# 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

prof. dr hab. inż. Andrzej Milecki
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## 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 advenced 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 suppy 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 nad 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, III 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 |