(*faculty stamp*)

COURSE DESCRIPTION

1. Course title: DISTRIBUTED REAL-TIME SYSTEMS	**2. Course code: SRCR**
3. Validity of course description: 2015/2016	
4. Level of studies: BSc programme	
5. Mode of studies: intramural studies	
6. Field of study: INFORMATICS	AEI
7. Profile of studies: COMPUTER SCIENCE	
8. Programme:	
9. Semester: 7	
10. Faculty teaching the course: Institute of Informatics, RAu2	
11. Course instructor: Prof. dr hab. inż. Andrzej Kwiecień	
12. Course classification:	
13. Course status: required	
14. Language of instruction: English	
15. Pre-requisite qualifications: Computer Networks, Fundamental of Computer Science	

16. Course objectives:

The aim of the course is presentation of the problems occurring in the application of distributed real-time computer systems in industry. The lecture should facilitate the configuration of distributed IT systems with particular emphasis on the correct selection of types and types of subscriber stations, computer network protocols and their design based on a detailed time analysis of communication systems so that the global system is operational and has the bandwidth. An important goal of the lecture is also to indicate methods of integration the local systems into a global system

17. Description of learning outcomes:

Nb.	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student has knowledge in the field of deterministic communication protocols of industrial networks. He has knowledge of time analysis of data flow in networks. He has knowledge of the existing models of industrial networks. He can choose the protocol depending on the type of industrial application. He can analyze the data flow. He can determine the basic time parameters of the network installation	Final test, Laboratory exercise	Lecture, Laboratory	K1A_W08, K1A_W10, K1A_W13, K1A_W14,
2.	Student can determine the model of the real system, describe and define its elements. He can configure the network, select parameters and examine basic time relationships. He can determine methods and methods of integration of distributed systems with other IT systems.	Final test, Laboratory exercise	Lecture, Laboratory	K1A_U01 K1A_U02 K1A_U03 K1A_U06 K1A_U15
3.	Student understand the importance and the role of IT in the creation of distributed real-time systems based on industrial controllers.	Final test, Laboratory exercise	Lecture, Laboratory	K1A_K01
4.	Student can work individually and in a team	Final test, Laboratory exercise	Lecture, Laboratory	K1A_U31

18. Teaching modes and hours

Lecture: 15 h

Laboratory: 30 h

19. Syllabus description:

Lectures:

Introduction to the subject of distributed information systems. Definitions and markings. Distribution of distributed systems due to IT measures and models. (Client - Server, Master - Slave, Manufacturer - Distributor - Consumer). Advantages and disadvantages of distributed systems - reliability and computing power.

IT real-time systems. Definitions and designations, and breakdown due to reaction times. Time as a critical parameter in industrial systems. The necessity of maintaining temporal determinism in real-time systems. Discussion of several real-time distributed real-time systems.
Models of real-time distributed systems. Determining the scope of the model's research Definition of the system node. Distribution of global node tasks. The interaction of processes occurring in the system node. Determining the interrelationships between node processes. Indication of the purpose of the analysis.
The controller is freely programmable as a basic element of the industrial system of distributed real time. Work cycles of central units. Time analysis of reaction time. Methods for shortening the duration of the basic cycle of the central unit.
Industrial networks with Token-Bus access. Description of the protocol and quantitative and qualitative determination of factors affecting the time of information exchange. Defining and determining the efficiency and bandwidth of a usable protocol.
Industrial networks with Master-Slave access. Description of the protocol and quantitative and qualitative determination of factors affecting the time of information exchange. Defining and determining the efficiency and bandwidth of a usable protocol.
Industrial networks with producer-distributor-consumer access. Description of the protocol and quantitative and qualitative determination of factors affecting the time of information exchange. Defining and determining the efficiency and bandwidth of a usable protocol.
EtherCat access networks. Description of the protocol and quantitative and qualitative determination of factors affecting the time of information exchange
Methods of integration of industrial systems. Application of non-deterministic protocols to the construction of industrial systems. Application of the Internet and wireless networks for industrial purposes

Labs:

SCADA station as a node of a distributed system
Systems of increased reliability
Communication with supervisory systems via the HTTP protocol
Systems integration using OPC
SignalR Library for inter-process communication
Advanced Driver Asistance Systems

20. Examination: none

21. Primary sources:

1. A.Kwiecień: „Analiza przepływu informacji w komputerowych sieciach przemysłowych”
2. Wskazane materiały konferencyjne „Computer Networks” seria CCIS Springer Verlag 2009-20017

22. Secondary sources:

Materials available on websites

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	15/15
2	Classes	30/30
3	Laboratory	/
4	Project	/
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	45/45

24. Total hours: 90

25. Number of ECTS credits: 3

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

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

26. Comments:

Approved:

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(date, Instructor's signature) (*date , the Director of the Faculty Unit signature)*