Course Unit	Industrial Communications			Field of study	Automation and Control										
Bachelor in	Electrical and Computers Engineering			School	School of Technology and Management										
Academic Year	2023/2024	Year of study	3	Level	1-3	ECTS credits	6.0								
Type	Semestral	Semester	1	Code	9112-742-3101-00-23										
Workload (hours)	162	Contact hours	T 30	TP -	PL 30	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): José Augusto de Almeida Pinheiro Carvalho

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. understand the industrial communication specificities including its requirements and the available technologies;
2. select technological solutions to implement communications for industrial application domains;
3. define and to configure industrial communication networks;
4. develop applications based on services supported by industrial communications network;
5. design communications architectures to support the integration of industrial applications with heterogeneous characteristics and requirements.

Prerequisites

Before the course unit the learner is expected to be able to:
1. use programmable logic controllers (PLC);
2. programme logic controllers.

Course contents

Communications models and its adequacy with the industrial systems requirements. Industrial communications architectures. Fieldbus, cell and factory networks. Wireless networks for industrial applications.

Course contents (extended version)

1. Introduction to industrial communications:
   - overview of communications systems, concepts, and functional requirements.
2. OSI model: structure, description of OSI layers and services. Application examples.
3. Interaction models:
   - client – server;
   - master – slave,
   - producer – consumer.
   - publisher - subscriber
4. Industrial communications architectures:
   - the hierarchical structure, data and real time requirements characterization.
5. Fieldbus, cell and factory networks: ASi, DeveiceNet, PROFIBUS-DP, CANopen, Industrial Ethernet.
6. Wireless networks for industrial applications: IEEE802. 11, IEEE802. 15.
7. Building automation networks - KNX

Recommended reading

1. Tanenbaum, Andrews S. Computer Networks, Prentice Hall International, 1996, ISBN: 0-13-394248-1
2. Zurawski Richard; The industrial communication technology handbook. CRC Press 2005, ISBN: 0-8493-3077-7
3. Steve Mackay, Edwin Wright, Deon Reynders, Jonh Park; Practical Industrial Data Networks: Design, Installation and Troubleshooting. Newnes 2004, ISBN: 075065807X
4. Donald Sterling, Steven Wissler; The Industrial Ethernet Networking Guide, Thomson Delmar Learning, 2002. ISBN: 076684210X

Teaching and learning methods

Classes using the Project-Based Learning model. Use of challenges to discuss applications and present the theoretical component to support their resolution. Application development in the field of industrial and building automation, supervisory control involving networks and protocols in the field of industrial communications. Non-presential: preparation of reports on the applications developed.

Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
  - Final Written Exam - 40% (In online assessment, the teacher can call students to defend the grade obtained in the exam.)
  - Practical Work - 60% (In e learning, the assessment included participation in classes. Execution of the works and reports)

Language of instruction

Portuguese

Electronic validation

José Augusto de Almeida Pinheiro Carvalho	José Luís Sousa de Magalhaes Lima	Orlando Manuel de Castro Ferreira Soares	José Carlos Rufino Amaro
01-10-2023	11-10-2023	14-10-2023	31-10-2023