Specification for the book of courses

Study program	Electrical Engineering and Computer Science		
Module	Common		
Type and level of studies	Doctoral studies		
The name of the course	Synthesis of Filters		
Lecturer (for lectures)	Nikolić V. Saša, Stančić Z. Goran		
Lecturer/associate (for exercises)			
Lecturer/associate (for OFE)			
Number of ECTS	10	**Course status (obligatory/elective)**	Elective

Prerequisites	
Course objectives	The expansion and upgrade of the basic knowledge acquired in the field of analog and digital signals processing and method of filter transfer function approximation with goal to adopt new techniques which require specific approximations and specific implementations. At the same time optimal filter implementation are analyzed. Analysis of the impact of the finite word length.
Course outcomes	Students gain the necessary level of theoretical and practical knowledge to answer any specific requirements related to the design, modeling, performance estimation, optimization, implementation, and verification of the practical application of filter systems.
Course outline	
Theoretical teaching	Transfer function. Characteristic function. Reflection coefficient. z and y parameters of the two port network. Synthesis of passive filters. Synthesis of polynomial filters. Synthasis of filters with finite transmission zeros.Minimum phase filters. Synthesis of mechanical, ceramic and crystal filters. Filters with distributed parameters. Synthesis of active RC filters. Filter configurations. Impedance converters. Realization of biquad transfer function. Active RC network with distributed parameters in the integrated technology. Digital filters. Transfer function of the digital filter. Bilinear z transform. The basic filter configurations. Recursive and nonrecursive digital filters. Direct methods of approximation in the z-domain. IIR and FIR filter function. Filter realization. Properties of different configurations. Sensitivity. Decompozition. Tipical filter realization problems. Applying of MATLAB, MATHEMATICA, WORKBENCH, FILTER.
Practical teaching (exercises, OFE, study and research	Recursive and nonrecursive digital filters. Direct methods of approximation in the z-domain. IIR and FIR filter transfer functions. Implementation of filters. The properties of different configurations. Sensitivity. Decomposition. Typical problems in the implementation of filters. Application of Matlab, Mathematica, WORKBENCH, FILTER.
Textbooks/references	
1	A. Antoniou, Digital filters: Analysis, design and applications, second edition, Prentice-hall, 1975.
2	S. Mitra, Digital signal processing A computer based approach, McGraw-Hill, 2006.
3	Jon G. Proakis, Dimitris Manolakis, Digital Signal Processing, Pearson, 2007.
4	L Milic, Multirate filtering for digital signal processing: MATLAB applications, Information Science Reference-Imprint of: IGI Publishing, 2008.
5	

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

Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
3	0	0	0	0

Teaching methods	Lectures, auditory exercices, projects, consultations.

Grade (maximum number of points 100)

Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures		**Written exam**	
Exercises		**Oral exam**	50
Colloquia			
Projects	50		