COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modern systems for the acquisition of measurement signals [S2Eltech2-ISP>NSASP]

Course

Field of study
Electrical Engineering

Year/Semester
2/3

Area of study (specialization)
Smart Measurement Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
0

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of electrotechnics, electronics, computer science and measurement systems. The ability to effectively self-educate, awareness of expanding one's competences and being ready to work in a team. Ability to comply with the rules of the university study process.

Course objective

Learning advanced signal acquisition techniques in a multi-channel measurement system and digital processing of recorded data for signal analysis.

Course-related learning outcomes

Knowledge:
1. The student has well-established knowledge in the field of measuring electrical and non-electrical quantities, the use of electronic circuits, including a multi-channel system with A/D converter, with computer data recording.
2. The student has knowledge of engineering technologies used in digital signal processing systems and algorithms, the use of programming tools for data processing and analysis.

Skills:
1. The student is able to work independently and in a team, using knowledge in the field of engineering and technical sciences.
2. The student is able to plan and assemble a simple measuring system with a signal acquisition card in order to record electrical and non-electrical signals.
3. The student is able to creatively design simple measurement systems with signal processing, use new technologies with the use of non-technical aspects.

Social competences:
1. The student understands the need to acquire knowledge as well as raise and update their competences in the field of IT tools.
2. The student understands the need for creative action and application of current knowledge to assigned tasks and compliance with the rules of professional ethics.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Laboratory: assessment of knowledge and skills related to the implementation of a laboratory task, assessment of the report made in class or at home. Rewarding insights regarding the improvement of the content of teaching materials.
Project: assessment of knowledge, skills and activity in the implementation of the project task, evaluation of the study related to the implementation of the project task.

Programme content

Laboratory:
planning and execution of measurement tasks, acquisition of electrical signals electrical, implementation of signal recording application with DAQ card, signal filtering, measurement of non-electrical quantities, non-invasive measurements of bioelectrical signals.

Project:
Planning of the project task, feasibility analysis, development of project assumptions and work schedule, implementation of tasks related to signal acquisition and processing and presentation.

Course topics

Laboratory:
1. Planning and implementation of measurement tasks with DAQ cards, A/D and D/A processing.
2. Acquisition of electrical signals.
3. Implementation of signal recording application with DAQ card, presentation and interpretation of signal samples, saving to file.
4. Digital filtering of the signal.
5. Measurement of non-electrical quantities.
6. Non-invasive measurement of bioelectrical signals from the surface of human skin, measurement of photoplethysmographic signal with optical sensors.

Project:
1. Planning the design task, feasibility analysis, review of commercially available solutions.
2. Development of design assumptions and work schedule.
3. Implementation of the control program of the measuring station.
4. Implementation of signal acquisition tasks.
5. signal processing, presentation of results.
6. Preparation and discussion of the report, inference.

Teaching methods

Laboratory: individual or team work, discussion of various methods and aspects of problem solving. Reviewing the documentation from the laboratory by the teacher.
Project: work individually or in teams, discussing possible solutions and practical implementation of selected issues of the project task, reviewing the developed documentation.

Bibliography

Basic:
1. Zieliński T. Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKŁ, Warszawa 2014.
2. Lyons R. G., Wprowadzenie do cyfrowego przetwarzania sygnałów, tł. z jęz. ang.Zarzycki J., Jerzy Szymbor J., WKŁ, Warszawa 2010.
3. Świsulski D., Przykłady cyfrowego przetwarzania sygnałów w LabVIEW, Wydawnictwo Politechniki Gdańskiej, 2012.
4. Winiecki W., Organizacja komputerowych systemów pomiarowych, Oficyna Wydawnicza Politechniki Warszawskiej, 2006.

Additional:
1. Gajo Z., Podstawy cyfrowego przetwarzania sygnałów, Oficyna Wydawnicza Politechniki Warszawskiej, 2019.
2. Moczko J. A., Kramer L., Cyfrowe metody przetwarzania sygnałów biomedycznych : zadania Wydawnictwo Naukowe UAM, 2001.
3. Lesiak P., D. Swisulski D., Komputerowa technika pomiarowa w przykładach, Agenda Wydawnicza PAK, 2002.
4. Bishop R. H., LabVIEW student edition, National Instruments, Prentice Hall 2015.
5. Krawiecki Z, Szałkiewicz S., Hulewicz A., Identyfikacja artefaktów EKG zarejestrowanych podczas monitorowania sygnału EMG, Poznan University of Technology Academic Journals. Electrical Engineering - 2017, Issue 89, s. 229-238
6. Krawiecki Z., Hulewicz A., Dziarski K., The measurement stand with DAQ card for recording a bioelectric signal from human muscles, ITM Web of Conferences - 2019, vol. 28, s. 01042-1-01042-2.

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