Biomatics and Applied Artificial Intelligence Institute			Semester 4. of the curriculum 2025-26-2			
Name of the subject:	Code of the subject:	Credits:	Weekly hours:			
				lec	sem	lab
System Theory	NBXRE1EBNF	4	full-time	2	1	0
Responsible person for the subject: Levente KOVÁCS PhD, DSc			Classification: Professor			
Subject lecturer(s): Dr. Stephen Kimathi						
Prerequisites:	NMXAN2EBNF	Calculus II				
Way of the assessment:	Exam					

Course description	
Goal:	The students will become familiar with the foundations of system theory. The subject focuses on the description and analysis of linear dynamic systems. It provides an overview about the description of the linear dynamic systems in the time domain, frequency domain and complex frequency domain, investigates the connection between these domains and their applications.
Course description:	Introduction to control theory, basic terms, mathematical foundations, differential equations, Laplace-transformation, transfer function. Stability. Time domain description, common inputs, transient response. Frequency domain description, characteristic functions, steady states. Stability in frequency domain, Bode-plots, Nyquist-diagram. Block diagram and connectivity of systems, stability of the closed loop. Discrete systems, difference equations, fixed points, sampling, Shannon's theorem, z-transformation.

Lecture schedule	
Education week	Topic
1.	Introductory lecture
2.	Mathematical foundations (System’s modelling)
3.	Transfer functions, Stability of continuous time systems
4.	Time domain analysis
5.	Time domain analysis, system response
6.	Homework & Classroom test
7.	Frequency domain descriptions
8.	Stability in frequency (Bode-plots, Nyquist-diagram)
9.	Closed-loop systems
10.	Block diagram manipulation and reduction
11.	Classroom test
12.	Discrete time systems (Sampling, Difference equations)
13.	Stability of discrete time systems
14.	Replacement test

Mid-term requirements	
Conditions for obtaining a mid-term grade/signature	**Student participation in the lectures and seminars 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
6.	Homework
14.	Replacement test

Method used to calculate the *mid-term grade* (to be filled out only for subjects with mid-term grades)
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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:

Midterm tests	20 points
Homework	10 points
Final Exam	20 points
Total	50 points

The final grade will be calculated using the following scale:

Achieved result	Grade
87% - 100%	excellent (5)
75%- 86%	good (4)
64% -74%	satisfactory (3)
51% - 63%	pass (2)
0 - 50 %	failed (1)

References	
Obligatory:	• Lecture notes (download from https://elearning.uni-obuda.hu/)
Recommended:	• W. Levine; Control System Fundamentals, K. Ogata; Modern Control Engineering,
Other references:	• R. Burns; Advanced Control Engineering