COURSE DESCRIPTION CARD - SYLLABUS

Course name
Selected issues of signal processing

Course

Field of study
Electrical Engineering

Year/Semester
2/2

Area of study (specialization)
-

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Michał Gwóźdź

email: Michal.Gwozdz@put.poznan.pl

tel. 616652646

Wydział Automatyki, Robotyki i Elektrotechniki

ul. Piotrowo 3A, 60-965 Poznań

Responsible for the course/lecturer:
mgr inż. Mariusz Świderski

email: Mariusz.Swiderski@put.poznan.pl

tel. 6166552071

Wydział Automatyki, Robotyki i Elektrotechniki

ul. Piotrowo 3A, 60-965 Poznań

Prerequisites

The student starting this subject should have a basic knowledge of the basics of programming, telecommunications and mathematics. He should also be able to obtain information from specified sources and be willing to cooperate as part of a team.

Course objective

To provide students with basic knowledge of the properties and principles of signal analysis in the field of time and frequency, analysis and design of digital filters, especially in the aspect of discrete closed systems.

Course-related learning outcomes

Knowledge

1. Has knowledge of development trends, new achievements and dilemmas of modern engineering.

Skills

1. Is able to obtain information from literature, databases and other sources, make their interpretation, evaluation, critical analysis and synthesis, as well as draw conclusions and formulate and comprehensively justify opinions.

2. Can formulate and test hypotheses related to engineering problems and simple research problems, develop detailed documentation of the results of the experiment, design task, interpret the results obtained and draw conclusions.

Social competences

1. Recognizes the importance of knowledge in solving cognitive and practical problems and understands that in technology knowledge and skills are quickly becoming outdated and therefore require continuous replenishment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified by one 45-minute colloquium carried out at the last lecture. The test consists of 15-20 questions (test and open), variously scored. Passing threshold: 50% of points. Final issues on the basis of which questions are prepared will be sent to students by e-mail using the university e-mail system.

Skills acquired as part of the laboratory classes are verified on the basis of a final test, consisting of 5-7 tasks with various points depending on the degree of their difficulty and on the basis of reports on the classes. Passing threshold: 50% of points.

Programme content

Issues implemented during the lecture: Systems and signals. Classification of signal properties. Introduction to the issues of signal space. Signal approximations. Signal presentation using Fourier formulas. Stationary linear systems. Time domain analysis. Weave. Singular functions: impulses and jumps. Impulse response. Transfer functions. Stripe spectra and spectral transmittance. Fourier series. Frequency analysis. Fourier transforms and spectra still. Pulses in the time and frequency domain. Feedback systems and their transmittances. Analysis of frequency characteristics. Nyquist and Bode plots. Sampling and discrete signals. Fourier discrete transform. Discrete models. Differential equations. Z transformation. Inverse transformation z. Application of digital filtering and pulse control. Linear discrete systems. Impulse response. Transmittance. Causality and stability of digital circuits. Digital Filters. SOI filters. NOI filters. Design issues for digital filters.

Issues implemented during the laboratory: Determination of basic parameters of signals. Signal processing and reconstruction. Fourier transformation. Digital simulation of analog circuits - Transformation Z. Digital filters. Analog and digital modulation.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board.

2. Laboratory exercises: multimedia presentation illustrated with examples given on the board and performance of tasks given by the teacher - practical exercises.

Bibliography

Basic

Zieliński T.P., Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, Wydawnictwa Komunikacji i Łączności, Warszawa 2009.

Smith S.W., The Scientist and Engineer's Guide to Digital Signal Processing, California Technical Publishing, San Diego 1999.

Stranneby D., Digital Signal Processing: DSP and Applications, Elsevier Inc, Burlington 2001.

Lyons R.G., Wprowadzenie do cyfrowego przetwarzania sygnałów, Wydawnictwa Komunikacji i Łączności, Warszawa 1999.

Oppenheim V, Schaffer R.W., Cyfrowe przetwarzanie sygnałów, WKŁ, Warszawa 1979.

Izydorczyk J. i inni, Matlab i podstawy telekomunikacji, Wydawnictwo Helion, 2017.

Mrozek B., Mrozek Z., MATLAB i Simulink. Poradnik użytkownika. Wydanie IV, Wydawnictwo Helion, 2017.

Materiały edukacyjne Mathworks: https://www.mathworks.com/

Additional

Fitz M. P., Fundamentals of Communications Systems, 2007, McGraw-Hill

Hsu Hwei P., Schaum’s Outlines of Theory and Problems of Signals and Systems, 1995, McGraw-Hill

Stewart Robert W., Barlee Kenneth W., Dale S.W. Atkinson, and Crockett Louise H., Software Defined Radio using MATLAB & Simulink and the RTL-SDR, Strathclyde Academic Media, 2015

MathWorks, FM Stereo Receiver with USRP® Hardware, dostępny 14/12/2019

Breakdown of average student's workload

	Hours	ECTS
Total workload	65	2,0
Classes requiring direct contact with the teacher	35	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests, preparation of reports) [1]	40	1,0

[1] delete or add other activities as appropriate