

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Control Systems		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Fundamentals of Predictive Control		
Lecturer (for lectures)		Mitić B. Darko, Antić S. Dragan		
Lecturer/associate (for exercises)		Spasić D. Miodrag		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives				
Introduction to the fundamental principles of predictive control in order to train students for designing these controllers that are nowadays very popular for industrial applications.				
Course outcomes				
After the course, students will acquire basic knowledge about predictive control and supporting elements necessary for design of predictive controllers. In addition to the acquired theoretical knowledge, students will be able to independently design several types of predictive controllers and simulate their application by using software simulation tools.				
Course outline				
Theoretical teaching				
Optimal control systems. Criteria functions. Parameter optimization. LQR design. LQR with predefined degree of exponential stability. Design of observer. Digital LQR. Kalman's estimator. The notion of predictive control. LQR and predictive control (comparison). Main components of predictive control (prediction, receding horizon, system models, performance index, constraints). Predictive model of a system in the state space. Predictive model of a system in the form of transfer function. Generalized Predictive Control (GPC). Dynamic Matrix Control (DMC). Constraints and optimization.				
Practical teaching (exercises, OFE, study and research)				
LQR design. Different prediction models of system (state-space model and transfer function) in the design of predictive controller. Performance index. Design of controllers by using software packages. Design of generalized predictive control (GPC). Tuning of predictive controller parameters and the analysis of system responses. Design of a predictive controller using the Model Predictive Control toolbox.				
Textbooks/references				
1	J. A. Rossitr, A First Course in Predictive Control, Second Edition, CRC Press (2018)			
2	Eduardo Camacho, Carlos Bordons, Model Predictive Control, Springer (2007)			
3	Jan Maciejowski, Predictive Control with Constraints, Prentice Hall (2000)			
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	0	0
Teaching methods				
Lectures; Auditory exercises; Computer exercises; Consultations.				
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	10	Written exam		20
Exercises	10	Oral exam		20
Colloquia	40			
Projects				