COURSE DESCRIPTION CARD- SYLLABUS

Course name

Fundamentals of electronic processing of signals

Course

Field of study

Mathematics in Technology

Area of study (specialization)

—

Level of study

first-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

Polish

Requirements

elective

Number of hours

Lectures

30

Laboratory classes

15

Other (e.g. online)

—

Tutorials

—

Projects/seminars

—

Number of credit points

3

Lecturers

Responsible for the course/lecturer::

dr hab. inż. Grzegorz Wiczyński

Responsible for the course/lecturer::

dr inż. Dariusz Prokop

Prerequisites

Basic knowledge of algebra and mathematical analysis, electrical engineering and basic knowledge of electronic analog circuits and digital techniques. Proper selection of electronic components and layout design for the implementation of a simple electronic engineering task. He is aware of the need to broaden his/ her competence and shows willingness to cooperate within the team and ability to meet the requirements of participation in the didactic process realized by the university.

Course objective

Learn about the characteristics and application possibilities of analog, digital-to-analog and digital-analog converters. Learn about modern measurement signal processing techniques.

Course-related learning outcomes

Knowledge

- well-ordered knowledge on the classification of basic electronic components and methods of processing electrical signals;
- can explain principles and techniques of acquisition and processing of measurement signals for industrial applications.

Skills

- can design and implement signal processing for simple measurement engineering applications and diagnose the cause of technical malfunction;
- he/she is able to work alone and in team for the proper selection of tools for signal processing tasks and to properly evaluate non-technical aspects such as time and cost of installation.

Social competences

- ability to think and act in a responsible and entrepreneurial manner in the area of electronic signal processing.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: evaluation of the knowledge and skills shown during a written test (a test sheet includes information necessary to solve computational tasks). The grade from laboratory as well as attendance and activities during the lectures are taken into account.

Laboratory classes: entrance tests and rewarding of knowledge necessary to implement the problems posed in the area of laboratory tasks. Assessment of skills related to the implementation of the measurement task. Assessment of reports on exercises performed. Assessment of knowledge demonstrated on the written test in the scope of laboratory content (test questions and accounting tasks).

Programme content

Update: 10.09.2020r.

Lectures: the use of operational amplifiers for the implementation of analog signal converters. Analog converters of electrical signals (voltage to voltage, voltage to current, current to voltage, peak value detectors, rms value, sample and hold). Voltage-frequency and frequency-voltage converters. D/A converters: parameters, components and types of D/A converters. Analog-to-digital voltage converters: parameters, components and processing methods. Experimental tests of selected transducers.

Laboratory classes: laboratory exercises carried out during 90 minutes in groups of 4. The introductory classes present safety rules, regulations and criteria for passing the laboratory. Next, the laboratory program and measuring apparatus used during the exercises are discussed. The performed laboratory tasks were divided into two parts. The first part contains exercises regarding: current-voltage and voltage-current converters, peak value detectors, RMS converters, voltage-frequency and frequency-voltage converters, and various types of analog-to-digital and digital-to-analog converters. In the second part, the

project of electronic circuit processing signals coming from selected different types of measuring sensors is being implemented. Each group correctly assembles the electronic system and then tests its parameters and properties.

Teaching methods

Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports.

Lectures: Multimedia presentations expanded by examples shown on a board. Activity of students is taken into consideration in final students evaluation. Theoretical questions are presented in the exact reference to the practice.

Laboratory classes: Realization of laboratory tasks in teams, taking into account the specific computational experiments.

Bibliography

Basic

- Z. Kulka, A. Libura, M. Nadachowski, Przetworniki analogowo-cyfrowe i cyfrowo-analogowe, WKŁ, Warszawa 1987.
- U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa 2009.
- J. Zakrzewski, Czujniki i przetworniki pomiarowe, Wyd. Politechniki Śląskiej, Gliwice 2004.
- Z. Kulka , M. Nadachowski, Wzmacniacze operacyjne i ich zastosowania cz. 1 i 2 WNT 1983.
- J. Rydzewski, Pomiary oscyloskopowe, WNT, Warszawa, 2007.

Additional

- J. Jakubiec, J. Roj, Pomiarowe przetwarzanie próbkujące, wyd. Politechniki Śląskiej, Gliwice 2000.
- Denton J. Dailey, Electronic Devices and Circuits, copyright 2001 by Prentice-Hall, Inc., Upper Sadle River, New Jersey 07548, USA. Warszawa 2002.
- Bibliografia wyszukana przez studenta ze źródeł drukowanych i elektronicznych.
- W. Kester, Przetworniki A/C i C/A: teoria i praktyka, BTC, 2012.
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- B. Carter, R. Mancini, Wzmacniacze operacyjne: teoria i praktyka, BTC, 2011.
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- Z. Nawrocki, Wzmacniacze operacyjne i przetworniki pomiarowe, Wyd. PWr, Wrocław, 2008.
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- Aviation Electronics Technician – Basic, NAVEDTRA 14028, 2003.
- Www.electropedia.org.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam)	25	1,0