COURSE DESCRIPTION CARD - SYLLABUS

Course name
Industrial robotics [S1MiBM2>RoP]

Course

Field of study
Mechanical Engineering

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

5,00

Coordinators

Lecturers

Prerequisites

A student starting this subject should have basic knowledge of physics, mechanics and technology (e.g. machine science, automation, control, programming basics, etc) at the level of learning outcomes achieved for these subjects in technical higher education system. The ability to solve elementary problems in the design of control algorithms (general principles of programming) and automation based on their knowledge. Understand the need to learn, acquire new knowledge, organise obtained information, verbalise own conclusions (including self-presentation) and have the readiness to cooperate in a team.

Course objective

To present current trends and theoretical and practical aspects related to robotics issues, construction, programming and application of industrial robots in manufacturing processes. To develop and shape in students the skills of conceptual problem solving and teamwork.

Course-related learning outcomes

Knowledge:
The student has knowledge of:
- classification, construction, role and principles of operation of the basic structural assemblies of the manipulator and control system of an industrial robot and it's technical and technological equipment
- current trends in the design and application areas of industrial robots

- technical characteristics of industrial robots in terms of application requirements
- principles of selection and technical requirements of industrial robots and technical and technological equipment as well as configuration of robot workstations while observing the principles and requirements of the Machinery Directive and safety of robot workstations.

Skills:
The student should be able to:
- identify a technical problem, determine its complexity and then propose a solution taking into account the final objective (result)
- select an industrial robot for a production task / develop a multivariant solution for a robotised production station, taking into account the initial and final conditions
- propose the technical and technological equipment of the industrial robot and the cooperating robot on the
- analyse the proposed variants of the robotised production workstation and select the preferred solution
- develop control programs for industrial robots cooperating with external devices (sensors, control-measuring and technological equipment, etc.) and taking into account the initial and final conditions, and carry out tests on the control program (online or offline).

Social competences:
Students should be able to co-operate in a group, express and justify their judgement, act in accordance with ethical principles.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: The knowledge acquired in the lecture is verified by a test (approximately 20 questions). Pass threshold of 50%.
Laboratory: Credit on the basis of an oral or written answer on the content of each laboratory exercise performed, a report on each laboratory exercise according to the guidelines set out in the exercise guide and the instructions of the laboratory exercise leader. In order to receive credit for the laboratories, all exercises must be passed (a positive mark for the answer and the report).
Project: the assessment includes the development of the project, presentation and discussion in the student group.

Programme content

Lecture: Development and forecast in the robotics market; Areas of robot applications; Technical and organisational aspects of robotisation; Profitability of robotisation (cost components of robotised production, impact of robotisation on investment costs; economic efficiency calculus); Contemporary industrial robots and trends in their development; Technical and technological equipment of robotic workstations (m. e.g. grippers, process heads, mating devices); Methodology for the selection of an industrial robot taking into account the conditions of its work on a production stand; Machine directive and safety of work on robotised stands; Examples of configurations of robotised stands.
Laboratory: Practical exercises in the principles and methods of programming educational-industrial robots and cooperating technical-technological equipment - Practical exercises in the development of a design of a robotic workstation for a specific manipulation or technological task.
Project: development of a design of a robotic workstation for a specific technological task. Preparation of a design task using CA software (e.g. RobotStudio, RoboGuide) supporting the design, programming and simulation and testing of virtual robotic workstations.

Course topics

none

Teaching methods

Lecture: multimedia presentation illustrated by video films, PBD - problem-based discussion (in aspects of Problem Base Learning (PBL).
Laboratory: solving practical problems, searching and using sources of knowledge, teamwork, discussion.

Project: solving practical problems, searching for and using sources of knowledge, teamwork, discussion.

Bibliography

Basic:
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- Szkodny T., Podstawy robotyki, WPŚ, Gliwice, 2011
- Zdanowicz R. Podstawy robotyki, WPŚ, Gliwice, 2011
- Zdanowicz R., Robotyzacja procesów technologicznych, WPŚ, Gliwice, 2001
- Appleton, E., Williams D. J., Industrial Robot Applications, Springer, 1987, ISBN 978-94-009-3125-1, DOI: 10.1007/978-94-009-3125
- Gołda G., Kost G. (red.), Swider J. (red.), Zdanowicz R., Programowanie robotów online, WPŚ, Gliwice, 2011
- Podręczniki programowania robotów ABB, Fanuc, Panasonic

Additional:
- Wilson M., Implementation of robot systems: an introduction to robotics, automation, and sucesssful systems integration in manufacturing, But-Hein, 2015, ISBN: 9780124047334
- Pires J. N., Robótica Industrial Indústria 4.0, Lidel, 2018, ISBN-13: 978-989752226
- Dinwiddie K., Industrial Robotics, Cengage Learning, 2018, ISBN-13: 978-1133610991
- Ross L. T., Fardo S. W., Walach M. F., Industrial Robotics Fundamentals: Theory and Applications, Goodheart-Wilcox Publisher, 2017, ISBN-13: 978-1631269417
- Ross L. T., Fardo S. W., Masterson J., Towers R. L., Robotics: Theory and Industrial Applications, Goodheart-Willcox, 2014, ISBN-13: 978-1605253213
- Zdanowicz R., Robotyzacja dyskretnych procesów produkcyjnych, WPŚ, Gliwice, 2011
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- Olszewski M., Barczyk J., i inni, Manipulatory i roboty przemysłowe, WNT, 1992

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	65	2,50