Course title: Mechatronic Systems	Neptun code: GEMRB400-a
Course coordinator: Tamás Szabó, Associate Professor, PhD.	
type and number of lesson: lecture, number of lessons per week: 2 lectures	
method of accountability: colloquium	
curriculum location of the subject: autumn	
pre-study conditions: -	
The task and purpose of the subject:	
The PhD student deepens his theoretical and practical knowledge analyzing and designing of the mechatronics systems.	
Course description:	
Definitions: mechatronics, system, system parameters, state variables. Extended Hamilton principle, Lagrange equation of the second kind, differential equations of mechatronic systems. System of equation of inverted pendulum, linearization. Laplace transformation, transfer function. Stability of time invariant systems. Nyquist stability criterion of feedback systems. State space representation. The mathematical conditions of controllability, observability. Lyapunov stability of the state space representation. Design of state feedback with pole placement. State feedback with optimum control (LQR), CARE. Analysis of the inverted pendulum. Design of state observer. Discrete state representation based on equivalency for STEP function.	
Required literature:	
1. R. H. Bishop: The Mechatronics Handbook, 2002 CRC Press, Boca Raton-London-New York-Washington, D.C 2. K. Janschek: Mechatronic Systems Design, Springer, 2012.	
Recommended literature:	
1. DA. Bradly, A. Loader, NC. Burd, D. Dawson: Mechatronics, Electronics in products and processes, CRC Press, Taylor and Francis Group, Boca Raton, London, New York, 1991. 2. R. Isermann: Mechatronics Systems, Fundamentals, Springer, 2005. 3. CW. de Silva: Mechatronics, An Integrated Approach, CRC Press, Taylor and Francis Group, Boca Raton, London, New York, Washington D.C., 2004.	