(faculty stamp)

COURSE DESCRIPTION

1. Course title: INDUSTRIAL COMPUTER SYSTEMS	**2. Course code:** ICS
3. Validity of course description: 2012/2013	
4. Level of studies: 2 nd cycle of higher education	
5. Mode of studies: intramural studies	
6. Field of study: MACROFACULTY	
7. Profile of studies: academic	
8. Programme: COMPUTER SCIENCE	
9. Semester: 2	
10. Faculty teaching the course: Institute of Informatics	
11. Course instructor: prof. dr hab. inż. Andrzej Kwiecień	
12. Course classification: common subject	
13. Course status: obligatory	
14. Language of instruction: English	
15. Pre-requisite qualifications: Architectures of Computers, Computer Networks, Computer Programming, Distributed Systems	

16. Course objectives:

The lecture global scope is to present good practice during industrial distributed real-time system designing. A stronger emphasis was put on communication as a backbone of any efficient control or/and supervisory IT industrial system. Those problems were divided into three thematic groups:

- computer distributed systems and real-time systems,
- node model of distributed system,
- time analysis of data flow between application program, network coprocessor and communication protocol.

The listed above topics of the lecture are closely bound to computer networks and computer distributed systems.

17. Description of learning outcomes:

No	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1	Student possesses basic knowledge of distributed system.	Participation in laboratory exercises	Lecture Laboratory	K2A_W11, K2A_W14, K2A_U11, K2A_U13
2	Student possesses basic knowledge of real-time systems.	Participation in laboratory exercises	Lecture Laboratory	K2A_W09, K2A_W11, K2A_W14, K2A_U11, K2A_U13
3	Student possesses basic knowledge of industrial architecture.	Participation in laboratory exercises	Lecture Laboratory	K2A_W05, K2A_W11, K2A_W14, K2A_U11, K2A_U13
4	Student possesses basic knowledge of industrial communication protocols.	Participation in laboratory exercises	Lecture Laboratory	K2A_W11, K2A_W14, K2A_U11, K2A_U13
5	Student understands the fundamental industrial deterministic networks.	Participation in laboratory exercises	Lecture Laboratory	K2A_W11, K2A_W14, K2A_U13

18. Teaching modes and hours

Lecture: 30 Laboratory: 30

19. Syllabus description:

Lectures:

The target of lectures is a presentation of fundamental problems in building distributed informatics systems in industry area. Most of important feature of almost industry informatics system is works in real-time. From this point of view, acknowledgment of deterministic networks protocol is most important and fundamental for design process of industry systems. Three of basic topics must be present:

- an idea of distributed informatics system in industry applications,
- deterministic process of control and monitoring as a goal of real-time systems,
- time analysis of global informatics

system from point of view:

- architecture of computer node and methods of it programming,
- analyzing possibilities and features of network coprocessors,
- time analyzing of deterministic network protocols.

After discussion of all of these problems, is possible answer for question about parameters of designed system.

1. Introduction. Definition of industry distributed system. Definition and partition of real-time systems
2. Model of informatics distributed real-time system (DRTS)
3. Phenomenon on the border between: software application and coprocessor and coprocessor and network protocol
4. Programming the node of system and methods of CPU cycle shorten
5. Presentation of industrial computer protocols
6. Presentation of token-bus protocol:
    a. Methods of network cycle construction,
    b. Time analysis
7. Presentation of Master-Slave protocol
    a. Build and parameterization of exchange scenario
    b. Time analysis
8. Presentation of PDC protocol
9. Macro and micro cycles
    a. Time analysis
    b. Improvement of time data exchanges in industry protocols.
10. Presentation of protocols build on Ethernet layer
11. Examples

Laboratory:

1. Presentation of basic information about PLC programming and configuration
2. Configuration of typical industry network
    a. How to choose protocol.
    b. Set of groups parameters into PLC (Programmable Logic Controller).
3. Token-Bus network on GeFanuc PLC
    a. Exchanges parameterization
    b. Measurement of time data exchange
4. Modbus protocol (Master-Slave Protocol)
    a. Exchanges parameterization
    b. Measurement of time data exchange
5. FIP protocol (PDC protocol)
    a. Exchanges parameterization
    b. Measurement of time data exchange
6. ProfiBus protocol
    a. Exchanges parameterization
    b. Measurement of time data exchange

20. Examination: no

21. Primary sources:

- Carcagno L., Dours D., Facca R., Sautet B., Distributed Hard-Real-Time Systems: from specification to Realisation, Repr. 13th IFAC Workshop on Distributed Computer Control Systems,Toulouse, pp. 49-54, 1995
- A. Kwiecień: „Analiza przepływu informacji w komputerowych sieciach przemysłowych", PKJS, Gliwice 2013, "Computer networks" Springer CCIS series 2009-2017

22. Secondary sources:

23. Total workload required to achieve learning outcomes

No	Teaching mode :	Contact hours / Student workload hours
1	Lecture	30/30
2	Classes	0/0
3	Laboratory	30/30
4	Project	0/0
5	BA/ MA Seminar	0/0
6	Other	15/15
	Total number of hours	75/75

24. Total hours: 150

25. Number of ECTS credits: 5

26. Number of ECTS credits allocated for contact hours: 2

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1

28. Comments:

Approved:

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(date, Instructor's signature)

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(date, the Director of the Faculty Unit signature)