Course title: Simulation of Mechatronic Systems	**Neptun code: GESGT402-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: spring	
pre-study conditions:	
The task and purpose of the subject:	
The PhD Student learns the method of producing differential equations of mechatronic systems and their numerical solution techniques.	
Course description:	
Holonomic, non-holonomic constrains, virtual displacements. Stored energies of conservative mechatronical elements, kinetic co-energy, potential energy, magnetic energy, electric energy, magnetic co-energy, electric co-energy. Virtual works of non-conservative mechatronics elements. Extended Hamilton's principle, Lagrange equation of the second kind. Derivation of differential equations with charge and displacement formulations. Application of Laplace transformation, obtaining transfer functions. State space equations. Numerical solution of differential equations using Euler explicit method and trapezoid implicit method. Simulation blocks in MATLAB/SCILAB environment. Models of DC motor, electric circuits, plunger, loudspeaker, quarter car model, active suspension, PID controlling. Analysis of nonlinear problems.	
Required literature:	
1. A. Preumont: Mechatronics Dynamics of Electromechanical and Piezoelectric Systms, Springer, Brussels, Belgium, 2006ISBN-13 978-1-4020-4696-4 (e-book). 2. D. Schramm, Mechatronical Modelling, Duisburg-Essen University, 2013.	
Recommended literature:	
1. R. H. Bishop: The Mechatronics Handbook, 2002 CRC Press, Boca Raton-London-New York-Washington, D.C.	