Study programme(s): Applied Mathematics – Data Science

Level: master studies

Course title: Signals and systems

Lecturer: Nataša M. Krklec Jerinkić

Status: elective

ECTS: 6

Requirements: Basics of linear algebra

Learning objectives

- Understanding of fundamental concepts in communications, control, and signal processing

Learning outcomes

- Acquired knowledge of fundamental concepts in communications, control, and signal processing
- Ability to effectively communicate/collaborate with electrical engineers on both practical and research problems
- Ability of students to effectively utilize their mathematical skills on both practical and research problems in communications, control, and signal processing
- Ability to model real-world systems using the taught concepts

Syllabus

Theoretical instruction Signals: Continuous time signals, Discrete time signals, Fourier series, Continuous time Fourier transform, Nyquist-Shannon sampling theorem; Systems: Linear time invariant systems (continuous time and discrete time): Input-output representation, State-space representation, Laplace transform for continuous time systems, Z-transform for discrete time systems; Feedback: Control loop, Linear feedback systems, Controllability, Observability, Stability; Communication fundamentals: Communication channel, Modulation, Demodulation, Coding, Decoding.

Practical instruction

Application examples in telecom, electric grid (smart grid), machine learning, sensor networks, etc.

Literature

Selected parts of the following books:

11. A. V. Oppenheim, and A. S. Willsky: Signals and Systems, Prentice Hall, 1982.
12. S. Haykin: Digital Communication Systems, Wiley, 2013.
13. J. P. Hespanha: Linear Systems Theory, Princeton University Press, 2009.

Weekly teaching load				Other: 0
Lectures: 2	Exercises: 3	Other forms of teaching: 0	Student research: 0	

Teaching methodology

Lectures; revisions of the material; active students' participation in problem solving; knowledge tests – colloquia; homeworks.

Grading (maximum number of points 100)

Pre-exam obligations	**points**	**Final exam**	**points**
Colloquia + homeworks	30 (Colloquia) + 30 (Homeworks)	written exam	40