Specification for the book of courses

Study program	Electrical Engineering and Computer Science		
Module	Communications and Information Technologies - Communications and Information Processing		
Type and level of studies	Undergraduate Academic Studies		
The name of the course	Digital Signal Processing		
Lecturer (for lectures)	Nikolić R. Jelena, Perić H. Zoran		
Lecturer/associate (for exercises)	Nikolić R. Jelena, Anastasov A. Jelena		
Lecturer/associate (for OFE)	Nikolić R. Jelena, Anastasov A. Jelena		
Number of ECTS	6	**Course status (obligatory/elective)**	Obligatory

Prerequisites	
Course objectives	Providing fundamental knowledge about digital signals in time and frequency domain, as well as about systems for their processing. Training students to analyze and design algorithms for digital signal processing.
Course outcomes	Acquired knowledge about basic algorithms of signal processing in discrete time and gained practical experience in working with software tool for digital signal processing.
Course outline	
Theoretical teaching	The advantages of digital signal processing versus analogue one. Application areas of digital signal processing. Main characteristics of discrete signals. Classes of discrete-time signals (Finite-Length Signals, Infinite-Length Signals). Basic operations over discrete signals. Discretization of analog signals. Practical aspects of discretization and reconstruction of analog signals. Properties of discrete systems. Linear Time-Invariant (LTI) systems. Finite Impulse Response systems (FIR). Infinite Impulse Response systems (IIR). Z-transform properties. Inverse z-transform and methods of finding it. Discrete Fourier Transform (DFT). Discrete Fourier Series (DFS). Discrete-Time Fourier transform (DTFT) and its proporties. Inverse DTFT. Fast Fourier transform (FFT). Zero-padding. Radix-2 algorithm with decimation in time. Radix-2 algorithm with decimation in frequency. Practical applications of FFT. Time-Frequency analysis. Spectral analysis of deterministic discrete-time signals. Issues in practical spectral analysis. The effect of windowing. The effect of spectral sampling. Non-parametric spectral methods. Periodogram. Parametric spectral methods.
Practical teaching (exercises, OFE, study and research	Practical exercises: theoretical and practical knowledge is acquired by solving tasks and some practical problems in DSP and students have the opportunity to understand the importance of applying digital signal processing algorithms. Laboratory exercises: students gain practical experience in working with software tools for digital signal processing.
Textbooks/references	
1	M. Sečujski, N. Jakovljević, V. Delić, Digital Signal Processing (in Serbian), FTN Novi Sad, 2019.
2	M. Sečujski, V. Delić,N. Jakovljević, I Radić, Solved Problems in Digital Signal Processing (in Serbian), FTN Novi Sad, 2007.
3	N. Jakovljević, M. Sečujski, S. Suzić,V. Delić, Practicum from Digital Signal Processing (in Serbian), FTN Novi Sad, 2016.
4	S. M. Alessio, Digital Signal Processing and Spectral Analysis for Scientists, Springer International Publishing, Cham, Switzerland, 2016.
5	V. K. Ingle, J. G. Proakis, Digital Signal Processing Using MATLAB, Third Edition, CL Engineering, Stamford, CT 06902 USA, 2012.

Number of classes of active education per week during semester/trimester/year

Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0

Teaching methods	Lectures, Power Point presentations, practical exercises, practical training on computers, homework assignments, consultations.

Grade (maximum number of points 100)

Pre-exam duties	Points	Final exam	Points
Activity during lectures	5	**Written exam**	25
Exercises	20	**Oral exam**	25
Colloquia	25		
Projects			