Signal analysis - course description

General information

Course name	Signal analysis
Course ID	13.2-WF-FizP-SA-S18
Faculty	Faculty of Physics and Astronomy
Field of study	Physics
Education profile	academic
Level of studies	First-cycle studies leading to Bachelor's degree
Beginning semester	winter term 2021/2022

Course information

Semester	5
ECTS credits to win	6
Available in specialities	Computer Physics
Course type	obligatory
Teaching language	english
Author of syllabus	• dr Marcin Kośmider

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Laboratory	30	2	-	-	Credit with grade

Aim of the course

The course covers theory and methods for modern digital signal processig

Prerequisites

Initial physics course, linear algebra with geometry at the level of the first two years of study, mathematical analysis at the level of the first two years of study. Ability to program in C / C ++ / Python.

Scope

- Continuous and discrete signals
- Analog-to-digital conversion
- Statistical analysis of signals
- Linear signals
- Fourier representation of periodic signals
- Signal filtering and aliasing
- Continuous Fourier transform
- Discrete Fourier transform
- FFT
- The characteristics of the signal in the time and frequency domain, spatial distribution as the equivalent of the time variable
- Sampling and signal reconstruction
- Introduction to digital image processing
- Image processing with Fourier transform

Teaching methods

Lectures, accounting exercises, computer lab

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Student is able to define the area of signal analysis applications and knows the basic terminology	• K1A_W03 • K1A_U01 • K1A_U02 • K1A_U03	• activity during the classes • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Laboratory
Student is able to apply basic image analysis techniques	• K1A_W04 • K1A_W05 • K1A_U03	• a project • activity during the classes • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Laboratory

Outcome description	Outcome symbols	Methods of verification	The class form
Student is able to use appropriate filters to remove unwanted interference	• K1A_W03 • K1A_W04 • K1A_W05 • K1A_U02 • K1A_U03 • K1A_U04	• a project • activity during the classes • an ongoing monitoring during classes	• Lecture • Laboratory
Student is able to perform basic analysis in the domain of time and in the frequency domain	• K1A_W03 • K1A_W04 • K1A_U02 • K1A_U03 • K1A_U04	• a project • activity during the classes • an exam - oral, descriptive, test and other • an ongoing monitoring during classes	• Lecture • Laboratory

Assignment conditions

Laboratory: minimum 50% of points from tests positive passing the semester project.

Evaluation - the average of the marks and tests of the semester project

Lecture - oral exam

Course grade - 50% laboratory and 50% lecture

Recommended reading

Cyfrowe przetwarzanie sygnału. Od teorii do zastosowań, T.P. Zieliński, WKŁ, 2009

The Scientist and Engineer's Guide to Digital Signal Processing, Steven W. Smith, Ph.D. (http://www.dspguide.com/pdfbook.htm)

Further reading

A.V. Openheim, A.S. Willski, S.H. Nawab, Signals and Systems, Prentice Hall 2006

Notes

Modified by dr Marcin Kośmider (last modification: 11-05-2021 17:08)