# STUDY MODULE DESCRIPTION FORM

| Name of the module/subject | | Code |
|---|---|---|
| **Industrial Control Engineering and Robotics** | | **1011101261011100545** |
| Field of study | Profile of study (general academic, practical) | Year /Semester |
| **Engineering Management - Full-time studies -** | **(brak)** | **3 / 6** |
| Elective path/specialty | Subject offered in: | Course (compulsory, elective) |
| **-** | **Polish** | **elective** |
| Cycle of study: | Form of study (full-time,part-time) | |
| **First-cycle studies** | **full-time** | |
| No. of hours | | No. of credits |
| Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **-** | | **1** |
| Status of the course in the study program (Basic, major, other) | (university-wide, from another field) | |
| **(brak)** | **(brak)** | |
| Education areas and fields of science and art | | ECTS distribution (number and %) |

## Responsible for subject / lecturer:

Dr inż. Marcin Kiełczewski
email: marcin.kielczewski@put.poznan.pl
tel. 61 665 2848
Wydział Informatyki
ul. Strzelecka 11, 60-965 Poznań

## Prerequisites in terms of knowledge, skills and social competencies:

| | | |
|---|---|---|
| 1 | **Knowledge** | Basic knowledge of linear algebra, Boolean algebra, information technology, and fundamentals of programming |
| 2 | **Skills** | Acquiring information from technical literature and documentation (also in English), team work, using computer tools |
| 3 | **Social competencies** | Risk awareness when working with mechanical and electrical equipment, sense of responsibility for other people safety |

## Assumptions and objectives of the course:

Demonstrating knowledge of theoretical and practical basics of automation and robotics. The course presents topics related to fundamentals of automation, automatic control systems, PLC systems, design and programming of industrial robots as well as selected measurement elements in control systems.

## Study outcomes and reference to the educational results for a field of study

### Knowledge:

1. The student knows the basic terms related to automation, automatic control system components and the principle of work of selected controllers and their properties. - [K04-InzA_W02]
2. He/she knows the basic concepts of robotics, structure and programming systems for typical industrial manipulators, he/she is able to explain the two tasks associated with the manipulator kinematics. - [K04-InzA_W02]
3. He/she knows the structure and principle of operation of the PLC systems and the elements of their programming. - [K07-InzA_W5]
4. He/she knows the selected types of sensors and measuring devices as well as the art of their work. - [K07-InzA_W5]

### Skills:

1. The student should call the elements and the signals appearing in automatic control systems, adjust settings of controllers using known techniques. - [K01-InzA_U5]
2. He/she should handle selected types of industrial manipulators, should program movement sequences which perform a simple manipulation task. - [K01-InzA_U6]
3. He/she should develop an algorithm implementing the selected task and program it in the PLC system in the ladder language. - [K01-InzA_U7]

### Social competencies:

1. The student should be aware of dangers that may happen in industrial conditions with working manipulators and the consequences of changes introduced in control systems. - [K01-InzA_K1]
2. He/she should follow safety rules and be careful about the safety of people and devices. - [K01-InzA_K2]

## Assessment methods of study outcomes

-Formative assessment:

a) for the lecture: on the basis of answers to questions about the topics covered in previous lectures,

b) for the laboratory: based on an assessment of the progress of the laboratory tasks.

Recapitulative assessment:

a) for the lecture: on the basis of written work on the issues discussed during the lectures,

b) for the laboratory: on the basis of the assessment of performed laboratory tasks and their reports.

## Course description

1. The concept of automation, automatic control system, examples of control systems, components and classification of control systems, tools for supervising of technological processes, SCADA systems.
2. Controllers: the task of controllers, types and properties of the regulators, two- and three-position controllers, continuous PID controllers, tuning methods.
3. Fundamental concepts of robotics, types and general design of robots, tasks of industrial robots, kinematic structures, coordinate systems, representation of the localization, manipulator kinematics, systems and programming languages based on KUKA and Stäubli manipulators.
4. Structure and basics of PLC operation, cycles of the PLC, inputs and outputs, programming languages, elements of programming in the ladder language.
5. Construction and principle of operation of selected sensors and measuring devices used in automation and robotics, proximity sensors for presence detection, measurement of linear

Teaching methods:

information lecture, problem lecture;

methods of independent learning: classic problem method (problem formulation, verification, student work assessment), case study method;

discussion methods: seminar, student's lecture, brainstorming, metaplan (conclusions from discussions in teams presented on the forum in the form of a poster, multimedia presentation);

practical and practical methods: auditory exercises, solving cognitive tasks.

## Basic bibliography:

1. Wybrane zagadnienia z automatyki i robotyki / Stanisław Flaga, Dariusz Grzybek, Andrzej Jurkiewicz, Janusz Kowal, Krzysztof Lalik, Filip Lejman, Dorota Marszalik, Piotr Micek, Agata Nawrocka, Kamil Zając. Kraków : Katedra Automatyzacji Procesów Akademia Górniczo-Hutnicza, 2016.

2. Podstawy automatyki i robotyki / Renata Kalicka. Gdańsk : Wydawnictwo Politechniki Gdańskiej, 2016.

3. Laboratorium automatyki i robotyki / Wiktor Hudy, Kazimierz Jaracz. Kraków : Wydawnictwo Naukowe Uniwersytetu Pedagogicznego, 2013

## Additional bibliography:

1. Automatyzacja i robotyzacja procesów produkcyjnych / Gabriel Kost, Piotr Łebkowski, Łukasz N. Węsierski. Warszawa : Polskie Wydawnictwo Ekonomiczne, cop. 2013.

2. Polskie innowacje w automatyce i robotyce / [red. nauk. Małgorzata Kaliczyńska]. Warszawa : Przemysłowy Instytut Automatyki i Pomiarów PIAP, 2013.

## Result of average student's workload

| Activity | Time (working hours) |
|---|---|
| 1. Lecture | 15 |
| 2. Laboratories | 15 |
| 3. preparation for laboratories | 10 |
| 4. Consultations | 5 |
| 5. Finas assessment and exam | 5 |

## Student's workload

| Source of workload | hours | ECTS |
|---|---|---|
| Total workload | 50 | 1 |
| Contact hours | 35 | 1 |
| Practical activities | 15 | 0 |