UNIVERSITY OF PANNONIA

COURSE DATASHEET

Semester:	2015/16/1
Course:	Systems Engineering
Code:	VEMKFOB254R
Responsible department:	Department of Process Engineering
Department code:	MKFO
Responsible instructor:	Dr. János Abonyi

Course objectives:

The aim is to develop the attitudes to looking at the mechatronic elements and equip-ments from the point of view of systems engineering, providing the fundamental methods and techniques for analysing the engineering simple and complex equipments as systems with their environment.

Course content:

1. System and models. Types of models. Signals, information. Structure and behaviour of systems. 2. The concept of dynamical systems: state, state space. Simple and complex systems. The concept of hierarchy. Continuous and discrete systems. 3. Methods of description of the structure of systems. Block diagrams, graphs, structural matrices. 4. Fundamentals of mathematical modelling. Linear and nonlinear models. Concentrated and distributed parameter models. 5. The role of integral transformations in analysing the engineering systems. Laplace, Fourier and Z-transformation. 6. Linear continuous systems. The principle of superposition. State space, input-output models. Frequency characteristics. 7. Linear discrete systems. Methods of discretization. Recurrent equations. 8. Qualitative systems dynamics. Causality. Theory of feedback. 9. The concepts of stability, operability, observability, controllability, uncertainty. 10. Stochastic signals, stochastic systems. Correlations. 11. Discrete event systems. 12. Introduction to nonlinear systems.

Requirements, evaluation and grading:

Grading is based on a written midterm examination and the written final examination. Each examination consists of 2 general questions and 2-4 problems to be solved. The final mark is determined according to following table based on the weighted average of the points obtained for the midterm and the final written examination (ratio of midterm and final exam weights=0.33/0.67): % final mark above 85 excellent (5) 75-84 good (4) 65-74 medium (3) 50-64 pass (2) below 50 fail (1)

Required and recommended readings:

Lakatos B., Rendszertechnika, rendszertervezés. Jegyzet (elektronikus forma). Pannon Egyetem, Veszprém. Szabó I.: Gépészeti rendszertechnika. Műszaki, Budapest, 1986. Kulakowski, B.T., J.F. Gardner, J.L. Shearer: Dynamic Modeling and Control of Engineering Systems (3rd Ed.), Cambridge University Press, Cellier, F.E., 1991, Continuous System Modelling. Springer, Berlin. Bishop, R.H. (Ed.), 2002, The Mechatronics Handbook. CRC Press, Boca Ranton. Karnopp, D.C., Margolis, D.L. & Rosenberg, D.L., System Dynamics: Modeling and Simulation of Mechatronic Systems. Meisel, J.: Principles of Electromechanical Energy Conversion, Krieger, 1984. Blanchard, B.S. and W.J. Fabrycky, 1998, Systems Engineering and Analysis. Prentice Hall, Upper Saddle River, New Jersey.