POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Robotics

Course

Field of study	Year/Semester
Automatic Control and Robotics	3/5
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
First-cycle studies	Polish, English
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30		0
Tutorials	Projects/seminars	

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

dr inż. Jarosław Warczyński

email: jarslaw.warczynski@put.poznan.pl

tel. 61 665 2877

Faculty of Control, Robotics and Electrical Engineering

Piotrowo 3A 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knows and understands in an advanced level selected facts, objects and phenomena, as well as methods and theories explaining the complex relations between them, constituting basic general knowledge of mathematics including algebra, geometry, analysis, probabilistic and elements of discrete mathematics and logic, including mathematical methods and numerical methods necessary for:

• description and analysis of linear and basic non-linear dynamic and static systems

• description and analysis of complex quantities

• description of control algorithms and stability analysis of dynamic systems

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- description, analysis and methods of signal processing in the time and frequency domain

- numerical simulation of dynamic systems in the domain of continuous time and discrete time. [K1_W01 (P6S_WG)]

Knows and understands in an advanced level - selected facts, objects and phenomena and their methods and theories explaining the complex relationships between them, constituting basic general knowledge in selected areas of general physics including electricity and magnetism, and solid state physics, including the knowledge necessary to understand basic physical phenomena occurring in and around automation and robotics components and systems. [K1_W02 (P6S_WG)]

The graduate has an well-ordered and theoretically based knowledge of general mechanics: statics, kinematics and dynamics. The graduate knows and understands the principles of modelling and constructing simple mechanical systems. [K1_W03 (P6S_WG)]

Course objective
Assumptions and objectives of the course:

Acquaintance of knowledge about robot control algorithms and about controlling robot interactions with environment .

Course-related learning outcomes
Knowledge
The graduate has an ordered and theoretically founded general knowledge of general mechanics: statics, kinematics and dynamics, including the knowledge necessary to understand the principles of modeling and construction of simple mechanical systems; [K1_W3 (P6S_WG)]];

The graduate has ordered knowledge of classification, construction and kinematic structures, mathematical description, principles of operation and programming of manipulating robots; knows and understands advanced mathematical description, properties and principles of operation and programming of simple mobile robots;[K1_W15 (P6S_WG)]];

The graduate is familiar with the current state and the latest development trends in the field of automation and robotics. The graduate knows and understands the fundamental dilemmas of modern civilization connected with the development of automation and robotics. [K1_W21 (P6S_WG)]];

knows the methods, techniques, tools and materials used to solve simple engineering tasks in the field of automation and robotics; [K1_W23 (P6S_WG)]]

Skills
The graduate can read and understand technical design documentation and simple technological diagrams of automation and robotics systems ;[K1_U2 (P6S_UW)]

is able to determine and use models of simple electromechanical systems and selected industrial processes, as well as to use them for the purposes of analysis and design of automation and robotics systems; [K1_U11 (P6S_UW)]

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The graduate is able to select the type and parameters of the actuator system, measurement system, control unit and peripheral and communication modules for the selected application and to integrate them in the form of the final measurement and control system. [K1_U17 (P6S_UW)]

Social competences

The graduate is aware of the need for a professional approach to technical issues, scrupulous familiarization with the documentation and environmental conditions in which devices and their components can operate; is ready to comply with the principles of professional ethics and require it from others, respect for the diversity of views and cultures; [K1_K05 (P6S_KR)]

Methods for verifying learning outcomes and assessment criteria
Learning outcomes presented above are verified as follows:
Lecture: Written test (test of theoretical knowledge) in the field of robotics

Exercises: Score points in terms of computation, programming and knowledge of dynamics and control of robots.

Programme content

Statics of robots. Robot control systems: Independent joint control. Point-to-point motion control. Path motion control. Inverse dynamics control. Computed torque feedforward control. Manipulator interaction with environment: Compliance control. Force control with inner position loop. Force control with inner velocity loop. Hybrid position/force control. Impedance control. Adaptive robot control. Basics of the trajectory planning and robot programming.

Exercises: Construction of the dynamics model of manipulators, Simulation of control with dynamic interactions, Simulation of position and force control.

Teaching methods

1. Lecture: multimedia and board presentation,

2. Exercises: multimedia presentation, illustrated presentation,

examples given on the blackboard and the execution of the tasks given by

the lecturer - practical exercises.

Bibliography

Basic

1. Szkodny, T: Podstawy robotyki. Wydawnictwo Politechniki Śląskiej, 2012.

2. Zdanowicz: Podstawy robotyki. Wydawnictwo Politechniki Śląskiej, 2012.

3. Buratowski, T.: Podstawy robotyki. AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków, 2006.

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4. Jezierski, E.: Dynamika robotów. WNT, Warszawa, 2006.

5. Craig, J.J.: Wprowadzenie do robotyki. Mechanika i sterowanie, WNT 1993.

Additional

1. Morecki, A., Knapczyk, J.: Podstawy robotyki. Teoria i elementy manipulatorów. WNT, Warszawa, 1999.

2. Spong, M. W., M. Vidysagar: Robot modeling and Control. John Wiley & Sons, Inc., 2006

3. McKerrow, Ph. J.: Introduction to Robotics, Addison-Wesley 1991.

4. Paul, R.P: Robot Manipulators: Mathematics, Control, and Programming, Boston MIT Press 1981. (available on Internet)

Breakdown of average student's workload

	Hours	ECTS
Total workload	148	5,0
Classes requiring direct contact with the teacher	78	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	70	2,0

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[1] delete or add other activities as appropriate