

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		Error Control Coding		
Lecturer (for lectures)		Jovanović Ž. Aleksandra		
Lecturer/associate (for exercises)		Jovanović Ž. Aleksandra, Cvetković M. Aleksandra		
Lecturer/associate (for OFE)		Jovanović Ž. Aleksandra, Cvetković M. Aleksandra		
Number of ECTS	6	Course status (obligatory/elective)	Obligatory	
Prerequisites				
Course objectives	Provide students with fundamental knowledge about error control coding. Explain the modern principles of coding and decoding algorithms encountered in efficient error correction codes.			
Course outcomes	The student will acquire theoretical and practical knowledge necessary for the application and design of error control codes in modern communication systems.			
Course outline				
Theoretical teaching	Introduction to error control coding: the Shannon channel coding theorem. Galois fields, vector spaces and polynomials over Galois fields. Linear block codes: generator and parity check matrices. Decoding of linear block codes based on an optimal standard array. Syndrome decoding. Hadamard codes. Reed-Muller codes. Cyclic codes: BCH codes. Reed-Solomon codes. LDPC Codes: the independence condition and the Gallager's method for code construction. Bit-flipping algorithm. Graphical representation of LDPC codes. Message passing algorithm and turbo principle. Convolutional codes: generator polynomials and generator matrix, state diagram. Graphical representation of convolutional codes: trellis diagram. Viterbi algorithm. Turbo codes.			
Practical teaching (exercises, OFE, study and research)	Solving concrete problems from method units from lectures. Software implementation and testing of error correction code performances.			
Textbooks/references				
1	W. E. Ryan, S. Lin, Channel Codes - Classical and Modern, Cambridge University Press, 2009.			
2	D. Drajić, P. Ivanis, Introduction in information theory and coding (in Serbian), Academic mind, Belgrade, 2009.			
3	P. Ivaniš, D. Drajić, Information Theory and Coding - Solved Problems, Springer, 2017.			
4	T. Richardson, R. Urbanke, Modern Coding Theory, Cambridge University Press, Cambridge, 2008.			
5	S. Lin, D. J. Costello, Error Control Coding, Pearson, 2004.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
3	1	1	0	0
Teaching methods	Lectures, 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	20	
Exercises	15	Oral exam	20	
Colloquia	40			
Projects				