Study Programme: Applied Mathematics – Data Science	
Course Unit Title: Audio, Speech and Language Processing	
Course Unit Code: MDS23	

Name of Lecturer(s): Dušan Jakovetić

Type and Level of Studies: master

Course Status (compulsory/elective): elective

Semester (winter/summer): winter

Language of instruction: English/Serbian

Mode of course unit delivery (face-to-face/distance learning):

Number of ECTS Allocated: 5

Prerequisites: Introduction to Digital Signal Processing, Pattern Recognition and Machine Learning, Graphical Models and Probabilistic Inference.

Course Aims: Understanding of fundamental concepts in audio, speech and natural language processing and their application in big data analytics.

Learning Outcomes:

- Acquired knowledge of basic algorithms in audio, speech and natural language processing and their application in big data analytics
- Ability to communicate/collaborate with engineers on practical and research problems
- Ability to implement algorithms of audio, speech and natural language processing using appropriate software tools
- Ability to solve real-world problems using the acquired knowledge

Syllabus:

Theory Physics of Sound, Auditory perception fundamentals, Speech models and speech synthesis, Compression (MPEG/Audio compression), Speech recognition, Hidden Markov models and finite-state transducers in speech recognition, Statistical Language Models, POS tagging, Syntax and Grammars, Statistical Parsing, Dependency Parsing, Word Sense Disambiguation, Sound mixtures and separation, Music analysis and recognition, Content-based retrieval of large-scale archives.
Practice Application examples in speech and audio coding, speech recognition and synthesis, language modelling and other relevant domains.

Required Reading: Selected parts of the following books:

1. Ben Gold and Nelson Morgan: Speech and Audio Signal Processing: Processing and perception of speech and music, Wiley, 2000.
2. Daniel Jurafsky and James H. Martin: Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, 2nd edition, Prentice Hall, 2009.

Weekly Contact Hours: 4	**Lectures:** 2	**Practical work:** 2

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 (Homeworks)	oral exam	
Preliminary exam(s)	20 (Colloquia)	…….	
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.