

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		Adaptive Control Systems		
Lecturer (for lectures)		Perić Lj. Staniša, Milojković T. Marko		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS	10	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives	Familiarising students with different adaptive control methods for dynamical systems with uncertain parameters.			
Course outcomes	At the end of this course, students will have knowledge of adaptive control methods and will be trained to design their own control structures.			
Course outline				
Theoretical teaching	Parameter estimation in real time. On-line parameter estimation: gradient methods and least squares methods in continuous and discrete time. Parameter estimation with projection. Extremum seeking methods. Self-tuning regulators. Direct and indirect adaptive control: pole placement control (PPC), adaptive pole placement control (APPC), model reference control (MRC), model reference adaptive control (MRAC), adaptive backstepping with tuning functions. Machine learning methods: neuroadaptive control and reinforcement learning control. Practical aspects and implementation of adaptive control systems and introduction to computational learning theory.			
Practical teaching (exercises, OFE, study and research)				
Textbooks/references				
1	Shankar Sastry, Marc Bodson, "Adaptive Control: Stability, Convergence and Robustness ", Prentice-Hall, 1994.			
2	Petros Ioannou, Jing Sun, "Robust adaptive control", Prentice Hall, 1996.			
3	Howard Kaufman, Itzhak Barkana, Kenneth Sobel, "Direct Adaptive Control Algorithms: Theory and Applications ", Springer, 1998.			
4	George Rovithakis, Manolis Christodoulou, "Adaptive Control with Recurrent High-order Neural Networks", Springer, 2000.			
5	Ioan Landau, Rogelio Lozano, Mohammed M'Saad, Alireza Karimi, "Adaptive Control: Algorithms, Analysis and Applications", Springer, 2011.			
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/consultations (according to the number of students); study and research work (insight into literature, problem analysis, finding solutions, writing and presentations of independent work).			
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			