



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Design of electrical and electronic circuits [S1AiR2P>PO7-PUEiE]

### Course

Field of study	Year/Semester
Automatic Control and Robotics	3/6
Area of study (specialization)	Profile of study
–	practical
Level of study	Course offered in
first-cycle	Polish
Form of study	Requirements
full-time	elective

### Number of hours

Lecture	Laboratory classes	Other
15	30	0
Tutorials	Projects/seminars	
0	0	

### Number of credit points

3,00

### Coordinators

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### Lecturers

### Prerequisites

The student starting the subject should have a good knowledge of electronics and electrical engineering. One should also be able to obtain information from specified sources and be willing to cooperate as part of a team.

### Course objective

Familiarize students with the principles of electronic and electrical circuit design. Acquire the skills to use programs to support the process of designing and analysis of electronic and electrical circuits. Knowledge in reading and writing technical documentation.

### Course-related learning outcomes

Knowledge:

Knowledge learning outcomes include advanced familiarity with the theory and methods of operation of basic electronic, analog and digital components and selected electronic circuits and systems [K1\_W12].

In addition, the student acquires knowledge of techniques, technologies and principles of construction of simple automation and robotics systems. Student knows the principles of selection of actuators, computing units and measurement and control devices [K1\_W20]. Thanks to the lecture content, which is updated on a regular basis, the student also becomes familiar with the current status and the latest development trends in the area of automation and robotics [K1\_W21].

#### Skills:

As part of the course, the student acquires the ability to use selected tools for rapid prototyping of automation and robotics systems [K1\_U13]. In addition, he or she acquires the key skill of building, commissioning and testing simple electronic and electromechanical systems [K1\_U15]. Implementation of practical projects of electrical and electronic systems teaches the selection of the type and parameters of measuring systems, control units or measuring and communication modules. As a result, the student is able to carry out this selection for a specific application and integrate them in the form of the resulting measurement and control system [K1\_U22]. In addition, as part of the course, the student acquires the ability to design simple electrical and electronic circuits for various applications, taking into account material properties [K1\_U25].

#### Social competences:

The course also develops social competencies, in particular, the readiness to critically evaluate the knowledge possessed and the understanding of the need and knowledge of the possibility of continuous training [K1\_K1]. In addition, the content covered in the course of the lecture increases the awareness and understanding of the importance and non-technical aspects and consequences of engineering activities, including their impact on the environment and related responsibility [K1\_K2]. The student participating in the course also acquires competencies related to the awareness of the need to approach technical issues in a professional manner and to be meticulously familiar with the documentation and environmental conditions in which equipment and its components may operate [K1\_K5].

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written exam (checking theoretical knowledge) on electrical and electrical circuits designing.  
Design: Design review and assessment.

### Programme content

Lecture. Symbols and general rules determining the correct documentation of technical system / device. Methods of designing electrical circuits together with necessary calculations of their properties. Becoming familiar with the available programs for creating and analyzing electronic and electrical circuits. Familiarization with the process of manufacturing electronic and electrical circuits. Techniques and materials used in the production of printed circuits. PCB design methods and techniques supported by real-world examples and industry standards. Electromagnetic compatibility issues and higher frequency circuit design. Design for manufacturing and methods for adapting designs to the technological requirements of the production stage. Technologies for electronic component assembly and printed circuit board testing.

#### Project:

Design of electrical circuits in the field of control and instrumentation .

Designing of printed circuits - selection of technology and components for the design task, preparation of schematics and layout of components on the printed circuit board; preparation of files for the production and assembly stage of the electronic circuit, optimization of production cost.

### Course topics

none

### Teaching methods

Lecture: multimedia presentation, illustrated with real examples of engineering projects in the field of control and measurement systems, as well as printed circuit designs.

Project: designing own projects of electronic devices and engineering projects typical for the industry. Discussions and defense of projects. Teaching materials in the form of a series of instructional videos and tutorials to support the design process.

## Bibliography

### Basic:

1. Cezary Zieliński, Podstawy projektowania układów cyfrowych, PWN 2012
2. Robert A. Pease, Projektowanie układów analogowych. Poradnik praktyczny, BTC 2005.
3. Harry Kybett, Earl Boysen, Elektronika dla każdego. Przewodnik, Helion.

### Additional:

1. David Cook, Budowa robotów dla początkujących. Wydanie II.
2. Selected application notes.

## Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00