Name of the subject: **Automatics**		***NEPTUN-code:*** KMWAZBABNE	***Contact hours/week:*** 2 lectures + 2 lab. practice
Credits:* 4** ***Requirement: Assignment		***Recommended (optional) prerequisite:*** -	
Lecturer: Árpád Varga Antal Csuka, Ph.D	***Assignment:*** teaching assistant senior lecturer	***Faculty and institute:*** Kandó Kálmán Faculty of Electricity Institute of Instrumentation and Automation	

Subject		
Aim of the course: Presenting the basics of automation theory and industrial applications of automatics.		
Lecture topics:	**Week**	**Cont. hours**
Introduction: Concept of automation, historical background. Manufacturing and process technologies. General structure of process control systems. Static and dynamic system characteristics.	**1.**	**2**
LTI Systems. Using Differential equations as possible transcription method of processes. Transfer functions in time and frequency domain.	**2.**	**2**
Basic transfer functions: P, I, D, PT1, PT2, H elements, transfer and step functions. Block diagram manipulation, serial/parallel/feedback connections	**3.**	**2**
Structure of closed loop control. Concept of PID compensation. Loop stability conditions.	**4.**	**2**
Actuators I: Electric actuators. Relays, AC/DC/stepper motors. Inverters.	**5.**	**2**
Actuators II: Hydraulic and pneumatic actuators. Control valves, industrial hydraulic cylinders	**6.**	**2**
Theoretical test I.	**7.**	**2**
Transmitters I: Position measurement devices: Limit switches, potentiometers, absolute and incremental encoders.	**8.**	**2**
Transmitters II: Level measurement in reservoirs. Temperature measurement: thermocouples, thermistors and RTD-s.	**9.**	**2**
Transmitters III: Pressure measurement. Flow measurement: volume flow rate and mass flow rate devices.	**10.**	**2**
Concept and architecture of industrial Programmable Logical Controllers (PLC-s). PLC programming languages. Structure of PLC programs, interruption handling.	**11.**	**2**
Communication protocols used in industrial process control systems. Noise reduction technologies. SCADA systems.	**12.**	**2**
Theoretical test II.	**13.**	**2**
Retake test, consultation	**14.**	**2**

Laboratory topics:	**Week**	**Cont. hours**
Introducing open loop digital control devices. Zelio hardware and software presentation.	**1.**	**2**
Zelio hardware and software presentation.	**2.**	**2**
Solving control tasks with Zelio -1.	**3.**	**2**
Solving control tasks with Zelio -2.	**4.**	**2**
Laboratory test I.: solving control tasks with Zelio independently.	**5.**	**2**
Matlab- I software presentation.	**7.**	**2**
Feedback control- example and practice.	**8.**	**2**
Defining basic transfer functions and function blocks in Matlab.	**9.**	**2**
Practice of compensation and stability structure design in Matlab.	**10.**	**2**
Matlab-II software presentation.	**11.**	**2**
Example of loop stability control design based on Simulink model.	**12.**	**2**
Laboratory test II.: simple control loop design with Matlab.	**13.**	**2**
Laboratory retake test	**14.**	**2**

Requirements for subject accomplishment, marking system.

The subject is evaluated by a ***midterm mark.***
Midterm mark is calculated based on the average of 4 marks (the mark of the 2 theoretical and the 2 laboratory tests).
For the subject accomplishment ***all of the test marks must be larger than "1"!***
More than one test with mark "**1**" cause "***not accomplished***" notice in the Neptune system!

Limits for test grading (results are given in %):

0%	-	35%	mark "**1**"
35%	-	50%	mark "**2**"
50%	-	62,5%	mark "**3**"
62,5%	-	75%	mark "**4**"
75%	-	100%	mark "**5**"

Retake possibilities:

One of the failed theoretical tests *and* ***one of the failed laboratory tests*** can be retaken during the semester.
There are one extra retake possibility during the exam period, concerning on ***only one test***.

Literature:

László Gecsey –József Neszveda Ph.D.: Design Engineering In Practice

Practical Process Control