Theory of Systems Course

Name of the subject: **Theory of Systems - BSc**	*SUBJECT code:*	Weekly hours: 3 lectures + 3 indoor practice	Credit: 8
Subject leader: *Ivan Mihajlovic*	*Academic Degree:* *Associate Professor*	Prerequisites:	

Purpose: Gaining basic knowledge of general systems theory (GST) and basis of application of systems thinking in the management of business systems.

Course description: After this course, students will be able to analytically perceive the problems that can occur during the operation of complex systems. Students will be familiar with the general systems theory and operation of complex systems defined through a systematic approach. The course will enable the students with the capability of development of simple models for the simulation of systems and optimization..

Schedule

Weeks	Topics
1.	The development of systems theory as a scientific discipline.
2.	The difference between classic and systemic approach. Basic principles of systems thinking. Methodological fundamentals of system theory. The general systems theory.
3.	Ideal and real systems and the meaning or disturbance. Basic characteristics of the system. Elementary properties of systems. The classification of system.
4.	The concept of entropy in the general systems theory. Systematic approach to processes. System and environment. System representations. The boundaries and growth of the system.
5.	The input and output values of the system. Coupling elements in the system. Basics of system management. Cybernetics.
6.	Management of the system object structure.
7.	Standard signals. Laplace and inverse Laplace transform. The characteristic equation of the system.
8.	Modeling dynamic elements of the system. Types and tools for system modeling. Analytical and statistical methods of systems modeling.
9.	The transfer functions of the system. The example of the inventories modeling in the business system.
10.	The system's response. Displaying the system on a "black box". Structural block diagram of the system.
11.	Frequency response of the system. Amplification in the systems. System states. Vector equation of state changes and responses of the system of equations. Steady state system.
12.	The stability of the system. The criteria for testing the stability of the system.
13.	Examples of complex systems modeling. Application of MATLAB software package in the system modeling.
14.	Seminar project work

Final grade: 10pt – class attendance – lectures; 10pt – class attendance – practical work; 20pt – seminar project; 20pt – colloquium; 40pt – final exam (<51pt fail; 51-60 grade 6; 61-70 grade 7; 71-80 grade 8; 81-90 grade 9; 91-100 grade 10)

Compulsory literature: Rob Dekkers, Applied Systems Theory, Springer, 2015.
Supplemental literature: Gary B. Shelly, Harry J. Rosenblatt, Systems Analysis and Design, Shelly Cashman Series, Course Technology, 2012.