(faculty stamp)

COURSE DESCRIPTION

1. Course title: INDUSTRIAL REAL-TIME SYSTEMS	**2. Course code: IRTS**
3. Validity of course description: 2019/2020	
4. Level of studies: 2nd cycle of higher education	
5. Mode of studies: intramural studies	
6. Field of study: INFORMATICS	
7. Profile of studies: general academic	
8. Specialty: INDUSTRIAL INFORMATICS SYSTEMS	
9. Semester: II	
10. Faculty teaching the course: Institute of Informatics	
11. Course instructor: Prof. Andrzej Kwiecień	
12. Course classification: common courses	
13. Course status: obligatory	
14. Language of instruction: English	
15. Pre-requisite qualifications: Computer Networks, Computers Structure	
16. Course objectives: The course is associated with computer networks and real-time systems. The goal of the course is to present knowledge on real-time systems construction and implementation especially considering industrial systems. During the lecture the issue of team work and cooperation will be addressed.	
17. Description of learning outcomes:	

No.	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
W1	Knows the construction and operation of programmable logic controllers PLC and Computerized Numerical Control CNC devices. Knows and understands their role in industrial computer systems	EP	WM	K2A_W03
W2	Knows methods of shortening the PLC automata cycle	EP	WM	K2A_W06
W3	Knows Ethernet based industrial protocols used in open communication systems and industrial databases	EP	WM	K2A_W08
U1	Can program PLC controller used in a number of sample applications	PS	L	K2A_U08

U2	Can change configuration of industrial devices using communication network	PS	L	K2A_U13

18. Teaching modes and hours

Lecture: 30 h, Class: -, Laboratory: 30h

19. Syllabus description:

Lectures:

- Basic definitions: distributed system, real-time systems, hierarchical structure, functions etc.
- Models of communication networks nodes and methods of their assesment
- Controllers (PLC, CNC) – construction, operation and fields of application
- Operation cycles, programming methods
- Methods of shortening of automata cycle
- Influence of shortening of automata cycle on communication medium access delay
- Embedded controllers with PC functions
- Remote Input/Output communication nodes
- Redundancy of communication medium
- Redundancy of computer system nodes
- Cost of redundancy in computer systems
- Ethernet based protocol example – EtherCAT
- Integration of industrial systems using Ethernet networks
- Application of open communication systems and industrial databases

Laboratory classes:

- Regulation loops
- Frequency inverters
- Models of industrial objects (elevators, robots, production lines, press)

20. Examination: yes

21. Primary sources:

- Kwiecień A.: Analiza przepływu informacji w komputerowych sieciach przemysłowych. PKJS, Gliwice 1999.
- Niederliński A.: Systemy automatyki cyfrowej. WNT, Warszawa 1977.
- Kwiecień A., Gaj P. (red.): Współczesne problemy systemów czasu rzeczywistego. WNT, Warszawa 2004.
- Kwiecień A. (red.): Systemy Czasu Rzeczywistego – kierunki badań i rozwoju. WKŁ, Warszawa 2005.
- Gaj P. (red.): Systemy Czasu Rzeczywistego – projektowanie i aplikacje. WKŁ, Warszawa 2005.

22. Secondary sources:

- Grzywak A. (red.): Laboratorium Sieci Komputerowych. Skrypt uczelniany nr 2153, Wyd. Pol. Śl., Gliwice 1999
- Materiały konferencyjne
- Instrukcje laboratoryjne

23. Total workload required to achieve learning outcomes

No.	Teaching mode	Contact hours / Student workload hours
1	Lecture	30/30
2	Classes	-
3	Laboratory	30/30
4	Project	-
5	BA/ MA Seminar	-
6	Other (exam)	-
	Total number of hours	60/60

24. Total hours: 120

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): 2

28. Comments: none

Approved::

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(*date, Instructor's signature*)

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(date, the Director of the Faculty Unit signature)