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	Compressive Sensing with Applications		
Lecturer (for lectures)	Nikolić R. Jelena		
Lecturer/associate (for exercises)			
Lecturer/associate (for OFE)			
Number of ECTS	10	**Course status (obligatory/elective)**	Elective
Prerequisites			
Course objectives	Providing knowledge about compressive sensing of analog signals, sparse representation of signals and sparse signal coding. Training students to write scientific papers in this very current field of research.		
Course outcomes	Students first acquire knowledge about modern approaches in data acquisition, compressive sensing of analog signals, sparse representation of signals and sparse signal coding, and also about challenges that this field of research carries and sets, and then apply these knowledge through scientific research in the A / D conversion of different signals.		
Course outline			
Theoretical teaching	Modern approaches to data acquisition. Significance of compressive sensing of analog signals and a sparse representation of signals. Mathematical formulation of compressive sensing. Required conditions for sucessfull application of compressive sensing- RIP, SPARK and MIP. The problem of convex optimization in compressive sensing. Minimization of vector norms l0, l1 and l2. Deterministic approach in constructing the measurement matrice. Probabilistic approach in constructing the measurement matrice. Sparse representations of signals for the reconstruction of information from incomplete data. Sparse signal coding. Compressive sensing for a predefined dictionary. Greedy algorithms and algorithms with a relaxed condition of sparsity. Orthogonal matching pursuit algorithm. Matching pursuit algorithm. Weak matching pursuit algorithm. Analysis of the obtained approximations. Dictionary learning. Application of compressive sensing algorithms in A / D conversion of variety of signals, also in MRI algorithms and face recognition.		
Practical teaching (exercises, OFE, study and research	Lectures.Consultations. Project work.		
Textbooks/references			
1	Y. C. Eldar, G. Kutyniok, Compressed Sensing: Theory and Applications, Cambridge University Press, 2012.		
2	Y. C. Eldar, Sampling Theory: Beyond Bandlimited Systems, Cambridge University Press, 2015.		
3	M. Elad, Sparse and Redundant Representations: From Theory to Applications in Signal and Image Processing, Springer, 2010.		
4	I. Rish, G. Grabarnik, Sparse Modeling: Theory, Algorithms, and Applications, CRC Press, 2014.		
5	S. Stanković, I. Orović, E. Sejdić, Multimedia Signals and Systems: Basic and Advanced Algorithms for Signal Processing, Springer, 2016.		

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, Power Point presentations, Consultations.			

Grade (maximum number of points 100)

Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures	5	**Written exam**	
Exercises	30	**Oral exam**	35
Colloquia			
Projects	30		