COURSE DESCRIPTION CARD - SYLLABUS

Course name
Robotics [S1IBio1>ROB]

Course

Field of study
Biomedical Engineering

Year/Semester
4/7

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

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Lecturers

Prerequisites

Basic knowledge of mathematics, physics (mechanics) and programming principles (core curriculum for secondary schools, basic level).

Course objective

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

Course-related learning outcomes

Knowledge:
1. The student is able to identify, describe and explain the principle of operation of the basic elements of the construction of an industrial robot with the meaning and role of basic programming (control)

instructions.
2. The student is able to choose the appropriate programming instructions for a specific task in the field of programming industrial robots.
3. The student is able to identify and describe the issues (problems) of operation and diagnostics of industrial robots, including their life cycle.

Skills:
1. Student is able to identify a technical problem, determine its complexity level, and then propose a solution taking 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 to test the control program taking into account the initial and final conditions.

Social competences:
1. The student is able to actively engage in solving given problems, independently develop and expand his competences and cooperate in a team.
2. The student is able to properly define the priorities for the realization of the tasks he or she sets.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture
Final test (20 questions carried out at the end of the semester)
51-60% dst; 61-70% dst +; 71-80% db; 81-90% db +; 91-100% very good

Laboratory
Passing on the basis of an oral or written answer concerning the content of each performed laboratory exercise, a report on each laboratory exercise according to the guidelines set out in the guide to exercises and indications of the laboratory teacher. In order to pass the laboratories, all exercises must be passed (positive grade from the answers and the report).

Programme content

Basic definitions related to industrial robots and manipulators, Areas of industrial robots applications, Construction of robots and manipulators, Kinematics of an industrial robot, Control and programming of industrial robot; Biomechanics of human movement; Industrial safety requirements for application of robots

Course topics

Lecture
Basic concepts: definition, classification and application of robots, construction of robots and manipulators, kinematic chains (open, closed, flat and spatial, series and parallel, designation, kinematic pairs, number of degrees of freedom and mobility); coordinate systems; Kinematics of an industrial robot - simple and reverse transformation; PTP, MP and CP control, Fundamentals of industrial robot programming; Biomechanics of human movement, Safety conditions when working with manipulators and robots.

Laboratory
Practical exercises in the field of principles and methods of programming educational and industrial robots.

Teaching methods

1. Lecture: presentation illustrated with examples given on the board, solving problems.
2. Laboratory exercises: conducting experiments, working in teams, discussion.

Bibliography

Basic:
1. Żurek J., Podstawy Robotyzacji - Laboratorium., WPP, Poznań, 2006
2. Morecki A., Knapczyk J., Podstawy robotyki. Teoria i elementy manipulatorów i robotów. WNT, Warszawa
3. Honczarenko J., Roboty przemysłowe. Budowa i Zastosowanie, WNT, Warszawa, 2010

4. Podręczniki programowania robotów, IRp-6, Fanuc, Panasonic

Additional:
1. Szkodny T., Podstawy robotyki. Wydawnictwo Politechniki Śląskiej, Gliwice, 2012
2. Morecki A., Knapczyk J., Kędzior K., Teoria mechanizmów i manipulatorów. Podstawy i przykłady zastosowań w praktyce, WNT, Warszawa, 2004
3. Zielińska T., Maszyny Kroczące. Podstawy, projektowanie, sterowanie i wzorce biologiczne, PWN, Warszawa, 2003
4. Kurfess R.T., Robotics and Automation Handbook, CRC Press 2005
5. http://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/lecture-notes/

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	30	1,20
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,80