



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of electronics

Course

Field of study

Automation and robotics

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

18

Laboratory classes

18

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

Paweł Pawłowski, PhD

Responsible for the course/lecturer:

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Engineering

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Prerequisites

Knowledge: A student starting this subject should have a basic knowledge of electrical engineering (especially circuit theory), programming and computer skills.

Skills: She or he should have the ability to solve systems of linear equations and analyze basic electrical circuits, calculate elementary derivatives and integrals. A student should also be able to use basic computer tools. She or he should also understand the need to expand her/his competences and be ready to cooperate in a team.

Social competences: In addition, she or he should exhibit qualities such as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture and respect for other people.



Course objective

1. Providing students with knowledge of basic electronic components, their structure and properties as well as basic analog and digital electronic circuits.
2. Developing students' skills in testing and designing electronic circuits.
3. Developing students' teamwork skills in performing laboratory exercises.

Course-related learning outcomes

Knowledge

1. A student has structured and theoretically founded knowledge of the principles of operation of basic electronic, analog and digital components, selected electronic circuits and systems - [K1_W12]

Skills

1. A student can read and understand design technical documentation and simple technological diagrams of automation and robotics systems - [K1_U2]
2. A student is able to build, run and test a simple electronic circuit - [K1_U15]
3. A student is able to design simple electrical and electronic circuits intended for various applications - [K1_U25]

Social competences

1. A student understands the need and knows the possibilities of continuous training - raising professional, personal and social competences, she or he is able to inspire and organize the learning process of other people - [K1_K1]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative assessment:

a) in the scope of lectures:

based on answers to questions about the material discussed in previous lectures, tests checking understanding of the lecture content at the end of selected lectures

b) in the scope of laboratories:

based on an assessment of the current progress of task implementation.

Summative assessment:

a) in the scope of lectures: the verification of the assumed learning outcomes is carried out by:



i. assessment of knowledge and skills demonstrated during the written exam consisting of 4 problem tasks; during the exam a student can get 20 points, a positive grade requires a minimum of 10 points, the use of supporting materials is not allowed.

ii. discussion about exam results,

b) in the scope of laboratories: verification of assumed learning outcomes is carried out by:

i. assessment of student's preparation for individual sessions of laboratory classes ("entrance" test) and assessment of skills related to the implementation of laboratory exercises,

ii. continuous assessment, during each class (oral answers) - rewarding the increase in the ability to use known principles and methods,

iii. assessment of the laboratory reports prepared partly during the classes and partly at home; this assessment also includes teamwork skills.

Obtaining additional points for activity during classes, in particular for:

i. discuss of additional aspects of the issue,

ii. effectiveness of applying the acquired knowledge while solving a given problem,

iii. ability to work as part of a team that practically performs a specific task in the laboratory,

iv. comments related to the improvement of teaching materials,

v. indicating students' perceptive difficulties enabling ongoing improvement of the didactic process.

Programme content

The lecture program includes the following topics:

1. Introduction: design of electronic devices, surface mounted (SMT) and THT (through-hole) technologies, RoHS directive, technologies, EDA, software and equipment used in the laboratories: NI LabVIEW, ELVIS II

2. Semiconductor phenomena (metals, semi-metals, non-metals; conductors, semiconductors, insulators, charge carriers in semiconductors, p-n junction, a diode)

2. Semiconductor electronic components: models, thermistors, varistors, semiconductor diodes, optocouplers

3. Semiconductor electronic components: bipolar junction transistors (BJT) and field-effect transistors (FET), construction, operating conditions, characteristics, basic transistor circuits

4. Power supplies and linear voltage and current regulators



5. Switching circuits: half bridge, H-bridge, switching regulators and switching power supplies
6. Transistor amplifiers, power amplifiers: class of amplifiers, practical solutions, switching amplifiers
7. Operational amplifiers
8. Passive electronic components: resistors, capacitors, coils, transformers, relays, switches
9. Electronic components and circuits: summary, questions and answers

Laboratory classes are conducted in the form of nine 2-hour exercises taking place in the laboratory. Exercises are carried out by teams of 2 students.

The laboratory program includes the following issues:

1. P-n junction (semiconductor diodes)
2. Field effect transistor (FET)
3. Measurements of CMOS circuits (digital input and output)
4. Bipolar junction transistor (BJT)
5. Operational amplifier
6. Rectifiers, ripple suppression circuits
7. Zener diode as a voltage regulator, surge suppression and overvoltage protection circuits
8. Transistor in digital circuits (switch, transmission gate, inverter)
9. Transistor amplifier (bipolar junction transistor, BJT)

Teaching methods

1. Lecture: multimedia presentation illustrated with examples on the board
2. Laboratory classes: configuration of measuring systems (hardware and software), performing of measurements, teamwork

Bibliography

Basic

1. Teaching materials on the www.dsp.put.poznan.pl website



2. Sztuka elektroniki, cz. 1 i 2, P. Horowitz, W. Hill, WKiŁ, Warszawa 2009

3. U.Tietze, Ch.Schenk: Układy półprzewodnikowe, WNT 2008

Additional

1. Układy elektroniczne cz. I. Układy analogowe liniowe, Z. Nosal, J. Baranowski, WNT, Warszawa 1994

2. Układy elektroniczne cz. II. Układy analogowe nieliniowe i impulsowe, J. Baranowski, G. Czajkowski, WNT, Warszawa 2004

3. Układy elektroniczne cz. III. Układy i systemy cyfrowe. J. Baranowski, B. Kalinowski, Z. Nosal, Warszawa 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5
Classes requiring direct contact with the teacher	42	2
Student's own work (literature studies, preparation for laboratory classes, preparation of laboratory reports) ¹	83	3

¹ delete or add other activities as appropriate