COURSE DESCRIPTION CARD - SYLLABUS

Course name
Robot programming [S1ETI2>PR]

Course

Field of study
Education in Technology and Informatics

Year/Semester
3/6

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
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

Lecturers

Prerequisites

Basic knowledge of mathematics, physics (mechanics) and standard programming pronciples (basics of informatics/programming) (basics for the first degree of this course). Ability to solve elementary problems in the field of control algorithm construction (programming principles) based on the knowledge possessed, ability to obtain information from indicated sources. Understanding the need to expand one's competences, readiness to cooperate within a team.

Course objective

1. Providing students with theoretical and practical issues related to the construction, programming and application of industrial robots within the scope defined by the program content appropriate to the field of study. 2. Developing students' skills in solving simple problems and performing simple experiments and analyzing results based on the knowledge obtained. 3. Shaping students' teamwork skills.

Course-related learning outcomes

Knowledge:
1. The student is able to identify, describe and explain the operating principle of the basic elements of the industrial robot kinematic structure, together with the meaning and role of basic programming (control) instructions.
2. The student is able to select appropriate programming instructions for a specific task in the field of

industrial robot programming.
3. The student is able to identify and describe issues (problems) of operation and diagnostics of industrial robots, including their life cycle.

Skills:
1. The student is able to identify a technical problem, determine its level of complexity, and then propose a solution that takes into account the final goal (effect).
2. The student is able to develop control programs for industrial robots cooperating with external devices (sensors, control and measurement devices, and technological devices, etc.) and conduct tests of the control program taking into account initial and final conditions.

Social competences:
1. The student is able to actively engage in solving problems, independently develop and expand their competences, and cooperate in a team.
2. The student is able to appropriately define priorities for the implementation of a task defined by themselves or others.
3. The student is able to act in an entrepreneurial and creative (innovative) manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
Knowledge acquired during the lecture is verified by a test (approx. 20 questions). Passing threshold above 50%.
Laboratory
Passing based on an oral or written answer regarding the content of each laboratory exercise performed, a report from each laboratory exercise according to the guidelines specified in the exercise manuals and the instructions of the laboratory exercise instructor. To obtain a pass in the laboratories, all exercises must be passed (positive grade for the answers and report).

Programme content

Lecture
Basic definitions and terms related to robotics and industrial robots (IR); IR application areas; IR classification and construction; IR programming basics, IR safety.
Laboratory
Practical exercises in the scope of principles and methods of programming educational-industrial robots and cooperating technical-technological equipment.

Course topics

Lecture
Basic concepts: definition, classification and application of robots, construction of robots and manipulators, kinematic chains (open, closed, flat and spatial, serial and parallel, designation, kinematic pairs, number of degrees of freedom and mobility); Coordinate systems; Kinematics of an industrial robot - direct and inverse transformation; Methods of programming industrial robots (on-, off-line); Theoretical foundations of developing an algorithm for the robot control system using basic programming instructions and taking into account cooperation with technical and technological equipment - examples.
Laboratory
Practical exercises in the construction and configuration of an industrial robot and the development of an algorithm and program for its work for a specific manipulation or technological task in connection with technical and technological equipment.

Teaching methods

Lecture
Multimedia presentation, presentation illustrated with video material and selected virtual IR programming environment
Laboratory
Solving tasks, practical exercises, discussion, team work.

Bibliography

Basic:
- Wiśniewski M., Podstawy Robotyzacji: Laboratorium., WPP, Poznań
- Szkodny T., Podstawy robotyki, WPŚ, Gliwice
- Zdanowicz R. Podstawy robotyki, WPŚ, Gliwice
- Zdanowicz R., Robotyzacja procesów technologicznych, WPŚ, Gliwice
- 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
- Podręczniki programowania robotów ABB, Fanuc, Panasonic, Kuka

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
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)	25	1,00