COURSE DESCRIPTION CARD - SYLLABUS

Course name

Signals and Dynamic Systems

Course

Field of study

Automatic Control and Robotics

Year/Semester

2/3

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

English

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

0

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

The student starting this course should have basic knowledge of mathematics, statistics and the basics of signal theory. Should be able to use a computer and show willingness to learn to use various computer programs, such as Matlab. The student should be able to obtain information from the indicated sources.

He should also understand the need to expand his competences. In addition, in the field of social competences, the student must present attitudes and qualities such as: honesty, responsibility.

perseverance, cognitive curiosity, creative thinking, diligence, personal culture and respect for other people, care for laboratory equipment.

Course objective

Teaching students methods of generating and analyzing basic deterministic and stochastic signals in the time and frequency domain using applications in the Matlab programming language. Acquiring and consolidating the skills of spectral analysis of signals using a discrete Fourier transform - DFT or FFT and interpretation of results depending on the sampling frequency of analog signals. Understanding the properties and applications of linear convolution in signal filtration procedures.

Course-related learning outcomes

Knowledge

The student gains knowledge in the field of mathematics including algebra, geometry, analysis, probability and elements of discrete mathematics, including mathematical methods and numerical methods necessary for the description and analysis of the properties of linear static and dynamic systems, description and analysis of complex quantities, description of random processes, description, analysis and signal processing methods in the time and frequency domains, numerical simulation of dynamic systems in the continuous and discrete time domains. The student also acquires basic knowledge in the field of service and use of IT tools for these purposes.

Skills

As a result of the course the student should demonstrate skills in the use of basic methods of signal processing and analysis in the time and frequency domains and extract information from the analyzed signals.

Social competences

The graduate is ready to critically evaluate his or her knowledge. The graduate understands the need for and knows the possibilities of continuous learning - improving professional, personal and social competences, the graduate is able to inspire and organize the learning process of others. The graduate is aware of the need for a professional approach to technical issues, meticulous familiarization with the documentation and environmental conditions in which the equipment and its components can operate. The graduate is ready to observe the rules of professional ethics and to demand it from others, to respect the diversity of opinions and cultures.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Assessment of laboratory exercises based on a positive final grade. The final grade results from partial grades for:

- answers to control questions during exercises,

- tasks performed during laboratory exercises,

- final test solution.

Programme content

Laboratory program:

1. Exercise overview and introduction to Matlab - 2 exercises.

2. Determining the basic parameters of deterministic signals: average value, RMS value, form factor, power - 2 exercises.

3. Estimation of basic parameters of random signals: probability density, expected value, variance - 1 exercise.

4. Estimation of the random signal correlation function, crosscorrelation of signals and radar model - 2 exercises.

5. Discrete Fourier transform: DFT properties, influence of sampling period and length of analyzed signal, resolution and spectral discrimination - 4 exercises.

6. Calculation of the linear convolution in the time and frequency domain and its application in signal filtration - 2 exercises.

7. Additional time to do it or repeat a specific exercise - 1 exercise.

8. Final test - 1 exercise.

Teaching methods

Laboratory exercises are embedded in the Moodle platform. The necessary basic theoretical knowledge and instructions for laboratory exercises have been placed on the Moodle platform. During the laboratory, particular attention is paid to the selection of optimal functions and methods for creating applications in MATLAB, resulting in the correct, transparent and reliable operation of the application. It is also important to pay attention to the practical applications of applied methods of signal analysis and processing.

Bibliography

Basic

1. Oppenheim A.V., Willsky A.S., Nawab S.H, Signals & System, Pearson 2016, 944 pp.

2. Instructions for laboratory exercises on the Moodle platform.

3. Matlab Signal Processing Toolbox.

Additional

1. Florek A., Mazurkiewicz P., Sygnały i systemy Dynamiczne. Interpretacje - przykłady - zadania, wyd. 2, WPP, Poznań, 2015, 158 pp.

2. Zieliński T.P., Od teorii do cyfrowego przetwarzania sygnałów, WKŁ, Warszawa, 2016, 832 pp

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,2
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	0,8

[1] delete or add other activities as appropriate