# Industrial automation equipment - course description

## General information

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| Course name | Industrial automation equipment |
| Course ID | 06.0-WE-AutP-IAE-Er |
| Faculty | Faculty of Computer Science, Electrical Engineering and Automatics |
| Field of study | Automatic Control and Robotics |
| Education profile | academic |
| Level of studies | First-cycle Erasmus programme |
| Beginning semester | winter term 2021/2022 |

## Course information

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|---|---|
| Semester | 5 |
| ECTS credits to win | 4 |
| Course type | obligatory |
| Teaching language | english |
| Author of syllabus | • dr hab. inż. Jacek Kaniewski |

## Classes forms

| The class form | Hours per semester (full-time) | Hours per week (full-time) | Hours per semester (part-time) | Hours per week (part-time) | Form of assignment |
|---|---|---|---|---|---|
| Laboratory | 30 | 2 | - | - | Credit with grade |
| Lecture | 15 | 1 | - | - | Credit with grade |

## Aim of the course

Skills and competencies needed to choice industrial automation elements and equipment. Skills and competencies needed to design and model basic pneumatic and electropneumatic control systems.

## Prerequisites

Physics for engineers, Fundamentals of electrical engineering, Fundamentals of electronics,

## Scope

*Introduction.* Control tasks and functional elements of control systems. Types of industrial automation components and equipment and their specifications. Specifications of electronic and electrical automation components and equipment. Relays, reed relays, bimetallic overload relays, controllers. Sensors and transducers.

*Controllers.* Controller types, properties and specifications. Self-actuated controllers. PID controllers, on-off controllers. Digital controllers. Control specification and performance indices. PID controller tuning methods.

*Electrical actuators.* Actuator types and their specifications. Advantages and disadvantages of electrical actuation. Electrical servo motors and actuators. Basic principles of AC and DC servo motors and stepper motors.

*Pneumatic automation equipment.* Pneumatic components, their types and classification. Pneumatic symbols. *Air preparation units, pressure regulators, filters, and lubricators.*

*Pneumatic actuators.* Types, specifications, and applications. Pneumatic motors: types, specifications, and applications.

*Pneumatic valves.* Air flow and air pressure control valves: directional control valves, flow control valves, shutoff valves, throttle valves, non-return valves, pressure control valves, air distribution valves. Blocks of valves and valve islands.

*Pneumatic system designing.* Design calculations for pneumatic systems. Designing, modeling and simulation of pneumatic and electropneumatic circuits using FluidSim 4 Pneumatics software.

## Teaching methods

Lecture: problem lecture, conventional lecture

Laboratory: laboratory exercises

## Learning outcomes and methods of theirs verification

| Outcome description | Outcome symbols | Methods of verification | The class form |
|---|---|---|---|
| Knows methods for the development of electropneumatic control systems using 3/2 and 5/2 way directional valves. | | • a test <br> • carrying out laboratory reports | • Lecture <br> • Laboratory |
| Is able to select, configure and tune industrial PID controllers | | • a test <br> • carrying out laboratory reports | • Lecture <br> • Laboratory |

| Outcome description | Outcome symbols | Methods of verification | The class form |
|---|---|---|---|
| Knows methods for the development of pneumatic control systems using 3/2 and 5/2 way directional valves. | | • a test<br>• carrying out laboratory reports | • Lecture<br>• Laboratory |
| Can classify industrial automation elements and equipments. Knows the functions of the actuators in automation systems. | | • a test | • Lecture |
| Has basic knowledge of pneumatic, hydraulic and electromechanical actuators of automation systems | | • a test | • Lecture |
| Knows symbols and standards used in pneumatics and electropneumatics | | • a test | • Lecture |

## Assignment conditions

Lecture - getting a positive grade from the test

Laboratory - get positive grades from all lab exercises.

## Recommended reading

1. P. Croser, F. Ebel, *Pneumatics. Basic Level*. Festo Didactic GmbH & Co., Denkendorf, 2000

2. A.K. Gupta, *Industrial Automation and Robotics: An Introduction*. Mercury Learning & Information, 2013

3. G. Prede, D. Scholz, *Electropneumatics. Basic Level*. Festo Didactic GmbH & Co., Denkendorf, 2002

4. J. Stenerson, *Industrial Automation and Process Control*. Prentice Hall. 2002

## Further reading

1. S. Medida, *Pocket Guide on Industrial Automation. For Engineers and Technicians*. IDC Technologies, 2007 (www.PAControl.com)

2. *FluidSim 4 Pneumatics. Users Guide*. Festo Didactic GmbH & Co., Denkendorf, 2007

## Notes

Modified by dr hab. inż. Wojciech Paszke, prof. UZ (last modification: 12-07-2021 07:56)

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