



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electronics in medical devices [S1IBio1E>EwUM]

Course

Field of study

Biomedical Engineering

Year/Semester

3/6

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

2,00

Coordinators

Lecturers

Prerequisites

Electrical engineering, knowledge of basic electronic elements and circuits. Ability to design and assemble electronic circuits. Basics of microprocessor controllers. Design of printed circuit boards. Understands the importance of electronics in medical devices.

Course objective

Extending knowledge of electronics. Application of advanced IC. Acquainting with the construction, operation, design of electronic measuring systems and power systems used in medical devices.

Course-related learning outcomes

Knowledge:

Extended knowledge of various parameters and characteristics of electronic components

Knowledge of parameters and non-linearities of selected operational amplifiers and methods of their compensation

Knowledge of the construction and application of measuring amplifiers

Knowledge of high power components and high power amplifiers and power supply units

Examples of construction of chosen electronic circuits used in medical devices

Skills:

Is able to design and build an electronic system based on operational amplifiers
Can select electronic components and design a circuit with an operational amplifier
Is able to design a power supply and a power amplifier
Is able to design systems cooperating with microprocessors
Is able to design and build an electronic system for medical applications

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 medical devices and its importance for the health of the society

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. Electronic components - an extended overview of the types and their actual parameters. Signals and their transmission. Noise properties of active elements. Filtering.
2. Special diodes and transistors, voltage stabilizers and power supply units. Construction of transistor amplifiers.
3. Ideal and real operational amplifiers, nonlinearities and their compensation
4. Various circuits with operational amplifiers, including non-linear ones.
5. Advanced integrated circuits, power circuits, examples of controlling motors, valves, etc.
6. Instrumental amplifier, measuring circuits, application in ECG and other examples.
7. Electronics in exemplary medical devices.

Course topics

none

Teaching methods

Lecture with presentations and examples, explanations using the table

Bibliography

Basic:

1. The Art of Electronics Hardcover , 2015, Paul Horowitz , Winfield Hill
2. Career Paths. Electronics. Student's Book. Evans Virginia, Dooley Jenny, Taylor Carl
3. Getting Started in Electronics Spiral-bound . 2000, I Mims, Forrest M

Additional:

Operational Amplifiers and Linear Integrated Circuits Publisher: Mohawk Valley Community College, James M. Fiore, 2018

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00