RTU Course "Methods of Systems Theory"

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General data

Code	DSP342
Course title	Methods of Systems Theory
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Academic
Field of study	Computer Science
Responsible instructor	Alla Anohina-Naumeca
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN, RU
Annotation	Job of a system analyst is directly related to the analysis of different business and technical systems. For this purpose a system analyst must know methods and tools for the identification and describing of characteristics and operating principles of different systems. The main attention of the course is devoted to the development of the systems thinking of the students by concerning the use of the methods of systems theory in the analysis of different kinds of systems. The study course is based on students' intensive in-class activities working in small groups by solving practical tasks that allow acquiring and strengthening knowledge on such concepts as system goals and performance measures, static objects, functional objects (inputs-processes-outputs), relations, resources, environment, control loop, control objects, and feedback. Solutions of practical tasks are discussed in wide discussions when students defend their viewpoint by providing arguments rooted in the systems theory.
Goals and objectives of the course in terms of competences and skills	The goal of the course is to develop students' knowledge system on concepts of systems thinking and to develop their skills to apply the studied concepts to the analysis of different systems.
Structure and tasks of independent studies	During the semester, students should independently study offered information sources and lecturer's prepared lecture notes while preparing to in-class practical activities.
Recommended literature	•Schuster, S. (2018). The Art of Thinking in Systems: Improve Your Logic, Think More Critically, and Use Proven Systems To Solve Your Problems - Strategic Planning For Everyday Life, CreateSpace Independent Publishing Platform, 192 p. •Dekkers, R. (2017). Applied Systems Theory, Springer International Publishing, 315 p. •Von Bertalanffy, L., Hofkirchner, W., & Rousseau, D. (2015). General System Theory: Foundations, Development, Applications, George Braziller Inc., 296 p. •Mobus, G. E., & Kalton, M. C. (2015). Principles of Systems Science (Understanding Complex Systems), Springer, 755 p. •Mella, P. (2014). Systems Thinking: Intelligence in Action, Springer, 304 p. •Boardman, J., & Sauser, B. (2013). Systemic Thinking: Building Maps for Worlds of Systems, Wiley, 262 p. •Meadows, D. H. (2008). Thinking in Systems: A Primer, Chelsea Green Publishing, 240 p. •Skyttner, L. (2006). General Systems Theory: Problems, Perspectives, Practice. World Scientific Publishing Company, 536 p.
Course prerequisites	None

Course outline

Theme	Hours
Introduction into Systems Science	2
System definition and basic characteristics of systems thinking	2
System goals and performance measures	2
System static objects, relations, structure, and whole	2
System functional objects and resources	4
System environment and boundary	2
System attributes	2
Basic principles of system control	2
Cybernetics approach to systems thinking	2
Control loops and basic elements	4
Feedback as a system control mechanism	4
Concluding remarks of Systems Science (comparison of analytical and systems approach, system hierarchy, system complexity)	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Students will know main concepts of system definition and systems thinking (goal, performance measure, static object, structure, whole, relations, functional objects in terms of inputs, processes, and outputs, resources, environment, and boundary) and their interrelationships	Concept map 1

Students will know main concepts related to system control (control function, planning function, control object, detector, comparison, effector, open control loop, closed control loop, positive feedback, negative feedback, feedforwarding) and their interrelationships	Concept map 2
Students will be able to identify goals and performance measures for systems of different kinds and to evaluate quality of the defined goals based on specific criteria	Practical task
Students will be able to identify static objects in systems of different kinds	Practical task
Students will be able to identify relations in systems of different kinds	Practical task
Students will be able to identify functional objects in systems of different kinds	Practical task
Students will be able to identify environment for systems of different kinds	Practical task
Students will be able to identify elements that implement control functions in systems of different kinds	Practical task
Students will be able to identify elements of control system in systems of different kinds	Practical task
Students will be able to identify control loop in systems of different kinds	Practical task
Students will be able to identify types of feedback in systems of different kinds	Practical task

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	2.0	0.0	0.0	*		