Specification for the book of courses

Study program			Control Systems	
Module			Automatic Control	
Type and level of studies			Master studies	
The name of the course			Predictive Control	
Lecturer (for lectures)			Antić S. Dragan, Mitić B. Darko	
Lecturer/associate (for exercises)			Spasić D. Miodrag	
Lecturer/associate (for OFE)				
Number of ECTS	5	**Course status (obligatory/elective)**		Elective
Prerequisites				
Course objectives	The aim of the course is to provide fundamental knowledge of theory and design of model predictive control (MPC) and regulator design.			
Course outcomes	Knowledge of system modeling which is appropriate for MPC apllication. Skills to identify control problem and to design and implement corresponding MPC regulators.			
Course outline				
Theoretical teaching	Introduction to model predictive control (MPC). Models and modeling. Linear dynamic models. Input-output models. Discrete models. Constraints. Linear quadratic regulator. Optimizing multistage function. Dynamic programming. Controllability. State estimation. Linear systems and normal distribution. Discrete-time MPC. State-space models with embedded integrator. Predictive control within one optimization window. Receding horizon control. Predictive control of MIMO systems. State estimation in predictive control. Discrete-time MPC with constraints. Discrete-time MPC using Laguerre functions (DMPC). Continuous-time MPC. Model structures for continuous-time MPC design. MPC using finite prediction horizon. Optimal control strategy. Continuous-time MPC with constraints. Formulating of constraints. Numerical solutions for the constrained control problem. Real-time implementation of continuous-time MPC. MPC systems in state space formulation.			
Practical teaching (exercises, OFE, study and research work)	Discrete-time MPC. Introduction to model predictive control (MPC). Generation of optimal control by parameters tuning. Implementation of receding horizon. Observer design. Constrained control problems. Quadratic programming. Simulation of predictive control system with/without observer. Continuous-time system modeling using Laguerre functions. Continuous-time systems modeling using Kaitz functions. Constrained systems modeling. Basis for the design of continuous-time MPC system. Closed-loop simulation of MPC system. Nyquist plot of the predictive control system. Implementation of predictive control systems.			
Textbooks/references				
1	Wang L., Model Predicitive Control Systems Design and Implementation Using MATLAB, Springer, 2009.			
2	Rawlings B. R., Mayne D.Q., Model Predicitive Control: Theory and Design, Nob Hill Publishing, 2009			
3				
4				
5				

Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	0		
Teaching methods	Lectures; Auditory exercises; Computing exercises			

Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures		**Written exam**	20
Exercises		**Oral exam**	20
Colloquia	60		
Projects			