Óbuda University Bánki Donát Faculty of Mechanical and Safety Engineering	*Institute of Mechatronics and Vehicle Engineering*

Subject title and code:	**Control Engineering (BMXIRIE4BNF)**	**Credits:**	*4*
Full-time study	2025/26 *ac. year* *Semester* **II**		

The course is available at:	mechatronical engineering

Supervised by:	Prof. László Pokorádi	**Instructors:**	Prof. József K. Tar

Prerequisite (neptun code):	System Engineering (BMXRTE3BNF)

Weekly number of lessons			
Lecture: 2	Group seminar: 0	Lab: 1	Consultation: 0

Way of assessment:	Midterm mark	(Written)

Online consultation *(in case it's required):*	https://bbb3.banki.hu/rooms/rgp-lv2-gv5-mqv *(BBB link)*

Edu. goal:	*Theoretical and practical application of Control Technology*

Schedule	
Education week	**Topics**
1.	Historical antecedents. Possible system models: classical mechanical models, universal approximators-based models (neural networks and fuzzy models), data driven techniques.
2.	Control methods (brief overview): simple linear models, controllability, obsrevability, stability, adaptive approach via Lyaponov's technique, Computed Torque Control, Robust variable Structure / Sliding Mode Controller.
3.	Model components: scalar, vector, and tensor quantities; Fundamental meASUREMENT UNITS.
4.	Phenomenology of Classical Mechanics, Euler – Lagrange equations of motion.
5.	Basic components in electrical systems.
6.	Canonical LTI forms, Cayley-Hamilton Theorem, Jordan Canonical Form and its consequences.
7.	Frequency domain, Bode diagram, Strecker-Nyquist criteria, Nyquist plot.
8.	Noise filtering: double integrating filter, the use of virtual compartments.
9.	CTC PD, PID control, Lyapunov equation, Sliding Mode Control
10.	Random signals, causal random signal generation, the logistic function, deterministic chaos, fixed point, bifurcation, period doubling,
11.	Julia language, global and local variables; LATEX as documentation aid.
12.	Laboratories.
13.	Laboratories.
14.	Final consultation.

Mid-semester requirements					
Test		Assignment to be submitted		Szöveg beírásához kattintson vagy koppintson ide.	
amount	dates	amount	deadlines	amount	dates

In this subject it is irrelevant.	---	Submission of documented simulation of a particular control solution for a particular physical system on the basis of sample programs and documentation templates.	Till the end of the semseter. In the worst case in an signature-substitute exam.	---	---

According to the HKR attendance of group seminars and lab exercises are mandatory.

Other requirements for participation in sessions not covered by the regulations and restrictions on substitutions:

Test		Assignment to be submitted		Submission of documented simulation of a particular control solution for a particular physical system.	
maximum points available	minimum score required to pass /test	maximum points available	minimum score required to pass / assignment	maximum points available	minimum score required to pass /lab
…points	…points	…points	…points	…points	…points

Total number of points achievable in semester: …points				
Grading thresholds	**satisfactory** … choose	**average** … choose	**good** … choose	**excellent** … choose
Other evaluation criteria: The evaluation of the assignment happens in the presence of the student that resembles the classic colloquium.				
Receive a signature denied entry:	If the student does not take part in the lectures and labs without respectable proof.			
Required references:	„Control Technology Mecha English.pdf": lecture notes, „Model Library.pdf", sample programs, sample documentations (available free of charge)			
Recommended references:	József K. Tar, László Nádai, Imre J. Rudas: System and Control Theory with Especial Emphasis on Nonlinear Sytems. Typotex Electronic Publishing Ltd., Budapest, Hungary, 2012, ISBN: 978-963-279-676-5 (Avaiable free of charge for the students due to the support by the National Development Agency and the Hungarian Scientifc Research Fund OTKA CNK 78168)			
Quality assurance methods of the subject:	Students can request individual or small group (based on student-initiated email requests) personal or online consultations outside of the timetable if they have questions regarding the material acquisition.			

Things, that are not included, can be found within the regulations of Óbuda University.