# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Signals and Systems [S1Teleinf1>SiS]

## Course

Field of study
Teleinformatics

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
15

Projects/seminars
0

## Number of credit points

6,00

## Coordinators

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## Lecturers

## Prerequisites

A student has knowledge in the field of mathematics, in particular, demonstrate knowledge of differential and integral calculus. In addition, student must have the ability to acquire knowledge from the indicated sources and understand the need to expand their competences.

## Course objective

1. Give students basic knowledge in the field of: theory of one-dimensional signals, description of linear systems in the field of time and frequency. 2. Developing students with the ability to solve basic problems of analysis of deterministic signals and signal transmission problems by LTI systems. 3. Developing students in the skills of acquiring knowledge in the field of signals and transmission of signals in LTI systems.

## Course-related learning outcomes

Knowledge:
As a result of the conducted classes, the student:
1. Can solve typical problems related to the analysis of deterministic signals.
2. Can solve typical tasks related to signal transmission through LTI circuits.

Skills:
As a result of the conducted classes, the student:
1. Has knowledge of the theory of one-dimensional signals. Can determine and interpret selected parameters of deterministic signals.
2. Knows and understands the concepts of the description of linear systems in the time and frequency domains.

Social competences:
The student knows the limitations of his own knowledge and understands the need to update it. It is open to the possibility of continuous training and improvement of professional, personal and social competences.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Final exam grade:
In the field of lectures, verification of the assumed learning outcomes is carried out by an exam. The exam concerns the content presented in the lecture. During the exam, students answer the questions posed. In order to receive a grade of 3.0, it is necessary to obtain at least half of the possible points.
Final grade from the classes:
In terms of exercises, verification of the assumed learning outcomes is carried out through tests. In order to receive a grade of 3.0, it is necessary to obtain at least half of the possible points.
Final grade from laboratory classes:
In the field of laboratory classes, verification of the assumed learning outcomes is carried out through tests and / or reports. In order to receive a grade of 3.0, it is necessary to obtain at least half of the possible points.

## Programme content

1. Signal concept and classification of signals.
2. Selected properties and parameters of signals.
3. Frequency analysis of periodic and non-periodic signals.
4. Linear systems (LTI) and signal transmission through LTI systems.
5. Discrete signals and systems.

## Course topics

Classes within the module are conducted in the form of lectures, exercises and laboratory exercises.
PROGRAM CONTENT
1. The concept of a signal. Classification of signals (deterministic, stochastic, continuous, discrete, quantized signals).
2. Selected properties and parameters of signals (constant and variable components of the signal, mean value of the signal, energy and signal power, RMS value).
3. Analysis of periodic signals (the concept of orthogonal series, trigonometric Fourier series, complex Fourier series, spectrum of a periodic signal, selected features of the signal spectrum, Gibbs effect, Parseval theorem).
4. Analysis of non-periodic signals (Fourier transform and its properties, selected theorems on Fourier transform, Parseval theorem for Fourier transform).
5. Linear circuits (LTI) and signal transmission through LTI circuits (impulse response of a linear system, linear convolution and convolution theorems, transfer function of the LTI system, response of the LTI system to an input signal).
6. Frequency characteristics of LTI circuits. Ideal filters (amplitude and phase characteristics of a linear system, characteristics of ideal filters: low-pass, high-pass, bandpass filters).
7. Description of systems in the operator space.
8. Stability of linear systems (zeros and poles of transmittance of the system, BIBO stability and minimal phase of the systems).
9. Automatic control systems and nonlinear systems.
10. Discrete signals (signal definition, frequency representation of a discrete signal, signal sampling

and its reconstruction from a series of samples, Shannon's sampling theorem).

## Teaching methods

1. Lecture: Content presented on a board/multimedia projector complemented by examples of accounting tasks.
2. Auditory exercises: Solving accounting tasks.
3. Laboratory exercises: Solving technical problems using a computer.

## Bibliography

Basic:
1. J. Szabatin, Podstawy teorii sygnałów, WKiŁ, 2007.

Additional:
1. J. Wojciechowski, Sygnały i Systemy, WKiŁ, 2008.
2. K. Snopek, J. Wojciechowski, Sygnały i systemy. Zbiór zadań, O.Wyd. PW, 2009.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 150 | 6,00 |
| Classes requiring direct contact with the teacher | 79 | 3,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 71 | 3,00 |