Program:
13.04.02 Electric Power Engineering, MSc

South Ural State University
National Research University

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Form of training: Full-time
Department: Automated electric drive

INFORMATION SYSTEMS IN INDUSTRY

Instructor: Aleksandr Nesterov, PhD, Associate Professor
Department: Automated electric drive

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Course: Information Systems in Industry

The course is designed for the students enrolled on the Electric Power Engineering program, and it aims to make students acquainted with process control systems.
The course is worth 5 ECTS.

LEARNING Outcomes

Upon completion of the course, you will be able to
▸ develop the graphic interface of control system
▸ design SCADA-based control systems.

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Contents of the modules

Module number	Name of the Module	Content of the Modules
①	Introduction. HMI and SCADA-system basics)	History of HMI and SCADA. How to design effective and robust control systems. Definition of the term SCADA. General trends of SCADA development. SCADA-system as a management process, as a monitoring and control system. Basic requirements of SCADA. Functionality. Basic graphical capabilities. Technical and operating parameters. Classification.
②	User interface in HMI and SCADA-system	User interface. Basic terms and definitions. User access level. New technology of design the user interface
③	Connection of industrial automation devices and electric drives with SCADA	COM technology. Interprocess communication Methods. ActiveX objects. OPC servers. Built-in drivers. Communication with databases. DDE-exchange.
④	SCADA-based industrial control systems	SCADA application for monitoring and control of continuous process. Examples of application.
⑤	Distributed automation systems	The ideology of distributed systems. The levels of ACS: level controller (PLC), the operational level, the administrative level. Data line. Network sharing. Network exchange modes. Exchange via radio channel. The data exchange via GSM: the organization of exchange in compliance with the GSM requirements for modems. Management via the Internet. Access to the project via the Internet.

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Practical classes

Module number	Name of practical classes	The contents of practical classes
②	Basic design of simple user interface. Development software, graphical primitive, special features.	Development of the graphical interface of the SCADA-system using basic functions and graphical primitives.
③	Test communication connection between industrial automation devices and SCADA using emulator.	Development of communication interface between the SCADA-system and automation tools.
④	Application of SCADA in continuous process control systems. Basic features.	Development of the Executive project SCADA-system for process control.
⑤	Access to the executive SCADA project via the Internet	Development of the interface for access to the SCADA-system via the Internet.

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Summary of laboratory classes

| Module number	Name of laboratory classes	Tthe contents of laboratory classes
❷	SCADA-system user interface engineering (on the basis of TRACE MODE)	Design of user Executive project SCADA-system on the basis of TRACE MODE, including graphical interface.
❸	Connecting the PLCs to SCADA-system via built-in drivers (on the basis of TRACE MODE and Siemens S7-1200, Omron CPM2A, Schneider Electric M241)	Design the interconnection between the PLCs and SCADA-system via built-in drivers.
❸	Connecting the PLCs to SCADA-system via third-party OPC-server (on the basis of TRACE MODE, OPC-Server KEPWare and PLCs Siemens S7-1200, Omron CPM2A, Schneider Electric M241)	Design the interconnection between the PLCs and SCADA-system via third-party OPC-server.
❸	Connecting industrial automation devices to SCADA-system via built-in drivers and third-party OPC-server (on the basis of TRACE MODE, OPC-Server KEPWare and electric drives and process controller)	Design the interconnection between industrial automation devices and SCADA-system via built-in drivers and third-party OPC-server.
❹	Development of process monitoring and control node based on SCADA	Design simple example of process monitoring and control system based on SCADA Adastra TRACE MODE.

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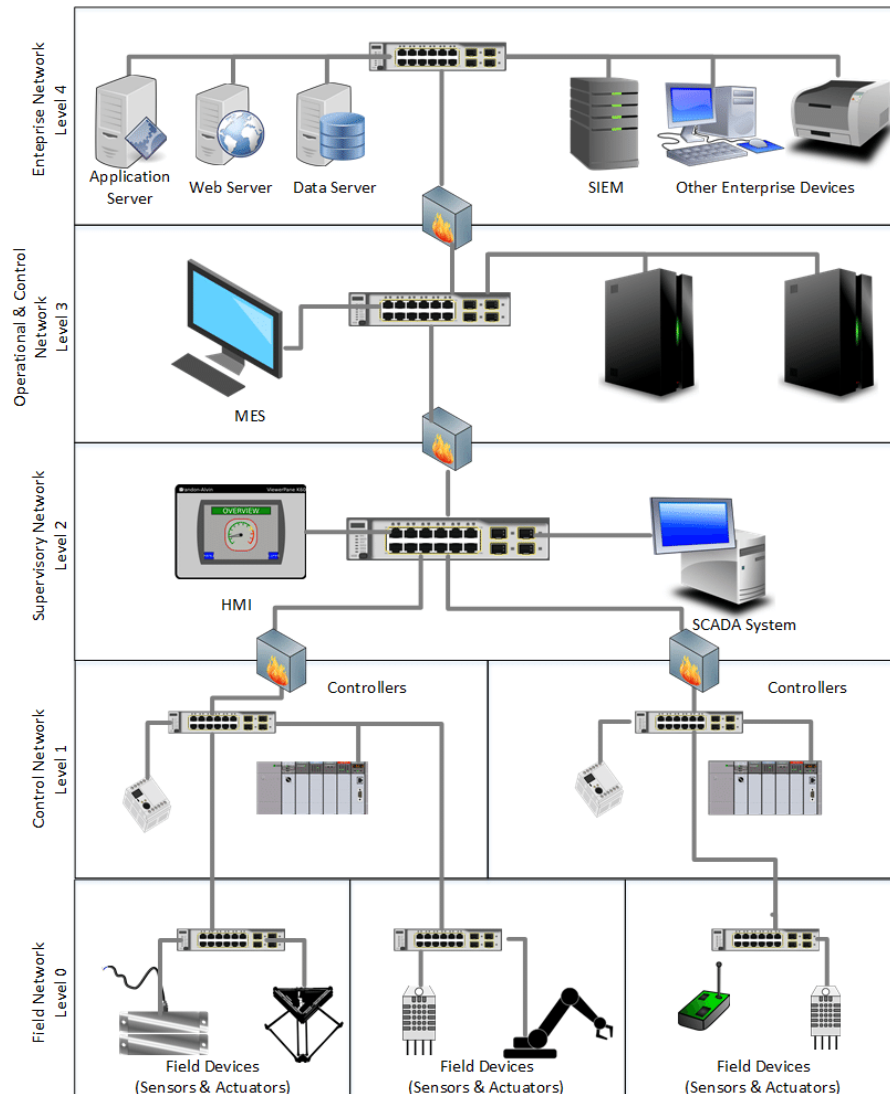South Ural State University
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Laboratory equipment
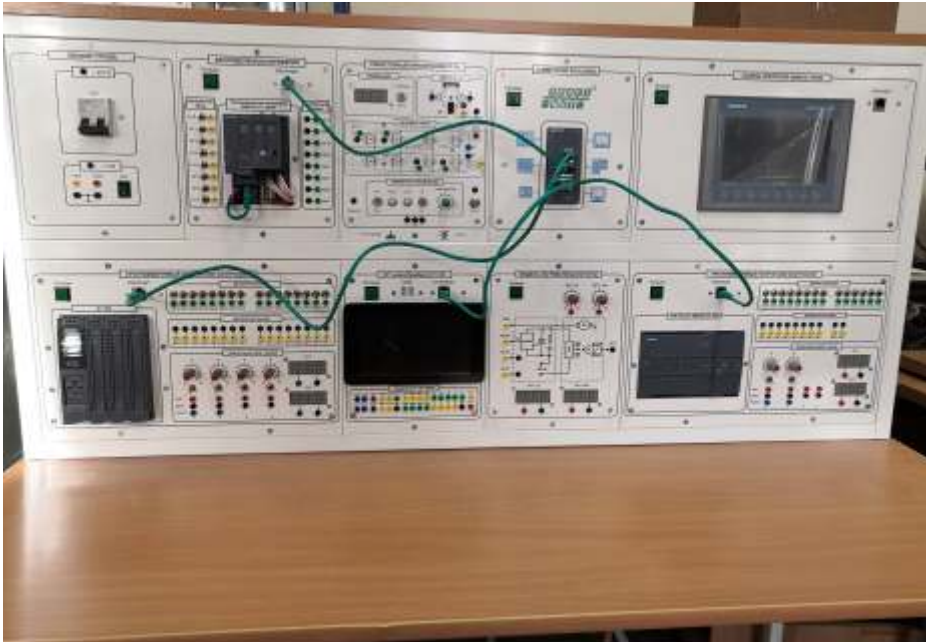
**Lab stand «Automation Systems
based on AS-i equipment»**

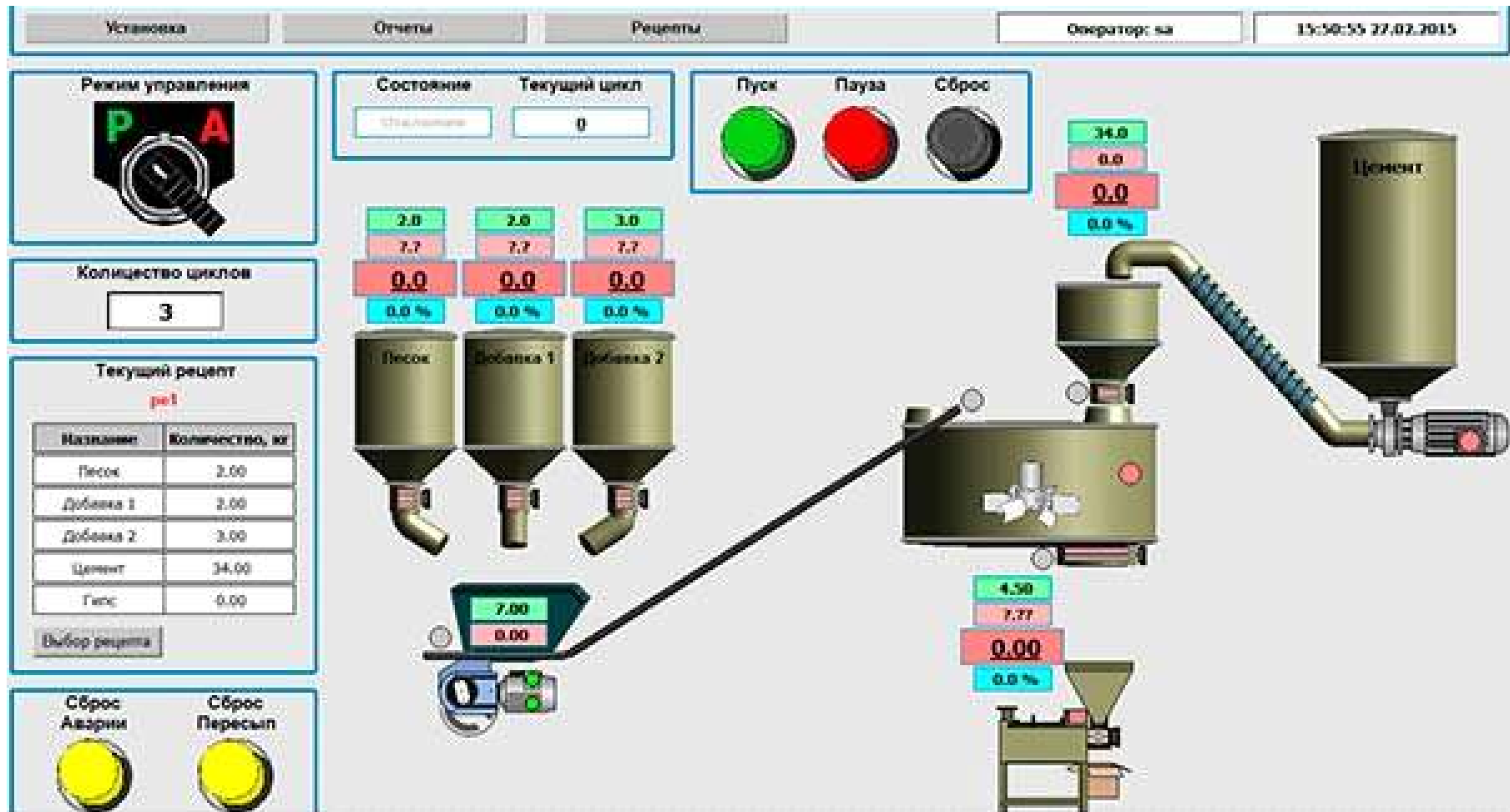
**Lab stand «Automation Systems
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Industrial Applications I

Development of the structure
for the SCADA-based industrial
automation systems

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Industrial Applications II

Design of graphical interface of the SCADA-system a
nd its interconnections with electric drives and industrial automation devices

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Industrial Applications III

Development of SCADA-based industrial automation applications

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Thanks for attention!