

Óbuda University Kandó Kálmán Faculty of Electrical Engineering		Institute of Instrumentation and Automation	
Name & Neptun code of subject: Automation I		KMXAU1ABNE	Credit: 5
Subject leader:	Árpád Varga teaching assistant 1084 Budapest, Tavaszmező utca 17. Building C, Room 412 varga.arpad@kvk.uni-obuda.hu +36 (1) 666-5171	Semester 2019/20/1 (fall)	
Weekly hours::		Lecture: 2	Laboratory:2
The goal of subject			
Introduction to the theory SISO. The structure and use of the PID compensation element. The choice of the sampling time. The PI and the compensation process PDT in the frequency and time domain.			
Schedule and topics of subject:			Date & Hours
Description of basic concepts of automation. Open and closed loop control comparison. Laplace and inverse Laplace transform. Dimensionless technique.			
		1.	2
LTI basic block (P, I, D, PT1, PT2, and H) concept, block's descriptions in operator frequency and time domain. Complex block deduction.			
		2.	2
Grey model: Based on physical laws modeling mechanical, electrical, and so on systems. Black model: Based on time or frequency response modeling process. Frequently used process transfer functions.			
		3.	2
Define the terms of a closed loop LTI (Linear Time Invariant) system. Transfer functions of the closed loop system. Set the steady state behavior of controller.			
		4.	2
Closed loop control steady state behavior for set-point holder and follower control. Examples. Control quality examination methods and description. PIDT1 controller structure. Fitting of controller type to the process.			
		5.	2
Concept of stability examination methods in operator and frequency domain. How can choose sample time for hybrid systems?			
		6.	2
Theoretical test I.			
		7.	2
PI and PDT compensation on frequency domain. Presentation of compensation technique in frequency domain using process field transfer function with and without integral behavior.			
		8.	2
Compensation on time domain. How choosing controller type for process field. Presentation of compensation technique in time domain using process field transfer function with and without integral behavior.			
		9.	2
Zeros, poles replacement compensation technique assuming PIDT controller. Presentation of zeros, poles replacement compensation technique.			
		10.	2
Programmable logic controller types, hardware buildup, and programming methods. Buildup and working principle of transmitter, controller and actuator elements..			
		11.	2
Theoretical test II.			
		12.	2
Retake test, consultation			
		13.	2
Exam consultation			
		14.	2

Semester rating

The subject is evaluated with an exam mark.

The condition for taking the exam is accomplishing the Automation I. laboratory course and accomplishing the two theoretical tests successfully!

10 points can be achieved on each theoretical test. Less than 4 points is insufficient. The 4 – 5.5 points belong to the rating 2, the 5.5 – 7.5 points belong to the rating 3, the 7.5 – 8.5 points belong to the rating 4, and the 8.5 – 10 points belong to the rating 5.

Visit of the lectures are obligatory! Missing more than 4 occasions (30% of the total 14 lecture occasions) cause “not accomplished” notice in the Neptune system!

If the result of the two theoretical tests and the final result of the laboratory course reach at least rating 4, offered exam mark can be accepted.

Retake possibilities: One of the failed theoretical tests can be retaken during the semester. There are one extra retake possibility during the exam period, concerning on one theoretical or one laboratory test.

The exam consist of written part and an oral part. The students elaborate the questions in written form than answer the examiner’s questions.

The final exam rating is the average of the laboratory mark, the average of the midterm theoretical tests and the exam result:

Final exam rating = [laboratory rating + (theor. Test I rating + theor. Test 2. Rating)/2 + exam rating]/3

Extra points: during the semester it is possible to get 1-1 extra points after presenting the handwritten lecture notes (if the quality of the notes are acceptable). The extra points are added to the result of the theoretical tests.

The literature

Visit the next web sites.

<http://mai-aut.kvk.uni-obuda.hu/>, (Lecture ppt-s, and all final exam questions)

www.mathworks.com

<https://www.youtube.com/playlist?list=PLUMWjy5jgHK1NC52DXXrriwihVrYZKqjk>

Automation I. laboratory topics and requirements

The goal of subject		
Demonstrate the concept and methods of automation of LTI (Linear Time Invariant) systems with simulation		
Schedule and topics of subject:	Date and hours	
Briefing, description of requirements. Knowledge of management of Zelio control relay.	1.	2
Developing the programming skills of Zelio control relay. Problem solving with teacher leadership.	2.	2
<i>Problem solving independently (Zelio).</i>	3.	2
Getting to know MATLAB program. Description of the basic transfer function.	4.	2
Continuation of getting to know MATLAB program. Problem solving with teacher leadership (M1: Frequently used transfer functions).	5.	2
<i>Problem solving independently. M1: Frequently used transfer functions and combinations of transfer functions</i>	6.	2
Getting to know SIMULINK program. Description of the feedback system. Problem solving with teacher leadership (M2: Stability and quality examination using P controller).	7.	2
<i>Problem solving independently. M2: Stability and quality examination using P controller</i>	8.	2
Presentation of compensation technique in frequency domain using process field transfer function without and with integral behavior. Problem solving with teacher leadership.	9.	2
<i>Problem solving independently. M3: Compensation technique in frequency domain using process field transfer function</i>	10.	2
Presentation of compensation technique in time domain using the step response of process field without and with integral behavior. Problem solving with teacher leadership.	11.	2
<i>Problem solving independently. M4 Compensation in time domain using the step response of process field transfer function.</i>	12.	2
Presentation of pole-zero replacement compensation technique. Problem solving with teacher leadership.	13.	2
Replacement of the failed tasks.	14.	2

Laboratory Semester rating

Average of the five independently solved problems gives the rating of the laboratory course. Ten points belong to every independently solved problem. Less than 3.75 points is insufficient. The 3.75 – 5 points belong to the rating 2, the 5 – 6.25 points belong to the rating 3, the 6.25 – 7.5 points belong to the rating 4, and the 7.5 – 10.0 points belong to the rating 5.

Visit of the laboratories are obligatory! Missing more than 4 occasions (30% of the total 14 laboratory occasions) cause “not accomplished” notice in the Neptune system!

For the subject accomplishment all of the independent problem solving ratings must be higher than insufficient!

Retake possibilities: two failed independent problem solving laboratory can be retaken during the semester. There are one extra retake possibility during the exam period, concerning on only one independent problem solving laboratory or theoretical test.

The literature

Visit web sites:

<https://oktatas.mai.kvk.uni-obuda.hu/>,
www.mathworks.com, www.schneider-electric.com

Offered: Neszveda, J. Gecsey, L Design Engineering, Free in Moodle system