



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Cyfrowe przetwarzanie sygnałów - Digital signal processing

Course

Field of study

Teleinformatics

Year/Semester

2/4

Area of study (specialization)

Profile of study

general academic

Level of study

first-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

0

Projects/seminars

0/0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

mgr. Mateusz Lorkiewicz, ITM, 61 665 3893
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Prerequisites

Mathematics: analysis, series, linear algebra; analog signal analysis, analog filters.



Course objective

Discrete systems and signals analysis, digital filter design, fast Fourier transform and its applications.

Course-related learning outcomes

Knowledge

Knowledge about systems and signals analysis: z transform, and Fourier transform, knowledge how to design digital filters, knowledge how to use fast Fourier transform for fast convolution computation and for spectral analysis of signals.

Skills

Competent analysis of digital signals and systems using mathematical and programistic techniques.
Ability to design digital filters.

Social competences

Knows how to present results of digital signals, or systems analysis.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: final exam, 10 questions for 1 point each, passing level - 5.1 point. Exercises: correctly done lab exercises, correctly written reports, and knowledge verification, 2 colloquia.

Programme content

LECTURES

1. Comparison of analog and digital techniques of signal processing. Signal sampling, sampling theorem, quantization.
2. Basic properties of digital systems, linear time-invariant (LTI) systems.
3. z transform.
4. Discrete time Fourier transform and Discrete Fourier transform.
5. Recapitulation of LTI systems description methods.
6. Digital filters structures, effects of their coefficients quantization.
7. FIR filters design (window technique, equiripple filters, frequency domain design).
8. IIR filters design (impulse response invariance method, bilinear transform).
9. Fast Fourier transform.
10. Fast computation of convolution and correlation.
11. Non-parametric methods of spectrum estimation.

LABORATORY



1. Sampling, interpolation and reconstruction of signal
2. Estimation of probability density, and estimation of autocorrelation function
3. Quantization error estimation
4. Difference equations
5. DFT properties
6. Transfer function - block diagrams of discrete systems
7. FIR filter design
8. IIR filter design
9. Introduction to psychoacoustics
10. Introduction to generation of acoustics effects
11. Influence of LTI systems on spectra of signals
12. Using digital signal processor to signal filtration

Teaching methods

Lecture - presentation, exercises using lab kits

Bibliography

Basic

T. Zieliński "Cyfrowe Przetwarzanie sygnałów - od teorii do zastosowań", WKŁ, 2005

Additional

1. C. Lyons "Wstęp do cyfrowego przetwarzania sygnałów", WKŁ, 2009

2. Cyfrowe Przetwarzanie Sygnałów, A.V. Openheim, R.W. Schafer, WKŁ, Warszawa, 1982

Breakdown of average student's workload

	Hours	ECTS
Total workload	116	4.0
Classes requiring direct contact with the teacher	60	2.0
Student's own work (preparation for tests, preparation for laboratory classes, literature studies)	56	2.0