

POLI ESCOLA SUPERIOR TECNOLOGIA GESTÃO TÉCNICO GUARDA	SUBJECT DESCRIPTION	MODELO PED.013.03
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Course	Energy and Environment					
Subject	Automation and Industrial Control					
Academic year	2023-2024	Curricular year	2nd	Study period	2nd semester	
Type of subject	Compulsory	Student workload (H)	Total: 126	Contact: 60	ECTS	4,5
Professor(s)	Adérito Neto Alcaso					
<input checked="" type="checkbox"/> Area/Group Coordinator <input type="checkbox"/> Head of Department	(select)	Rui Pitarma Ferreira				

Planned Subject Description

1. LEARNING OBJECTIVES

With this subject students gain knowledge in measurements and automatic control systems and its importance for the energy and environment field. In particular, the student must:

- O1. Describe the principles and goals of measurement and control systems;
- O2. Characterize technologies and applications of sensors and actuators ;
- O3. Characterize technologies and applications of logic, discrete and continuous automation;
- O4. Identify common controllers and develop their basic programming and tuning.

2. PROGRAMME

P1 BASIC CONCEPTS OF AUTOMATION AND CONTROL

- Definitions of automation and control
- Concepts of systems, processes and signals
- Operating modes of systems
- Basic structures of automatic systems

P2 SENSORS AND ACTUATORS

- Characterization of sensors and actuators
- Digital and analog sensors
- Active and passive sensors
- Signal Conditioning
- Electrical and mechanical actuators

P3 BINARY LOGIC AND NUMBERING SYSTEMS

- Binary, decimal and hexadecimal systems
- Binary codes in Automation
- Logical operations and functions
- Truth tables
- Karnaugh maps

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P4 PROGRAMMABLE CONTROLLERS

- Structure of programmable logic controllers (PLC) and microcontrollers
- PLC programming languages
- Ladder program coding development
- Simulators and PLC programmers

P5 CONTINUOUS CONTROLLERS

- Continuous control and servo control
- ON-OFF and PID servocontrollers
- Characterization of time and frequency responses
- PID controller tuning and adjust

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

Objective 1 (O1) is transversal to the whole programme, with the main emphasis on P1, where the concepts of automatic systems are presented. O2 is achieved through P2. O3 presents the contents in order to comply with P3. O4 will be met by the presentation of the contents provided in P4 and P5.

4. MAIN BIBLIOGRAPHY

Mandatory:

- Teacher's notes.

Recommended:

- Thomas Hughes, "Measurement and Control Basics (ISBN 9780876640142), ISA Press, (3rd Ed available at academia.edu site).
- Jay Hooper, "Introduction to PLCs", Carolina Academic Press, (ISBN: 9781594603310).

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

Teaching methodologies:

- Expository and interrogative methods, using a video projector of the teacher's notes and online simulators;
- Demonstrative and experimental methods, using practical demonstrations and laboratory work with simulators.

Evaluation methodologies:

- Continuous evaluation grade: written test*50%+ laboratory work*40% + behaviour *10% To approve in continuous evaluation the student must have a grade higher than 7 in written test and to 9.5 in laboratory work.
- Exam evaluation grade: best value between continuous evaluation and written exam evaluation. In any case approval requires a final grade or equal or higher than 9.5.

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6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

1. Expositive lecture using slides, videos and simulations, is used for all objectives, O1 to O4, because it will introduce fundamentals subjects.

2. Additionally, practical assignments will be carried out using equipment and doing experimental demonstrations and tests, with real measurements and control systems.

7. ATTENDANCE

There are no minimum requirements, but attendance is considered for evaluation.

DATE

26 de February de 2024

SIGNATURES

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

Professor



(signature)

Area/Group Coordinator

(signature)