Course Unit Descriptor

Study Programme: Applied Mathematics – Data Science		
Course Unit Title: Introduction to Digital Signal Processing		
Course Unit Code: MDS16		
Name of Lecturer(s): Dušan Jakovetić		
Type and Level of Studies: master studies		
Course Status (compulsory/elective): elective		
Semester (winter/summer): summer		
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, Signals and systems		
Course Aims: - Understanding of fundamental concepts in digital signal processing and their application in big data analytics		
Learning Outcomes: - Acquired knowledge of basic concepts in digital signal processing, digital signal transforms and their application in big data analytics - Ability to communicate/collaborate with electrical engineers on practical and research problems - Ability to design discrete-time signal processing systems using appropriate software tools - Ability to solve real-world problems using the acquired knowledge		
Syllabus: *Theory* Discrete time signals: Nyquist-Shannon sampling theorem, Discrete time Fourier transform, Discrete Fourier transform, Fast Fourier transform; Discrete time systems: Linearity and time invariance, Causality, Stability, Input-output representation, Analysis and characterization in frequency domain. Discrete Fourier transform. Fast Fourier transform. Practical aspects of interfacing analog and digital signal processing. Digital filters: Properties and design of FIR and IIR filters, practical implementation. Multirate signal processing. Adaptive filters. Advanced topics in digital signal processing related to big data analytics: Sparse DFT, DSP on graphs. *Practice* Application examples in all domains where digital signal processing is applied.		
Required Reading: Selected parts of the following books: 5. John G. Proakis and Dimitris K. Manolakis: Digital Signal Processing, Principles, Algorithms and Applications, Prentice Hall, 2006. 6. Paolo Prandoni and Martin Vetterli: Signal Processing for Communications, EPFL Press, 2008. 7. Emmanuel Ifeachor and Barrie Jervis: Digital Signal Processing – A Practical Approach, Prentice Hall, 2001.		
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 participation		written exam	70
Practical work	10	oral exam	
Preliminary exam(s)	20	…….	
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.			