Course Unit Descriptor

Study Programme: Mechanical Engineering, Information Technology-Engineering, Environmental Engineering, Industrial Engineering in Exploitation of Oil and Gas and Informatics and Technology in Education.
Course Unit Title: Automatic control
Course Unit Code: OAS183
Name of Lecturer(s): Ivan Palinkaš, PhD
Type and Level of Studies: Bachelor Academic Degree
Course Status (compulsory/elective): Compulsory
Semester (winter/summer): Summer
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 5
Prerequisites: Mathematics I, Mathematics II, Physics
Course Aims: The main goal of the course is to present the fundamental knowledge of the theory of automatic control systems. It introduces the basic techniques of analysis and design of continuous linear control systems in the transfer function domain. Develop an understanding of the elements of classical control theory as applied to the control of different systems. In particular understand: the concept of feedback and its properties; the concept of stability and stability margins; and the different tools that can be used to analyze the previous properties. Finally gain a working knowledge of the basic linear design techniques. It also represent a modern software and hardware tools for analysis, design and implementation of control systems
Learning Outcomes: Students will develop a systematic mathematical approach to the analysis and design of automatic control systems, and will be able to model, analyze and design a so-called conventional (classical) control system for systems of medium complexity. The acquired knowledge can be used in solving practical engineering problems and forms a basis for future engineering subjects. Analyze and interpret date obtained from experiments in system modeling, stability analysis or frequency-domain of linear systems.
Syllabus: *Theory* Basic notions and principles of automatic control systems. Mathematical description of continual linear and non linear systems.Laplace transform. Block diagram models. Block diagram algebra and signal flow graph. Mason formula..Quality evaluation and of control in stationary and transition regime. Analysis of system stability using analytical methods. Root locus. Analysis and syntheses of system in frequency domain. Nyquist stability criteria, Bode method, Concept of space of system state. Choice and adjusting of parameters of industrial regulators. PID regulators, Elements of digital control systems. Introduction to computer application in control. *Practice* Direct and inverse Laplas transformation and solving differential equations using Laplase transformation. Transfer function of the automatic control system in which through the tasks processed algebra block diagram, graph of the flow of

signals as visual representations of the system. There are examples of converting standardized transfer functions into factorized form and form of state space, that is, their interconnections using appropriate software forms. Time and frequency characteristics of the systems. Analysis of system stability using analytical methods. Grafoanalitic stability criteria . Nyquist stability criteria, Bode method. The design procedure is explained in more detail using the root locus method. The synthesis of a differential and integral compensator based on conventional grafoanalytic methods is given, followed by the appropriate software support for the use of MATLAB Simulink.

Required Reading:

1. R. Dorf, R. Bishop, Modern Control Systems, Prentice Hall, 2010

2. Z. Gajić, M. Lelić, Modern Control Systems Engineering, Prentice Hall, 1996

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Weekly Contact Hours: 4	**Lectures:** 2	**Practical work:** 2

Teaching Methods:

Lectures, calculation, laboratory, computer and computer-laboratory practice. Consultations. Part of the course which forms a logical whole can be taken in the form of a colloquium. Colloquium and examinationsare oral and written. Both parts are taken in written form. The final grade is formed on the bases of performance at the colloquium, computer-laboratory practice and the written and oral examination.

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	**Final exam**	points
Active class participation	10	written exam	25
Test I and Test II	40	oral exam	25
Preliminary exam(s)			
Seminar(s)			