COURSE DESCRIPTION CARD - SYLLABUS

Course name
Robotized Systems and Industry 4.0 [N2AiR1-RiSA>PO2-SZiP]

Course

Field of study
Automatic Control and Robotics

Year/Semester
2/3

Area of study (specialization)
Autonomous Robots and Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
10

Laboratory classes
20

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Jarosław Warczyński
jaroslaw.warczynski@put.poznan.pl

Lecturers

Prerequisites

Students starting this subject should: know and understand selected mathematics sections to a good level; has extended and deepened knowledge necessary to formulate and solve complex tasks in the field of control theory, optimization, modeling, identification and signal processing; [K2_W01 (P7S_WG)] have specialist knowledge of remote and distributed systems, real-time systems and network techniques; [K2_W03 (P7S_WG)]

Course objective

The aim of the course is to learn the principles of communications of the Industry 4.0 applications, standards of this communications and principles of cooperation between robots and people, based on machine intelligence.

Course-related learning outcomes

Knowledge
Students understands the methodology of designing specialized analog and digital electronic systems;
Skills
are able to critically assess and select appropriate methods and tools to solve tasks from the field of

automation and robotics; is able to use innovative and unconventional tools in the field of automation and robotics;
are able to design and implement a complex device, object or system, taking into account non-technical aspects;
Social competences
understand the need and know the possibilities of continuous training - improving professional, personal and social competences, can inspire and organize the learning process of other people;

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The learning outcomes presented above are verified as follows:
Formative assessment:
a) in the scope of lectures:
based on answers to questions about the material discussed in previous lectures,
b) in the field of laboratories:
based on an assessment of the current progress of task implementation,
Summative rating:
a) in the scope of lectures, verification of assumed learning outcomes is carried out by:
i. assessment of knowledge and skills demonstrated during the written lecture exam
ii. assessment of knowledge and skills based on individual discussion of the results of the written exam (additional control questions),
b) in the scope of laboratories, verification of assumed learning outcomes is carried out by:
i. assessment of student's preparation for individuallaboratorywork and assessment of skills related to the implementation of laboratory exercises (a given series of laboratory exercises is preceded by a test, i.e. the so-called entrance ticket),
ii. continuous assessment, during each class (oral answers), rewarding the increase in the ability to use known principles and methods,
iii. assessment of knowledge and skills related to the implementation of learning outcomes through two written tests.
Getting extra points for activity during classes, especially for:
i. discuss additional aspects of the issue,
ii. effectiveness of applying the acquired knowledge while solving a given problem,
iii. comments related to the improvement of teaching materials,
iv. indicating students' perceptive difficulties enabling ongoing improvement of the didactic process

Programme content

Industry 4.0 - definitions and concepts, pillars of industry 4.0. Communications in an intelligent factory - DDE, OPC, WWW. Data exchange standards: HTTP, SOAP protocol, OPC classic and UA standard. XML markup language. Cooperative robots - Cobots. Principles of coping a robot with a human. Artificial intelligence in recognizing human intentions. A posteriori probability - Bayesian inference, Bayesian networks. Hidden Markov models. Intelligent cobot control

Course topics

none

Teaching methods

Teaching methods:
1. Lecture: traditional presentation illustrated with numerous examples solved on the board.
2. Laboratory exercises: discussion of exercises and joint implementation of laboratory tasks

Bibliography

Basic

1. Fryźlewicz, Z., Salamon, A.: Podstawy architektury i technologii usług XML sieci WEB. PWN, Warszawa, 2008.
2. Short, S. - Zastosowanie XML do tworzenia usług internetowych na platformie Microsoft .NET. Microsoft Press., Promise 2005.
3. Walmsley, P. - Wszystko o XML Schema, WNT 2008
4. Mahnke, W, Leitner,S-H, Damm,M: OPC Unified Architecture. Springer-Verlag Berlin Heidelberg, 2009.
5. Iwanitz, F., Lange, J.: OPC - Fundamentals, Implementation, and Application. Wyd. Hüthig, Heidelberg, 2006.

Additional

1.Kravets, A.G. (Ed.) Robotics: Industry 4.0 Issues & New Intelligent Control Paradigms. Springer Verlag, 2020.
2. http://www.opcfoundation.org/
3. http://www.mesa.org/
4. http://www.isa.org/

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	2,00