COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronics I

Course

Field of study
Mechatronics
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
30
Laboratory classes
15
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
prof. DSc. PhD. Eng. Andrzej Milecki
Responsible for the course/lecturer:
MSc. Eng. Roman Regulski

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 advanced integrated circuits. Getting knowledge of electronic sensors.

Course-related learning outcomes

Knowledge

Methods of assembling electronics. Knowledge of the properties and parameters of passive electronic components

P-n junction, construction and operation of a diode, LED diode, photodiodes, solar cells and others, diode circuits.

Knowledge of the structure, operation, characteristics and models of bipolar and unipolar transistors.

Knowledge about power supply, types and systems of operation of transistors. Construction and operation as well as the basics of designing transistor amplifiers.

Thyristor, triac, diac and their applications. Electronic sensors.

Digital circuits: levels, signals, AC conversion, basic digital components.

Knowledge of operational amplifiers (WO) and circuit design from WO

Knowledge of advanced integrated circuits.

Knowledge about electronic based sensors.

Skills

Can design and build circuits with different types of diodes

Can select elements, design and build basic transistor circuits

Is able to design a circuit that amplifies or adjusts electrical signals

Can find, select and design an electronic circuit with operational amplifiers

Can design and connect digital circuits

Can use electronic based sensors

Social competences

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

He/She is aware of the role of electronics in the modern engeneering and its importance for society and the environment

Can define priorities for the implementation of a specific task

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, conductors, insulators

2. Passive components used in electronic circuits. Methods of assembling electronics

3. N and p semiconductor, p-n junction. Diodes, rectifiers, ripple filtering, Zanera diode. Types and parameters of diodes. LEDs, photodiodes, other diodes.

4. Bipolar transistors: structure, characteristics. Power supply, work configurations, mathematical models

5. Super beta transistor, key, sinusoidal signal amplifier, class A amplifier, two stage amplifier

5. Class B power amplifiers. Heat dissipation, basics of heat flow.

6. Integrated circuits, construction, production, types, derivation.

6. JFET and MOSFET transistors, structure, operation, parameters, work circuits

7. Thyristor, triac, diac, work systems, waveforms.

8. Semiconductor elements as sensors

8. Operational amplifiers, comparators

9. Circuits of various operational amplifiers

10. Integrated stabilizers, impulse power supplies, chargers.

11. Basics of digital technology: signal levels, gates and other elements.

12. Connecting in electronics, interference and noise. Sample layouts

13. Microprocessors - connection

14. Advanced integrated circuits

Lab:

1. Study of diode systems

2. Investigation of bipolar transistors

3. Study of unipolar transistors

4. Testing of key systems and transistor amplifiers

5. Study of the operational amplifier.

6. Integrated circuits

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	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate