

## **Abstract**

### **Methods and Algorithms for the Synthesis of Digital Signal Processing Devices**

**Department responsible for the course or equivalent:** Institute for Radiotechnical Systems and Control

Department of Fundamentals of Radio Engineering

#### **Lecturer:**

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**Semester when the course unit is delivered:** Autumn semester

**ECTS credits:** 5, 180 academic hours

#### **Level of the course unit:**

Master.

#### **Course description**

This course provides the base of knowledge that the following courses subsequently build upon:

- modern methods and tools for measurements in radioengineering and communications;
- methods and algorithms for complex signal processing in transmitters and receivers;
- digital television.

#### **Course objectives**

- obtaining theoretical and practical education necessary for the construction of devices that implement the basic linear and nonlinear methods of digital signal processing;
- formation of a system of concepts, ideas and methods in the field of digital signal processing, consolidating physical views and mathematical models of common classes of digital deterministic and stochastic signals, as well as relevant devices;
- studying of the engineering methods for designing the digital signal processing devices of different use.

#### **Course contents**

Module 1. Analysis and simulation of digital signals

- Estimation of signal characteristics in time domain
- Spectral characteristics estimation
- Correlation characteristics estimation
- Estimation of signal characteristics based of spectrogram representation
- Digital signal simulation with given characteristics

Module 2. Methods and algorithms for designing the digital filters

- Digital filters and their characteristics
- Methods for synthesis of digital filters of standard types
- Digital matched filters
- Sampling frequency conversion. Modulation and demodulation

#### **Learning outcomes.**

Knowledge: modern software for simulation and development of digital signals and devices;

Abilities: to collect and to analyze the original data for calculations and design parts, blocks and devices for radioengineering and communication systems;

Skills: to work with modern local and foreign software for design in radioengineering and communications.

## **12. Planned learning activities and teaching methods**

During the classes, a student will be able to obtain the following skills: problem solving, interpersonal communications skills as well as experience team work with the use of interactive lectures, group discussions, and imitational models analysis. Teaching involves results of scientific researches, provided at SFedU.

## **13. Assessment methods**

Formative and interim assessment include performing and defense of laboratory works, performing and defense of individual tasks.

## **14. Course literature (recommended)**

1. R. Lyons, Understanding Digital Signal Processing, Addison Wesley Longman, Reading, Massachusetts, 1997.
2. A. Oppenheim, et al, Discrete-Time Signal Processing, Prentice Hall, Upper Saddle River, New Jersey, 1999.
3. J. Proakis and D. Manolakis, Digital Signal Processing-Principles, Algorithms, and Application, Prentice Hall, Upper Saddle River, New Jersey, 1996.
4. Rabiner L.R., Gold B. Theory and application of digital signal processing. Prentice Hall, New Jersey, 1975.