Course Unit Descriptor

Study Programme: Applied Mathematics – Data Science
Course Unit Title: Signals and systems
Course Unit Code: MDS11
Name of Lecturer(s): Nataša M. Krklec Jerinkić
Type and Level of Studies: Master studies
Course Status (compulsory/elective): Elective
Semester (winter/summer): Winter
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 6
Prerequisites: Basics of linear algebra
Course Aims: - 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: *Theory* 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. *Practice* Application examples in telecom, electric grid (smart grid), machine learning, sensor networks, etc.
Required Reading: Selected parts of the following books: 1. A. V. Oppenheim, and A. S. Willsky: Signals and Systems, Prentice Hall, 1982. 2. S. Haykin: Digital Communication Systems, Wiley, 2013. 3. J. P. Hespanha: Linear Systems Theory, Princeton University Press, 2009.

Weekly Contact Hours:	**Lectures:** 2	**Practical work:** 3

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

Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class		written exam	40

participation			
Practical work	30	oral exam	
Preliminary exam(s)	30	…….	
Seminar(s)			
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			