# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of signal, systems and information theory

## Course

Field of study
Management Engineering

Year/Semester
3/5

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
elective

## 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:
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Responsible for the course/lecturer:

## Prerequisites

Knowledge: Basic issues of algebra, probability theory, computer science, information technologies.

Skills: Basic ability to conduct computer calculations and simulations.

Social competences: Student is aware of the importance of the engineer's knowledge of digital signal processing algorithms in modern ICT systems.

## Course objective

Introduction to the basics of recording, conversion and analysis of digital signals.

## Course-related learning outcomes

### Knowledge

The student discusses the parameters of deterministic and random signals, the process of discretizing analog signals, and the frequency analysis of signals [P6S_WG_16].

The student describes DFT (Discrete Fourier Transform) and FFT (Fast Fourier Transform) algorithms, the theory of linear systems, and basic concepts of information theory [P6S_WG_17].

### Skills

The student applies knowledge of entropy coding, dictionary coding, DCT transformation, lossy compression, and data encryption and correction [P6S_UW_13].

The student designs and analyzes systems and algorithms in the field of signal and system theory, considering technical and computer science aspects [P6S_UW_14].

The student uses tools and techniques to solve practical problems related to signals and systems in the Matlab environment [P6S_UW_15].

### Social competences

The student integrates technical knowledge in the process of designing and analyzing telecommunication systems, considering user needs and various systemic aspects [P6S_KO_02].

The student is aware of the impact of telecommunication technologies on the environment and society and assesses their responsibility for decisions made [P6S_KR_01].

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Final test (45 min). The test consists of 8 test questions and 3 calculation tasks. Passing threshold 50%.

Laboratory: Class reports. Passing threshold 50%.

## Programme content

Lecture: parameters of deterministic and random signals, discretization of analog signals, frequency analysis of signals, DFT and FFT algorithms, linear systems, information theory, entropy coding, dictionary coding, DCT transformation, lossy compression, encryption and data correction.

Laboratory: introduction to Matlab environment, sampling and quantization process, signal filtering, lossless coding, lossy coding, data encryption.

## Teaching methods

1. Lecture: multimedia presentation

2. Laboratory classes: simulation experiments in the Matlab / Simulink environment.

## Bibliography

Basic

1. T. P. Zieliński, Cyfrowe przetwarzanie sygnałów - Od teorii do zastosowań, WKŁ, Warszawa, wydanie 2, 2009

2. S. W. Smith, Cyfrowe przetwarzanie sygnałów - Praktyczny poradnik dla inżynierów i naukowców, Wydawnictwo BTC, Warszawa, 2007

3. T. Marciniak, Przetwarzanie sygnałów i informacji -taskbook, available on-line from the author's website, 2020

4. A. Dąbrowski, P. Figlak, R. Gołębiewski, T. Marciniak, Przetwarzanie sygnałów przy użyciu procesorów sygnałowych, Wydawnictwo PP, Poznań, wydanie 3, 2000.

Additional

1. MitOpenCourseWare, Massachusetts Institute of Technology, http://ocw.mit.edu/ (courses: 6.011 "Introduction to Communication, Control, and Signal Processing", 6.003 "Signals and Systems").

2. A. Przelaskowski, Kompresja danych. Podstawy. Metody bezstratne. Kodery obrazów, Wydawnictwo BTC, 2005.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 50 | 2,0 |
| Classes requiring direct contact with the teacher | 30 | 1,0 |
| Student's own work (literature studies, preparation for laboratory classes, preparation for tests, preparation of laboratory reports) [1] | 20 | 1,0 |

[1] delete or add other activities as appropriate