COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electronic measuring systems and regulations [S1IBio1>EUPiW]

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
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

dr inż. Arkadiusz Hulewicz
arkadiusz.hulewicz@put.poznan.pl

Lecturers

Prerequisites

A student starting this subject should have a basic knowledge enabling the use of computer aided software and systems for engineering work in biomedical engineering and technology. He should also have the ability to effectively self-study, using information obtained from the indicated sources, and show willingness to cooperate within a team.

Course objective

To introduce students to the properties of selected electronic transducers and the principles of their use in measuring systems. Developing students' skills in designing, assembling and starting selected electronic systems.

Course-related learning outcomes

Knowledge:
1. has basic knowledge enabling the use of computer aided software and systems for engineering work in biomedical engineering and technology.
2. has basic knowledge of electrical engineering and electronics, thanks to which he can describe DC and AC electric circuits, digital and logic circuits.

3. has knowledge of sensors and measurements of non-electrical quantities.

Skills:
1. is able to apply knowledge of electrical engineering and electronics to design and analyze electrical and electronic systems.
2. is able to plan and carry out experiments, including computer measurements and simulations, interpret obtained results and draw conclusions.
3. can obtain information from literature, databases and other properly selected sources

Social competences:
1. is able to interact and work in a group, assuming different roles in it, and set priorities for the implementation of the task specified by him or others.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified on a written test, which consists of 10-15 questions (mostly open), variously scored. Test pass threshold: 60%. The issues on the basis of which questions are prepared are sent to students by e-mail using the university's e-mail system.
Skills acquired as part of the laboratory are verified on the basis of continuous assessment related to the implementation of tasks during each class and evaluation of the report of exercises performed.
Skills acquired as part of the project classes are verified at each class and based on the assessment of the completed project.

Programme content

Lecture: Detectors and transducers of electrical signals and their static and dynamic parameters. Basics of sensor technology and acquiring their signals.
Laboratory: Static and dynamic parameters of measurement transducers. Methods of transmitting electrical signals.
Projects: Basics of designing electronic actuating systems. Design of the selected measurement system.

Course topics

Lecture:
1. AC voltage detectors.
2. Static and dynamic parameters of measuring amplifiers.
3. Analog converters of electrical signals based on an operational amplifier.
4. Elements of sensor technology.
5. Examples of transducers and sensors.
6. Cooperation of operational amplifier with measuring sensors.

Laboratory:
1. Static and dynamic parameters of optocouplers.
2. Properties of an industrial fiber optic link.
3. Characteristics of voltage - current and current - voltage transducers based on an operational amplifier.
4. Static and dynamic parameters of maximum value detectors.
5. AC voltage measurement.

Projects:
1. Basics of electronic executive design.
2. Assumptions applicable during the assembly and commissioning of electronic systems.
3. Construction of measuring systems using PLC controllers.
4. Programming languages of PLC controllers: ladder diagrams, list of instructions.
5. Examples of configuration of measuring systems using a PLC controller.

Teaching methods

1. Lecture: presentation illustrated with examples given on the board, problem solving.
2. Laboratory exercises: conducting experiments, teamwork, discussion.
3. Projects: solving practical tasks, teamwork, discussion.

Bibliography

Basic:
1. J. Kasprzyk, Programowanie sterowników przemysłowych, WNT, Warszawa 2006.
2. A. Cysewska-Sobusiak, Podstawy metrologii I inżynierii pomiarowej, Wyd. Politechniki Poznańskiej, Poznań 2010.
3. U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa 2009.
4. P. Horowitz, W. Hill, Sztuka elektroniki, WKŁ, Warszawa 1996.

Additional:
1. A. Cysewska-Sobusiak, Modelowanie I pomiary sygnałów biooptycznych, Wyd. Politechniki Poznańskiej, Poznań 2001.
2. A. Guziński, Liniowe elektroniczne układy analogowe, WNT, Warszawa 1994.
3. Z. Kulka, M. Nadachowski, Analogowe układy scalone, WKŁ, Warszawa 1985.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	28	1,00