

Biomatics and Applied Artificial Intelligence Institute			Semester 2. of the curriculum 2025-26-2			
Name of the subject:	Code of the subject:	Credits:	Weekly hours:			
				lec	sem	lab
System and control theory	NBXRI1EMNF	5	full-time	2	0	2
Responsible person for the subject: Levente KOVÁCS PhD, DSc			Classification: Professor			
Subject lecturer(s): Ágota VASS						
Prerequisites: -						
Way of the assessment: exam						
Course description						
Goal:	The aim of the lecture is to familiarize the students with the basics of linear control theory.					
Course description:	Open vs closed loop systems, linear time-invariant continuous systems. Modelling, Laplace transform. Transfer function. First and second order systems. Steady state error, pole-zero location, stability. Frequency Domain Analysis. Bode and Nyquist plots, stability and loop transfer function. Series compensations, Ziegler-Nichols, Kessler methods, PID control. Discrete-Time Control Systems. State-feedback control. LQ control. Robust control.					

Lecture schedule	
Education week	Topic
1.	Introduction lecture
2.	Mathematical description of systems
3.	Time domain analysis; system response
4.	Frequency domain analysis
5.	Systems connectivity, loop transfer functions
6.	Block diagram manipulation and reduction
7.	Homework & Classroom test
8.	State space methods
9.	State-feedback control
10.	Series compensation, PID control
11.	Discrete time systems
12.	Classroom test
13.	Introduction to nonlinear control
14.	Replacement test
Mid-term requirements	
Conditions for obtaining a mid-term grade/signature	Student participation in the lectures and labs is required. One homework will be given during the semester, which must be solved independently and submitted by the given deadline. Signature requirement: Submission of the homework before the deadline, and a minimum of 50% score in the midterm tests and homework.
Assessment schedule	
Education week	Topic
7.	Homework

14.	Replacement test												
Method used to calculate the <i>mid-term grade</i> (to be filled out only for subjects with mid-term grades)													
-													
Type of the replacement													
Type of the replacement of written test/mid-term grade/signature	In the case if the mid-term test does not reach 50%, the student can replace the test in the form of re-take test(s) in the 14th week. Replacement of the signature: once in the first 10 working days of the examination period.												
Type of the exam (to be filled out only for subjects with exams)													
Written exam													
Calculation of the exam mark (to be filled only for subjects with exams)													
Test result needs to exceed 51%.													
Final grade calculation methods:													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Midterm tests</td> <td style="text-align: right;">20 points</td> </tr> <tr> <td>Homework</td> <td style="text-align: right;">10 points</td> </tr> <tr> <td>Final Exam</td> <td style="text-align: right;">20 points</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">50 points</td> </tr> </table>		Midterm tests	20 points	Homework	10 points	Final Exam	20 points	Total	50 points				
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The final grade will be calculated using the following scale:													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Achieved result</th> <th style="width: 50%;">Grade</th> </tr> </thead> <tbody> <tr> <td>87% - 100%</td> <td>excellent (5)</td> </tr> <tr> <td>75%- 86%</td> <td>good (4)</td> </tr> <tr> <td>64% -74%</td> <td>satisfactory (3)</td> </tr> <tr> <td>51% - 63%</td> <td>pass (2)</td> </tr> <tr> <td>0 - 50 %</td> <td>failed (1)</td> </tr> </tbody> </table>		Achieved result	Grade	87% - 100%	excellent (5)	75%- 86%	good (4)	64% -74%	satisfactory (3)	51% - 63%	pass (2)	0 - 50 %	failed (1)
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References													
Obligatory:	Lecture notes (download from https://elearning.uni-obuda.hu/)												
Recommended:	Karl J. Åström and Richard M. Murray; Feedback Systems: An Introduction for Scientists and Engineers, K. Ogata; Modern Control Engineering,												
Other references:													