Industrial computer networks - course description

General information

Course name	Industrial computer networks
Course ID	11.9-WE-INFP-InComNet-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Computer Science
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2021/2022

Course information

Semester	6
ECTS credits to win	5
Course type	optional
Teaching language	english
Author of syllabus	• dr inż. Adam Markowski

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Laboratory	30	2	-	-	Credit with grade

Aim of the course

To familiarize students with the basic solutions used in the field of industrial computer networks.

To shape basic skills in programming using digital serial interfaces used in industrial automation.

To shape basic skills in the design and characterization of communication properties of distributed measurement and control systems.

Prerequisites

Experimental techniques, Principles of programming, Microcomputer circuits and systems, Computer networks.

Scope

The evolution of measurement and control systems. The architecture of computer industrial networks. Topology of industrial networks. Transmission media. Access methods to a medium in industrial networks: Master-Slave, Token-Passing, CSMA and TDMA.

Standard communication protocols. Characteristics of standard communication protocols: PROFIBUS, MODBUS, CAN, LonWorks, INTERBUS-S, ASI and HART.

Industrial Ethernet. Characteristics of selected solutions: PROFINET, EtherCAT and Powerlink. Internet technologies in computer industrial networks. Dedicated WWW servers.

Analysis of communication efficiency and time parameters of selected protocols. Time determination in industrial networks. Industrial network components. Converters, amplifiers, concentrators, nodes, routers, bridges and gates. Integration of industrial networks with local computer networks.

Utility programs for creating intelligent devices operating in industrial network nodes. Software of serial digital interfaces for data exchange with industrial automation devices. Integration and management of industrial networks. Methods of industrial network integration.

Standards engineering of industrial network environments. Specifics of application areas for particular standards. Elements of industrial network designing.

Teaching methods

Lecture, laboratory exercises.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Can configure and use basic serial digital interfaces for programming data exchange with automation devices		• a quiz • an ongoing monitoring during classes • carrying out laboratory reports	• Laboratory
Understands aim of application of computer industrial networks		• a quiz • an exam - oral, descriptive, test and other	• Lecture

Outcome description	Outcome symbols	Methods of verification	The class form
Can choose the devices to create a distributed measurement and control system for the given simple object		• a quiz • an ongoing monitoring during classes • carrying out laboratory reports	• Laboratory
Can run the analysis of communication properties of the presented measuring and control system		• a quiz • an exam - oral, descriptive, test and other	• Lecture
Can characterize basic computer solutions in the area of industrial networks		• a quiz • an exam - oral, descriptive, test and other	• Lecture

Assignment conditions

Lecture – obtaining a positive grade in written or oral exam.

Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Calculation of the final grade: lecture 50% + laboratory 50%

Recommended reading

1. Mielczarek Wojciech: Serial digital interfaces, Helion, Gliwice, 1999 (in Polish)

2. Nawrocki W.: Computer measuring systems. WKŁ, Warszawa 2002 (in Polish)

3. Sacha K.: Local Profibus networks. MIKOM, Warszawa 1998 (in Polish)

4. Winiecki W.: The organisation of computer measuring systems. Oficyna Wydawnicza Politechniki Warszawskiej WPW, Warszawa 1997 (in Polish)

5. Lesiak P., Świsulski D.: Examples of computer measuring methods, Agenda Wydawnicza PAK, Warszawa, 2002 (in Polish)

6. Nawrocki W.: Distributed measuring systems, WKŁ, Warszawa 2006 (in Polish)

7. Kwiecień R.: Computer systems for industrial automation, Helion, Gliwice 2012 (in Polish)

8. Mackay S., Wright E., Reynders D., Park J.: Practical Industrial Data Networks: Design, Installation and Troubleshooting, Newnes, 2004

9. Reynders D., Mackay S., Wright E.: Practical Industrial Data Communications: Best Practice Techniques, Butterworth-Heinemann, 2004

Further reading

Notes

Modified by dr inż. Adam Markowski (last modification: 06-09-2021 14:37)