved through P4 and P5 presentation. Planning a solution independently will be the ultimate objective of the subject. This will be achieved with case studies analysis (C5a/b) and use ETS tool.

#### 4. MAIN BIBLIOGRAPHY

Mandatory:

- B1. Handbook for Home and Building Control – Basic Principles, ZVEI 2006, 5ª edição
- B2. KNX Training Documentation, edição de Fev. de 2007, KNX Association
- B3. Textos de Apoio, Fernando Melo Rodrigues

Optional / Recommended:

- B4. Building Automation – Communication Systems with EIB/KNX, LON, and BACnet, Springer 2009
- B5. KNX System Specifications, KNX Association - Version 2.1, Out. 2013

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

Teaching methodologies:

1. Expositive lecture
2. Individual Search
3. Teamwork
4. Case studies
5. Practical demonstration

Assessment criteria:

**Continuous Assessment:** The student approves this subject when the weighted average of continuous assessment factors and practical component, is equal to or higher than ten. This Assessment includes:

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Completion of a synthesis work, a teamwork and 3 laboratories. Synthesis teamwork consists in a building automation technology survey. The teamwork is related with KNX device exploration (detailed study, practicing when possible). Laboratories consolidate concepts and automation basics functions (60%). A written assessment (1<sup>st</sup> / 2<sup>nd</sup> / 3<sup>rd</sup> assessment), where theoretical-practical questions are formulated to evaluate scientific knowledge and practical domain. (40% with 7 values as minimum grade).

**Final assessment:** Student who has no evaluating on “continuous Assessment“, he or she must do written assessment (70%) and 3 laboratories (30%) on the same day of written assessment.

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

1. **Expositive lecture** is crosswise to the objectives O1, O2 and O3 due to the need for the introduction of the theoretical contents;
2. Intending to start planning solutions, O4, **individual work** will be undertaken on a KNX device. Later, this individual works is grouped in a teamwork in order to obtain a small functional solution.
3. **Case studies** allow to analyze and compare solutions previously developed in order to comply with the O4
4. As conclusion of objectives O1 to O4 is intended to consolidate the "know-how" as described in O5. To do this, **Experimental demonstration** method will be adopted to complete several laboratories planned.

#### DATE

**19 de fevereiro de 2024**

#### SIGNATURES

*Professor(s), Area/Group Coordinator or Head of Department signatures*

Professor

Fernando Melo Rodrigues

(signature)