



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Theory of the discrete signals [S1MwT1>D-TSD]

### Course

Field of study

Mathematics in Technology

Year/Semester

3/6

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

polish

Form of study

full-time

Requirements

elective

### Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3,00

### Coordinators

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### Lecturers

### Prerequisites

Mathematical analysis, complex numbers, calculus of probability. Binary system. Metrology. Makes of symbolic calculation and also complex number calculation. Understand necessity of education and systematization of knowledge in scope of processing of information.

### Course objective

Knowledge in scope of mathematical description of discrete systems and also in scope of methods of discrete signal processing.

### Course-related learning outcomes

Knowledge:

1. Has a basic knowledge in scope of theory of discrete of single-dimensional and two-dimensional signal.
2. Knows a selected methods of signal processing in a time domain and a frequency domain and also knows a selected methods of time-frequency analysis.

Skills:

1. Can calculate basic parameters of deterministic and stochastic signals. Can design of FIR filter and IIR filter and also can realize a digital filtration.
2. Can interpret results of signal processing in a time domain and a frequency domain.

Social competences:

Can ask a precisely questions with the purpose of understanding of problems.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Lecture: Final exam in form of a test in writing (passing over 50%).

Tutorials: Currently estimating of knowledge and skills. Final test in writing (passing over 50%).

Laboratory classes: Currently estimating of knowledge and skills. Evaluation of prepared reports from laboratories.

### Programme content

Update: 2020.

Lectures: The definition of single dimensional and two dimensional discrete signal. The block diagram of acquisitions system of discrete signals. Theorem of sampling. Notation of samples in memory of computer. Evaluate of selected parameters of data set. The description of discrete LTI systems in a time domain and also a frequency domain. The impulse response of discrete LTI system. Design of FIR and IIR filters. The discrete convolution in a time domain and a frequency domain. The interpretation of DFT. The selected transforms of discrete signals and their interpretation. Adaptive filtration. The block diagram of imaging system. The acquiring and sampling of image. Histogram of image and its application. Selected linear and non-linear methods of processing of images.

Tutorials: Computational tasks in scope of discrete signals processing.

Laboratory classes: Implementation of selected algorithms of discrete signals processing.

### Teaching methods

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: Detailed reviewing of particular exercises reports. Realization of laboratory tasks in teams. Specific computational experiments.

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

### Bibliography

Basic

1. Zieliński T., Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań. WKiŁ, Warszawa 2014.

2. Lyons R.G. Wprowadzenie do cyfrowego przetwarzania sygnałów, WKiŁ, Warszawa 2010.

Additional

1. Szabatın J. Teoria sygnałów. WKiŁ., Warszawa 2015.

2. Stranneby D., Cyfrowe przetwarzanie sygnałów, Wyd. BTC, Warszawa 2004.

### Breakdown of average student's workload

|   | Hours | ECTS |
|---|-------|------|
| Total workload  | 90    | 3,00 |
| Classes requiring direct contact with the teacher   | 55    | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 35    | 1,00 |