Course Unit	Industrial Communications		Field of study	Automation and Control	
Bachelor in	Electrical and Computers Engineering		School	School of Technology and Management	
Academic Year	2022/2023	Year of study 3	Level	1-3	ECTS credits 6.0
Type	Semestral	Semester 1	Code	9112-742-3101-00-22	

Workload (hours)	162	Contact hours	T	TP	PL	TC	S	E	OT	O
			30	-	30	-	-	-	-	-

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.
4. Industrial communications architectures:
   - the hierarchical structure, data and real time requirements characterization.
5. Serial communications: RS232, RS485/422, modems.
6. Fieldbus, cell and factory networks: ASi, DeveiceNet, PROFIBUS-DP, CANopen, Industrial Ethernet.
7. Wireless networks for industrial applications: IEEE802. 11, IEEE802. 15.
8. 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

Lectures: presentation of the course contents supported on real applications examples. Problem-solving, project or laboratory: use of latest technological solutions on industrial communications. Development of a small communication applications supported on industrial network protocols. Non-presential hours: implementation of laboratory experiments and work out the results in reports.

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	Paulo Alexandre Vara Alves
06-10-2022	16-10-2022	21-10-2022	04-11-2022