



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electronics

### Course

Field of study

Materials engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

english

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

mgr inż. Roman Regulski

Responsible for the course/lecturer:

prof. DSc. PhD. Eng. Andrzej Milecki

### Prerequisites

Physics in the field of the structure of matter and the phenomena of electricity. Basics of electrical engineering. Ability to calculate electrical circuits. Knowledge of properties and parameters of passive elements.

### Course objective

Getting to know the structure, operation and characteristics of electronic components and learning the basics of designing and commissioning simple electronic circuits. Getting acquainted with microprocessor systems, eg Arduino

### Course-related learning outcomes

Knowledge

Has a basic knowledge of electrical engineering and electronics, with which he can describe the basics of electrostatics and electromagnetism, DC and AC electrical circuits; define power and energy in single-phase and three-phase circuits; recognize a transformer, DC and AC machines, electric motors and drives; describe semiconductor circuits and instruments, rectifier and stabilizer circuits, digital and logic



circuits; read block diagrams and microcomputer architecture; and can apply materials in electrical and electronic engineering. K\_W07

Knowledge of basic passive electronic components. Electronics assembly methods. The p-n junction and the structure and operation of a diode and circuits with diodes. Knowledge of the structure, operation and parameters of bipolar and unipolar transistors, knowledge about power supply, types and systems of operation of transistors 2 Knowledge of integrated circuits and operational amplifiers (WO) Fundamentals of digital technology. Knowledge of microcontrollers, in particular Arduino. K\_W07

#### Skills

Can build circuits with different types of LEDs and analyze their work Can select elements, design and build a single transistor circuit - a key Can build a simple microprocessor system based on Arduino Can analyze a simple electronic circuit. K\_U20

#### Social competences

Understands the need for lifelong learning; can inspire and organize the learning process of other people K\_K01

He/She is aware of the role of electronics in the modern engineering and its importance for society and the environment K\_K07

Can define priorities for the implementation of a specific task K\_K04

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

EXAM: Passed on the basis of an examination consisting of 5 general questions (for a correct answer to each question - 1 point. Grading scale: less than 2.6 points - 2, 2.6 ÷ 3.0 - 3.0, 3.1 ÷ 3.5 points - 3.5, 3.6 ÷ 4.0 points - 4.0, 4.1 ÷ 4.5 points - 4.5, 4.6 ÷ 5.0 points - 5.0 very good)

Laboratory: Credit based on the correct implementation of exercises and reports on each laboratory exercise according to the instructions of the laboratory teacher. Before the exercises, short entrance tests, and after the exercises, a written final test. In order to pass the laboratories, all exercises must be passed (positive grade from the answers and the report).

#### Programme content

1. Structure and electrical properties of an atom, conductors, insulators and semiconductors, Passive components used in electronic systems. Electronics assembly. 2. Semiconductors, p-n junction. Rectifier circuits. 3. Bipolar transistors: structure, parameters, operation, key. 4. JFET and MOSFET transistors, thyristor, triac. 6. Integrated circuits. Operational and other amplifiers. 7. Basics of digital technology: gates and microprocessors (Arduino). Lab: 3 1. Study of diode systems 2. Investigation of bipolar transistors 3. Study of unipolar transistors 4. Testing of key systems and transistor amplifiers 5. Arduino I. 6. Arduino II

The laboratory is used to teach the subject of Electronics, which includes exercises related to the construction, operation and characteristics of electronic components, as well as teaching the basics of



designing and commissioning simple electronic circuits in the teaching cycle. In the laboratory, in addition to teaching, research is carried out by the scientific staff with the participation of students and doctoral students.

Equipment and teaching equipment:

1. KPS-3005DU laboratory power supply 0-30V 5A - 5pcs.
2. KD3005D 0-30V 0-5A 150W laboratory power supply - 5pcs.
3. UTP3705S 2 x 0-32V 0-5A DC symmetrical laboratory power supply - 2pcs.
4. UT71A digital universal multimeter + USB UT-71A - 5pcs.
5. UT33A digital universal multimeter - 10 pcs.
6. SDS1052DL 2x50MHz digital oscilloscope + MENU PL - 5 pcs.
7. function generator JDS6600-15MHz two-channel - 5 pcs.
8. EIC-1308 universal prototype contact board 3220 fields - 5 pcs.
9. 140 pieces of connection cables for contact boards
10. BNC - BNC 1.5m 75Ω cable - 15 pcs.
11. antistatic ESD mat 40x40cm - 10 pcs.
12. pliers L=160mm - 5 pcs.
13. side cutting pliers L=115mm - 5 pcs.
14. set of ceramic capacitors 300 pieces
15. set of electrolytic capacitors 120 pieces
- 16) Set of 0.25W through-hole resistors 1000pcs. - various values
17. set of 180 pieces of PNP and NPN bipolar transistors
18. laboratory tables and chairs + Blackboard

### Teaching methods

Lectures and presentations of models and simulations of circuits

### Bibliography

Basic

1. The Art of Electronics Hardcover , 2015, Paul Horowitz , Winfield Hill



Additional

Getting Started in Electronics Spiral-bound . 2000, III Mims, Forrest M

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	30	1,0

<sup>1</sup> delete or add other activities as appropriate