Z1-PU7	WYDANIE N1	Strona 1 z 2

(*faculty stamp*)

COURSE DESCRIPTION

1. Course title: DISTRIBUTED COMPUTER SYSTEMS	**2. Course code: DCS**
3. Validity of course description: 2017/2018	
4. Level of studies: MSc programme, 2nd cycle of higher education	
5. Mode of studies: intramural studies	
6. Field of study: MACROFACULTY	RAU
7. Profile of studies:	
8. Programme:	
9. Semester: II	
10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science	
11. Course instructor: PhD Rafał Cupek	
12. Course classification: computer science (informatics)	
13. Course status: compulsory	
14. Language of instruction: English	
15. Pre-requisite qualifications: computer networks and computer programming on the level taught at BA courses	
16. Course objectives: to achieve skills in the designing distributed computer systems with the focus on soft real-time and hard real-time applications.	

17. Description of learning outcomes:

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student gets knowledge on models of distributed computer systems including hardware configuration, data flow and tasks distribution	test	Lecture, class	K2A_W05
2.	Student acquires knowledge on cooperative collaboration in distributed computers systems with focus on agent and holon based systems used in industrial applications	test	Lecture, class	K2A_W05, K2A_W11
3.	Student gets knowledge on distributed, object oriented information modeling including using meta-information and object oriented context information presentation, distributed information processing and collaborative services	test, discussion	Lecture, class	K2A_W10,K2_W15
4.	Student is able to design and prepare service and agent based distributed computer systems	laboratory reports	laboratory exercises	K2A_U01
5.	Student is able to design and prepare distributed address space and communication channels including soft and hard real-time communication, converting row process data into information, that can be used in Business Intelligence systems	laboratory reports	laboratory exercises	K2A_U01, K2A_U06
6.	Student is able to apply selected Data Mining methods and tools in order to process information available in distributed computer system	laboratory reports	laboratory exercises	K2A_U01, K2A_U01
7.				
8.				

18. Teaching modes and hours

Lecture / Laboratory

Sem 2 - 30/30 h

19. Syllabus description:

Problems related with systems distribution, time constrained communication, task scheduling, monitoring and formal system description are presented. The lecture concerns on reliability, scalability and efficiency problems in large scale distributed computer systems used in industrial applications. There is a special focus given to make system well efficient and kip required timing constraints. The lecture describes system on model level, and shows many practical examples as well.
The laboratory part is focused on industrial application use cases including the distributed middleware level that joins: control, HMI (Human Machine Interface), MES (Manufacturing Execution Systems) and BI (Business Intelligence) parts. The OPC UA C# SDK is used in order to present vertical data exchange issues in distributed industrial systems.
The Rapid Miner environment is used in order to demonstrate data mining methods and tools available to process information collected in distributed computer system.

20. Examination: no examination

21. Primary sources:

J.H. Christensen, Holonic manufacturing systems: initial architecture and standards directions, Proc 1st Euro Wkshp Holonic Manuf. Syst. (1994).
Mahnke, Wolfgang, Stefan-Helmut Leitner, and Matthias Damm. OPC unified architecture. Springer Science & Business Media, 2009.
Tsai J., Bi Y., Yang S., Smith R.: Distributed Real -Time Systems. A Wiley – Interscience Publication, New York 1996.
https://www.unified-automation.com/ .NET Based OPC UA Client & Server SDK (Bundle)
https://vector.com :Programming with CAPL, Quick Introduction to CANalyzer

22. Secondary sources:

M. Rolón, E. Martínez, Agent-based modeling and simulation of an autonomic manufacturing execution system, Comput. Ind. 63 (2012) 53–78. doi:10.1016/j.compind.2011.10.005.
Bernstein P.: Middleware: A model for Distributed System Services. Communication of the ACM: Computer Science in Manufacturing. V39.N2. February 1996Comer D. E.: Sieci komputerowe i intersieci. WNT Warszawa 2001.
International Society of Automation, ANSI/ISA-95, (n.d.). http://isa-95.com/.
Cupek, R., Ziebinski, A., Huczala, L., & Erdogan, H. (2016). Agent-based manufacturing execution systems for short-series production scheduling. Computers in Industry, 82, 245-258.
Cupek, R., Folkert, K., Fojcik, M., Klopot, T., & Polaków, G. (2015). Performance evaluation of redundant OPC UA architecture for process control. Transactions of the Institute of Measurement and Control

23. Total workload required to achieve learning outcomes

Lp.	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	/
	Total number of hours	/

24. Total hours:60

25. Number of ECTS credits: 5

26. Number of ECTS credits allocated for contact hours: 2,5

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):2,5

26. Comments:

Approved:

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(date, Instructor's signature)

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(date , the Director of the Faculty Unit signature)