1. Course title: INDUSTRIAL COMPUTER SYSTEMS
2. Course code:

3. Validity of course description: 2012

4. Level of studies: 2nd cycle of higher education

5. Mode of studies: intramural studies

6. Field of study: MAKROKIERUNEK

7. Profile of studies: general academic

8. Programme: INFORMATICS

9. Semester: 2

10. Faculty teaching the course: Institute of Computer Science

11. Course instructor: Prof. dr hab. inż. Andrzej Kwiecień

12. Course classification: common

13. Course status: obligatory

14. Language of instruction: English


16. Course objectives:
The global scope of lecture is presentation of fundamental problems during industrial distributed real-time systems designing. Good made project of industrial communications system is a fundamental target for good made control or supervisory informatics industrial system. Those problems are divided for three thematically groups:
- distributed computer systems and real-time systems
- node model of distributed system
- time analysis of data flow between application program, network coprocessor and communication protocol.
Main topics of lecture are connected with problems of computer network and computer distributed systems.

17. Description of learning outcomes:

<table>
<thead>
<tr>
<th>Nr</th>
<th>Learning outcomes description</th>
<th>Method of assessment</th>
<th>Teaching methods</th>
<th>Learning outcomes reference code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student possesses basic knowledge of distributed system</td>
<td>Participation in laboratory exercises</td>
<td>Lecture</td>
<td>K1A_W14, K1A_U1, K1A_U3</td>
</tr>
<tr>
<td>2</td>
<td>Student possesses basic knowledge of real-time systems</td>
<td>Participation in laboratory exercises</td>
<td>Lecture</td>
<td>K1A_W14, K1A_U24</td>
</tr>
</tbody>
</table>
18. Teaching modes and hours
Lecture 30h / Laboratory 30h

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 distribute 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 exercises
1. Presentation of basic information about PLC programming and configuration
2. Configuration of typical industry network
a. Chose of 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

Laboratory:

20. Examination: no, pass of laboratories


22. Secondary sources:

23. Total workload required to achieve learning outcomes

<table>
<thead>
<tr>
<th>Lp.</th>
<th>Teaching mode</th>
<th>Contact hours / Student workload hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lecture</td>
<td>30/30</td>
</tr>
<tr>
<td>2</td>
<td>Classes</td>
<td>0/0</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory</td>
<td>30/30</td>
</tr>
<tr>
<td>4</td>
<td>Project</td>
<td>0/0</td>
</tr>
<tr>
<td>5</td>
<td>BA/ MA Seminar</td>
<td>0/0</td>
</tr>
<tr>
<td>6</td>
<td>Other</td>
<td>15/15</td>
</tr>
<tr>
<td></td>
<td>Total number of hours</td>
<td>75/75</td>
</tr>
</tbody>
</table>

24. Total hours: 150

25. Number of ECTS credits: 5

26. Number of ECTS credits allocated for contact hours: 3

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

26. Comments: