AUTOMATED CONTROL SYSTEMS
(course title)

COURSE SYLLABUS ABSTRACT

7-06-0714-02 Innovative technologies in mechanical engineering

Profiling Computer engineering of transport and technological machines

	STUDY MODE	
	full-time	part-time
Year	**1**	**2**
Semester	2	3
Lectures, hours	16	4
Laboratory classes, hours	34	8
Exam, semester	2	3
Contacthours	50	12
Independentstudy, hours	58	96
Total course duration in hours / credit units	108/3	

1. Course outline
The purpose of the discipline is to present the basic methods of the theory of automatic control, taking into account the latest developments, an idea of the current state of this field of science.
2. Course learning outcomes
Upon completion of the course, students will be expected to
know:
basic principles of building automatic control systems with direct and indirect action regulators; mathematical description of typical ACS links and typical input actions, block diagrams and transfer functions of ACS; algebraic and frequency stability criteria, criteria for assessing the quality of regulation; basic logical operations and their implementation on relay-contact and non-contact elements; software for programmable logic controllers and smart relays; basic operations of fuzzy logic and the principle of functioning of systems with fuzzy logic; basic concepts of telecontrol systems, telesignaling and telemetry of short and long range, methods of signal separation, multiplexing of communication channels and methods of increasing the reliability of the transmission of coded information; the principle of selectivity of relay protection and the principle of near and far redundancy; characteristics and technical capabilities of modern automatic devices; rules for constructing cyclograms and the mathematical apparatus used in the synthesis of electroautomatic systems for industrial mechanisms;
be able to:
analyze processes in the simplest ACS in static and dynamic modes, as well as transient processes in typical ACS links using time and amplitude-phase frequency characteristics; analyze dynamic processes in CAP using stability criteria; apply methods for minimizing logic functions and circuits using the basic laws of logic algebra; determine the amount of information obtained as a result of a single check of the system, and its entropy; to formulate, on the basis of empirical knowledge, the base of fuzzy rules used in the fuzzy inference system; to analyze processes in the simplest telemetering systems of intensity and code-pulse systems; choose the settings and time delays of the main and backup protections, taking into account the degree of selectivity of their operation; make a reasonable choice of technical means of automation that meet specific operating conditions, and find a combination solution from cyclograms or introduce intermediate signals into the original cyclogram that eliminate the ambiguity of solving the problem of building an industrial automation system
to possess a skill:
methods of mathematical description of automatic control systems and basic concepts of modeling processes in the simplest automatic control systems using modern mathematical packages MathCad and MATLAB; methods for converting ACS block diagrams and an algorithm for selecting industrial controllers for various control objects; methods for depicting processes on the phase plane and the basic concepts of modeling dynamic processes in ACS using transfer functions; methods of mathematical description using Boolean algebra in the integrated package MathCad of a telemechanical system of three-digit automatic code blocking in railway transport; concepts, characteristics, methods for calculating relay protection installations and methods for mathematical modeling of processes in complex relay protection devices using the integrated mathematical package MathCad.
3. Competencies SK-4 Has the skills to automate transport and technological machines
4. Requirements and forms of current and intermediate certification. Current certification: KR - control work in the form of a test, Intermediate certification - an exam in the form of a test in Moodle