

Research and development company

**Uchtekh-Profi**



# Teaching equipment

and visual aids  
for educational  
institutions

[www.Labstand.ru](http://www.Labstand.ru)

## «Uchtekh-Profi»

- I. The main activity is development and mass production of educational and lab equipment, and visual aids.
- II. More than 8,200 items of automated laboratory facilities, stands, simulators, emulators, parts cuts, tablets and interactive visual aids, test and program facilities have been developed. About 1,100 of them are high-tech products. Every year 30–50 new samples of innovative training equipment are developed.
- III. Delivery to more than 1,500 universities, technical schools, colleges and vocational training schools, retraining centers at industrial enterprises in Russia and 267 educational entities of Kazakhstan, Belarus, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan, Turkey and Europe.
- IV. Production capacity of 500–750 million rubles of educational and research products per year.

*Compliance with educational standards, modern digital technologies (3D, VR, AR) and design.*

*Reliability and safety, visibility and informativeness are the principal features of the products of Research and Production Enterprise, Uchtekh-profi.*

*The main customers of educational equipment and visual aids are more than 2,800 federal, national research, state and technical universities, as well as military, mining, railway, construction, aviation, marine, automotive, medical, pedagogical and engineering and economic universities/academies, technical schools, colleges, specialized schools and lyceums, and training centers of industrial enterprises in Russia, Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, Mongolia, Turkey.*



<b>1. General technical and natural sciences</b>		<b>7. Metallurgy</b>	
• Physics .....	2	• Materials science and materials technology .....	86
• Chemistry. Chemical industry .....	6	• Metallurgy. Equipment and technologies .....	88
• Technical drawing. Descriptive geometry. Engineering graphics .....	10	<b>8. Mechanical engineering</b>	
• Resistance of materials. Construction mechanics .....	12	• Metrology. Measurements. Machine engineering technology .....	92
• Machine parts. Design basics .....	14	• CNC machines and presses .....	94
• Theoretical, technical and applied mechanics .....	16	• Robotics. Cell-type systems. CAD/CAM .....	96
• Heat engineering and thermodynamics .....	18	• Metal welding and cutting (equipment and technologies) .....	98
• Health & Safety. Electrical safety .....	20	• Prototyping. Reverse engineering .....	100
• Fire safety .....	22	• Non-destructive testing. Flaw detection. Technical diagnostics .....	102
<b>2. Electrical engineering. Electronics. Electromechanics. Electric equipment</b>		• Repair of mechanical equipment.....	104
• Electrical engineering and the basics of electronics. Electromechanics. Electric circuits .....	24	<b>9. Transport. Oil and gas. Technological machines</b>	
• Electronics and converter technology. Circuit design .....	26	• Automotive and road construction equipment .....	106
• Electric machines and electric drives, electric devices	30	• Electric transport. Vehicle electric equipment and electronics .....	112
• Electric equipment and automation of general industrial equipment .....	34	• Aviation equipment and technologies.....	116
• Computers and microprocessors .....	36	• Drones and UAVs .....	120
• Installation, commissioning and repair of electric equipment, drives and instrumentation.....	38	• Rocket and space technology .....	122
<b>3. Electric and thermal power engineering</b>		• Gyroscopy. Navigation and aircraft motion control systems .....	126
• Electric networks, stations & substations. Relay protection. Energy saving.....	40	• Railway transport and track facilities.....	130
• Alternative and renewable energy sources .....	44	• Marine and river engineering, shipbuilding .....	132
• Nuclear and hydrogen power .....	46	• Agricultural machinery and technology.....	134
• Heat supply and ventilation. Air conditioning. Refrigeration equipment .....	48	• Mining machines and technologies .....	136
• Lighting .....	50	• Oil and gas. Mining, transportation and storage .....	138
• Gas supply .....	52	<b>10. Construction</b>	
<b>4. Radio engineering. Data protection. Computer networks. Telecommunications. FOCL</b>		• Construction materials. Machines and technologies..	142
• Data protection and security systems .....	54	• Cranes, excavators, lifting and transport machines .....	144
• Internet of Things .....	58	• Utility systems. Water, energy and heat supply.....	146
• COMPUTER NETWORKS. Telecommunications. Digital communication.....	60	• Ecology. Waste management, disposal and recycling. Reclamation.....	148
• Radio engineering. HF and microwave technologies. Navigation. Radio detection & ranging.....	64	<b>11. Workshops. Offices. Labs. Professional level. WSR workshops.</b>	
<b>5. Automation and control</b>		• Labs. Professional level/WSR – young professionals ...	150
• Information and measuring equipment .....	66	• Technology classrooms .....	151
• Automatic control theory and systems.....	68	<b>12. Other areas</b>	
• Technological processes and production automation .	70	• Military equipment and technologies .....	152
• Mechatronics .....	74	• Food production .....	154
• Artificial intelligence (AI), machine learning and neural networks.....	76	• Bioengineering and medical technology .....	156
<b>6. Hydraulics. Pneumatics</b>		• Veterinary medicine (equipment and technologies) ...	158
• Hydraulics. Fluid and gas mechanics .....	78	• Household appliances. Consumer goods industry.....	160
• Hydraulic drives and hydraulic automation .....	80	<b>13. Posters. Boards. Information tools</b>	
• Pneumatic actuators and pneumatic automation. Gas and aerodynamics.....	82	• Language labs. Simultaneous translation systems.....	162
• Pumping and compressor equipment .....	84	• Demonstration complexes. Conference systems.....	163
		• Interactive visual aids. Posters (for classrooms & labs).....	164

# PHYSICS

## ELECTRICITY AND MAGNETISM

### Teaching lab and demonstration equipment



Physics. Electricity and magnetism EiM-K  
(18 lab works)



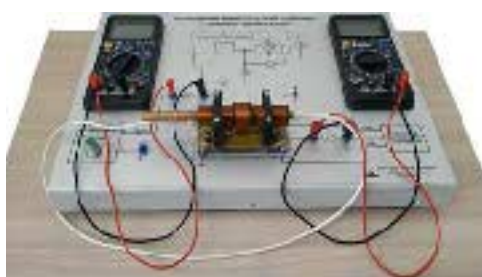
Mutual induction phenomenon EiM-M-L6



Magnetron method for electron charge to mass ratio, EiM-M-L7



Hall effect in semiconductors EiM-M-L12



Solenoid magnetic field with a Hall sensor, EiM-M-L17

### Lab stands

- «Typical lab set Physics. Electricity and Magnetism» (18 lab works):
  - EiM-K (computer);
  - EiM-R (manual).
- «Modular lab installations Physics. Electricity and Magnetism» (38 lab works – installations)

### Demonstration equipment

- «Demonstration galvanometer» (GD-01)
- «Demonstration ammeter» (AmD-01)
- «Lenz Law»
- «Parallel currents interaction» (F-Dem-DpGN)
- «Electromagnet with adjustable inter-pole magnetic field induction» (F-EIMag-01)
- «Disc coil suspended to a tripod with a flexible conductive suspension»
- «Foucault pendulum with two interchangeable plates» (solid and incised)
- «Manual electromagnetic induction demonstration frame»
- «Ampere power demonstration installation»
- «Permanent magnet with adjustable pole spacing»
- «Engine generator, demonstration electric machine»

### Virtual laboratory stands

- Physics. Electricity and magnetism VLS-FEM



Peltier Effect



Helmholtz coils

# PHYSICS MECHANICS

## Teaching lab and demonstration equipment



Elastic and inelastic collision of balls



Movement along the Inclined plane



Gyroscopic effect



Oberbeck pendulum



Atwood's machine

### Lab stands

- «Elastic collision of bodies»
- «Movement along the Inclined plane»
- «Flywheel»
- «Inelastic collision of physical pendulums»
- «Elastic and inelastic collision of balls»
- «Oberbeck pendulum»
- «Physical pendulum»
- «Ideal pendulum»
- «Maxwell pendulum»
- «Coupled pendulums»
- «Elastic pendulum»
- «Ballistic pendulum»
- «Atwood's machine»

### Demonstration equipment

- «Gyroscopic effect»
- «Solid and hollow cylinders, identical in mass and radius, rolling down along an inclined plane»
- «Magic cylinder»
- «Zhukovsky's bench»
- «In-rotation inertia forces»
- «Momentum conservation principle»
- «Closed system demonstration»
- «Free rotation axes»

### Virtual laboratory stands

- «Physics and Mechanics VLS-FM»



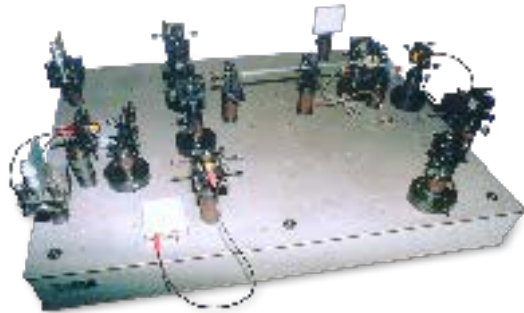
Maxwell pendulum



Physics and Mechanics VLS-FM, virtual lab stand

# PHYSICS OPTICS

## Teaching lab and demonstration equipment



Holographic installation



Diffraction of light on one- and two-dimensional grids



Geometrical optics laws



External photoelectric effect

### Lab stands

- «Light dispersion»
- «Light diffraction» (2 workstations)
- «Interference of light. Newton's Rings»
- «Polarization of light»
- «External photoelectric effect»
- «Geometrical optics laws»
- «Determination of the speed of light»
- «Fresnel equation»

### Demonstration equipment

- «Geometrical optics»
- «Young's experiment»
- «Light diffraction at a half-plane and a round hole»
- «Diffraction of light on one- and two-dimensional grids»

### Holographic equipment

- «Optical flat plane»
- «A set of mechanical and optical elements mounted on the optical plate»

### Virtual laboratory stands

- «Physics – Optics VLS-FO»



Diffraction of light



Polarization of light



Virtual laboratory stand  
Physics - Optics VLS-FO

# PHYSICS NUCLEAR, QUANTUM AND MOLECULAR PHYSICS

## Teaching lab and demonstration equipment

### Quantum and nuclear physics



Gas discharge meter



The half-life of a long-lived isotope



Heisenberg's uncertainty principle

### Lab stands

- «Gas discharge meter»
- «Poisson's equation»
- «The half-life of a long-lived isotope»
- «Degree of a solid body blackness»
- «Heisenberg's uncertainty principle»



Virtual laboratory workshop  
Physics (secondary school)

### Molecular physics

#### Lab stands

- «Air viscosity»
- «Determination of the air heat capacities ratio»
- «Liquid surface tension»
- «Linear expansion of solids»
- «Heating-properties of materials»
- «The average free path length and the effective air molecules diameter»
- «Entropy increment during tin melting»
- «Fluid flow velocity according to Pitot and Venturi methods»
- «Thermodynamic parameters in gas mixing»
- «The air thermal conductivity coefficient determined by the hot-thread method»
- «Molecular physics and thermodynamics, virtual lab stand»



Air viscosity



Air heat capacity ratio

### Virtual laboratory workshop

- «Molecular physics and thermodynamics, virtual lab stand»
- «Physics, virtual laboratory workshop (secondary school)»
- «Physics, virtual laboratory complex (vocational training and higher education)»



### Projector interactive posters sets and printed classroom posters:

- Physics
- Physics (secondary school)

### Demonstration complexes

- Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# CHEMISTRY. CHEMICAL INDUSTRY

## Study labs and demonstration equipment



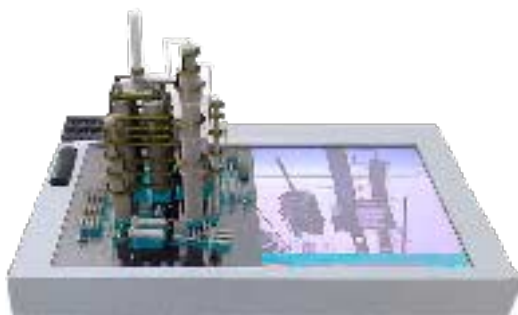
Stoichiometry



Conductometry



Distillation



Complex oil refining plant



Rectification column

## Lab installations

- «Stoichiometry»
- «Kinetics»
- «pH-metrics»
- «Conductometry»
- «Thermal effects»
- «Colorimetry»
- «Ionometry»
- «Distillation»
- «Electrochemistry»

## Chemical technology mock-ups

- «Complex oil refining plant»
- «Integrated gas processing plant»
- «Oil and gas storage tank farms»
- «Rectification column»
- «Petroleum products separation»
- «Acids production»
- «Carbamide production»
- «Ammonia production»

## Water chemistry lab complexes

- «Multi-stage filtering»
- «Deep oxidation»
- «Coagulation and flocculation»
- «Adsorption and ion exchange»
- «Cleaning with biofilms»
- «Activated sludge cleaning»

## Technological processes of chemical production

- «Rectification process»
- «Chemical production technological processes automation»
- «Gas constant determination»
- «Air dustiness determination»
- «Vaporization processes»
- «Drying of materials»
- «Heat exchangers»
- «Absorption process»
- «Extraction process»
- «Determination of bulk material solid and bulk density»
- «Separation process»
- «Vacuum cooling and phase transitions processes»
- «Solids heat capacity»





Solids heat capacity



Absorption process



Virtual training complex  
Petroleum products separation



Virtual training complex  
Oil refining



Virtual training complex  
Petroleum products separation



Virtual training complex  
Petroleum products separation



Virtual training complex  
Technological features of a gasoline  
redistillation unit



Fertilizer production



Sulfuric acid production



Plastic production



Nitric acid production



Oil refining



Phosphoric acid production



Carbamide production



Rubber production



Ammonia production

## Interactive demonstrations



D. Mendeleev's Periodic Table

- Sound
- Video
- Testing system
- Individual sectional RGB lighting
- Real chemical elements samples
- Control terminal with built-in software

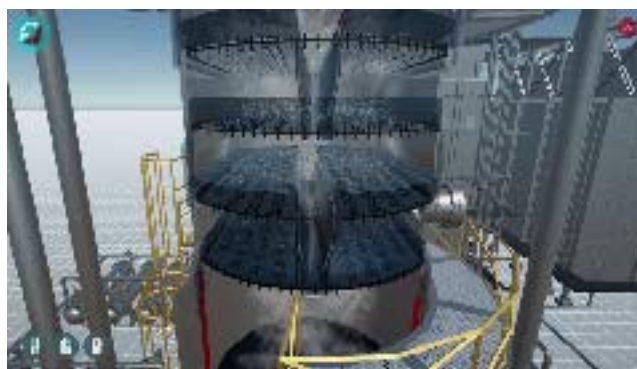
## Chemistry classrooms



### The maximum chemistry classroom equipment set includes the following:

- «A set of virtual laboratory works» (170+ training workshops)
- «A set of VR laboratory works» (40+ training simulations)
- «Computer equipment» (8 student sets + 1 teacher set)
- «VR equipment» (3 sets)
- «A standard physical chemistry equipment set»
- «A set of standard colloidal chemistry equipment set»
- «A standard general chemistry equipment set»
- «A set of laboratory installations» (9+ installations for various experiments)
- «Interactive whiteboard which allows demonstrating virtual chemical works»
- «Interactive Mendeleev's Periodic Table»

## Virtual laboratory works and training complexes. Chemical technologies



## Virtual laboratory works and training complexes. General chemistry



### Training and methodological complexes (didactic software, electronic and printed posters, laptop, projector):

- Chemistry
- Radiation reconnaissance and control equipment (LP-DP-5V)
- General chemistry
- Chemical kinetics
- Chemical thermodynamics
- Water Chemistry
- Oil and gas chemistry
- Chemical technologies
- Chemical production
- Substances and their compounds
- Analytical Chemistry
- Biochemistry

# TECHNICAL DRAWING. DESCRIPTIVE GEOMETRY. ENGINEERING DRAWING

## Study labs and demonstration equipment

- «Engineering graphics and descriptive geometry with an assembly drawing tasks album»
- «Engineering graphics 1. Hydraulic lock»
- «Engineering graphics 2. Check valve»
- «Engineering graphics 3. Gear – shaft connection»
- «Engineering graphics 4. Assembled ICE connecting rod»
- «Engineering graphics 5. Hub with bearing»
- «Engineering graphics 6. Tension roller»
- «Engineering graphics 7. Springs»
- «Engineering graphics 8. Thread types»
- «Engineering graphics 9. Measuring linear dimensions on a cylindrical part»
- «Engineering graphics 10. Measuring linear dimensions on a flat part»
- «Engineering graphics 11. Cylindrical parts with cutouts»



Hydraulic lock



Engineering graphics 2. Check valve



Gear – shaft connection



Thread types



Assembly drawings tasks album



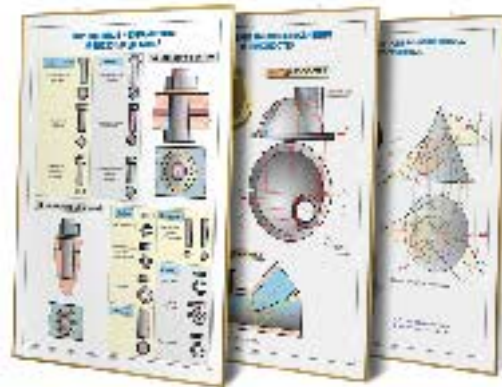
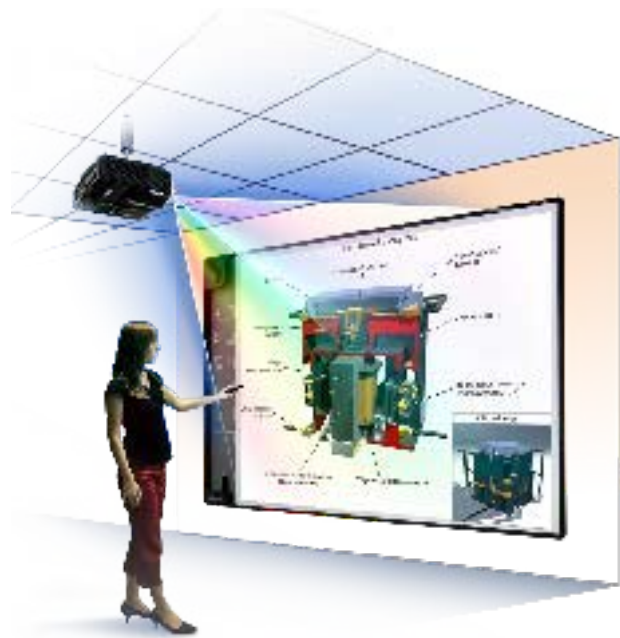
Hub with bearing



Assembled ICE connecting rod



Tension roller



#### Interactive manuals (CD) and classroom posters

- Engineering drawing
- Engineering drawing
- Descriptive geometry
- Demonstration complexes

**Basic equipment:** projector, screen or interactive whiteboard, laptop, pre-installed set of electronic posters.

# STRENGTH OF MATERIALS. CONSTRUCTION MECHANICS

## Study labs and demonstration equipment



Rods and beams

- «Mechanical properties of materials»
- «Mechanical testing of materials» (MIM-7LR-010)
- «Fundamentals of materials resistance» (OSM-8LR-09)
- «Fundamentals of materials resistance» (OSM-9LR-09)
- «Fundamentals of materials resistance» (OSM-11LR-11)
- «Rods and beams» (SM-SIB-7LR-010)
- «General bent rod stability»
- «Longitudinally compressed rod stability»
- «Composite materials testing» (IKM-010-4LR)
- «Model of the industrial building load-bearing structures» (MKPZ-7LR-11)
- «Plate girder stresses»
- «Vibrations of truss structures»
- «Wave dynamics»
- «Calculating elastic constants under tension»
- «Calculating elastic modulus under torsion»
- «Bending center identification»
- «Calculating main stresses»
- «Calculating displacements during beam bending»
- «Oblique beam bending»
- «Calculating stresses under simple bending»
- «Longitudinally compressed rod stability»
- «Moving in a flat frame»



Longitudinally compressed rod stability



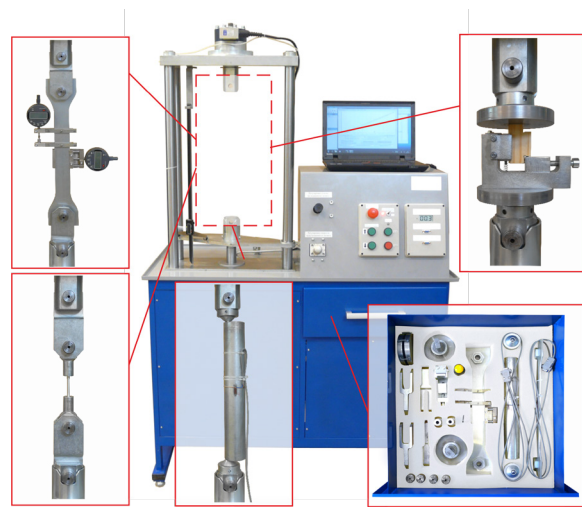
Composite materials testing



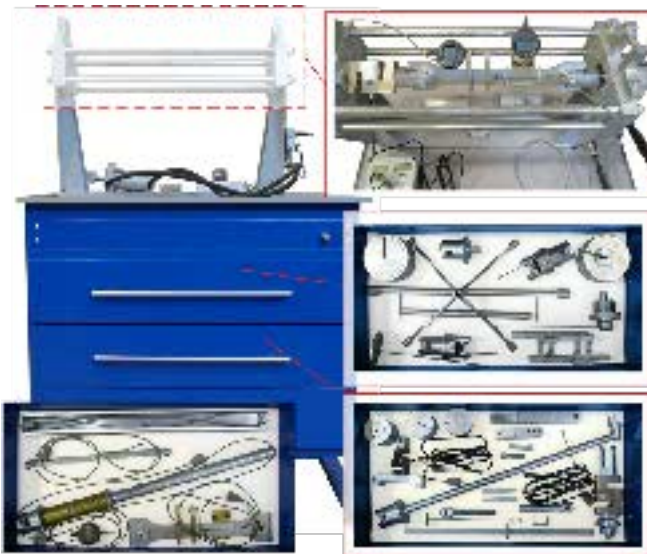
Mechanical properties of materials



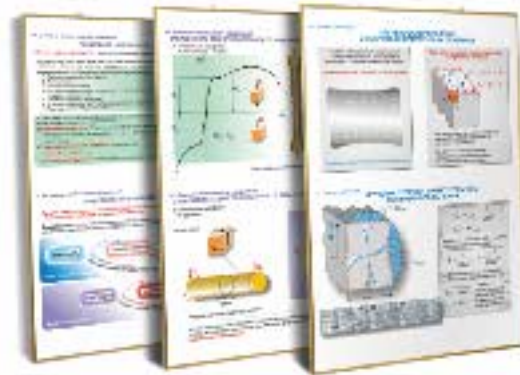
Wave dynamics



Mechanical testing of materials



Fundamentals of material resistance



Industrial building load-bearing structures model

**Interactive manuals (CD) and classroom posters**

- Engineering drawing
- Machine parts and design basics
- Strength of materials
- Technical mechanics
- Construction materials technology
- Pressure metal forming machines and technologies
- Fundamentals of cutting theory and tools

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# MACHINE PARTS. DESIGN BASICS

## Study labs and demonstration equipment



Industrial mechanics and installation



Machine parts – friction in threaded connections



Machine parts – safety couplings



Machine – chain transmissions



Machine parts – parallel-shaft reduction gear unit

## Training stands

- «Machine parts – mechanical transmissions»
  - «Machine parts – gear transmissions»
  - «Machine parts – belt transmissions»
  - «Mechanical connections»
  - «Machine parts – pressure couplings» (DM-CH-010-3LR)
  - «Machine parts – opening of the threaded joint» (DM-RSRS-010-3LR)
  - «Machine parts – friction in threaded connections» (DM-TR-010-2LR)
  - «Continuous involute tooth formation»
  - «General industrial gearboxes»
  - «Machine parts – worm gear» (DM-RF-010-4LR)
  - «Machine parts – bevel gear speed reducer» (DM-RK-010-4LR)
  - «Machine parts – parallel-shaft reduction gear unit» (DM-RC-010-4LR)
  - «Machine parts – planetary reduction gear» (DM-RP-010-4LR)
  - «Machine parts - chain transmission» (DM-PC-010-3LR)
  - «Operation and maintenance of industrial electromechanical drives»
  - «Characteristics of coiled compression and tension springs» (DM-PR-010-2LR)
  - «Machine parts – coupling fuse» (DM-MP-010-3LR)
  - «Machine parts – shoe brake assembly» (DI-TK-010-2LR)
  - «Machine parts – friction bearings» (DM-PS-010-4LR)
  - «Machine parts – shaft resonance» (DM-RV-010-3LR)
  - «Pressure distribution in a hydrodynamic bearing»
  - «Dry friction»
  - «Rolling bearings»
  - «Gear defects testing»
  - «Engineering graphics» (Gear-shaft connection, Springs, Thread types, ICE connecting rod assembly, Hub with bearing, Tensioning roller)
  - «A set of mechanism models on a stand» (20 pcs.)
  - «Working processes of a chain/belt conveyor, winch»
  - «Screw pair study»
  - «General industrial gearboxes»
  - «Shaft supports»
- A set of standard boards with real samples of parts and assemblies for the "Machine Parts" course**
- «Worm gear»
  - «Parallel-shaft reduction gear unit»
  - «Bevel gear speed reducer»
  - «Disk-type variable-speed friction drive unit»
  - «Cogged belts»
  - «V-belts»
  - «Flat and round belts»
  - «Bearings»
  - «Chains»
  - «Conveyor belts»
  - «Welded joints»





Working processes in mechanical transmissions

- «Threaded connections»
  - «Riveted joints»
  - «Threaded connections locking methods»
  - «Bolts and screws, Nuts and paltes»
  - «Machines mounting means»
  - «Shafts and axles»
  - «Planetary reduction gear»
  - «Springs»
  - «Elastic couplings»
  - «Compensating couplings»
  - «Safety couplings»
  - «Movable couplings»
  - «Permanent couplings»
- Teaching & methodical literature and manuals**
- «Reduction Gears Part 1»
  - «Reduction Gears Part 2»
  - «Drive belts and chains»
  - «Conveyor systems»
  - «Computer 1 – aided recirculating transmission design»
  - «Machine parts and design basics»



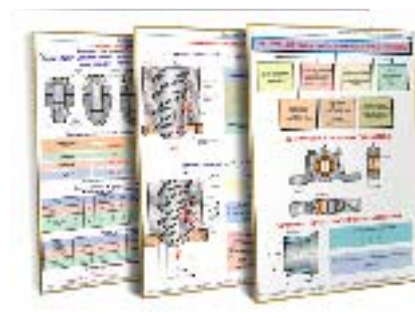
Operation and maintenance of industrial electromechanical drives



Machine parts – mechanical transmissions



Rolling bearings



Mechanical connections



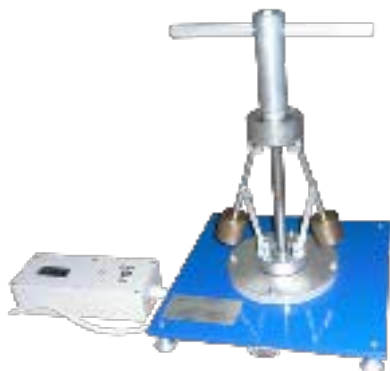
A set of mechanism models on a stand (20 pcs.)

- Interactive manuals (CD) and classroom posters**
- Machine parts and design basics
  - Engineering drawing
  - Technical mechanics
  - Theory of mechanisms and vehicles

**Demonstration complexes**  
Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# THEORETICAL, TECHNICAL AND APPLIED MECHANICS

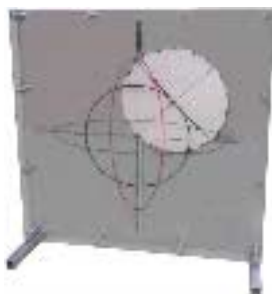
## Study labs and demonstration equipment



Maintaining axial kinetic moment



Gyroscopic effects



Ellipsograph



Building a catenary line



Calculating main stresses



Sliding and static friction

## Theoretical and technical mechanics

### Training stands

- «Gyroscopic effects»
- «Instantaneous rotation axis»
- «Maintaining axial kinetic moment»
- «Ellipsograph»

### Demonstration models

- «Natural trihedron»
- «Euler Angles»
- «Turning pair»

### Training stands

- «Building a catenary line»
- «Stress distribution in plate girders»

### Experimental installations

- «Calculating elastic constants under tension»
- «Calculating elastic modulus under torsion»
- «Bending center identification»
- «Calculating main stresses»
- «Calculating displacements during beam bending»
- «Oblique beam bending»
- «Calculating stresses under simple bending»
- «Longitudinally compressed rod stability»
- «Moving in a flat frame»
- «Mechanisms demonstration models set» (TM-012-14MD)

### **Standard training equipment set for the "Technical Mechanics" course (TMKM-12M)**

### Demonstration models

- «Demonstration of the stress concentration effect and the Saint-Venant principle» (TMKM1)
- «Determining the form of stability loss depending on the fixation» (TMKM2)
- «Elastic deformation of cylindrical compression springs» (TMKM3)
- «Flexible rods stability under compression» (TMKM4)
- «Flat shapes gravity center» (TMKM5)

### Lab stand

- «Converging forces coplanar system» (TMKM6)
- «Shaping teeth in machine clamps» (TMKM7)
- «Coplanar system of arbitrarily arranged forces» (TMKM8)

### Demonstration models

- «Sliding and static friction» (TMKM9)
- «Worm gear» (TMKM10)
- «Parallel-shaft reduction gear unit» (TMKM11)
- «Girder elements stability demonstration» (TMKM12)

### **Theory of machines and mechanisms**

- «Standard teaching aids set»
- «Continuous involute tooth formation»
- «Crank-rocker mechanism efficiency coefficient» (TMM-KKM-013-ZLR-01)
- «Cam gear» (TMM-ISH-013-5LR-01)
- «Identifying inertia moments based on a single-thread suspension method»



Worm gear



Parallel-shaft reduction gear unit

- «Structural analysis of mechanisms and machines, models set» (CA-TMM-01/14)
- «Metric synthesis of the crank-slider mechanism» (MS-TMM-01)
- «Metric synthesis of a four-hinged mechanism» (MS-TMM-02)
- «Determining mechanism efficiency» (LC-TMM-01)
- «Modeling the process of teeth shaping in the machine engagement» (LS-TMM-2)
- «Rotor dynamic balancing» (LS-TMM-3)
- «Cam gear» (LC-TMM-4)

**Standard equipment set for the course "Applied Mechanics" PM/TM:**

- «Coplanar converging forces system» (PM/TM-1TRM)
- «Coplanar system of arbitrarily arranged forces» (PM/TM-2 TRM)
- «Determining beam reactions» (PMDM-3 TRM)
- «Planar figure gravity center» (PMDM-4TMM)
- «Balancing rotation bodies» (PM/TM-5 TMM)
- «Determining the shear modulus during torsion» (PM/TM-6CM)
- «Linear and angular displacements of a statically definable beam» (PM/TM-7 CM)
- «Beam displacements at biaxial bending» (Tm/TM-8CM)
- «Stress-strain state under torsion and joint action of bending and torsion» (PMDM-9 CM)
- «Measurement of critical force for a compressed rod of great flexibility» (PM/TM-10 CM)
- «Mechanisms demonstration models set for the course "Applied Mechanics"» (40 pcs.)



Determining beam reactions



Coplanar system of arbitrarily arranged forces



Mechanisms demonstration models set



**Interactive manuals (CD) and classroom posters**

- Theoretical mechanics
- Technical mechanics
- Theory of mechanisms and vehicles
- Machine parts and design basics
- Engineering drawing
- Strength of materials

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# HEAT ENGINEERING AND THERMODYNAMICS

## Study labs and demonstration equipment



Gas heating engineering



Fluid heat engineering



Automated heating unit

- «Joule's experiment»
- «Technical thermogasdynamics» (TET-GAS) (TTGD-011-05LR-01)
- «Thermodynamic cycles of piston machines» (TCPM-011-05LR-01)
- «Gas Heat Engineering» (TPG-010-5LR-01)
- «Heat transfer during convection and blowing» (TPK-010-9LR-01)
- «Fluid heat engineering» (TPJ-010-6LR-01)
- «Cryogenic and refrigeration equipment» (KHT-SK)
- «Thermal and hydraulic characteristics of heating devices» (TGHPTO-9LR-010)
- «Heat supply and heating devices»
- «Investigation of thermal radiation impact on various materials» (OPTP-01)
- «Fourier's Law»
- «Microclimate control»
- «Automation of heat & gas supply and ventilation systems» (ATGSV-09-11LR-01)
- «Application of automation and dispatching tools in heating units of district heating systems of buildings»
- «Heat pump-1»
- «Heat pump-2»
- «Heat pump using geothermal low-potential energy» (based on heat pumps)
- «Renewable energy sources. Solar collector»
- «Automated liquid and gaseous fuel boiler house» (AK-1)
- «Automated heating unit» (ATP-01)
- «Indirect automated heating system» (ASO-03)



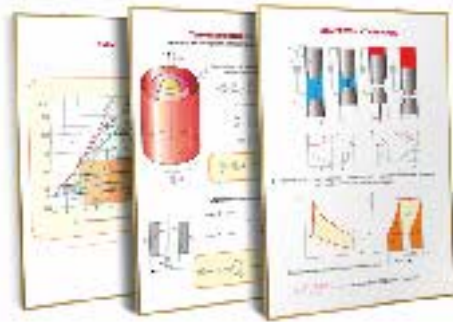
Technical thermogasdynamics



Thermodynamic cycles of reciprocating machines



Heat transfer during convection and blowing



Cryogenic and refrigeration equipment



**Interactive manuals (CD) and classroom posters**

- Technical thermodynamics
- Heat and mass transfer
- Heat and gas supply and ventilation

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed set of electronic posters.



Heat pump

# HEALTH & SAFETY. ELECTRICAL SAFETY

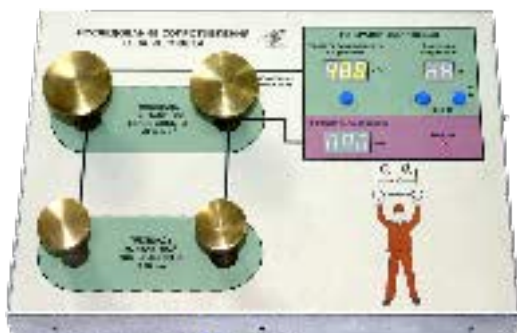
## Study labs and demonstration equipment



Phenomena associated with current grounding



Electrical safety in three-phase AC networks with insulated and grounded neutral



Human body resistance research



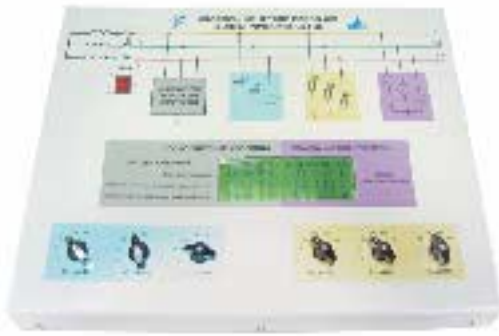
Protective grounding and self-grounding



Laser radiation protection

### Electrical safety

- «Fundamentals of Electrical Safety» (OEB-NI), (OEB-SI)
- «Electrical safety in three-phase AC networks with grounded neutral» (BZhD-01)
- «Electrical safety in three-phase AC networks with insulated neutral» (BZhD-02)
- «Electrical safety in three-phase AC networks with insulated and grounded neutral» (BZhD-01/02)
- «Phenomena associated with current grounding» (BZhD-03)
- «Human Body Resistance Research» (BZhD-04)
- «Protective grounding and self-grounding» (BZhD-05)
- «Protective grounding and neutral grounding» (BZhD-06)
- «Protective grounding and electrical safety protective measures» (ZiZME-NR), (ZiZME-SR)
- «Electrical safety in power supply systems» (BZhD-06/2)
- «Electrical safety in the units up to 1,000 V» (BZhD-06/3)
- «Protective shutdown devices» (BZhD-07)
- «Electrical safety in residential and office premises» (BZhD-08)
- «Electrical safety in residential and office premises» (EBJiOP-NR), (EBJiOP-SR)
- «Measurement of grounding resistance by the ammeter-voltmeter method» (BZhD-12)
- «Methods of insulation control in electric networks» (BZhD-13)
- «Electrical safety in the units up to 1,000 V» (EBU100-NI), (EBU 100-SI)
- «Health & safety»
- «Light sources efficiency and quality» (BZhD-09)
- «UV-radiation protection» (BZhD-10)
- «Laser radiation protection» (BZhD-11)
- «Investigation of the methods of protection against thermal radiation» (BZhD-14)
- «Research of protection methods against industrial vibration» (BZhD-15)
- «Investigation of protection methods against occupational noise» (BZhD-16)
- «Wastewater treatment»



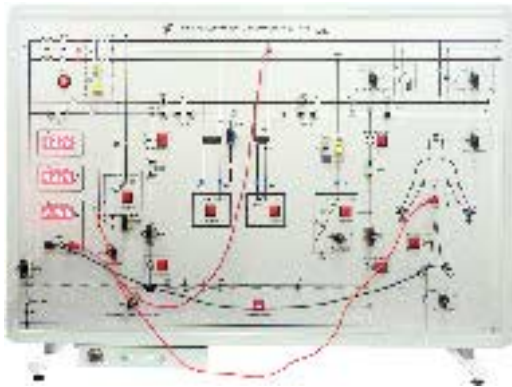
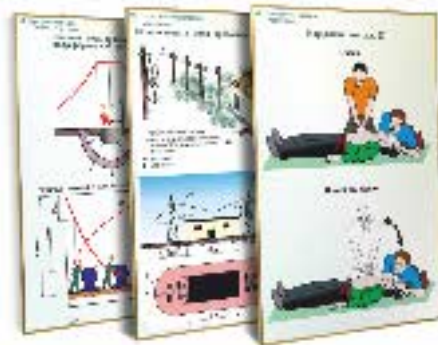
Methods of insulation control in electric networks



Protective shutdown devices



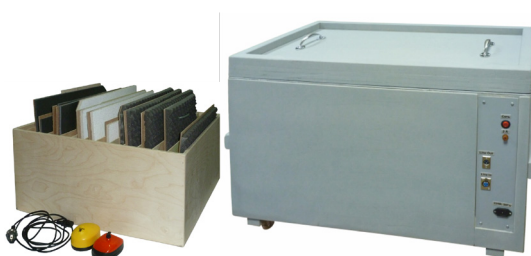
Light sources efficiency and quality



Electrical safety in the units up to 1,000 V



Research of protection methods against industrial vibration



Investigation of protection methods against occupational noise

**Interactive manuals (CD) and classroom posters**

- Industrial & occupational health & safety
- Civil defense and emergency situations
- Metal-cutting machines safety
- Ecology for engineers

**Training and methodical complex**

Basic equipment: projector, screen, laptop, pre-installed set of interactive posters, virtual laboratory, classroom posters.

# FIRE SAFETY



Simulator complex for the use of emergency fire-fighting appliance



Electric installation and commissioning of fire and security alarm



Fire pump operating processes

## Fire safety

- «Electric installation and commissioning of fire and security alarm EiNOPS-01»
- «Simulator complex for the use of emergency fire-fighting means»
- «Personal Protective Equipment, sample board»
- «Fire pump operating processes, lab stand»

## Training stands

- «Extinguishing media. Fire extinguishers»
- «Gas masks»
- «Fire pump»

## LED-dynamic stands

- «Breathing apparatuses»
- «Fire truck»
- «Fire truck ladder»



Extinguishing media. Fire extinguishers



PPE, sample board





Gas masks, training stand



Electric installation and commissioning of security and fire alarms



Application of emergency fire-fighting means (LP-BZH-P01)



Fire Pump, training stand



Equipping evacuation routes with fire safety means (LP-BZH-P02)



Fire pumps, virtual simulator



**Training and methodological complexes (didactic software, electronic and printed posters, laptop, projector):**

- Occupational health & safety
- Civil defense and emergency situations

# ELECTRICAL ENGINEERING AND THE BASICS OF ELECTRONICS. ELECTROMECHANICS. ELECTRIC CIRCUITS

## Study labs and demonstration equipment



Electric circuits (EC-MR)



Theoretical foundations of electrical engineering (TOE-NR)



Theoretical foundations of electrical engineering (TOE-SK)



Theoretical foundations of electrical engineering (TOEZ-MR)



electric circuits and the basics of electronics (TECiOE4-NRM)

### Electric circuits

- «Electric circuits» (manual monoblock version) (EC-MR)
- «Electric circuits» (desktop manual version) (EC-NR)
- «DC electric circuits» (manual monoblock version) (EC-PT-MR)
- «Single-phase AC circuits» (manual monoblock version) (EC-1F-MR)
- «Three-phase electric circuits» (manual monoblock version) (EC-3F-MR)
- «Electric circuits» (manual stand version) 3 monoblocks (EC-M3-SR)
- «Theory of electric circuits» (manual desktop version) (TEC-NR)
- «Theory of electric circuits» (manual stand version) (TEC-SR)
- «Theory of electric circuits» (desktop-laptop version) (TEC-NN)
- «Theory of electric circuits» (computer stand version) (TEC-SK)
- «Theory of electric circuits» (manual monoblock version) (TEC-MR)

### Theoretical foundations of electrical engineering

- «Theoretical foundations of electrical engineering» (manual desktop version) (TOE-NR)
- «Theoretical foundations of electrical engineering» (manual stand version) (TOE-SR)
- «Theoretical foundations of electrical engineering» (computer stand version) (TOE-SK)
- «Theoretical foundations of electrical engineering» (desktop-laptop version) (TOE-NN)
- «Theoretical foundations of electrical engineering» (manual monoblock version) (TOEZ-MR)

### Electric circuits and the basics of electronics

- «Electric circuits and fundamentals of electronics» (desktop manual minimodule version) (ECiOE4-NRM)
- «Electric circuits and fundamentals of electronics» (desktop manual version) (ECiOE4-NR)
- «Electric circuits and fundamentals of electronics» (computer stand mini-module version) (ECiOE4-SKM)
- «Theory of electric circuits and fundamentals of electronics» (desktop manual minimodule version) (TEZiOE4-NRM)
- «Theory of electric circuits and fundamentals of electronics» (computer stand minimodule version) (TEZiOE4-SKM)

- «Electric circuits and fundamentals of electronics» (manual monoblock minimodule version) (ECiOE4-MRM)

### Theoretical foundations of electrical engineering and fundamentals of electronics

- «Theoretical foundations of electrical engineering and fundamentals of electronics» (desktop manual minimodule version) (TOEiOE4-NRM)



Electric circuits and the basics of electronics (ECiOE-MRM)



Theoretical foundations of electrical engineering and fundamentals of electrical engineering (TOEiOE4-NRM)



Electrical engineering and fundamentals of electronics (ETiOE2-SK)



Desktop analog station Profi (PROFI-A-MR)

- «Theoretical foundations of electrical engineering and fundamentals of electronics» (computer stand minimodule version) (TOEiOE4-SCM)
- «Theoretical foundations of electrical engineering and fundamentals of electronics» (manual monoblock version) (TOEiOEZ-MR)

#### Electrical engineering and the basics of electronics

- «Electrical engineering and fundamentals of electronics» (desktop manual minimodule version) (ETiOE4-NRM)
- «Electrical engineering and fundamentals of electronics» (manual 3 monoblock stand version) (ETiOE2-M3-SR)
- «Electrical engineering and the basics of electronics» (computer stand 3 monoblock version) (ETiOE2-M3-»SK)

- «Electrical engineering and fundamentals of electronics» (manual desktop version) (ETiOE2-NR)
- «Electrical engineering and fundamentals of electronics» (desktop version with a laptop) (ETiOE2-NN)
- «Electrical engineering and fundamentals of electronics» (computer stand version) (ETiOE2-SK)
- «Electrical engineering and fundamentals of electronics» (computer minimodule 2 monoblock stand version) (ETiIE2-M2-SKM)
- «Electrical engineering and fundamentals of electronics» (manual minimodule 2 monoblock stand version) (ETiIE2-M2-SRM)

#### Universal desktop sets PROFI-A

- «Desktop analog station Profi» (manual monoblock version) (PROFI-A-MR)
- «Desktop analog station Profi» (manual monoblock version) (PROFI-A-MN)

#### Electrical engineering, electronics, electric machines and electric drives

- «Electrical engineering, electronics, electric machines and electric drives» (computer minimodule stand version) (E4-SKM)
- «Electrical engineering, electronics, electric machines and electric drives» (computer stand version) (E4-SK)
- «Electrical engineering, electronics, electric machines and electric drives with a universal AC machine» (computer minimodule stand version) (E4-2-SKM)
- «Electrical engineering, electronics, electric machines and electric drives with a universal AC machine» (computer stand version) (E4-2-SK)

#### Electrical engineering materials

- «Electrical engineering materials, desktop version» computer version) (ETM-NK) (without PC)
- «Electrical engineering materials, stand version» computer version) (ETM-SK) (without PC)

#### Interactive manuals (CD) and classroom posters

- Theoretical foundations of electrical engineering
- Electrical engineering
- Electromechanics
- Electronics
- Electrical engineering materials
- Electric drive control systems

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



# ELECTRONICS AND CONVERTER TECHNOLOGY. CIRCUIT DESIGN

## Study labs and demonstration equipment



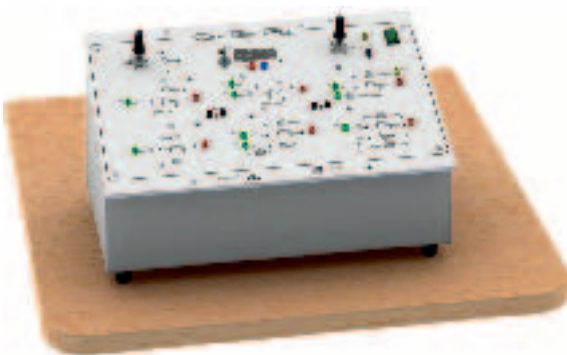
Fundamentals of Electronics–2 (desktop manual version with an oscilloscope) (IE2-NRC)



Fundamentals of electronics (manual monoblock version) (OE-PROFI-MR)



Semiconductor devices (monoblock manual version) (PP-MR)



Operational amplifiers (monoblock manual version) (OU-MR)

### Basics of electronics

- «Fundamentals of Electronics» (manual monoblock version) (OE-MR)
- «Fundamentals of Electronics–2» (desktop manual version with an oscilloscope) (IE2-NRC)
- «Optoelectronic and photoelectronic devices» (monoblock manual version) (OiFEP-MR)
- «Fundamentals of Electronics» (manual monoblock version) (OE-PROFI-MR)

### Analog electronics

- «Analog electronics» (desktop manual version) (AE-NR)
- «Analog electronics» (desktop computer version (without PC)) (AE-NK)
- «Analog electronics» (desktop manual version) (AE-NR)
- «Semiconductor devices» (monoblock manual version) (PP-MR)
- «Operational amplifiers» (monoblock manual version) (OU-MR)

### Electronics

- «Electronics» (desktop manual version) (E-NR)
- «Electronics» (desktop computer version (without PC)) (E-NK)
- «Electronics» (manual stand version) (E-SR)
- «Electronics» (desktop computer version (without PC)) (E-SK)

### Data electronics

- «Information electronics–4» (manual monoblock version) (IE4-MR)
- «Information electronics–4» (manual monoblock version with an oscilloscope) (IE4-MRC)
- «Information electronics–4» (computer stand version) (IE4-SKC)

### Physical fundamentals of electronics

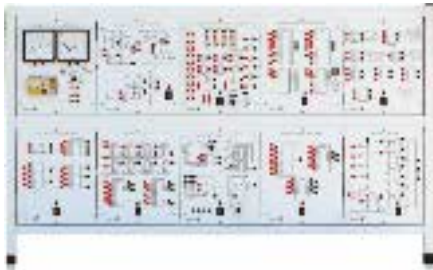
- «Fundamentals of Electronics–2» (desktop manual version with an oscilloscope) (FOE-NRC)
- «Physical fundamentals of electronics (desktop manual minimodule version with an oscilloscope)» (FOE-NRMC)



Physical fundamentals of electronics (desktop manual minimodule version with an oscilloscope) (FOE-NRMC)



Electronics (desktop manual version) (E-NR)



Digital electronics (computer stand version (without PC)) (PE-SKA)



Fundamentals of digital and microprocessor technology (OCiMPT4-MN)



Circuitry engineering (manual desktop version) (ST-NR)



Circuitry (desktop version, computer version) (ST-NK)



Circuitry (desktop version, manual version) (ST-NR)

### Digital electronics

- «Fundamentals of digital technology» (manual monoblock version) (OCT-MR)
- «Fundamentals of digital and microprocessor technology (monoblock manual version) (OCiMPT-MR)
- «Digital electronics» (desktop manual version) (CE-NR)
- «Digital electronics» (desktop computer version (without PC)) (CE-NK)
- «Digital electronics» (manual stand version) (CE-SR)
- «Digital electronics» (computer stand version (without PC)) (PE-SKA)
- «Fundamentals of digital and microprocessor technology–4» (monoblock version with a laptop) (OCiMPT4-MN)
- Combination digital devices (manual monoblock version) (KCU-MR)
- «Sequential digital devices» (manual monoblock version) (PCU-MR)
- «Analog-to-digital converters» (monoblock manual version) (ACP-MR)
- «Digital-to-analog converters» (manual monoblock version) (CAP-MR)
- «Object communication devices» (desktop manual version) (USO-M2-NR)
- «Object communication device2s (desktop manual version with an oscilloscope) (USO-M2-NRC)
- «Digital devices» (desktop manual version) (CU-M2-NR)
- «Digital devices» (desktop manual version with an oscilloscope) (CU-M2-NRC)
- «Digital devices» (desktop manual version) (CU-M4-NR)
- «Digital devices» (desktop manual version with an oscilloscope) (CU-M2-NRC)
- «Digital electronics» (desktop computer version (without PC)) (CE-NK)

### Electronics and circuitry engineering

- «Circuitry engineering» (manual desktop version) (ST-NR)
- «Circuitry engineering» (desktop computer version (without PC)) (ST-NK)
- «Circuitry engineering» (manual stand version) (ST-SR)
- «Circuitry engineering» (computer stand version (without PC)) (ST-SK)
- «Fundamentals of electronics and circuitry engineering» (manual stand version with an oscilloscope) (OEiS-SRC)



Electronics and circuitry engineering (desktop manual version with an oscilloscope) (EiS-NRC)



Fundamentals of power electronics (manual monoblock version with an oscilloscope) (OSE-MRC)



Power electronics (desktop manual version) (SE-NRC)



Power electronics and electric drive (desktop manual version) (SEiEP-NR)



Power electronics and electric drive (computer stand version) (SEiEP-SK)



Autonomous converters (desktop manual version with an oscilloscope) (AP-NRC)

- «Fundamentals of electronics and circuitry engineering» («desktop manual version with an oscilloscope») (OEiS-NRC)
- «Electronics and circuitry engineering» (manual stand version with an oscilloscope) (OEiS-SRC)
- «Electronics and circuitry engineering» (manual monoblock version with an oscilloscope) (EiS-MRC)
- «Electronics and circuitry engineering (desktop manual version with an oscilloscope) (EiS-NRC)

#### Power electronics

- «Fundamentals of power electronics» (manual monoblock version with an oscilloscope) (OSE-MRC)
- «Fundamentals of power electronics» (manual monoblock version) (OSE-MR)
- «Power electronics» (desktop manual version) (SE-NRC)
- «Power electronics» (desktop version with a laptop) (SE-NNC)
- «Power electronics» (computer stand version) (SE-SKC)
- «Power electronics» (manual stand version with an oscilloscope) (SE-SRC)
- «Power sources» (desktop manual version with an oscilloscope) (IEP-NRC)

#### Power electronics and electric drive

- «Power electronics and electric drive» (manual stand version) (SEiEP-SR)
- «Power electronics and electric drive» (desktop manual version) (SEiEP-NR)
- «Power electronics and electric drive» (computer stand version) (SEiEP-SK)
- «Power electronics and electric drive» (desktop version with a laptop) (SEiEP-NN)

#### Converter equipment

- «Single-phase rectifiers» (manual monoblock version) (OV-MR)
- «Three-phase rectifiers» (manual monoblock version) (TV-MR)
- «Autonomous converters» (desktop manual version with an oscilloscope) (AP-NRC)
- «Autonomous converters» (manual stand version with an oscilloscope) (AP-SRC)
- «Pulse-width converters» (manual stand version with an oscilloscope) (ShIP-SRC)
- «Pulse-width converters» (desktop manual version with an oscilloscope) (ShIP-NRC)
- «Three-phase rectifiers» (manual monoblock version) (TV-MR)
- «Converter equipment» (desktop manual version with an oscilloscope) (PT-NRC)
- «Converter equipment» (manual stand version with an oscilloscope) (PT-SRC)



Digital electronics (desktop manual version) (CE-NK)



Industrial electronics-2 (computer stand version with an oscilloscope) (PE2-SKC)



Industrial electronics (desktop version with a laptop) (PE-NNC)



Electronics and circuitry engineering (manual monoblock version with an oscilloscope) (EIS-MRC)

- «Converter equipment» (desktop version with a laptop and an oscilloscope) (PT-NNC)
- «Converter equipment» (computer stand version with an oscilloscope) (PT-SKC)
- «Converter equipment-2» (desktop manual version with an oscilloscope) (PT2-NRC)
- «Converter equipment-2» (manual stand version with an oscilloscope) (PT2-SRC)
- «Converter equipment-2» (desktop version with a laptop and an oscilloscope) (PT2-NNC)
- «Converter equipment-2» (computer stand version with an oscilloscope) (PT2-SKC)
- «Rectifiers» (desktop manual version with an oscilloscope) (V-M2-NRC)
- «Rectifiers» (manual desktop version) (V-M2-NR)

### Industrial electronics

- «Industrial electronics» (desktop manual version) (PE-NRC)
- «Industrial electronics» (manual stand version with an oscilloscope) (PE-SRC)
- «Industrial electronics» (desktop version with a laptop) (PE-NNC)
- «Industrial electronics» (computer stand version with an oscilloscope) (PE-SKC)
- «Industrial electronics-2» (desktop manual version) (PE2-NRC)
- «Industrial electronics-2» (manual stand version with an oscilloscope) (PE2-SRC)
- «Industrial electronics-2» (desktop version with a laptop and an oscilloscope) (PE2-NNC)
- «Industrial electronics-2» (computer stand version with an oscilloscope) (PE2-SKC)
- «Industrial electronics» (computer stand version with an oscilloscope) (PE2-SKC)



Converter equipment-2 (desktop manual version with an oscilloscope) (PT-NRC)



### Interactive manuals (CD) and classroom posters

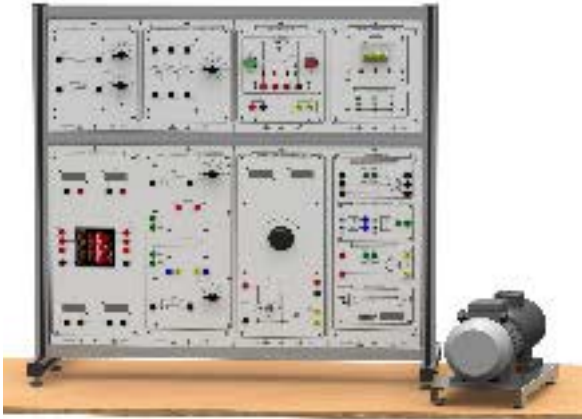
- Electronics
- Peripheral device interfaces
- Microcontrollers
- Relay protection basics
- Automatic control theory

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# ELECTRIC MACHINES AND ELECTRIC DRIVES, ELECTRIC DEVICES

## Study labs and demonstration equipment



Basics of Electric Machines (OEM-NR)



Three-phase synchronous generator 5 kW (TSG-5-SK)



Electric machines and devices (manual stand version)  
(EMiA-SR)

### Electric machines

- «Fundamentals of electric machines» (desktop manual version) (OEM-NR)
- «Electric machines» (desktop manual version) (EM-NR)
- «Electric machines with a universal AC machine» (desktop manual version) (EM2-NR)
- «Electric machines» (desktop version with a laptop) (EM-NN)
- «Electric machines» (computer stand version) (EM-SK)
- «Electric machines with a universal AC machine» (computer stand version) (EM2-SK)
- «Three-phase voltage transformers» (desktop manual version) (TTN-NR)
- «Three-phase voltage transformers» (stand manual version) (TTN-SR)
- «Three-phase voltage transformers» (computer stand version) (TTN-SK)
- «Three-phase synchronous generator 5 kW» (computer stand version) (TSG-5-SK)
- «Electric machines and apparatuses» (manual stand version) (EMiA-SR)
- «Construction of electric machines and apparatuses» (manual stand version) (KEMiA-SR)

### A set of boards for the design of electric motors

- «DC motors»
- «Asynchronous motor with a short-circuited rotor»
- «Asynchronous motor with phase rotor»
- «Inverted motor»

### Electric drive

- «DC electric drive» (manual monoblock version) (EPPTZ-MR)
- «DC electric drive» (manual monoblock version with an oscilloscope) (EPPTZ-MRC)
- «Asynchronous electric drive» (manual monoblock version) (AEPZ-MR)
- «Asynchronous electric drive» (manual monoblock version with an oscilloscope) (AEPZ-MR)
- «Fundamentals of an electric drive» (manual desktop version) (OEP-NR)
- «Electric drive» (desktop manual version) (EP-NR)
- «Electric drive with a universal AC machine» (desktop manual version) (EP2-NR)
- «Electric drive» (desktop version with a laptop) (EP-NN)
- «Electric drive» (computer stand version) (EP-SK)
- «Frequency-controlled electric drive» (manual desktop version) (ChEP-NR)
- «Frequency-controlled electric drive» (desktop version with a laptop) (ChEP-NN)
- «Frequency-controlled electric drive-2» (manual desktop version) (ChEP2-NR)
- «Frequency-controlled electric drive-2» (desktop version with a laptop) (ChEP2-NN)
- «Servo drive» (monoblock version with a laptop) (SP-MN)





Electric drive (EP-SK)



Frequency-controlled electric drive (CHEP-NN)



Microprocessor inverted motor control system (MPSU-VD-MN)



Electromechanics (desktop manual version) (EMekh2-NR)

- «Servo drive and stabilization systems» (computer stand version) (SSt-SK)
- «Generator–Motor system» (desktop manual version) (G-D-NR)
- «Generator–Motor system» (stand version with a laptop) (G-D-SN)

#### Microprocessor electric drive control systems

- «Microprocessor inverted motor control system» (monoblock version with a laptop) (MPSU-VD-MN)
- «Microprocessor stepped motor control system» (monoblock version with a laptop) (MPSU-ShD-MN)
- «Microprocessor electric drive control systems» (desktop version with a laptop) (MPSU-EP-NN)

#### Electromechanics

- «Electromechanics» (manual monoblock version) (EM2-MR)
- «Electromechanics» (desktop manual version) (EMekh2-NR)
- «Electric circuits and electromechanics» (desktop version with a laptop) (ECiEM2-M2-NN)
- «Electric circuits and electromechanics» (manual stand version) (ECiEM2-M2-SR)
- «Fundamentals of electromechanics and electronics» (manual stand version) (OEMiE-2-SR)

#### Relay-contact electric drives control systems

- «Relay-contactor control circuits of a DC motor» (monoblock manual version) (RKS-DPT-MR)
- «Relay-contactor control circuits of a DC motor» (manual monoblock version with an oscilloscope) (RKS-DPT-MRC)
- «Relay-contactor control circuits of an asynchronous motor» (desktop manual version) (RKS-AD-NR)
- «Relay-contactor control circuits of an asynchronous motor» (desktop manual version with an oscilloscope) (RKS-AD-NRC)
- «Relay-contactor control circuits of an asynchronous motor with a phase rotor and synchronous motor» (desktop manual version) (RKS-ADFR-NR)
- «Relay-contactor control circuits of an asynchronous motor with a phase rotor and synchronous motor» (desktop manual version with an oscilloscope) (RKS-ADFR-NRC)
- «Control system of a two-speed asynchronous motor with a short-circuited rotor» (desktop manual version) (SU-ADKR-NR)
- «Control system of an asynchronous motor with a short-circuited rotor» (desktop manual version) (SU-ADKR-mini)

#### Electric machines and electric drives

- «Fundamentals of electric machines and an electric drive» (manual desktop version) (OEMiEP-NR)
- «Electric machines and an electric drive» (manual desktop version) (EMiEP-NR)
- «Electric machines and an electric drive» (manual desktop version) (EMiEP2-NR)
- «Electric machines and an electric drive» (desktop version with a laptop) (EMiEP-NN)
- «Electric machines and an electric drive» (computer stand version) (EMiEP-SK)
- «Electric machines and an electric drive with Siemens converters» (computer stand version) (EMiEP-Siemens-SK)



Construction of electric machines and devices (KEMiA-SR)



Asynchronous electric drive (AEP-MRC)



Fundamentals of electric machines and an electric drive (manual desktop version) (OEMiEP-NR)



Industrial automation and electric drives (PAiEP-SK)

- «Electric machines and 1,5 kW electric drive» (computer stand version) (EMiEP-1.5-SK)
- «Electric machines and 1,5 kW electric drive with a universal AC machine» (computer stand version) (EMiEP2-1,5-SK)
- «Electric machines and 5 kW electric drive» (computer stand version) (EMiEP-5-SK)

#### Industrial automation and an electric drive

- «Industrial automation and an electric drive» (computer stand version) (PAiEP-SK)
- «Industrial automation and an electric drive» (desktop version with a laptop) (PAiEP-NN)

#### Electrical engineering, electronics, electric machines and electric drives

- «Electrical engineering, electronics, electric machines and electric drives» (computer minimodule stand version) (E4-SKM)
- «Electrical engineering, electronics, electric machines and an electric drive» (computer stand version) (E4-SK)
- «Electrical engineering, electronics, electric machines and an electric drive with a universal AC machine» (computer minimodule stand version) (E4-2-SKM)
- «Electrical engineering, electronics, electric machines and an electric drive with a universal AC machine» (computer stand version) (E4-2-SK)

#### Electrical devices

- «Electrical devices» (desktop manual version) (EA-NR)
- «Electrical devices» (manual stand version) (EA-SR)
- «Innovative electrical switches»
- «Contactor board»
- «Protective shutdown device board»
- «Automatic circuit breaker board»
- «Electromagnetic relay board»
- «Investigation of stepped motor characteristics ShD»



Relay-contactor control circuits of a DC motor (manual monoblock version) (RKS-DPT-MRC)



Control system of a two-speed asynchronous motor with a short-circuited rotor (SU-ADKR-NR)



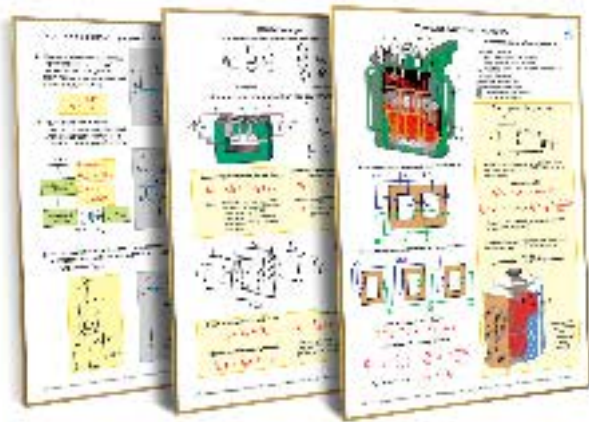
Electric machines and a 1,5 kW electric drive (EMiEP-1.5-SK)



Electric machines and electric drives (EMiEP-SK)



Relay-contactor control circuits of an asynchronous motor with a phase rotor and synchronous motor (RKS-ADFR-NRC)



Electric machines and electric drives (EMiEP2-NR)



#### Interactive manuals (CD) and classroom posters

- Electrical devices
- Electric machines
- Basics of electric drives
- Fundamentals of metrology and electrical measurements
- Electrical engineering materials
- Installation and operation of electrical equipment

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Electrical engineering, electronics, electric machines and an electric drive (E4-SKM)

# ELECTRICAL EQUIPMENT AND AUTOMATION OF GENERAL INDUSTRIAL EQUIPMENT

## Study labs and demonstration equipment



Crane electric equipment



Electrical equipment and automation of the pumping station (EOiA-NU-ShN)



Electrical equipment and automation of the elevator (EOiA-L-SK)

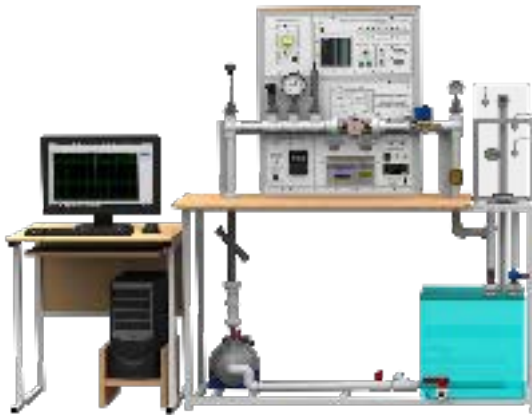


Electrical equipment of the ventilation unit (EO-VU-ShN)

- «Electrical equipment and automation of a pump unit» (version: control cabinet and laptop) (EOiA-NU-ShN)
- «Electrical equipment and the elevator automation» (computer stand version) (EOiA-L-SK)
- «Electrical equipment and automation of a centrifugal pump» (computer stand version) (EOiA-CN-SK)
- «Electric crane equipment» (version: control cabinet and a laptop) (EO-PK-ShN)
- «Electrical equipment of the ventilation unit» (version: control cabinet and laptop) (EO-VU-ShN)
- «Soft start devices» (version: control cabinet and a laptop) (UPP-ShN)
- «Soft start device and a frequency converter» (version: control cabinet and a laptop) (UPPiPCh-ShN)
- «Automatic control systems of technological parameters» (version: computer stand) (SAU-TP-SK)
- «Industrial automation and an electric drive based on SIEMENS and DANFOSS equipment» (version: control cabinet and a laptop) (PAiEP-SD-ShN)
- «Industrial automation and electric drive based on MITSUBISHI and ABB equipment» (version: control cabinet and a laptop) (PAiEP-MA-ShN)
- «Asynchronous motor control system with a short-circuited rotor» (desktop manual version) (SU-ADKR-mini-NR)
- «Control system of a two-speed asynchronous motor with a short-circuited rotor» (desktop manual version) (SU-ADKR-NR)
- «Installation and commissioning of automation systems» (manual version with a control cabinet) (MiN-SA-ShR)



Soft-start devices (UPP-ShN)



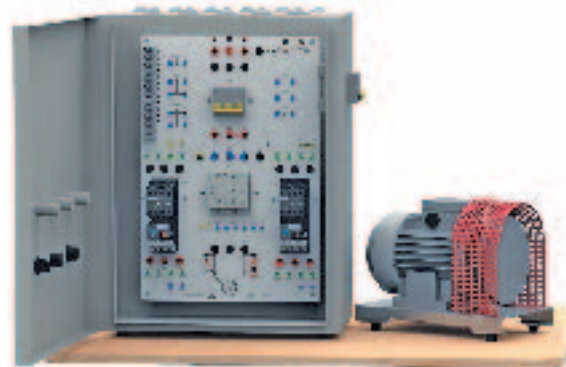
Automatic control systems of technological parameters (SAU-TP-SK)



Control system of a two-speed asynchronous motor with a short-circuited rotor (SU-ADKR-NR)



Industrial automation and an electric drive based on SIEMENS and DANFOSS equipment (PAiEP-SD-ShN)



Control system of a two-speed asynchronous motor with a short-circuited rotor (SU-ADKR-NR)



Industrial automation and an electric drive based on MITSUBISHI and ABB equipment (PAiEP-MA-ShN)

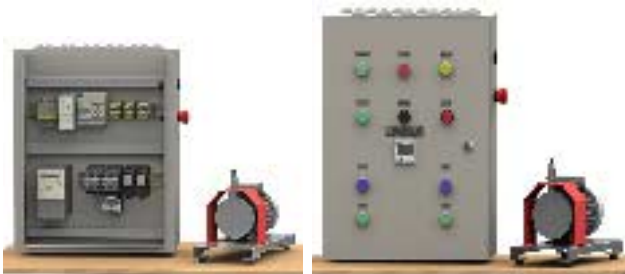


#### Interactive manuals (CD) and classroom posters

- Electrical equipment in industrial and residential buildings
- Installation and operation of electrical equipment
- Operation of electric networks and station and substation equipment
- Power supply of industrial and residential buildings
- Electrical engineering materials
- Electrical devices
- Electric machines
- Basics of electric drives

#### Demonstration complexes

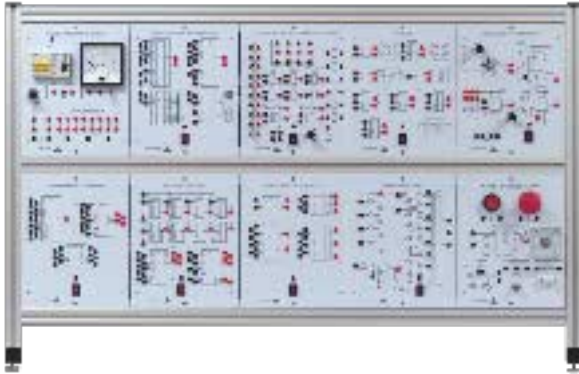
Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



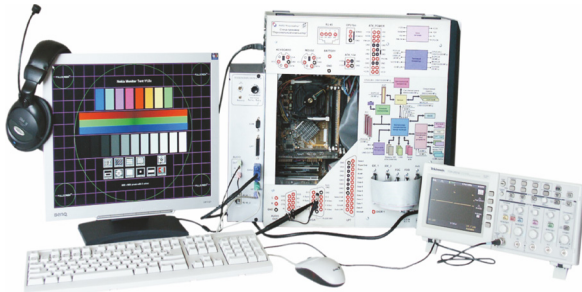
Installation and commissioning of automation systems (MiN-SA-ShR)

## COMPUTERS AND MICROPROCESSORS

### Study labs and demonstration equipment



Elements of automation and computer systems



Personal computer (PC-02)



Microprocessor Stepper Motor Control System (MPSU-SHD-MN)



Microprocessor control systems of electric drives (MPSU-EP-NN)

#### Computers

- «Personal computer» (PK-02)
- «Peripheral unit interfaces» (IPU)
- «Sensors, module»
- «Elements of automation and computer technology systems, desktop version, computer version» (without PC)

#### Elements of automation and computer systems

- «Manual version» (ESAIVT-NR)
- «Computer version» (without PC) (ESAIVT-NK)
- «Stand manual execution» (ESAIVT-SR) computer stand version (without PC) (ESAIVT-SK)

#### Microcontrollers

- «Microcontrollers and automation» (MKiA-NN)
- «Programming of microcontrollers» (PM-LM)
- «Microcontrollers and microprocessor technology
- «Microcontrollers and I/O devices» (desktop computer version; desktop version with a laptop; computer stand version) (MKiUVV-Nk)
- «ARM microcontroller»

#### Microprocessor control systems

- «Microprocessor control systems of electric drives» (desktop version with a laptop) (MPSU-EP-NN)
- «Microprocessor inverted motor control system» (monoblock version with a laptop) (MPSU-VD-MN)
- «Microprocessor stepped motor control system» (monoblock version with a laptop) (MPSU-ShD-MN)
- «Pulse-width converter–DC motor» (monoblock version with a laptop) (MPSU-ShIP-DPT-MN)
- «Modeling of digital control systems based on a multi-channel software digital controller» (remote I/O board and PC)
- «Field programmable logic devices» (FPGA)
- «Thyristor converter – DC motor» (monoblock version with laptop) (MPSU-TP-D-MN)
- «Servo drive and stabilization systems» (computer stand version) (SSt-SK)

#### Industrial programmable controllers

- «PLC-Omron»
- «PLC-Siemens»
- «PLC-Siemens+»
- «PLC-Siemens 1200»
- «PLC-Siemens 1200+»
- «Technological processes automation, 16 pcs.»
- «Relay protection, 18 pcs.»
- «Interfaces of peripheral devices. Microcontrollers, 12 pcs.»



Servo drive and stabilization systems (SSt-SK)



Industrial temperature sensors



Peripheral Device Interfaces (IPUs)



Microcontrollers and microprocessor devices



Microcontrollers



**Interactive manuals (CD) and classroom posters**

- Technological processes and
- Interfaces of peripheral devices. Microcontrollers

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Field-programmable gate array (FPGA)

# INSTALLATION, COMMISSIONING AND REPAIR OF ELECTRICAL EQUIPMENT, DRIVES AND INSTRUMENTATION AND CONTROL

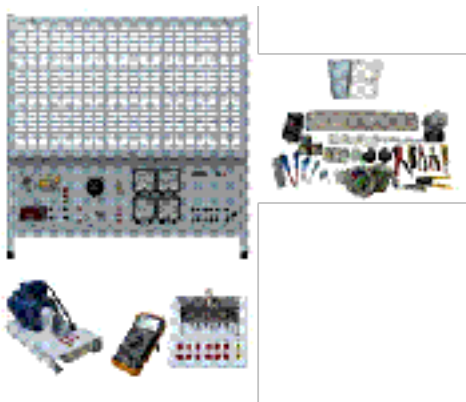
## Study labs and demonstration equipment



Instrumentation and control assembling fitter, desktop version, mounting panel (SpKIPIA-NMP)



Stand for the training of wiremen and electricians with a measuring unit, desktop version, power supply voltage 380V/220V (SPEI/380-NMP) (SPEI/220-NMP)



Installation and commissioning of electric circuits of electric motors and automation, desktop version, mounting panel (MNECA-NMP)

### Electrical installation tables

- «Electric motor fault simulator» (INAD)
- «Electrical installation table (desktop version, mounting panel) power supply voltage 220V/380V» (EMC/220-NMP) (EMC/380-NMP)

### Work stations of wiremen and electricians

- «Instrumentation and control assembling fitter, desktop version, mounting panel» (SpKIPIA-NMP)
- «Electrical installation, troubleshooting and repair of instrumentation systems, desktop version, mounting panel» (EPRsKIPIA-NMP)
- «Electrician workstation» (RME-NI)
- «Workstation for SKB in the field of electrical engineering, automation and electronics, stand version, power supply voltage 220V/380V» (RMSKBtA/220-SI) (RMSKBA380-SI)
- «Stand for the training of electricians and wiremen, desktop version, mounting panel, power supply voltage 220V/380V» (SPEE/380-NMP) (SPEE/220-NMP)
- «Stand for the training of electricians and wiremen with low-voltage control, desktop version, mounting panel, power supply voltage 380V/220V» (SPEN/380-NMP) (SPEN/220-NMP)
- «Stand for the training of electricians and wiremen with a measuring unit, desktop version, mounting panel, power supply voltage 380V/220V» (SPEI/380-NMP) (SPEI/220-NMP)
- «Electrical installation stand for hidden and open wiring mounting, desktop version, mounting panel, power supply voltage 380V» (EMSP/380-NMP)
- «Workstation of the household appliances and electronics repairman» (RMMpRBT)

### Workstations of radio installers

- «Radio installer's workstation, stand version, standard» (RMR-SI-standard)
- «Radio installer's workstation, stand design, standard plus» (RMR-SI-standard plus)

### Installation, commissioning and repair of electrical equipment and cabling systems

- «Installation and commissioning of electric circuits of electric motors and automation, desktop version, mounting panel» (MNECA-NMP)
- «Installation and commissioning of electrical equipment at the companies and civil structures, desktop version» (MNE-NI)
- «Fundamentals of electrical installation of electrical devices, desktop version, mounting panel (OEEA-NMP)
- «Electrical installation in residential and office premises, desktop version» (EMOP-NI)
- «Structured cabling systems» (SKS)
- «Method of searching for hidden wiring EM-MPSP»

### Installation, commissioning and repair of relay-contactor control systems of electric motors

- «DC motor control» (monoblock manual version) (RKS-DPT-MR)





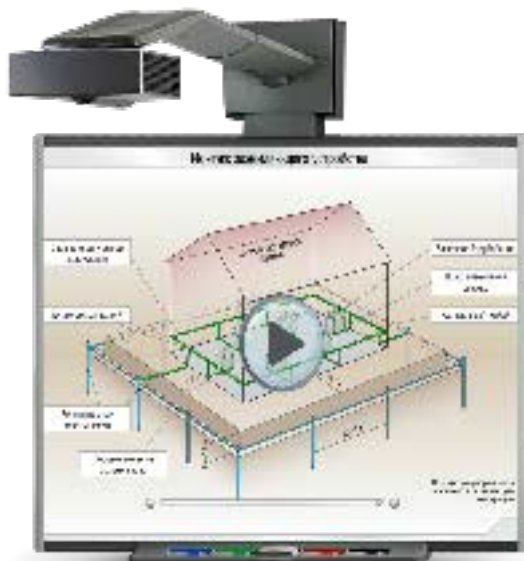
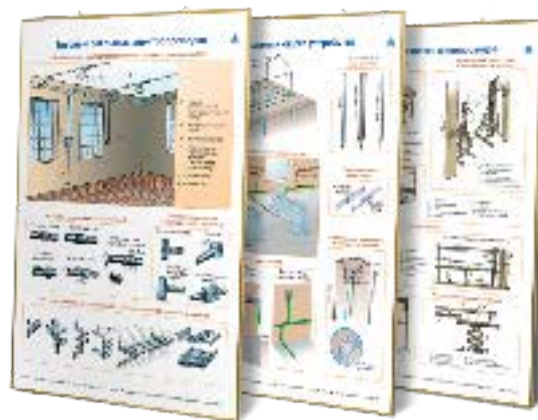
Installation and commissioning of electrical units up to 1,000 V in power supply systems, desktop version (MNEdo1,00V-NI)



Functioning injection engine VAZ-21067

### Installation, commissioning and repair of internal combustion engines

- Functioning carburetor ICE VAZ-21067
- Functioning injection engine VAZ-21067
- Functioning injection engine VAZ-2115



- «DC motor control» (monoblock manual version with an oscilloscope) (RKS-DPT-MRC)
- «Asynchronous motor control» (desktop manual version) (RKS-AD-NR)
- «Asynchronous motor control» (desktop manual version with an oscilloscope) (RKS-AD-NRC)
- «Control of asynchronous motor with phase rotor and synchronous motor» (manual desktop version) (RKS-ADFR-NR)
- «Control of asynchronous motor with phase rotor and synchronous motor» (desktop manual version with an oscilloscope) (RKS-ADFR-NRC)
- «Detecting electric motors flaws EM-IDE»
- «Testing start-up protection equipment and control equipment for suitability EM-PAAU»

#### Electrical safety (Installation and commissioning)

- «Installation and commissioning of electrical units up to 1,000 V in power supply systems, desktop version» (MNEdo1000V-NI)
- Security and fire alarm system (EiNOPS-01)

#### Interactive manuals (CD) and classroom posters

- Installation and operation of electrical equipment
- Power supply of industrial and residential buildings
- Operation of power grids and station and substation equipment
- Electrical devices
- Electrical engineering materials
- Basics of electric drives
- Electronics

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# ELECTRIC NETWORKS, STATIONS & SUBSTATIONS. RELAY PROTECTION. ENERGY SAVING

## Study labs and demonstration equipment



Model of a thermal power plant with an automatic control system (MTES-SC)



Electric stations and substations (SiPS-NN)



Electrical system model (MES-SK)



Electrical system model with a relay protection (MES-RZ-SK)



Power transmission line (EM-VLSIP)

### Electric stations and substations

- «Power stations and substations» (desktop version with a laptop) (SiPS-NN)
- «Electric power stations and substations» (computer stand version) (SiPS-SK)
- «Model of a thermal power plant with an automatic control system» (computer stand version) (MTES-SC)
- «Model of a thermal power plant with an automatic control system» (computer stand version) (MTEC-SK)
- «Model of a hydroelectric power station with an automatic control system» (computer stand version) (MGES-SC)
- «Model of a nuclear power plant with an automatic control system» (computer stand version) (MAES-SC)
- «Model of a wind power station with an automatic control system» (computer stand version) (MVES-SC)
- «Model of an electrical system» (desktop version with a laptop) (MES-NN)
- «Model of an electrical system» (computer stand version) (MES-SC)
- «Model of an electrical system» (manual desktop version) (MES1-NR)
- «Model of an electrical system» (manual stand version) (MES1-SR)
- «Model of an electrical system with a complex load node» (desktop version with a laptop) (MES-KN-NN)
- «Model of an electrical system with a complex load node» (computer stand version) (MES-KN-SK)
- «Electrical system model with a relay protection» (desktop version with a laptop) (MES-RZ-NN)
- «Electrical system model with a relay protection» (computer stand version) (MES-RZ-SK)
- «Electrical system model with the measurement of electricity quality indicators» (desktop version with a laptop) (MES-PKE-NN)
- «Electrical system model with the measurement of electricity quality indicators» (stand computer version) (MES-PKE-NN)
- «Study of the transmission line OL and SIP» (EM-VLSIP)
- «Switchgears in electric networks» (EOSP-RUES-S)
- «Current limiting reactor» (EOSP-TR)
- «Low-voltage switching equipment» (EOSP-NKA)
- «Automatic circuit breakers up to 1,000 V» (EOSP-AV1000)
- «Testing start-up protection equipment and control equipment for suitability» (EM-PPAAU)
- «Measuring current transformer» (EOSP-ITT)
- «Measuring voltage transformer» (EOSP-ITN)
- «Open switchgear board» (EOSP-P-ORU)
- «Disconnecting switch of indoor installation board» (EOSP-P-RVU)
- «Outdoor installation disconnecter switch, board» (EOSP-P-RNU)
- «Load switches and fuses above 1,000 V, board» (EOSP-P-VNiP)
- Surge arresters, board (EOSP-P-OP)



Digital Substation Model (MCP-SC)



Electric power systems automation (NPP-NN)



Intelligent electric networks (IES2-SC)



Microprocessor means of relay protection in power supply systems (MPSRZ-SES-SN)



Basics of relay protection and automation (ORZiA-SR)



Current limiting reactor (EOSP-TR)

### SMARTGR10 smart electric networks

- Smart electric networks (computer stand version) (IES2-SK)
- Digital substation model (desktop version with a laptop) (MCP-NN)
- Digital substation model (computer stand version) (MCP-SK)

### Virtual laboratory complexes and stands

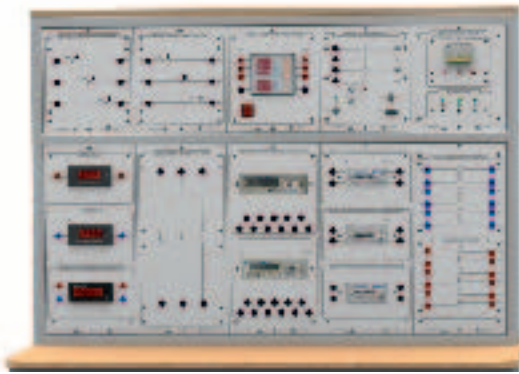
- Electrical substation VLS-EP (3 in one)
- 35 kV electrical substation
- 110 kV electrical substation
- 220 kV electrical substation
- Gas power plants automation VLS-AGE
- Lineworker (3 in one)
- Bypassing overhead line with wooden supports
- Bypassing overhead line with metal supports
- Bypassing overhead line with iron-concrete supports
- Alternative power sources (5 in one)
- Vacuum circuit breaker
- SF6 circuit breaker

### Relay protection

- «Relay protection» (desktop version with laptop) (RZ-NN)
- «Relay protection» (computer stand version) (RZ-SK)
- «Electric power systems automation» (desktop version with laptop) (NPP-NN)
- «Fundamentals of relay protection and automation» (manual desktop version) (ORZiA-HP)
- «Fundamentals of relay protection and automation» (manual stand version) (ORZiA-SR)
- «Fundamentals of relay protection and automation of an asynchronous motor» (desktop manual version) (ORZiA-AD-HP)
- «Fundamentals of relay protection and automation of an asynchronous motor» (manual stand version) (ORZiA-AD-SR)
- «Fundamentals of relay protection and automation of a cable line» (manual desktop version) (ORZiA-KL-NR)
- «Fundamentals of relay protection and automation of a cable line» (manual stand execution) (ORZiA-KL-SR)
- «Microprocessor means of relay protection of a two-transformer substation» (computer stand version) (MPSRZ-TP-SK)
- «Microprocessor means of relay protection in power supply systems» (stand version with a laptop) (MPSRZ-SES-SN)

### Power supply, energy conservation and energy accounting

- «Power supply systems of industrial companies» (computer stand version) (SES-PP-SK)
- «Power supply systems of industrial companies with relay protection devices» (desktop manual version) (SES-PP-RZ-NR)
- «Power supply systems of industrial companies with relay protection devices» (manual stand version) (SES-PP-RZ-SR)
- «Energy saving in power supply systems» (manual desktop version) (ES-SES-NR)
- «Energy saving in power supply systems» (manual stand version) (ES-SES-SR)
- «Energy saving in power consumption systems» (desktop manual version) (ES-SES-NR)
- «Energy saving in power consumption systems» (manual stand version) (ES-SEP-SR)



Measurement of electric power and energy (IEME-SR)



Power supply systems of industrial companies (SES-PP-SK)



Automated electric power monitoring and metering systems (ASKUE-SK)

- «Measurement of electrical power and energy» (manual desktop version) (IEME-NR)
- «Measurement of electrical power and energy» (manual stand version) (IEME-SR)
- «Electrical measurements in power supply systems» (manual stand version) (EI-SES-SR)
- «Energy audit in power supply systems» (computer stand version) (EA-SES-SK)
- «Energy audit in power supply systems» (desktop version with a laptop) (EA-SES-NN)
- «Transmission of electric energy in distribution networks» (manual desktop version) (PEE-NR)
- «Transmission of electric energy in distribution networks» (manual stand version) (PEE-SR)
- «Quality of electrical energy in power supply systems» (desktop version with a laptop) (KEE-NN)
- «Quality of electrical energy in power supply systems» (computer stand version) (KEE-SK)
- «Transmission and quality of electrical energy in power supply systems» (desktop version with a laptop) (PiKEE-NN)
- «Transmission and quality of electric energy in power supply systems» (computer stand version) (PiKEE-SK)
- «Automated electric power monitoring and metering systems» (desktop version with a laptop) (ASKUE-NN)
- «Automated systems for monitoring and metering of electricity» (computer stand version) (ASKUE-SK)
- «Electrical measurements and electricity accounting in power supply systems» (desktop manual version) (EIUE-NR)
- «Reactive power compensation devices» (desktop version with a laptop) (UKRM-NN)



Reactive power compensation device (UKRM-NR)



Transmission and quality of electrical energy in power supply systems (PiKEE-NN)



Relay protection (RZ-NN)



Study of the power transmission line OL and SIP EM-VLSIP



Measuring voltage transformer EOSP-ITN



Automatic circuit breakers up to 1,000 V (EOSP-AV1000)



Load switches and fuses above 1,000 V (EOSP-P-VNiP)



Outdoor installation disconnector EOSP-P-RNU

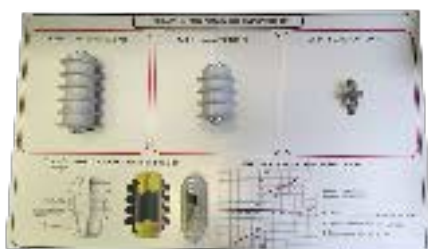


Testing start-up protection equipment and control equipment for suitability EM-PPAAU

- «Reactive power compensation in power supply systems» (manual desktop version) (KRM-NR)



Measuring current transformer EOSP-ITT



Surge arresters EOSP-P-OP

#### Interactive manuals (CD) and classroom posters

- Power industry Relay protection. Power supply. Energy and resource-saving technologies
- Operation of electric networks and the equipment of stations and substations
- Electrical substations
- Relay protection basics
- Electrical engineering materials
- Electrical devices
- Electric machines
- Electrical equipment of industrial and residential buildings
- Installation and commissioning of electrical equipment for industrial and residential buildings
- Computer networks
- Telecommunications
- Interfaces of peripheral devices. Microcontrollers

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# ALTERNATIVE AND RENEWABLE ENERGY SOURCES

## Study labs and demonstration equipment



Solar collector



Heat pump using geothermal low-potential energy



Solar photovoltaic system (SFES-NR)



Mock-up of a hydro power station

### Geothermal energy

- «Heat pump using geothermal low-potential energy» (based on heat pumps)

### Solar energy

- «Solar photovoltaic system» (desktop manual version) (SFES-NR)
- «Renewable energy sources. Solar collector» (SK-SK)
- «Solar collector, VLS»

### Wind power

- «Wind power system based on a synchronous generator» (desktop version with a laptop) (VES-SG-NN)
- «Renewable energy sources. Wind generator» (VIE-VG-SR)
- «Wind power system based on an asynchronous generator operating in the network» (desktop version with a laptop) (VES-AG-NN)
- «Wind power system» (monoblock manual version) (VES-MR)
- «Model of a vertical-axial wind power plant»
- «Wind power system, VLS»
- «Design and the principle of operation of a wind plant, VLS»

### Hydropower

- «Operating processes of microHPP of various types» (RP-MGES-017-6LR)
- «Hydropower – turbine-generator system» (GSTG-010-10LR)
- «Hydropower – Pelton turbine-generator» (GSTG-010-5LR)
- «Hydropower – axial turbine-generator system» (GSTG-010-4LR)
- «Hydropower – radial-axial turbine – generator system» (GROTG-010-4LR)
- «Mock-up of a hydro power station»

### Geothermal energy

- «Geothermal energy systems, VLS»
- «Configuration and principles of operation of a geothermal heat pump, VLS»
- «Configuration and principle of operation of geothermal collectors, VLS»

### Wind power

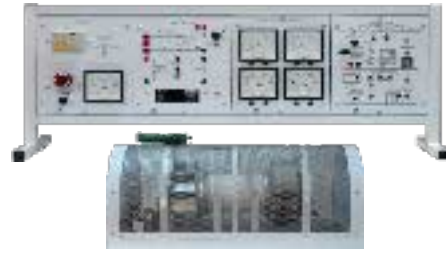
- «Wind power system, VLS»
- «Design and the principle of operation of a wind plant, VLS»

### Electric energy storages

- «Technologies and equipment for the production of electric energy storages, VLS» (VUK-TOPNEK)
- «Fuel batteries, VLS»
- «Energy conversion systems, VLS»
- «Energy accumulation, VLS»
- «Methanol fuel cell, VLS»



Wind power system (VES-MR)



Renewable energy sources.  
Solar collector (SK-SK)



Wind power system based on an asynchronous generator operating in the grid (VES-AG-NN)



Operating processes of micro hydroelectric power plants of various types (RP-MGES-017-6LR)



Virtual training complexes on hydropower



#### Interactive manuals (CD) and Cassroom posters

- Unconventional and renewable energy sources
- Heat engineering
- Technical thermodynamics
- Heat and mass transfer
- Hydraulics and hydraulic drives
- Electrical engineering
- Electrical measurements
- Electrical engineering materials
- Electric machines
- Installation and operation of electrical equipment
- Operation of electric networks and the equipment of stations and substations
- Power supply of industrial and residential buildings (107)

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Model of a vertical-axial wind power plant

#### Biogas and biodiesel engines

- «Biodiesel engine»
  - «Model of a biogas plant»
  - «Biogas power engineering, VLS»
- #### Virtual training complexes on hydropower
- «Hydroelectric power station»
  - «Simulator for a hydrogenerator equipment field operator»
  - «Features and configuration of hydrogenerators»
  - «Circuit engineering and HPP equipment»
  - «Hydrogenerator installations»
  - «Microhydroelectric power plant»

## NUCLEAR AND HYDROGEN POWER

### Study labs and demonstration equipment



Circuit engineering and equipment of nuclear power plants



VVER-1000 reactor configuration

- «Design and features of a turbine set for nuclear power plants»
- «Configuration of the NPP steam generator set»
- «Features of the NPP fuel unloading device»
- «Thermonuclear reactor configuration»
- «Circuit engineering and NPP equipment»
- «Configuration of the VVER-1000 reactor»
- «GNC-195 NPP pump configuration»
- «Turbine department of NPP Logistics NPP»
- «Interactive NPP model»
- «Educational complexes with virtual reality systems»
- «Sections of three-dimensional models of basic and thermal equipment»
- «Three-dimensional sections of NPP power units»
- «Interactive models of NPP configuration and circuitry»
- «Hydrogen energy, virtual laboratory stand»



Training complexes using a virtual reality system



GNC-195 NPP pump configuration



Configuration and features of a turbine plant for NPP



Turbine department of NPP Logistics NPP

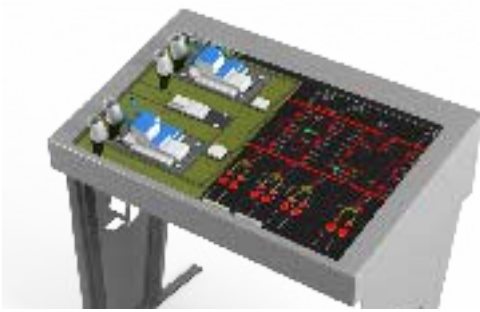


Features of the NPP fuel unloading device

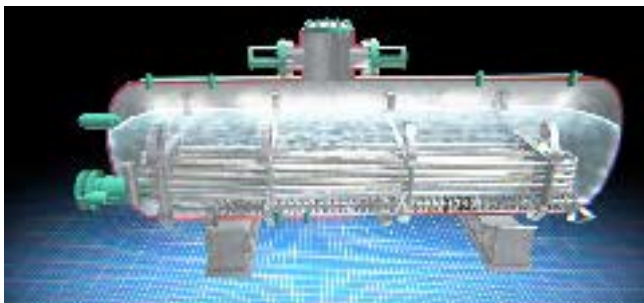
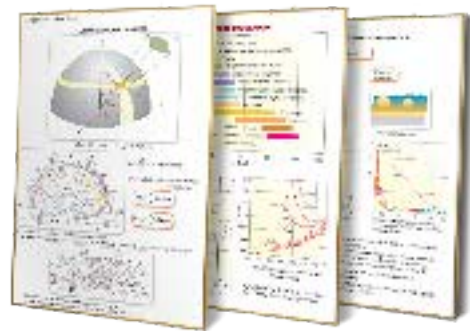




Interactive models of NPP configuration and circuitry



Interactive NPP model



Sections of three-dimensional models of basic and thermal equipment



Three-dimensional sections of NPP power units



The arrangement of a fusion-type reactor

#### Interactive manuals (CD) and classroom posters Heat engineering. Technical thermodynamics

- Materials Science
- Heat and mass transfer
- Hydraulics, hydraulic drive and hydraulic automation
- Technological processes and
- Use of electric networks, stations & substations.
- Electrical devices
- Electric machines
- Relay protection basics
- Heat and gas supply and ventilation

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# HEAT SUPPLY AND VENTILATION. AIR CONDITIONING. REFRIGERATION EQUIPMENT

## Study labs and demonstration equipment



Automated liquid and gaseous fuel boiler house



Air conditioner



Automated heating unit (ATP-01)



Heat supply and heating devices (TSOP-ST-13LR-10)



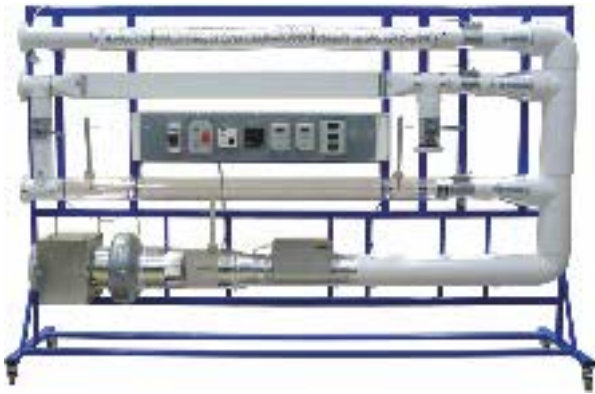
Autonomous automated heating system

### Heat and gas supply and ventilation

- «Ventilation systems» (VENT-017-10LR)
- «Ventilation systems» (VENT-017-13LR)
- «Ventilation systems» (VENT-017-16LR)
- «Heat & gas supply and ventilation systems automation» (ATGSV-09-11LR-01)
- «Autonomous automated heating system» (ASO-03)
- «Automated liquid and gaseous fuel boiler house» (AK-1)
- «Automated solid fuel boiler house» (AK-T-02)
- «Automated heating unit» (ATP-01)
- «Thermal and hydraulic characteristics of heating devices» (TGKhPTO-9LR-010)
- «Heat supply and heating devices» (PSTN-ST-13LR-10)
- «Application of automation and dispatching tools in heating units of district heating systems of buildings»
- «Heat pump-1»
- «Heat pump-2»
- «Heat pump using geothermal low-potential energy» (based on heat pumps)

### Cryogenic and refrigeration equipment Air conditioners

- «Cryogenic and refrigeration equipment» (KHT-SK-017-6LR)
- «Refrigerator-1»
- «Refrigerator-2»
- «Freezer»
- «Air conditioner»
- «Maintenance of heat exchangers»
- «Gas leaks identification»
- «Repair and charging of a household refrigerator»
- «Split model for a refrigeration equipment compressor»
- «Assembly and disassembly of a compressor»



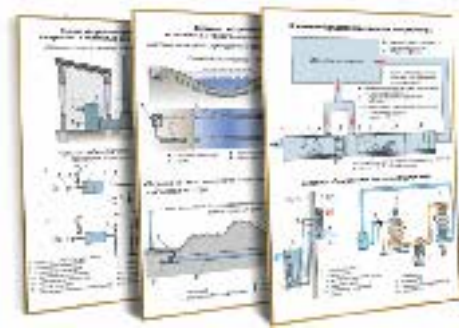
Ventilation systems (VENT-017-16LR)



Automation of heat & gas supply and ventilation systems (ATGSV-09-11LR-01)



Automated solid fuel boiler house (AK-T-02)



Refrigerator-1



Cryogenic and refrigeration equipment (KKHT-SK-017-6LR)

#### Interactive manuals (CD) and classroom posters

- Heat and gas supply and ventilation
- Heat engineering
- Technical thermodynamics
- Heat and mass transfer
- Operation of gas distribution and gas consumption systems
- Industrial & occupational health & safety.

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

## LIGHTING

### Study labs and demonstration equipment

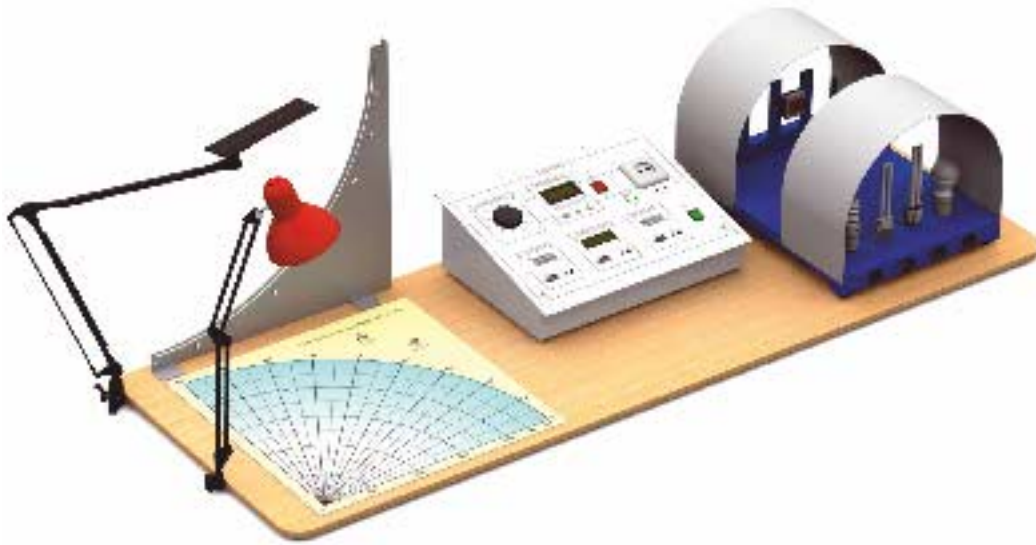


Lighting engineering – light sources and fixtures, efficiency and energy saving (ST-ISE-SN)

- «Fundamentals of lighting engineering» (manual monoblock version) (OST-MR)
- «Fundamentals of lighting engineering – light sources and lamps» (manual monoblock version) (OST-IS-MR)
- «Fundamentals of lighting engineering – lightning sources and lamps» (manual desktop version) (OST-IS-NR)
- «Lighting engineering – light sources, efficiency and energy saving» (manual desktop version) (ST-IE-NR)
- «Lighting engineering – light sources and lamps, efficiency and energy saving» (manual desktop version) (ST-ISE-NR)
- «Lighting engineering – light sources and lamps, efficiency and energy saving» (manual stand version) (ST-ISE-NR)
- «Efficiency and quality of light sources (BZhD-09)
- «Efficiency and quality of industrial lighting»
- «Lighting engineering – light sources and lamps, efficiency and energy saving» (stand version with a laptop) (ST-ISE-SN)



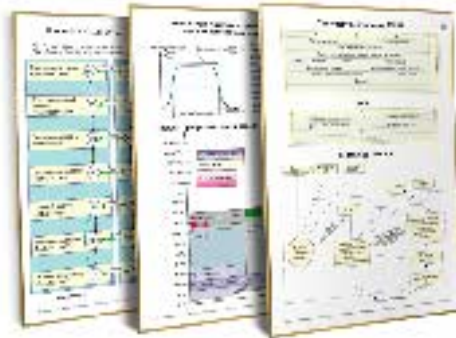
Fundamentals of lighting engineering - light sources and lamps (manual desktop version) (OST-IS-NR)



Fundamentals of lighting engineering - light sources and lamps (manual monoblock version) (OST-IS-MR)



Light sources efficiency and quality (BZhD-09)



#### Interactive manuals (CD) and classroom posters

- Electrical devices
- Power supply of industrial and residential buildings (107)
- Electrical engineering. DC electric circuits
- Industrial & occupational health & safety.

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Lighting engineering – light sources, efficiency and energy saving

## GAS SUPPLY

### Study labs and demonstration equipment



Gas burner



Boiler house, dynamically lit sample board



Operating processes of gas distribution point, lab stand



Gas control point cabinet with one reduction line and bypass, training stand

#### Heat and gas supply

- «Automated gaseous fuel boiler house»
- «Boiler house, dynamically lit sample board»

#### Gas distribution systems

- «Operating processes of gas distribution point, lab stand»
- «Gas control point cabinet with one reduction line and bypass, training stand»
- «Gas distribution point, dynamically lit sample board»
- «City gas supply system, dynamically lit sample board»
- «Installation of gas distribution network equipment, training stand»

#### Gas burners

- «Gas burner, slit-type device»
- «Operation of gas supply systems»
- «Measuring complex, lab stand»
- «Gas pollution control system, training stand»
- «Gas leaks identification»

#### Pipe fittings

- «Electrical valve, training stand»
- «Ball valves, sample board»
- «Gas filters, sample board»
- «Valves, sample board»
- «Elements of pipeline fittings, sample board»
- «Cast iron shut-off valve, stand»
- «Ball valve, stand»
- «Gas pressure controller RDG-50, split-type device»



Installation of gas distribution network equipment, training stand



Automated gaseous fuel boiler house



Gas pollution control system, training stand



Gas burner, split-type device



Electrical valve, training stand



Gas pressure controller RDG-50, split-type device



Gas filters, sample board



#### Interactive manuals (CD) and classroom posters

- Heat and gas supply and ventilation
- Compressor equipment
- Operation of gas distribution and gas consumption systems
- Technological processes and
- Industrial & occupational health & safety.

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Ball valves, sample board

## DATA PROTECTION AND SECURITY SYSTEMS

### Study labs and demonstration equipment



Network security



Block coding, laboratory stand



Structural interferences, laboratory stand



Symbol interleaving device, laboratory stand



Security audit of Wi-Fi wireless networks

#### Network security

- «Network security»
- «Security audit of Wi-Fi wireless networks»
- «Block coding»
- «Symbol interleaving»
- «Structural interferences»

#### Physical protection of information

- «Access control and management systems, teaching & practice stand»
- «Access control and management systems, virtual simulator»
- «Video surveillance systems, teaching & practice stand»
- «Video surveillance systems, virtual simulator»

#### Cryptographic data protection means

- «Cryptography software tools»
- «Cryptography hardware tools»
- «Basics of cryptography»
- «Cryptography software tools, digital textbook»
- «Basics of quantum cryptography, virtual simulator»

#### Software tools for information protection

- «Software tools for protecting information from unauthorized access»
- «Trusted download systems»
- «Application of hardware and software protection of information»

#### Technical tools for information protection

- «Protection of information from leaks through acoustic, optoelectronic and vibroacoustic channels»
- «Protection from data leaks through side EMP channels»
- «Protection from data leaks through electrical channels»
- «Detection of potential embedded devices»
- «Protection from data leaks through technical channels»
- «Detection of embedded devices and hidden video cameras»
- «Protection from data leaks through technical channels»
- «Certification of the informatization object according to the requirements of protection against leaks through the side EMP channel»
- «Protection of information from HF imposition»
- «Installation of AVAC protection equipment»
- «Detection of hidden video cameras»
- «Certification of an object according to the requirements of protection against information leaks through technical channels, virtual simulator»
- «Security audit of Wi-Fi wireless networks»
- «Protection from data leaks through technical channels»
- «Certification of the informatization object according to the requirements of protection against leaks through the side EMP channel»
- «Protection of information from HF imposition»
- «Installation of AVAC protection equipment»
- «Detection of hidden video cameras»
- «Certification of an object according to the requirements of protection against information leaks through technical channels, virtual simulator»
- «Security audit of Wi-Fi wireless networks»





Access control and management systems



Structural interferences



Virtual simulator  
Access control and management systems



Video surveillance systems, teaching & practice stand



Cryptography Hardware, training stand



Video surveillance systems, teaching & practice stand



Virtual tutorial Cryptography software tools



Basics of cryptography



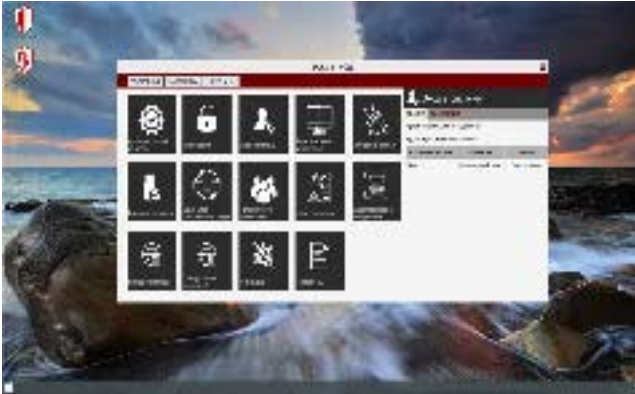
Virtual simulator  
Fundamentals of quantum cryptography



Software tools for protecting information from unauthorized access, copy, training stand



Protecting information from leaks through the electrical channel



Application of hardware and software tools for protection of information, virtual simulator



Protecting information from leaks by acoustic vibration channels



Detection of potential embedded devices



Protection from data leaks through side EMP channels



Protection from data leaks through technical channels, virtual complex



Detection of embedded devices and hidden video cameras, virtual simulator



Cryptography software tools



Teaching & practice stand  
Electronic warfare

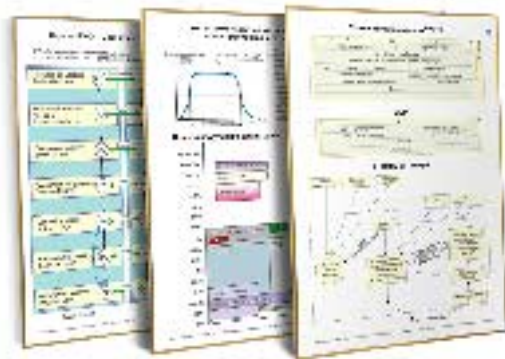


Electronic warfare, virtual simulator



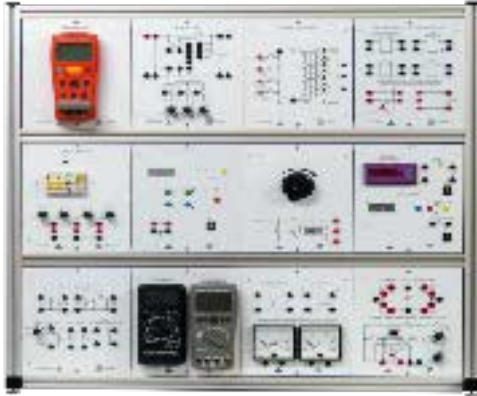
Object certification  
according to the requirements of protection against information leaks through technical channels, virtual stand

- Interactive manuals (CD) and classroom posters**
- Data protection
  - Security systems
  - HF and microwave technologies
- Demonstration complexes**
- Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



# INTERNET OF THINGS

## Study labs and demonstration equipment



Basics of the Internet of Things (IoT-Base) technology



Internet of Things access control and management systems, basic configuration of IoT-SKUD



Internet of Things in a smart city, virtual complex



Virtual complex Internet of Things at the industrial facility



Industrial Internet of Things multi-level system with sensors and controllers

### Training and laboratory stand,

- «Industrial Internet of Things multi-level system with sensors and controllers»

### Educational laboratory kit

- «Internet of Things in agriculture»

### Training simulators

- «Fundamentals of the Internet of Things (IoT-Base) technology»
- «Communication technologies in the Internet of Things»
- «Internet of Things access control and management systems, basic configuration of IoT-SKUD»
- «Internet of Things in a smart home»

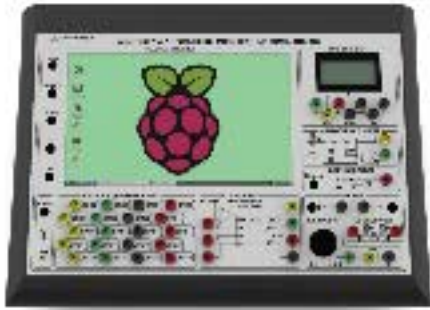
### Virtual complexes

- «Internet of Things in a smart home»
- «Internet of Things in a smart city»
- «Internet of Things in agriculture»
- «Internet of Things in the industrial process»
- «Internet of Things in production»
- «Internet of Things on railways»

### Laboratory complex

- «Internet of Things in production»
- «Internet of Things in a smart home»
- «Internet of Things in a smart city»
- «Internet of Things in agriculture»
- «Internet of Things in the industrial process»
- «Internet of Things in technological production»
- «Internet of Things on railways»
- «Digital twin technologies for robotic production»

### Internet of Things, teaching laboratory (WSR)



Communication technologies in the Internet of Things



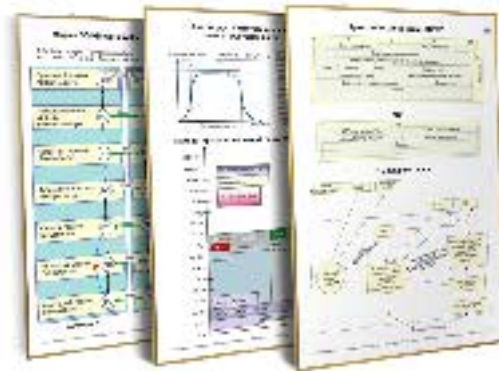
Internet of Things in agriculture, lab complex



Internet of Things in the industrial process



Internet of Things in a smart home



Internet of Things in agriculture, virtual lab complex



Internet of Things in agriculture, training lab set

**Interactive manuals (CD) and classroom posters**

- Computer networks (LP)
- Telecommunications (LP)
- Peripheral device interfaces (LP)
- Microcontrollers (LP)

**Demonstration complexes**

- Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# COMPUTER NETWORKS. TELECOMMUNICATIONS. DIGITAL COMMUNICATION

## Study labs and demonstration equipment



Telecommunication lines



Telecommunication lines



Copper structured cabling systems



Optical structured cabling systems



IP telephony

### Computer networks

- «Local computer networks»
- «Global computer networks»
- «Wireless computer networks»
- «Copper structured cabling systems»
- «Optical structured cabling systems»
- «Structured cabling systems»

### Digital communication

- «Fundamentals of the GLONASS GPS system, Interactive diorama stand»
- «GPS GLONASS GALILEO satellite navigation systems»
- «Bluetooth wireless interface»
- «Wi-Fi wireless interface»
- «Wireless analog and digital communication lines»
- «LoRa wireless networks»
- «ZigBee sensor networks»
- «GSM/3G/LTE cellular networks»
- «RFID radio frequency identification system»
- «IP telephony»
- «Streaming audio and video in computer networks»
- «GSM cellular communication systems»
- «Ethernet Protocol»
- «Wi-Fi wireless interface»
- «Bluetooth wireless interface»

### Telecommunications

- «Telecommunication lines»
- «Wireless digital and analog communication lines»

### Fiber-optic communication lines

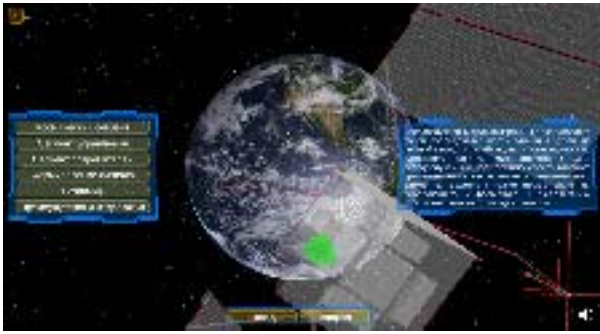
- «Components of a fiber-optic communication line»
- «Fiber-optic communication line VOLS-02»
- «Fiber-optic communication VOLS-04»
- «Fiber-optic data transmission systems with time and wave channeling»
- «Data encoding and modulation in communication systems»
- «Bandpass transmission/reception in digital communication systems»
- «Workshop: Main communication lines»
- «Construction and operation of VOLP»

### Data transmission networks

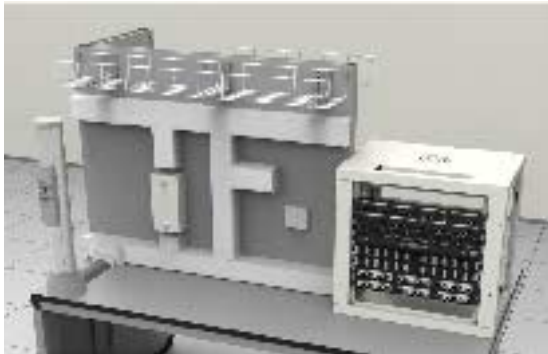
- «Local computer networks»
- «G-PON passive optical networks»
- «Global computer networks»
- «Corporate computer networks»
- «Wireless computer networks»
- «Satellite radio link-up and roaming in Wi-Fi networks»
- «Transmission of digital data via power lines»
- «Construction, configuration and operation of computer networks»
- «Network and System Administration, World Skills Workshop»

### Satellite communications

- Satellite communication systems, virtual textbook



Interactive diorama stand  
Fundamentals of the GLONASS GPS system



Structured cabling systems



Satellite communication systems, virtual textbook



Global local computer networks



Detecting the damage of a cable line



Data encoding and modulation in communication systems



Transmission of digital data via power lines



Fiber-optic communication line VOLS-02



Installation and operation of copper SKS



RFID radio frequency identification system



Wireless analog and digital communication lines



Components of a fiber-optic communication line



LoRa wireless networks



Satellite navigation systems  
GPS GLONASS GALILEO



ZigBee sensor networks



Bluetooth wireless interface



GSM3GLTE cellular networks



Wi-Fi wireless interface



LoRa wireless networks





Setting up a set of radio relay stations, both fixed and mobile



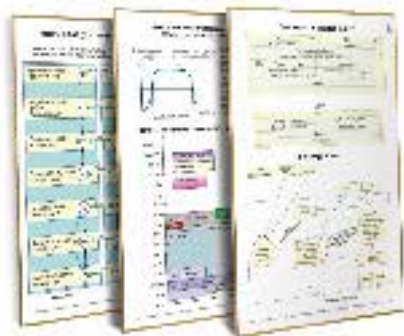
Radio relay communication



Designing a radio relay line based on fixed line-of-sight stations



Designing tropospheric communication



#### Structured cabling systems

- Installation and operation of copper SCSs
- Installation and operation of fiber-optic SCSs
- Installation of a telecommunication rack, virtual simulation
- Installation and operation of SCS, virtual simulator

#### Interactive manuals (CD) and classroom posters

- Computer networks (LP)
- Telecommunications (LP)
  - Peripheral device interfaces (LP)
  - Microcontrollers (LP)



Deployment of mobile radio relay stations

# RADIO ENGINEERING. HF AND MICROWAVE TECHNOLOGIES. NAVIGATION. RADIO DETECTION & RANGING

## Study labs and demonstration equipment



Theoretical foundations of radio engineering



Radio engineering circuits and signals (RTCiS-01-R, K)



Fundamentals of television OTV-01



Radar stations for detecting mobile AFAR-based mobile objects (RLS-01, RLS-02-16)



Microwave devices, SVCh-01

### Fundamentals of radio engineering, radio circuits and signals

- «Radio engineering circuits and signals» (RTCiS-01-R, K)
- «Radio engineering circuits and signals» (RTCiS-02-R, K)
- «Theoretical foundations of radio engineering» (TOR-SK)
- «Theory of electrical communication» (TES-01-K)
- «Fundamentals of adjustment and tuning of electronic equipment» (ONR-REA-01-HP)

### Radio Automation

- «Radio automation — linear continuous and pulse systems» (RA-L-MRC)
- «Radio automation — linear continuous systems» (RA-L-MN)

### Reception, generation, formation of signals

- «Signal generating and shaping devices» (UGFS-01, UGFS-02)
- «Signal reception and processing devices» (UPiOS-01)
- «Signal generation and processing devices» (UGiOS-01)
- «Coding and modulation of signals» (KiM-01)

### Basics of Television

- «Fundamentals of television OTV-01»

### Digital communication

- «Coding and modulation of information» (KiMI-01)
- «Bandpass transmission/reception» (PPP-01)
- «Temporary Channel Separation» (VRK-01-MR)

### Microwave Devices and Antennas

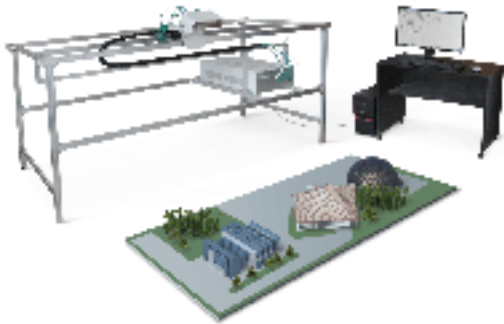
- «Microwave devices, MICROWAVE-01»
- «Antennas ANT-01»
- «Antenna arrays» «Research of the characteristics of symmetrical vibrating antennas» (SVAn-01)

### Radio detection & ranging

- «Fundamentals of radio detecting and ranging» (Osn-RLS)
- «Active phased antenna array of a millimeter range AFAR-8» (AFAR-8, AFAR-16)
- «Radar stations for detecting mobile AFAR-based objects» (RLS-01, RLS-02-16)
- «Synthetic aperture radar stations» (RSA-01)
- «Side-view radar stations» (RBO-01)
- «Active phased antenna array of a millimeter range AFAR-8» (AFAR-8, AFAR-16)
- «Radar stations for detecting mobile AFAR-based objects» (RLS-01, RLS-02-16)
- «Synthetic aperture radar stations» (RSA-01)
- «Side-view radar stations» (RBO-01)



Radiomontazhnik Laboratory (RMR)



Space-based radar stations (RKB-01)



Radio automation — linear continuous and pulse systems, (RA-L-MRC)



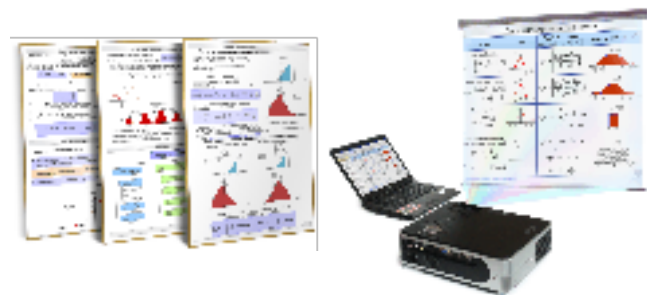
Signal generation and processing devices (UGiOS-01)



Signal reception and processing device (UPIOS-01)



Bandpass transmission/reception (PPP-01)

**Interactive manuals (CD) and classroom posters**

- Radio circuits and signals
- HF and microwave technologies

**Training and methodical complex**

Basic equipment: projector, screen, laptop, pre-installed set of interactive posters, virtual laboratory, classroom posters.



Temporary channel separation (VRK-01-MR)

# INFORMATION AND MEASURING EQUIPMENT

## Study labs and demonstration equipment



Physical basics of information obtaining



Measurement of electrical and non-electrical values.  
Fundamentals of metrology



Elements of instrumentation sensors



Industrial pressure gages (PDD-SK)

- Physical basics of information obtaining**
- «Physical basics of information obtaining» (FOPI-1-M)
  - «Physical basics of information obtaining» (FOPI-1-TiV)
  - «Steam thermostat»
  - «Zero thermostat»

### Electrical measurements and fundamentals of metrology

- «Desktop version, manual version»
- «Desktop version, computer version without PC»
- «Measurement of electrical and non-electrical values Fundamentals of metrology, desktop manual version»
- «Measurement of electrical and non-electrical values Fundamentals of metrology, computer desktop version» (without PC)
- «Measurement of electrical values, desktop version

### Elements of instrumentation sensors

- «Friction in device rolling bearings» (TrOKP-021-2LR)
- «Friction in device sliding bearings» (TrOSP-021-2LR)
- «Errors in transmission gears» (PPZ-021-2LR)
- «Friction moments in gears with involute gearing» (MTrPEZ-021-2LR)
- «Flat elastic elements» (PIUE-021-3LR)
- «Elastic elements – membranes» (MemUE-021)
- «Elastic elements of shock absorbers» (UEA-021-2LR)
- «Elements of instrumental devices – shock absorbers» (EPUAm-021-2LR)

### Industrial sensors

- «Industrial technological data sensors» (monoblock manual version) (PD-TI-MR)
- «Industrial mechanical quantities sensors» (monoblock manual version) (PD-MV-MR)
- «Industrial sensors» (monoblock manual version) (PD-MAX-MR)
- «Industrial level gages» (computer stand version) (PDU-SK)
- «Industrial flow sensors» (computer stand version) (PDR-SK)
- «Industrial temperature gages» (computer stand version) (PDT-SK)
- «Industrial pressure gages» (computer stand version) (PDD-SK)



Industrial sensors of mechanical values



Devices for measuring pressure, flow rate, temperature and energy

### Measurement of pressure, flow rate, temperature and energy

- «Pressure measuring devices and methods» (PMSI-08-MCh)
- «Pressure measurement methods» (MSI-D)
- «Instruments and means of pressure generation and measuring» (PSSID-010-6LR)
- «Pressure gages – pressure measuring devices» (DD-IPD-011-9LR-01)
- «Methods of temperature and humidity measurement» (MITiV-02)
- «Pressure, flow, temperature measuring devices» (IPDRT)
- «Flow, pressure and temperature gages in the housing and communal services system»
- «Measurement of electrical power and energy» (manual stand version) (IEME-SR) – (manual desktop version) (IEME-NR)



Industrial temperature sensors



Industrial level sensors PDU-SK



Sensor converter and data digitization systems

### Sensor converter and data digitizing systems, stands AVO

- «Sensor converter and data digitizing systems»
  - (monoblock, basic) (DPO-MB-BN)
  - (shelf-stand, basic) (DPO-PS-BN)
  - (monoblock, extended) (DPO-MB-RN)
  - (shelf-stand, extended) (DPO-PS-RN)
- «Thermocouple gradation»



### Interactive manuals (CD) and classroom posters

- Fundamentals of metrology and electrical measurements
- Sensitive elements of sensors
- Technical measurements. Metrology, standardization and certification

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed set of electronic posters.

# AUTOMATIC CONTROL THEORY AND SYSTEMS

## Study labs and demonstration equipment



Industrial automation — Siemens programmable controller (PA-Siemens-NN)



Asynchronous motor automatic control and management systems (SAR-AD-NN)



Automatic control theory (TAU-SK)



Automatic control and management systems of a synchronous generator (ACS-SG-SK)



Automatic temperature control and management systems (ACS-T-SC)

### Automatic control theory

- «Automatic control theory» (computer stand version) (TAU-SK)
- «Automatic control theory» (desktop version with laptop) (TAU-NN)
- «Automatic control theory» (manual desktop version) (TAU-NRC)

### Automatic control and control systems

- «Asynchronous motor» (desktop version with laptop) (SAR-AD-NN)
- «Permanent and alternating current electric motors» (desktop version with laptop) (SAR-ED-NN)
- «Servomotor» (monoblock version with laptop) (SAR-SD-MN)
- «Synchronous generator» (simplified computer stand version) (SAU-SG-SK)
- «Temperature» (computer stand version) (ACS-T-SK)
- «Pressure» (computer stand version) (SAU-D-SK)
- «Level» (computer stand version) (SAU-U-SK)
- «Flow rate» (computer stand version) (SAU-R-SK)



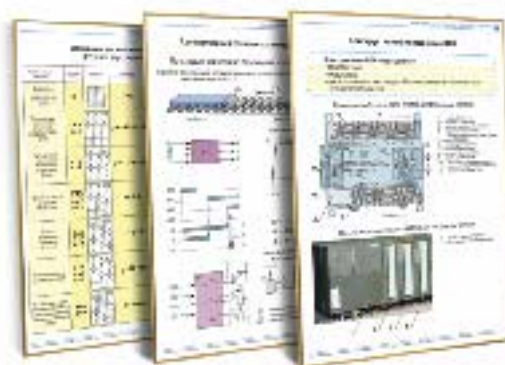
Automatic pressure control and management systems (ACS-D-SC)



Automatic control system of a servo motor (SAR-SD-NN)



Automatic level control and management systems (ACS-U-SC)

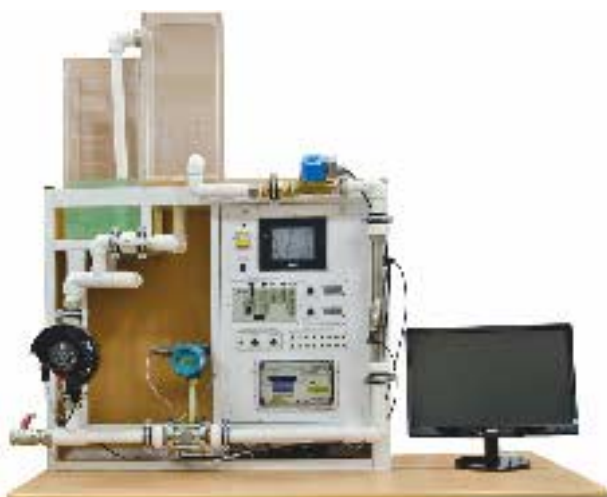


#### Interactive manuals (CD) and classroom posters

- Automatic control theory
- Technological processes and
- Programming of automated
- equipment
- Automated electric drive control system
- Pneumoautomatics
- Hydraulic automation
- Electronics

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Automatic flow control and management systems (ACS-R-SC)

# TECHNOLOGICAL PROCESSES AND PRODUCTION AUTOMATION

## Study labs and demonstration equipment



Basics of automation (monoblock version manual) (OA-MR)



LOGO Siemens (LOGO-SIEMENS-MP)



Siemens automation and control tools (SAU-MAX-Siemens-NN)



Industrial sensors (monoblock manual version) (PD-MAX-MR)

### Elements and fundamentals of automation systems

- «Fundamentals of automation» (monoblock manual version) (OA-MR)
- «Programmable relay OVEN» (OVEN-MN)
- «Technological data sensors» (DTI-LM)
- «LOGO Siemens» (monoblock manual version) (LOGO-SIEMENS-MR)

### Programmable logic integrated circuits

- Field programmable logic devices (FPGA)

### Automation and control systems

- «Siemens automation and control equipment» (desktop version with laptop) (ACS-MAX-Siemens NN)
- «OVEN automation and control tools» (desktop version with laptop) (ACS-OVEN-NN)
- «Application of automation and dispatching tools in heating units of district heating systems of buildings»
- «Automatic outdoor lighting control system»
- «Automation and control systems for security, fire and emergency alarm systems» ("Smart house") (OPAS)
- «Control of technological equipment based on relay-contact devices and logic controllers» (UTO-RCU-PLC-30LR-01-PC)
- «Control of technological equipment based on a logic controller» (UTO-PLC-15LR-01)

### Industrial sensors

- «Industrial technological data sensors» (monoblock manual version) (PD-TI-MR)
- «Industrial mechanical quantities sensors» (monoblock manual version) (PD-MV-MR)
- «Industrial sensors» (monoblock manual version) (PD-MAX-MR)
- «Industrial level sensors» (computer stand version) (remote control-SC)
- «Industrial flow sensors» (computer stand version) (PDR-SK)
- «Industrial temperature gages» (computer stand version) (PDT-SK)
- «Industrial pressure gages» (computer stand version) (PDD-SK)
- «Sensors in lifting mechanisms systems»
- «Instrumentation and control and automation» (computer stand version) (KIPiA-SK)

### Industrial programmable controllers

- «PLC-OVEN-MN»
- «PLC-SIEMENS 1200-MN»
- «PLC-SIEMENS 1200+NN»
- «Control of the portal manipulator on the basis of a programmable logic controller»

### Industrial automation

- «Fundamentals of automation» (computerized stand version) (OA2-Sk)
- «Industrial automation OVEN-1» (desktop version with laptop) (PA-OVEN-1-NN)





PLC-OVEN-MN

Industrial automation OVEN-3 (monoblock version with a laptop)  
(PA-OVEN-3-MN)Industrial automation and an electric drive  
(computer stand version) (PAiEP-SK)Automated industrial process control systems  
(computer stand version) (ASU-TP-SK)Automation and control tools of the robot manipulator  
(desktop version with a laptop)(SAU-Robot-NN)

- «Industrial automation OVEN-2» (desktop version with laptop) (PA-OVEN-2-NN)
- «Industrial automation OVEN-3» (monoblock version with a laptop) (PA-OVEN-3-MN)
- «Industrial automation SIEMENS-2» (monoblock version with a laptop) (PA-SIEMENS-2-MN)
- «Industrial automation SIEMENS-3» (version in an electrical cabinet with a laptop) (PA-SIEMENS-3-ShN)
- «Siemens industrial automation» (desktop version with a laptop) (PA-Siemens-1200-NN)
- «Industrial automation and an electric drive» (computer stand version) (PAiEP-SK)
- «Industrial automation and an electric drive» (desktop version with a laptop) (PAiEP-NN)

#### Automated process control systems

- «Automated industrial process control systems» (computer stand version) (ASU-TP-SK)
- «Automated process control systems with 2D virtual» objects (computer stand version) (ASU-TP-SK)
- «Automated process control systems with 3D virtual» objects (computer stand version) (ASU-TP-SC)

#### Physical automation objects

- «Automation and control tools of the robot manipulator» (desktop version with a laptop) (SAU-Robot-NN)
- «Elevator automation and control tools» (desktop version with a laptop) (SAU-Elevator-NN)
- «Physical objects of automation systems (computer stand version) (FOSA-SK)
- «Autonomous automated heating system» (ASO-OZ)
- «Automated liquid and gaseous fuel boiler house» (AK-1)
- «Automated heating unit» (ATP-01)

#### Automation systems and industrial networks

- «Fundamentals of the PROFINET industrial network» (desktop version with a laptop) (OPS-PROFINET-NN)
- «Fundamentals of the PROFIBUS industrial network» (computer stand version) (OPS-PROFIBUS-SK)
- «Fundamentals of the ETHERCAT industrial network» (computer stand version) (OPS-ETHERCAT-SK)
- «Fundamentals of the MODBUS industrial network» (desktop version with a laptop) (OfiC-MODBUS-NN)
- «Automatic temperature control system» (computer stand version) (SAU-T-SK)



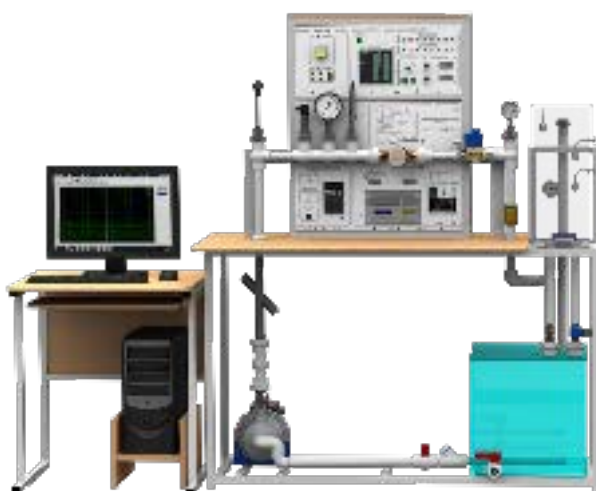
Instrumentation and control and automation (KIPiA-SK)



Automatic temperature control system (SAU-T-SK)



Automatic level control system (computer stand version)  
(SAU-U-SK)



Automatic control systems of technological parameters  
(SAU-TP-SK)

- «Automatic pressure control system» (computer stand version) (SAU-D-SK)
- Automatic level control system (computer stand version) (SAU-U-SK)
- «Automatic flow rate control system» (computer stand version) (SAU-R-SK)
- «Automatic control systems of process parameters» (computer stand version) (SAU-TP-SK)

#### Relay-contactor control circuits

- «Relay-contactor control circuits of a DC motor» (monoblock manual version) (RKS-DPT-MR)
- «Relay-contactor control circuits of an AC motor» (monoblock manual version with an oscilloscope) (RKS-DPT-MRC)
- «Relay-contactor control circuits of an asynchronous motor» (desktop manual version) (RKS-AD-NR)
- «Relay-contactor control circuits of an asynchronous motor» (desktop manual version with an oscilloscope) (RKS-AD-NRC)
- «Relay-contactor control circuits of an asynchronous motor with a phase rotor and synchronous motor» (desktop manual version) (RKS-ADFR-NR)
- «Relay-contactor control circuits of an asynchronous motor with a phase rotor and synchronous motor» (desktop manual version with an oscilloscope) (RKS-ADFR-NRC)
- «Control of process equipment based on relay-contact devices» (UTO-RKU-15LR-01-R)
- «Investigation of stepped motor characteristics ShD»

#### Automated lines

- «Automated line for container preparation, liquids dosing and packaging» (AL-PTDUZh-16LR-01)
- «Automated liquid dosing and packaging line» (AL-DUZh-13/1R-01)
- «Automated bulk materials dosing and packaging line» (AL-DUSM-10LR-01)
- «Automatic flow, pressure and liquid level control» (AU-RDUJ-010-30LR-01)



Automated liquid dosing and packaging line  
(AL-DUZh-13LR-01)



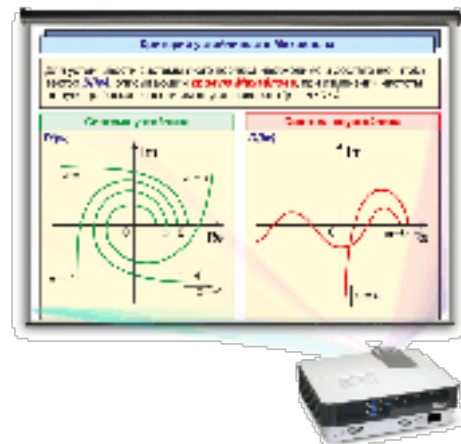
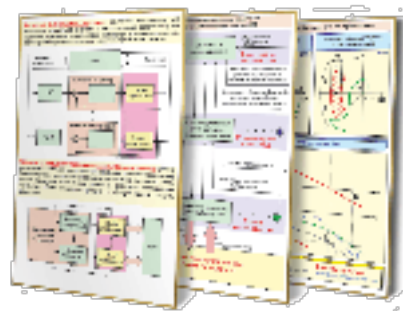
Automatic pressure control system (computer stand version)  
(SAU-D-SK)



Automatic level control system (computer stand version)  
(SAU-U-SK)



Automatic flow rate control system  
(SAU-R-SK)



Automated line for preparation of liquids dosing and  
packaging containers (AL-PTDUZh-16LR-01)



Relay-contactor control circuits of an asynchronous motor  
(RKS-AD-NRC)

#### Interactive manuals (CD) and classroom posters

- Technological processes and
- Automated equipment programming
- Basics of electric drives
- Electric drive control systems
- Pneumatic drive and pneumatic automation
- Hydraulics and hydraulic drives
- Hydraulic automation
- Electronics
- Automatic control theory

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# MECHATRONICS

## Study labs and demonstration equipment



Mechatronic module-electropneumatic movement of parts (MM-EP-NN)



Fundamentals of Mechatronics (OM-NN)



Start in mechatronics (stand version with a laptop) (SM-NN)



Max configuration of mechatronic devices of a sorting and assembly line (ML-PROFI-SK)



Hydraulic mechatronic pipeline valve position control and tracking module (GMM-USZT-019-7LR-01)

### Mechatronic modules

- «Mechatronic module-electropneumatic movement of parts» (desktop version with a laptop) (MM-EP-NN)
- «Mechatronic module — automated sorter» (desktop version with a laptop)(MM-SR-NN)
- «Mechatronic module — pneumoelectric robot» (desktop version with a laptop) (MM-PR-NN)
- «Mechatronic module — pneumoelectric revolver table» (desktop version with a laptop) (MM-RS-NN)
- «Mechatronic module — automated warehouse» (desktop version with a laptop) (MM-SK-NN)
- «Mechatronic module — vacuum pick-and-place unit» (desktop version with a laptop) (MM-PK-NN)
- «Mechatronic module — part orientation» (desktop version with a laptop) (MM-OR-NN)
- «Mechatronic module — pneumatic part movement» (desktop version with a laptop) (MM PP NI)
- «Mechatronic module — parts assembly» (desktop version with a laptop) (MM-SB-NN)
- «Mechatronic module — automated sorter with radio frequency tags» (desktop version with a laptop) (MM-SR-RFID-NN)
- «Fundamentals of mechatronics» (desktop version with a laptop) (OM-NN)
- «Start in mechatronics» (stand version with a laptop) (SM-NN)
- «Start in mechatronics-1» (desktop version with a laptop) (SM-1-SN)
- «Start in Mechatronics-2» (desktop version with a laptop) (SM-2-SN)
- «Start in Mechatronics-3» (desktop version with a laptop) (SM-Z-SN)
- «Mechatronic module with an industrial robot» (computer stand version) (MM-UR3-SK)

### Mechatronic lines

- «Max configuration of mechatronic devices of a sorting and assembly line» (ML-PROFI-SK)
- «Mechatronic line of parts preparation and assembly» (computer stand version) (ML-SB-SK)
- «Mechatronic line for transferring and sorting parts» (computer stand version) (ML-SR-SK)
- «Mechatronic line for transferring and storing parts» (computer stand version) (ML-SK-SK)

### Mechatronic automatic lines

- «Automated liquid dosing and packaging line» (AL-DUZh-13LR-01)
- «Automated line for preparation of liquids dosing and packaging containers» (AL-PTDUZh-16LR-01)
- «Automated bulk materials dosing and packaging line» (AL-DUSM-10LR-01)
- «Automated technological assembly line based on mechatronic modules» (ATLSP-PMM-014-30LR-01)
- «S»ectional assembly line of variable configuration» (SSLIK-017-46LR-01)



Automated line for preparation of liquids dosing and packaging containers (AL-PTDUZH-16LR-01)



Automated technological assembly line based on mechatronic modules (ATLSP-PMM-014-30LR-01)



Mechatronic liquid dosing module (MM-J-016-4LR-AL-DM)



Mechatronic bulk materials dosing module (MM-DSM-018-10LR-AL-DM)



Split-type models of pneumatic and hydraulic elements of mechatronic modules



- «Sectional production line of variable configuration» (SPLIK-017-46LR-01)

#### Mechatronic modules

- «Hydraulic mechatronic external object movement tracking module» (GMM-SSPO-019-8LR-01)
- «Tracking pneumatic actuators for mechatronic modules» (SPU-UN-SPP-MM-013-27LR-01)
- «Pneumatic mechatronic control and tracking module for the position of the pipe gate valve» (PMM-USZT-019-6LR-01)
- «Hydraulic mechatronic pipe gate valve position control and tracking module» (GMM-USZT-019-7LR-01)
- «Pneumatic mechatronic module of vertical cassette gravity storage device» (PMM-GN-016-3LR-ATLSP)
- «Conveyor mechatronic transport module» (KMM-TM-016-3LR-ATLSP)
- «Pneumatic mechatronic module for collision method parts moving» (PMM-TT-016-3LR-ATLSP)
- «Pneumatic mechatronic module "press" for part pressing-in/pressing-out» (PMM-PD-016-3LR-ATLSP)
- «Pneumatic mechatronic vacuum module for selecting and transporting parts in a linear plane» (PMVM-TM-016-4LR-ATLSP)
- «Pneumatic mechatronic module for selecting and transporting parts with rotation» (PMVM-TM-016-4LR-ATLSP)
- «Mechatronic liquid dosing module» (MM-J-016-4LR-AL-DM)
- «Mechatronic tank washing module» (MM-ME-016-3LR-AL-DM)
- «Mechatronic tank supply module to the washing module» (MM-TME-016-3LR-AL-DM)
- «Mechatronic positioning module for container closing» (MM-PEU-016-3LR-AL-DM)
- «Mechatronic container closing module» (MM-UE-016-4LR-AL-DM)
- «Mechatronic bulk materials dosing module» (MM-DSM-018-10LR-AL-DM)
- «Split-type models of pneumatic and hydraulic elements of mechatronic modules»



#### Interactive manuals (CD) and classroom posters

- Mechatronics

#### Training and methodical complex

Basic equipment: projector, screen, laptop, pre-installed set of interactive posters, virtual laboratory, classroom posters.

# ARTIFICIAL INTELLIGENCE (AI), MACHINE LEARNING AND NEURAL NETWORKS

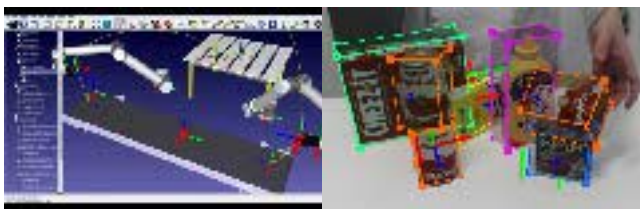
## Study labs and demonstration equipment



Virtual game-based laboratory of machine learning and convolutional neural networks Neural TD



Orientation of a flying object (quadcopter) using SLAM methods



Machine learning for controlling industrial robots and mechatronic objects



Laboratory of traffic modeling and management using convolutional neural networks

- «Visual processing and motion control using machine vision and AI technologies»
- «Virtual game-based laboratory of machine learning and convolutional neural networks Neural TD»
- «Hardware and software complex for the study of indoor optical navigation methods»
- «Orientation of a flying object (quadcopter) using SLAM methods»
- «Practicing outdoor navigation and control of a moving object using neural networks»
- «Machine learning for controlling industrial robots and mechatronic objects»
- «Object recognition and classification, product quality control using machine learning»
- «Laboratory of traffic modeling and management using convolutional neural networks»
- «Recognition and classification of objects using ultra-precise neural networks»
- «Handwritten character recognition and working with external data sets»
- «TensorFlow package use in gaming networks»
- «Study of the homing method»



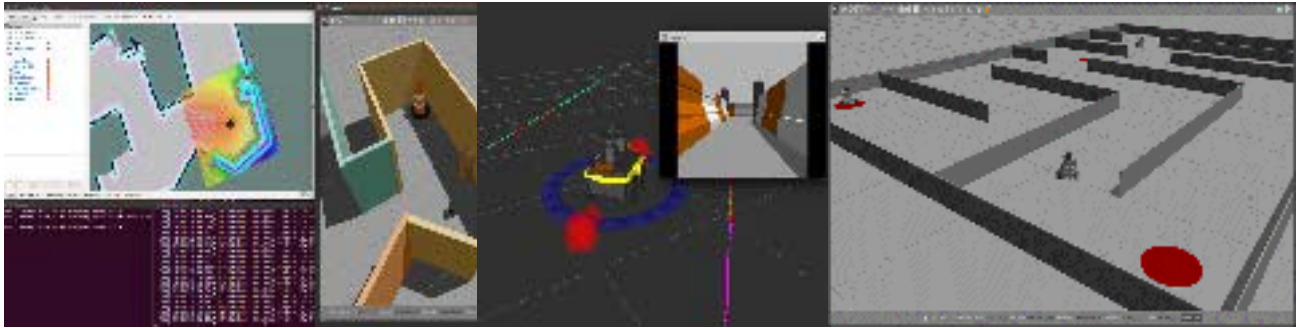
Handwritten character recognition and working with external data sets



Study of the homing method



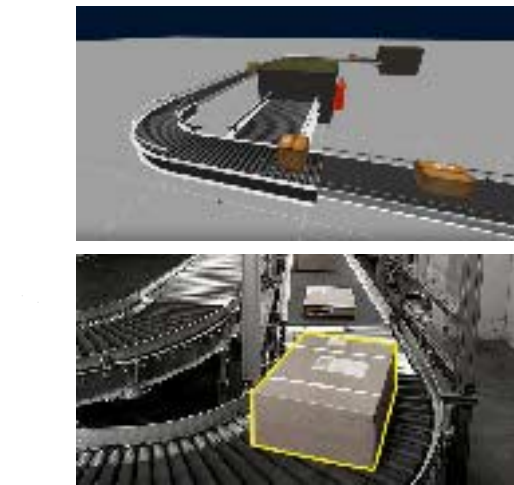
Visual processing and motion control using machine vision and AI technologies



Hardware and software complex for the study of indoor optical navigation methods



Practicing outdoor navigation and control of a moving object using neural networks



Object recognition and classification, product quality control using machine learning

Recognition and classification of objects with ultra-precise neural networks



TensorFlow package use in gaming networks

# HYDRAULICS. FLUID AND GAS MECHANICS

## Study labs and demonstration equipment



Devices and means of pressure generation and measuring (PSSID-010-6LR, MSID, PMSI)



Hydrostatics-M (GS-09-5LR-01) (GS-014-4LR-01)



Fundamentals of Fluid Mechanics (OMJ-016-10LR-01)

### Measurement in hydraulics and fluid mechanics

- «Devices and means of pressure generation and measuring» (PSSID-010-6LR), (MSID, PMSI)
- «Pressure gages — pressure measuring devices» (DD-IPD-011-9LR-01)
- «Liquid flow rate measurement» (IRZh-016-5LR)
- «Measuring tools in hydraulics and gas dynamics» (IPGiGZ)
- «Pressure, flow rate, temperature measuring devices» (IPDRT-017)
- «Methods of temperature and humidity measurement» (MITiV-02)

### Hydrostatics

- «Hydrostatics-M» (GS-09-5LR-01)
- «Hydrostatics-M2» (GS-014-4LR-01)
- «Dynamic fluid equilibrium» (DRZH-09)

### Kinematics and fluid dynamics

- «Fluid Mechanics» (TMJ-2B-09-12LR-01)
- «Experimental Fluid Mechanics» (EMJ-09-14LR-01)
- «Fundamentals of Fluid Mechanics» (OMJ-016-10LR-01)
- «Fundamentals of General Hydraulics» (OOG-016-8LR-01)
- «Fluid outflow from the holes and nozzles» (EMJ-IZh-014-8LR-01), (EMZh-IZh-014-10LR-01)
- «Hydraulic resistances of water fittings»
- «Fluid Mechanics – hydraulic shock» (MZh-GU-10-6LR-01)

### Current in open channels

- «Hydraulic tray» (MJ-LG-10-7LR-01), (MJ-LG-10-9LR-01)

### Special issues of fluid flow

- «Gazlift» (NFT-GZL-010-7LR-01-PC), (NFT-GZL-010-7LR-01-R)
- «Hydraulic characteristics of gas and liquid pipeline systems» (GC-GZHTS-015-10LR)
- «Hydraulics of complex pipeline systems» (GSTS-011-10LR-01)
- «Hydraulics of multi-storey buildings» (GSMZ-011-16LR-01)
- «Hydraulic characteristics of the soil filtration layer» (FG-GC-013-4LR-01-R), (FG-GC-013-4LR-01-PC), (FG-GC-013-6LR-01-R), (FG-GC-013-6LR-01-PC)
- «Pressure distribution in a hydrostatic lubricated radial bearing»
- «Pressure distribution in a center plate with hydrostatic lubrication»
- «Pressure distribution in a flat hydrostatic support»

### Gas dynamics. Aerodynamics

- «Fundamentals of gas dynamics» (OGD-010-13LR-01)
- «Subsonic nozzle — air outflow» (GD-DS-IV-014-R), (GD-DS-IV-014-PC)
- «Air flow in nozzles» (GD-TVNS-014-PC)
- «Body flow — smoke aerodynamic channel» (GD-OT-DAEK-014-R)
- «Straight-flow aerodynamic tube» (LK-TAP-017-25-R), (LK-TAP-017-25-PK)
- «Aerodynamic tube» (LC-TA-016-7,5-PC)

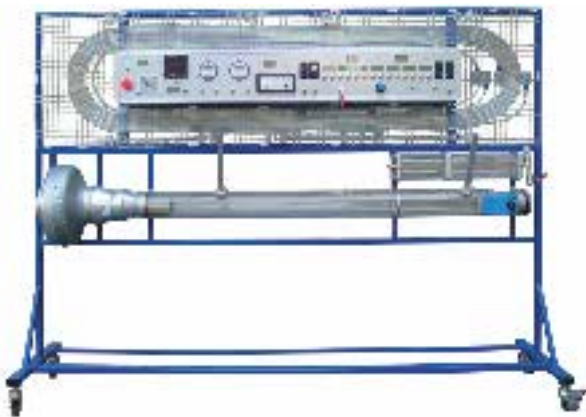




Fluid Mechanics – hydraulic shock (MZH-GU-10-6LR-01)



Hydraulic tray  
(MJ-LG-10-7LR-01), (MJ-LG-10-9LR-01)



Fundamentals of gas dynamics (OGD-010-13LR-01)



Straight-flow aerodynamic tube  
(LC-TAP-017-25- R), (LK-TAP-017-25- PC)



Gazlift (NFT-GZL-010-7LR-01-PC), (NFT-GZL-010-7LR-01-R)



**Interactive manuals (CD) and classroom posters**

- Hydraulics
- Fluid Mechanics

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Aerodynamic tube (LC-TA-016-7,5-PC)

# HYDRAULIC DRIVES AND HYDRAULIC AUTOMATION

## Study labs and demonstration equipment



Hydraulic drives and automation of technological processes, lab



Basis of stands (SGU-UN)



Electrohydroautomatics and drives laboratory (SGU-UN-145LR-019-02)



Operation and adjustment of hydraulic equipment with adjustable pumps and proportional equipment (SGU-UN-015-35LR-01)



Hydraulic drive, electrohydroautomatics and automation of industrial processes (SGU-UN-81LR-08-02)



Equipment of stands with elements of hydraulic drive, hydroelectric automation, electric automation

**Universal one-sided and two-sided stands used to study hydraulic drives, hydro- and electrohydroautomatics and automation of technological processes (275 laboratory and design tasks with a maximum removable equipment set):**

- «Basis of stands» (SSU-UN):

Stand options:

- Electrohydroautomatics and drives laboratory
  - Hydraulic drive, electrohydroautomatics and automation of technological processes, stand (SGU-UN-145LR-019-02)
- Hydraulic drive, electrohydroautomatics and automation of industrial processes (SGU-UN-81LR-08-02)
- Operation and commissioning of hydraulic equipment with adjustable pumps and proportional equipment (SGU-UN-015-35LR-01)
- Stand equipment with the elements of a hydraulic drive, hydroelectric automation, electric automation:
  - data processing and control program for pneumatic actuators;
  - hydraulic actuators of various types connected to sensors;
  - a set of hydraulic equipment (distributors, valves, pressure relays, etc.);
  - a set of hydraulic equipment with electrical control (distributors, electric relay and push-button control units, electric time and pressure relay units, etc.);
  - industrial controller unit;
  - a set of proportional hydraulic equipment (distributors, pressure valves, chokes);
  - electronic control unit for proportional hydraulic automation elements;
  - servohydraulics;
  - hydraulics of mobile, lifting and transport and agricultural machinery;
  - adjustable pumps with various controllers;
  - motion, force, pressure, flow sensors;
  - computer control unit

**Training stands for the study of hydraulic drives, hydraulic devices, hydraulic machines and discrete electrohydroautomatics with fixed elements:**

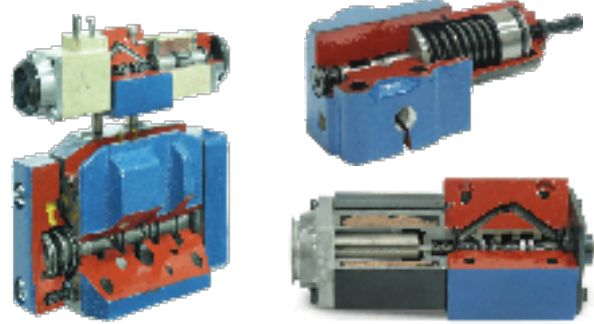
- «Hydraulic drives and hydraulic machines» (number of laboratory works — from 6 to 35)
- «Electrohydraulic drives and automation» (SGU-ST-010-23LR-01, SGU-ST-010-26LR-01)
- «Volumetric hydraulic machines and hydraulic devices» (SGU-IGM-08-12LR-01)
- «Industrial controllers in hydraulic drive control systems» (SGU-ST-011-33LR)
- «Controllable hydraulic machines, hydraulic drives and hydraulic automation» (SGU-RGG-GA-017-15LR-01)
- «Hydraulic machines and hydraulic drives of volumetric throttle control» (SGU-GMODR-013-11LR-01)



Volumetric hydraulic machines and hydraulic devices (SGU-IGM-08-12LR-01)



Industrial controllers in hydraulic drive control systems (SGU-ST-011-33LR)



Hydraulic equipment

### Teaching stands for the study of hydraulic systems of special equipment:

#### Examples of stands:

- «Hydraulic drive of road construction and lifting vehicles» (SGU-GP-DSiPTM-010-12LR-01)
- «Hydraulic reloading manipulator» (SGU-GPM-RU-011, SGU-GPM-EGSP-011)
- «Hydraulic drive of lifting and transportation machines» (SGU-GP-PTM-KR-016-15LR-01)

#### Training stands to study hydraulic systems of tracking control systems:

- «Electrohydraulic tracking drives — comparison of control methods» (SGU-EGSP-SSR-016)
- «Multichannel electrohydraulic redundant tracking drive» (SGU-MREGSP-016-36LR-01)
- «Electrohydraulic tracking drive» (SGU-EGSP-016-15LR)
- «Electrohydraulic tracking drive with digital control» (SGU-EGSP-PLC-CPU-21LR)
- «Electrohydraulic tracking volume control drive» (SGU-EGSP-OR-GM-016)
- «Electrohydraulic tracking drives of volumetric regulation» (SGU-EGSP-OR-HZ-016)

#### Split-type models of industrial hydraulic devices, units and equipment with a textbook describing the design and principle of device operation

- «Boards with split-type models of industrial hydraulic devices, units and equipment»



Controllable hydraulic machines, hydraulic drives and hydraulic automation (SGU-RGG-GA-017-15LR-01)



Hydraulic reloading manipulator (SGU-GPM-RU-011), (SGU-GPM-EGSP-011)



Hydraulic drive of lifting and transportation machines (SGU-GP-PTM-KR-016-15LR-01)



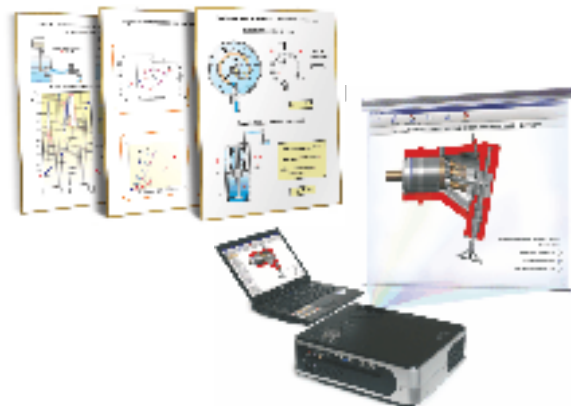
Multichannel electrohydraulic redundant tracking drive (SGU-MREGSP-016-36LR-01)



Hydraulic drives and hydraulic machines (number of laboratory works — from 6 to 35)



Volumetric hydraulic machines



#### Interactive manuals (CD) and classroom posters

- Hydraulics and hydraulic drives

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# PNEUMATIC ACTUATORS AND PNEUMATIC AUTOMATION. GAS AND AERODYNAMICS

## Study labs and demonstration equipment



Basis of stands  
(SPU-UN)



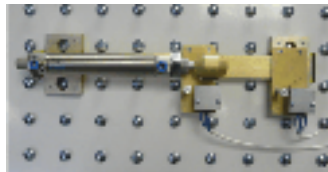
Stand (SPU-UN-77EP-7V-  
31PLK-018-02)



Stand (SPU-UN-122EP-  
36PLK-018-01)



Pneumatic actuator of food  
processing equipment  
(SPU-UN-PO-013-25LR-01)



Equipment of stands with elements of a pneumatic drive,  
pneumatic automation, electric automation

**Universal one-sided and two-sided stands for the study of pneumatic drive, pneumatic and electro-pneumatic automation and automation of technological processes (245 laboratory and design tasks with maximum configuration of removable equipment):**

- Basis of stands (SPU-UN)

### Stand options:

(SPU-UN-77EP-7V-31PLK-018-02)

(SPU-UN-122EP-36PLK-018-01)

### Equipment of stands with elements of a pneumatic drive, pneumatic automation, electric automation

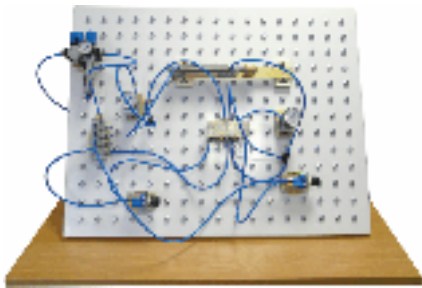
- data processing and control program for pneumatic actuators;
- pneumatic actuators of various types connected to sensors;
- a set of pneumatic equipment (distributors, valves, pressure switches, time relays, etc.);
- a set of pneumatic equipment with electrical control (distributors with electropneumatic control, electric relay and push-button control units, electric time and pressure relay units, etc.);
- industrial controller unit to be used both as part of stands and individually, without them;
- a set of proportional pneumatic equipment (distributors, pressure valves, chokes);
- electronic control unit for proportional pneumatic automation;
- vacuum equipment (suction cups, distributors, vacuum generators);
- motion, force, pressure, flow sensors;
- computer control unit

### Desktop stands:

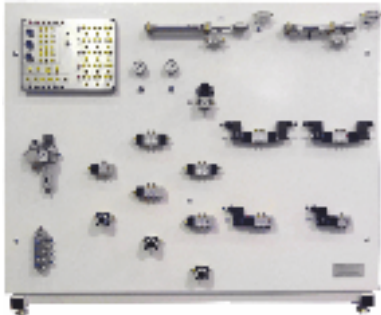
- «SPU series with removable elements»
- «ST series with permanently installed elements»

### Stands to be mounted on profile plates:

- «Pneumatic actuator of food processing equipment» (SPU-UN-PO-013-25LR-01)
- «Automated technological assembly line based on mechatronic modules» (ATLSP-PMM-014-30LR-01)
- «Proportional pneumatic automation» (SPU-UN-PrP-013-23LR-PLK-22LR-01)
- «Proportional pneumatic automation» (SPU-UN-PrP-013-23LR-PLK-22LR-02)
- «Pneumatic actuator of food processing equipment» (SPU-UN-PO-013-25LR)
- «Electropneumatic tracking drive of digitally controlled force control systems»
- «Pneumatic and vacuum devices in process equipment of the food industry» (SPU-UN-PIVT-013-17LR-01)
- «Pneumatic drive of the automated assembly line based on mechatronic modules» (PP-ATLSP-PMM-014-35LR-01)
- «Tracking pneumatic actuators for mechatronic modules» (SPU-UN-SPP-MM-013-27LR-0)
- «Pulsed pneumatic stabilization system» (SU-IPSS-018-14LR-01-PK)

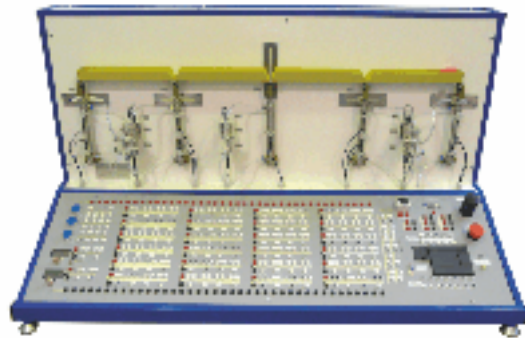


SPU series with removable elements



ST series with permanently installed elements

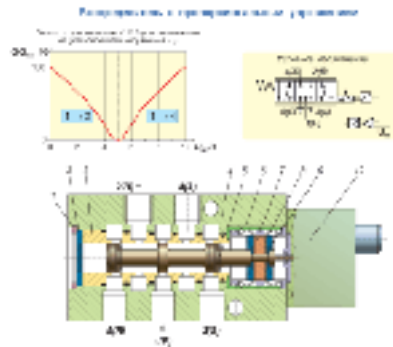
- «Pneumatic rotary platform stabilization system» (PSS-PP-018-10LR-01)
- «Control of technological equipment based on relay-contact devices and logic controllers» (UTO-RKU-PLK-30LR-01-PK)



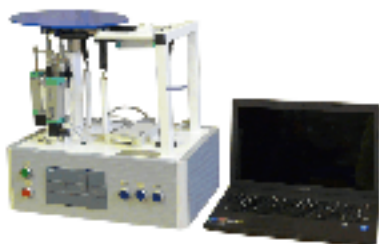
Control of technological equipment based on relay-contact devices and logic controllers (UTO-RKU-PLK-30LR-01-PK)



Automated technological assembly line based on mechatronic modules (ATLSP-PMM-014-35LR-01)



Pulsed pneumatic stabilization system (SU-IPSS-018-14LR-01-PK)



Pneumatic rotary platform stabilization system (PSS-PP-018-10LR-01)

#### Interactive manuals (CD) and classroom posters

- Pneumatic actuators and pneumatic automation. Compressor equipment
- Technological processes and
- Automatic control theory

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# PUMPING AND COMPRESSOR EQUIPMENT

## Study labs and demonstration equipment



Pumping station



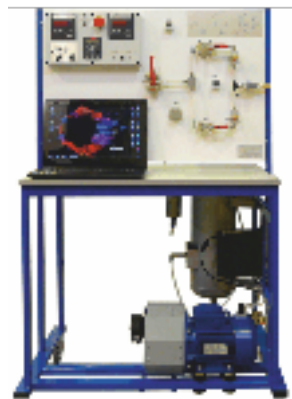
Piston compressor  
(PK-010-4LR)



Vacuum piston pump  
(PVN-010-4LR)



Operating processes of a two-stage  
piston compressor  
(RPDPK-018-06LR-01)



Automation of a compressor  
station with a reciprocating  
compressor (AKS-PK-8LR-10-01)



Piston pump (SGU-NP-010-4LR-01-R, SGU-NP-010-5LR-01-PK)

### Compressors and vacuum pumps

- «Piston compressor» (PK-010-4LR)
- «Operating processes of a reciprocating compressor» (RPPK-010-5LR)
- «Operating processes of a two-stage reciprocating compressor» (RPDPK-018-06LR-01)
- «Automation of a compressor station with a reciprocating compressor» (AKS-PK-8LR-10-01)
- «Vacuum piston pump» (PVN-010-4LR)
- «Operating processes of a reciprocating vacuum pump» (RPPVN-010-5LR)
- «System of vacuum pumping of groundwater — silo machines» (SVOGV-IM-4LR-10-01)

### Piston pumps

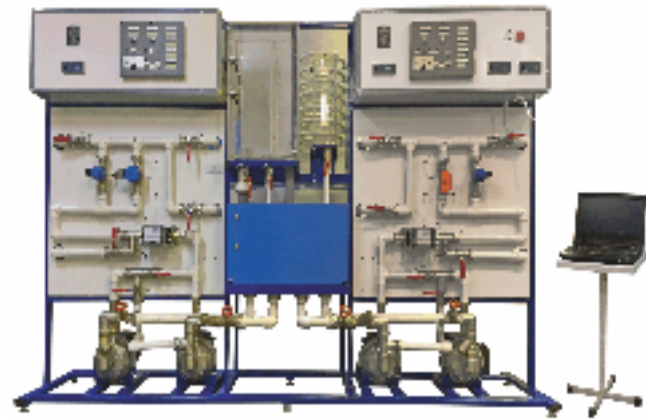
- «Piston pump» (SGU-NP-010-4LR-01-R), (SGU-NP-010-5LR-01-PK)
- «Automation of a pumping station with a piston pump» (ANS-PN-6LR-10-01)
- Study of the peristaltic pump

### Centrifugal pumps and aggregates. Automation

- «Dynamic type pumps» (SGU-NDT-017-9LR)
- «Dynamic pump testing» (IDN-010-4LR-01-R)
- «Dynamic pump testing» (IDN-011-6LR-02-R)
- «Dynamic pump testing» (IDN-011-6LR-02-PK)
- «Design and operation of a centrifugal pump»
- «Centrifugal pumps» (SGU-CNS-012-5LR-R)
- «Centrifugal pumps» (SGU-CNS-012-5LR-PK)
- «Centrifugal pumps» (SGU-CNS-012-6LR-PK)
- «Pumping stations of water supply systems of housing and communal services» (NSSV-019-6LR-01-R)
- «Automation of pumping stations of water supply systems» (SU-ANSSV-09-7LR-01)
- «Automation of pumping stations of water supply systems» (SU-ANSSV-015-17LR-01)
- «Sequential and parallel operation of pumping units»
- «Operation of pumps of various types»
- «Pumping stations in water supply systems in multi-storey buildings» (NS-MNEZ-011-10LR-01-PK)
- «Control of a pumping station» (SU-UNPS-01)
- «Split-type models of pumps of various types:
  - cantilever centrifugal type "K"
  - sectional centrifugal type "CNS"
- «Kit for assembly and disassembly of the cantilever centrifugal pump type "K", including tools»
- «Board – stands on pump configuration»
- «Virtual stands on the design and operation of pumps»



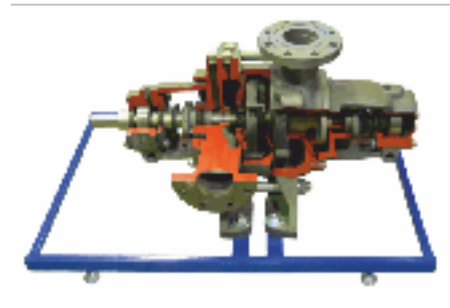
Automation of a pumping station with a piston pump (ANS-PN-6LR-10-01)



Control of a pumping station (SU-UNPS-01)



Dynamic type pumps (SGU-NDT-017-9LR)



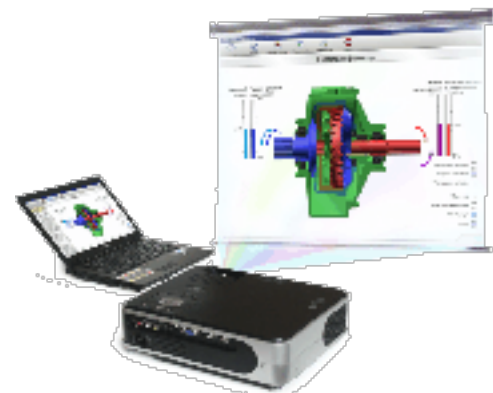
Split-type models of pumps of sectional centrifugal type CNS



Automation of pumping stations of water supply systems (SU-ANSSV-015-17LR-01)



Study of the peristaltic pump



#### Interactive manuals (CD) and classroom posters

- Pneumatic drive and pneumatic automation
- Compressor equipment
- Pumps and pumping units
- Vacuum technology

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Sequential and parallel operation of pumping units



Operation of pumps of various types

# MATERIALS SCIENCE AND MATERIALS TECHNOLOGY

## Study labs and demonstration equipment



Electrical Materials (ELCUT)



Defining specific volume and surface electrical resistances of polymer dielectrics at constant voltage



Determination of the heat resistance of a polymer material by Martens



Study of the Kinetics of Alloy Oxidation in air at high temperatures



Study of the microstructure of metals and alloys



Virtual Labs



Devices and equipment for classrooms and laboratories

### Electrical engineering materials

- «Electric engineering materials» (desktop version, computer version (without PC), (ELCUT student)
- «Electric engineering materials, desktop version, computer version» (without PC), (ELCUT professional), perpetual license
- «Metallography laboratory standard sets of educational equipment — materials science»

### Standard sets of educational equipment. Study of the microstructure of metals and alloys

- «The design and the principle of operation of the microscope»
- «Heat treatment of metals»
- «Study of the microstructure of steel in the equilibrium state»
- «Study of the microstructure of non-ferrous alloys»
- «Study of the structure of carbon steel in the equilibrium state»
- «Study of the alloy steel microstructure»
- «Study of the steel microstructure in a non-equilibrium state»
- «Study of the microstructure of cast iron»
- «Study of the microstructure of welded joints»
- «Study of the microstructure of coatings»
- «Hardening of carbon and alloy steels»
- «Steel temper»
- «Steel annealing and normalization»
- «Cementation of steel»
- «Influence of heating temperature on austenite grain size»
- «The influence of the chemical composition of steel on its temperability»
- «Research of the effect of cold plastic deformation and subsequent heating on the microstructure and hardness of low-carbon steel»
- «Construction of the lead – antimony diagram»

### Polymer and composite materials

- «Determination of the wear resistance of plastics»
- «Determination of the sliding friction coefficient of polymer metals»
- «Determination of specific volume and specific surface electrical resistances of polymer dielectrics at constant voltage»
- «Determination of the hardness of polymer materials»
- «Determination of polymer density»
- «Determination of the heat resistance of a polymer material by Martens»
- «Manufacturing and determination of the KM properties with a metal matrix»
- «Mechanical testing of materials» (MIM-7LR-010)

### Corrosion and protection of metals

- «Research of the kinetics of alloy oxidation in the air at high temperatures» (without PC)
- «Study of metal corrosion by the weight method» (without PC)





Polymer and composite materials



Production of undirected nanofibers by electrospinning (LK-NM-ES-2)



Equipment and technologies for the production of nonwoven nanofibers (ESUG-NN-1)



Production of polymer nonwoven nanofibers



Application of protective electroplating coatings



Electrochemical protection of metals from corrosion

- «Study of metal corrosion by the volumetric method»
- «Application of protective electroplating coatings»
- «Electrochemical protection of metals from corrosion»

#### Composite materials

- «Types, characteristics and production technologies»

#### Nanotechnologies and nanomaterials

- «Production of polymer non-woven nanofibers»
- «Production of undirected nanofibers by electrospinning» (LK-NM-ES-2)

- «Equipment and technologies for the production of microfibre» (ESUV-MN-1)
- «Equipment and technologies for the production of nonwoven nanofibers» (ESUG-NN-1)
- «Dynamic unit for the production of oriented nanofibers» (ESUD-ON-2)
- «Technology and equipment for obtaining bulk nanostructures»
- «Obtaining nanoparticles in solutions»
- «Technology and equipment for the production of graphene films»
- «Technologies for the graphene production and research»
- «Technology for producing carbon nanotubes»
- «Study of the properties and structures of nanotubes»
- «Nanostructures»
- «Research and control of parameters of micro and nanoscale objects» (5 licenses)
- «Nanomaterials. Types, characteristics and production technologies»
- «Types, characteristics and production technologies»
- «Breaking machine» (LP-RM)



Breaking machine LP-RM



#### Interactive manuals (CD) and classroom posters

- Materials Science
- Construction materials technology
- Corrosion and protection of metals
- Strength of materials
- Composite materials
- Technical measurements. Metrology, standardization and certification

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# METALLURGY (EQUIPMENT AND TECHNOLOGIES)

## Study labs and demonstration equipment



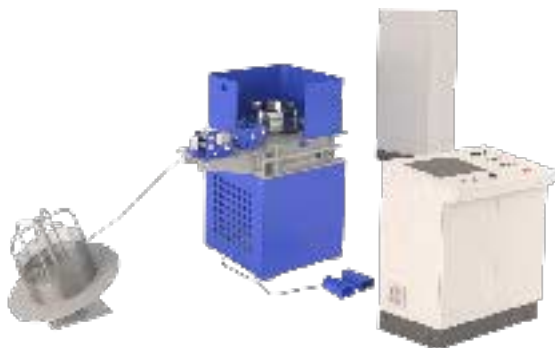
Pipe rolling mill simulator



Sheet bending press



Sheet bending press



Metal processing by pressure.  
Single drawing mill



Metal processing by pressure.  
Multiple drawing

### Rolling mills

- «Automated rolling mill» (DUO-130)
- «Soft Rolling»
- «Pipe Mill Roller»
- «Tube-rolling unit»
- «Piercing mill with individual roll drive»
- «Continuous Mill»
- «Extracting and sizing mill»
- «Central Mill»
- «Sheet rolling»
- «Cold rolling mill» (console control of technological processes)

### VR-simulators «Operator «Metallurgy»

- «Loading Line Operator»
- «Walking Beam Furnace Operator»
- «Cutting Line Operator»
- «The operator of a piercing mill with an individual drive of the rolls»
- «Operator of the hot-rolled pipe cooling line»
- «Continuous mill operator»
- «Mandrel Circulation Line Operator»
- «Central Mill Operator»
- «The operator of the extraction and calibration mill»

### Drawing mills

- «Automated laboratory single drawing machine»
- «Automated laboratory triple drawing machine»

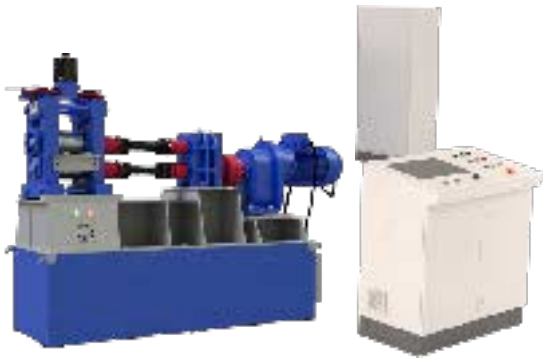
### Simulator-emulator «Drawing mill»

### Drawing mills

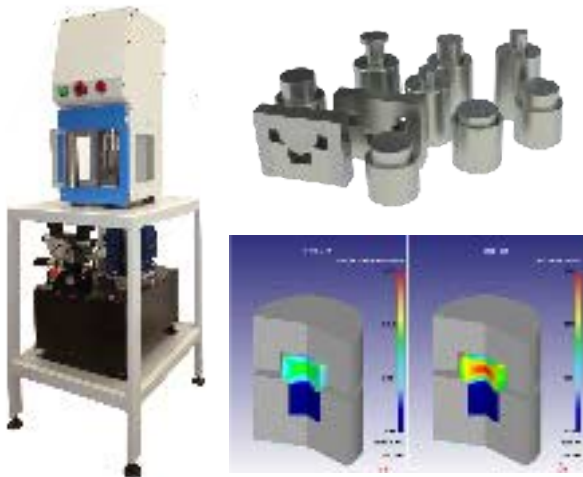
- «Automated laboratory single drawing machine»
- «Automated laboratory triple drawing machine»



Drawing mill



Metal processing by pressure. Rolling



Metal processing by pressure. Pressing



Computer simulator of metallurgical equipment



Blast furnace



Electroslag furnace

### CNC presses

- Automated laboratory complex «Press CNC»
- Simulator-emulator «Hydraulic press with CNC» (OMD-1 with CNC)
- Foundry
- Automated laboratory complex «Injection molding with CNC»
- Simulator-emulator «Foundry»
- «Casting in sand-clay molds»
- Training kits «Production of castings with an internal cavity»
- «Production of castings by centrifugal casting»
- «Production of investment castings»
- «Production of castings by vacuum casting»
- Educational laboratory complex «Centrifugal casting of the «Pipe» type»
- «Centrifugal casting of castings of complex shape»
- Virtual educational complex «Technology of manufacturing a casting mold»
- «Slab continuous casting machine»
- «Sectional continuous casting machine»
- «Laser cutting. Sheet bending machines Simulator «Bending Mill»
- Virtual training complex «Laser cutting»



Slab continuous casting machine



Electron beam oven



Metallurgical equipment



Centrifugal pipe blanks casting (LCG1-CNC)



Foundry



Rolling mill metal transportation units



Complex centrifugal casting (LCV1-CNC)



VR simulators for metallurgical production operators

### Metallurgical equipment and technologies

- «Heating devices & heating, standard training equipment set»
- «Metallurgical technologies, interactive lab work»
- «Pressure metal treatment, virtual training complexes»
- «Moulding»
- «Rolling steel mill operation technology»
- «Multi-pass rolling mill operation technology»
- «Design and the principle of operation of stamping presses»
- «Device and principle of operation of forging equipment»

### Simulators

- «Ladle furnace operation technology»
- «Blast furnace operation technology»
- «Arc steel furnace operation technology»
- «Oxygen converter operation technology»
- «Circulating vacuuming unit operation technology»
- «Metal pressing technologies»
- «Workpiece continuous casting machines»
- «Rolling mill metal transportation units»
- «Cogging mill»
- «Pipe packaging unit»
- «Electric pipe welding machine»
- «Part rolling mills»
- «Shaft furnace»
- «Electric beam furnace»
- «Electroslag remelting furnace»
- «Shot blasting unit»



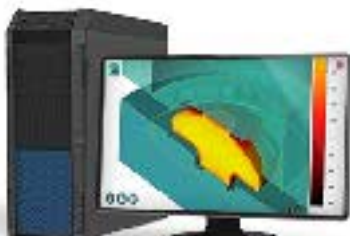
Metallurgical technologies



Cogging mill



Billet continuous casting machine



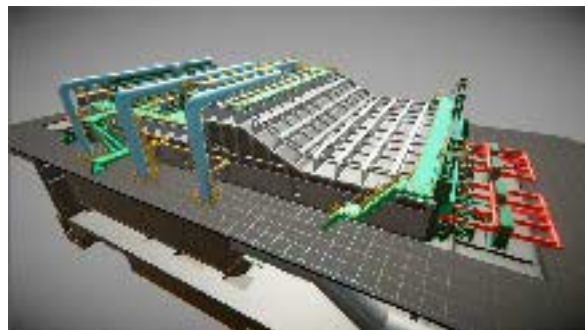
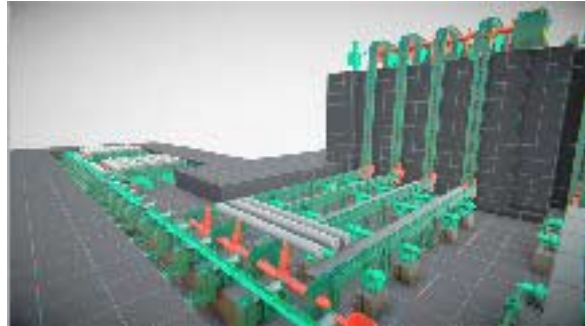
Metal pressing technologies



Electric pipe welding unit

### Non-ferrous metallurgy

- «Batch preparation»
- «Matte smelting»
- «Sorting non-ferrous metals and alloys scrap and waste»
- «Other as ordered by the customers»
- «Creation of models and calculation tasks in metallurgy»



Creation of models and calculation tasks in metallurgy



### Interactive manuals (CD) and classroom posters

- Metallurgical technologies
- Foundry
- Metallurgy of steel and ferroalloys
- Machines and technologies of metal processing by pressure (forging and stamping machines)
- Technical measurements. Metrology, standardization and certification

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# METROLOGY. MEASUREMENTS. MECHANICAL ENGINEERING TECHNOLOGY

## Study labs and demonstration equipment



Coordinate measuring machine with CNC (CMM)



Electrical measurements and fundamentals of metrology



Tooth processing production controller



Tooth processing production controller



Thread Inspector

### Electrical measurements and fundamentals of metrology

- «Electrical measurements and fundamentals of metrology, desktop manual version»
- «Electrical measurements and fundamentals of metrology, desktop computer version» (without PC)
- «Electrical measurements and fundamentals of metrology, desktop manual version, with a digital oscilloscope»
- «Electrical measurements and fundamentals of metrology, desktop manual version, with an analog oscilloscope»

### Metrology. Technical measurements in mechanical engineering

- «Metrology. Technical measurements in mechanical engineering (15 lab. works)» (MTI-15)
- «Metrology. Technical measurements in mechanical engineering (10 lab. works)» (MIT-10)
- «Metrology. Technical measurements in mechanical engineering (5 lab. works)» (MTI-5)
- «Geometric measurements» (VLS)

### Automated measurement systems

- «Automated measuring system» (6 lab. works) (AIS)
- «Automated workstation for a metrologist engineer» (AWS Metrologist) (11 lab. works)
- «Two-coordinate automated optical measuring system»
- «Coordinate measuring machine with CNC» (7 lab. works) CMM with CNC»
- «Coordinate measuring machine (CMM) with CNC and a vision system» (12 lab. works)
- «Coordinate measuring machine with CNC and a rotary table for control of gears and threaded calibers» (9 lab. 2 works)
- «Additional equipment of the CMM with a rotary table (item 8) to ensure control of cutting tools and tool adjustments»
- «Technology of coordinate measurements, software and methodological complex»
- «Automated stand for roughness measurement» (SISh)
- «Automated workstation for the controller of threaded surfaces» (AWS Controller of threaded surfaces) (7 lab. works)
- «Automated workstation of the gear controller» (AWS Controller of gear processing production) (11 lab. works)

### Measurement of flow, pressure, temperature

- «Pressure, flow, temperature measuring devices» (IPDRT)
- «Pressure gages – pressure measuring devices» (DD-IPD-011-9LR-01)
- «Pressure measuring devices and methods» (PMSI-08-MCh)
- «Pressure measurement methods» (MSI-D)
- «Instruments and means of pressure generation and measuring» (PSSID-010-6LR)
- «Methods of temperature and humidity measurement» (MITIV-02)



Temperature measurement methods (MIT-02)

- «Methods of temperature measurement» (MIT-02)
- «Pressure, flow and temperature measuring devices» (VLS)
- «Methods of temperature and humidity measurement» (MITiV-02)
- «Pressure, flow and temperature measuring devices, VLS»

#### Mechanical engineering technology

- «Study of drying methods of 3-phase asynchronous electric motors (EM-SSAD), training stand»
- «Technologies and equipment for the production of electric machines, virtual laboratory stand» (VLS-TOPEM)
- «Technologies and equipment for the production of transformers, virtual laboratory stand» (VLS-TOPT)
- «Production of printed circuit boards, virtual laboratory stand» (VLS-PPP)



Devices and means of pressure generation and measuring (PSSID-010-6LR)



Coordinate measurement technology



Electrical measurements and fundamentals of metrology



#### Interactive manuals (CD) and classroom posters

- Metrology, standardization and certification
- Tolerances and technical measurements
- Fundamentals of metrology and electrical measurements
- Mechanical engineering technology
- Foundry
- Metal-cutting machines (higher education)
- Technological equipment of metal-cutting machines
- CNC machines (automated equipment programming)
- Pressure metal forming machines and technologies
- Engineering drawing

#### Training and methodical complex

Basic equipment: projector, screen, laptop, pre-installed set of interactive posters, virtual laboratory, classroom posters.



Two-coordinate automated optical measuring system

# CNC MACHINES AND PRESSES. FOUNDRY PRODUCTION

## Study labs and demonstration equipment



Metal processing by pressure. CNC Press



Desktop educational lathe with a computer CNC system (PCNC class) and computer 3D simulators of turning and milling machines (UTS4-CNC)



Desktop milling machine with computer control and computer simulators of turning and milling machines (UFSp-CNC-USB)



Educational 5-axis CNC milling machine (PCNC class) and 3D computer simulators of turning and milling machines, «Micron 5x-CNC brand»



CNC milling machines and robotic complexes, stand construction kit

### CNC lathes and milling machines

- «3D models of components and systems of CNC machines»
- «Automated workstation of the operator-adjuster of CNC machines and machine systems» (AWS)
- «Part surface scanning and modeling system» (SK)
- «Desktop educational lathe with a computer system of CNC (PCNC class) and computer 3D simulators of turning and milling machines» (UTS4-CNC)
- «Desktop milling machine with computer control and computer simulators of turning and milling machines» (UFSp-CNC-USB)
- «Milling and engraving CNC machine Micron 4 CNC»
- «Educational 5-axis CNC milling machine (PCNC class) and 3D computer simulators of turning and milling machines, Micron 5x-CNC»
- «CNC milling machines and robotic complexes, stand construction kit»
- «CNC milling machine – construction kit»
- «Micron-construction kit»
- «Educational lathe with a computer CNC system» (PCNC class), (UTS8-CNC-ShK brand)
- «Milling machine with computer control» (UFSK-CNC-ShK brand)
- «Desktop educational and production lathe with a CNC computer system» (PCNC class), (UTS6-CNC-Ethernet brand)

### CNC press and laser cutting

- «Computer simulator of a cutting machine»
- «Metal processing by pressure. CNC Press»
- «Teaching laser cutting machine of a PCNC class and a 3D computer simulator of a laser machine, Laser 2.5x CNC brand»
- «Educational and production electroerosive wire-cutting machine with CNC and 3D emulators of digital production technologies»
- «Educational and production CNC plasma cutting machine» (UPSPR-CNC 3)

### Service and electrical automation of CNC machines

- «Hardware and software complex TechnoSIM Pro Commissioning and adjustment of CNC machines, version for virtual reality environmen» (license for 1 workstation)





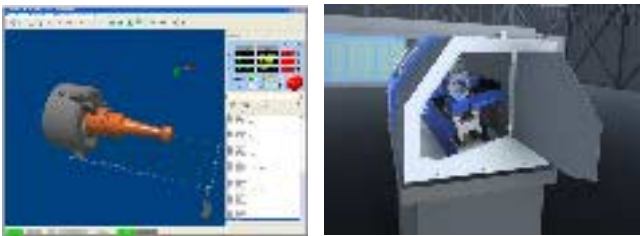
Electroautomatics of a CNC lathe and milling machine



Service engineer of a CNC machine with a virtual reality helmet



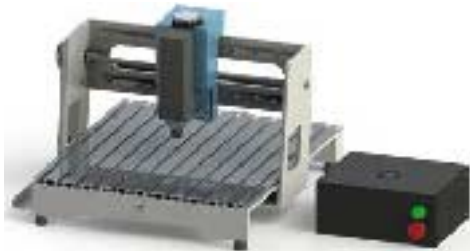
Teaching laser cutting machine of a PCNC class and a 3D computer simulator of a laser machine, Laser 2.5x CNC brand



Computer simulator of a CNC lathe



CNC milling machine – construction kit  
Micron-construction kit



Milling and engraving machine with CNC Micron 4 CNC



**Interactive manuals (CD) and classroom posters**

- CNC machines (automated equipment programming)
- Mechanical engineering technology
- Construction materials technology
- Machines and technologies for processing materials by pressure
- Fundamentals of cutting theory and tools
- Cutting materials
- Metal-cutting machines and processing technologies
- Metal-cutting machines safety
- Technological equipment of metal-cutting machines

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Computer-controlled milling machine of the UFSK-CNC-ShK brand



Educational lathe with a computer CNC system (PCNC class), UTS8-CNC-ShK brand



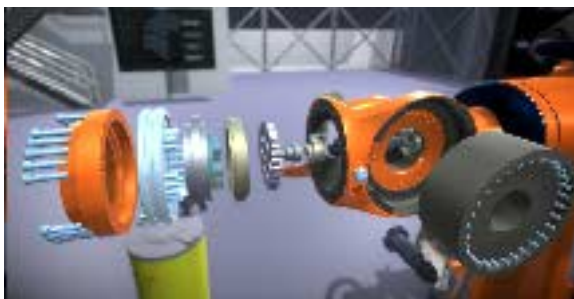
Computer simulator of a CNC lathe

# ROBOTICS. GPS AND GPM. CAD/CAM TECHNOLOGIES

## Study labs and demonstration equipment



Programming KUKA robots



TechnoSIM Pro software and hardware complex



TechnoSIM Pro software and hardware complex



KUKA KR3 Robotic assembly cell



KUKA KR6 R700 Robotic assembly cell with the KUKA VISION vision system



Robotic assembly cell based on the KUKA KR10 industrial robot

### Robots and their programming systems

- «Educational electromechanical robot with 3 degrees of mobility Robin RSS-1 USB Sfera»
- «Programming KUKA robots, simulator-emulator»
- «Educational electromechanical robot with 3 degrees of mobility ROBIN-1C USB/ShVP rectangular coordinate system»
- «Stacker robot»

### Complexes based on industrial robots

- «Robotic assembly cell based on the KUKA KR6 R700 industrial robot with KUKA VISION vision system»
- «Robotic welding complex based on the KUKA KR10 R1100 SixxAgilus industrial robot»
- «TechnoSIM Pro software and hardware complex Commissioning and adjustment of industrial robots and robotics complexes, version for virtual reality environment» (license for 1 workstation)
- «TechnoSIM hardware and software complex Pro Maintenance of industrial robots and robotics complexes, version for virtual reality environment» (license for 1 workstation)
- «Robotic assembly cell based on the KUKA KR10 industrial robot»
- «Robotic assembly cell based on the KUKA KR3 industrial robot»
- «Industrial robots in automation» (LP-Rb)

### Construction kits. GPM and GPS

- «Electroautomatics of a robot – SAU»
- «Flexible production module with computer control based on a desktop lathe and a training robot» (GPM-T-Robin C1)
- «Flexible production module with computer control based on a milling desktop machine and a training robot» (GPM-F-Robin C1) or (GPM-F-Robin Sfera)



Robot stacker

- «Flexible computer-controlled production system based on two computer-controlled machines and a training robot» (GPS-2T-Robin C1/Robin Sfera), (GPS-FT-Sfera/Robin C1)
- «Computer-controlled robotic assembly/sorting stand» (RSS-UR)
- «Automated assembly stand with computer control and a vision system» (ARS-UR-TZ)
- «Assembly line with computer-controlled transport and a storage system and vision system» (TNS-UR-TZ)
- «Construction kit for the assembly and research of robots and machine tools with CNC computer systems» (UMELETS 2)
- «Linear conveyor with a computer control system and part pusher»
- «Automated warehouse with a robot stacker»
- «Flexible production system with computer control based on a CNC lathe and an industrial robot KUKA KR3 R540»



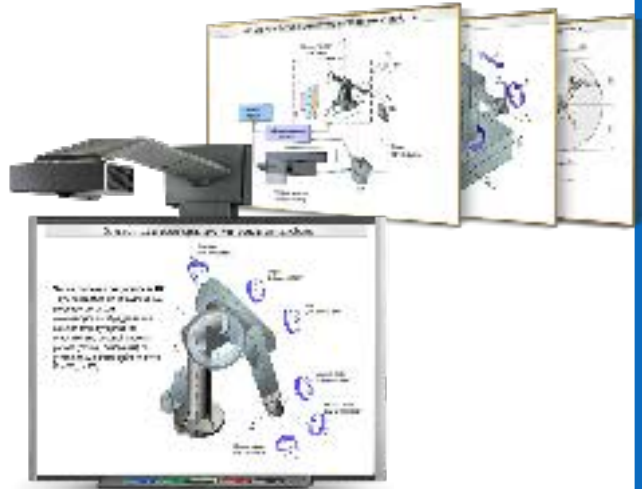
Educational Electromechanical Robot with 3 degrees of mobility Robin RSS-1 USB Sfera



Industrial robots in automation (LP-Rb)



Automated assembly stand with computer control and a vision system (ARS-UR-TZ)



**Interactive manuals (CD) and classroom posters**

- Fundamentals of robotics
- Programming of automated equipment
- Technological processes and
- Hydraulic pneumatic drives and automation in the automation of industrial processes
- Automated electric drive control system

**Training and methodical complex**

Basic equipment: projector, screen, laptop, pre-installed set of interactive posters, virtual laboratory, classroom posters.



Flexible production module with computer control based on a desktop lathe and a training robot (GPM-T-Robin C1)

# WELDING AND CUTTING OF METALS (EQUIPMENT AND TECHNOLOGIES)

## Study labs and demonstration equipment. Labs



The simulator of the welder TSV-03



Low-amperage arc welder simulator DTS-K



Welding cell based on the robot ROBIN WELD1



Computerized device for qualification control and certification of electric arc welders

### Training equipment and simulators

- «Welding simulator TSV-02»
- «Welding simulator TSV-03» (Electric welder, gas welder)
- «Low-amperage arc welder simulator MDTs-K»
- «Computerized device for qualification control and certification of electric arc welders»
- «Welding robots, training stand-simulator «
- «Welding cell based on the robot ROBIN WELD1» (simulated welding, safe version)
- «Robotic welding complex based on the KUKA KR10 R1100 SixxAgilus industrial robot»
- «Welding transformer, demonstration stand»
- «Inverter welding machine, demonstration stand»
- «Acetylene generator, split-type device»
- «Gas welding post, stand-simulator»
- «Soldering kit, stand-simulator»
- «Teaching laser cutting machine of a PCNC class and a 3D computer simulator of a laser machine, Laser 2.5x CNC brand»
- «Welding technique and technology» (LP-Sv)
- «Welding cell based on the KUKA industrial robot»

### Welding technologies, World Skills Workshop Equipment for preparation of materials and control of welded joints

- «Welder templates» USHS-2, USHS-3, USHS-4
- «Krasovsky USHK1 template»
- «Usharov — Marshak Template»
- «A set of tools for VIK visual inspection»

### Workshop equipment

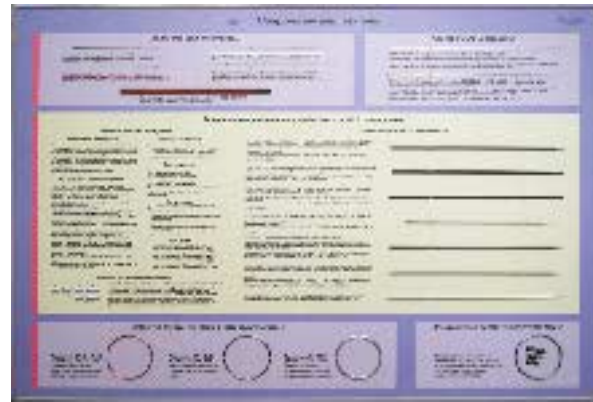
- «Post No. 1. Manual arc welding with a melting electrode MMA»
- «Post No. 2. Semi-automatic and manual arc welding»
- «Post No. 3. Assembly and semi-automatic or manual arc welding»



Teaching laser cutting machine of a PCNC class and a 3D computer simulator of a laser machine, Laser 2.5x CNC brand



Welding technique and technology (LP-Sv)



**Board stands with natural samples**

- «Welding materials, board»
- «Welding and welded joints material preparation control instrument, board»
- «Welded joints, board»
- «Welder's personal protective equipment, board»
- «Acetylene burners, board»
- «Gearboxes, board»
- «Gas-air burners, board»
- «Connecting equipment, board»



Welding cell based on the KUKa industrial robot



**Interactive manuals (CD) and classroom posters**

- Equipment, machinery and technology
- of welding and cutting of metals
- Metalwork
- Mechanical engineering technology
- Fundamentals of cutting theory and tools
- Construction materials technology
- Industrial & occupational health & safety

**Training and methodical complex**

Basic equipment: projector, screen, laptop, pre-installed set of interactive posters, virtual laboratory, classroom posters.



Workshop equipment

- «Post No. 4. Argon-arc welding with a non-melting TIG electrode and manual arc welding with a melting MMA electrode»
- «Post No. 5. Gas welding and cutting»
- «Post No. 6. Workstation for locksmith works»
- «Post No. 7. Spot welding»
- «Post No. 8. Plasma cutting»

## PROTOTYPING. REVERSE ENGINEERING

### Study labs and demonstration equipment. Labs



SLA 3D Printer



Optical scanner



3D scanner constructor (CICLOP)



Educational desktop 3D printer UZDP



CNC milling machine

### Prototyping and modeling

- «3D modeling and prototyping laboratory»
- «Educational desktop 3D printer UZDP»
- «3D scanner constructor» (CICLOP)
- «Assembly and commissioning of the prototyping machine»
- «3D printer adjuster»

### Prototyping equipment

- «SLA 3D printer»
- «3D FDM printer»
- «Optical scanner»
- «Laser engraving cutter»
- «CNC milling machine»
- «Set of painting equipment»
- «Set of processing equipment»
- «Equipment for polygraphy and printing»

### Prototyping laboratory

- «Virtual wind tunnel plant, software module»
- «Research and visualization of aerodynamic characteristics of typical urban development forms, software module»
- «Three-dimensional compositional modeling, software module»
- «Research of 3D models in the augmented reality system, software module»
- «Research of probabilistic evacuation routes in buildings, software module»
- «Analysis of the virtual urban environment, software module»
- «Visualization and analysis of ergonomics of construction objects, software module»
- «3D modeling and prototyping laboratory for school»
- «3D modeling and prototyping laboratory for secondary vocational education» (SVE)
- «Photopolymer 3D printer, laboratory complex»
- «Laboratory complex 3D printer» (laser sintering)
- «Multifunctional UMFS scanner»
- «Mobile gym complex»
- «Reverse Engineering» (3D Scanner)



Prototyping laboratory



Laser engraving cutter



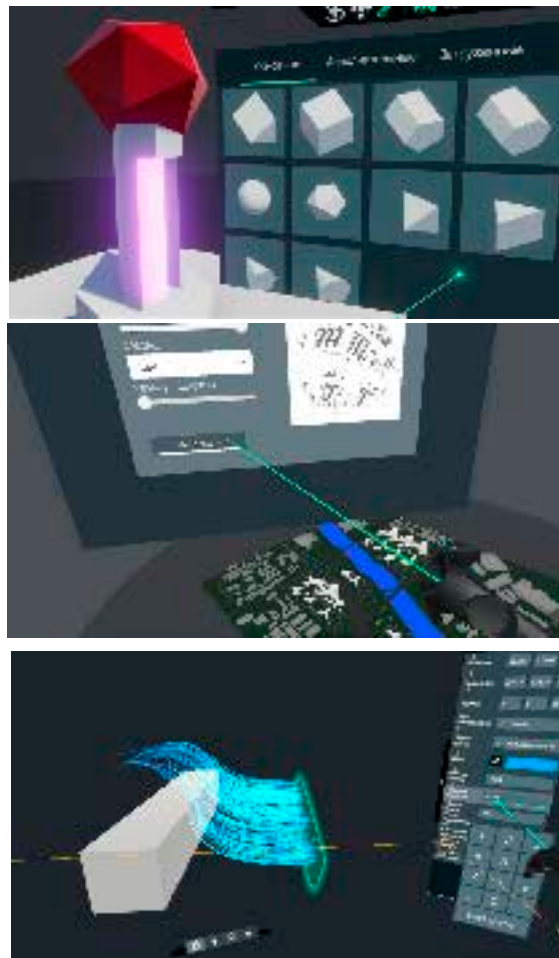
Laboratory complex 3D printer (laser sintering)



Mobile gym complex  
Reverse Engineering (3D Scanner)



Photopolymer 3D printer, laboratory complex



Laboratory complex 3D printer (laser sintering)

# NON-DESTRUCTIVE TESTING. FLAW DETECTION. TECHNICAL DIAGNOSTICS

## Study labs and demonstration equipment



Flaw detector-controller of railroad rails



Standard set of laboratory equipment - Magnetic particle control of metals (MPD 2.1)



Eddy current control of products, laboratory stand (NK VTK1)

- Ultrasonic control**
- «Software and hardware complex Ultrasonic quality control of railroad wheels and rails» (UZK ZHD1-mini)
  - «Hardware and software complex Ultrasonic control of metals» (UZK-PK1)
  - «Part quality control by ultrasonic flaw detection»
  - «Ultrasonic control of concrete structures»
  - «Ultrasonic control of polyethylene pipes»

- Magnetic particle control**
- «Part quality control by magnetic particle flaw detection»
  - «Standard set of laboratory equipment - Magnetic particle control of metals» (MPD 2.1)

- Visual-measuring, etc. control**
- «Standard set of laboratory equipment - Visual and measuring control of metal and welded joints» (VIK-LK-5)
  - «Eddy current control of products, laboratory stand» (NK VTK1)
  - «Flaw detector radiologist, AWS»
  - «Study and analysis of X-ray images of pipe and sheet metal, standard set of laboratory equipment»
  - «Monitoring the condition of vessels and aggregates, Leak detection, standard set of laboratory equipment»
  - «Control of composite materials KOM PK1, software and hardware complex»
  - «Standard set of laboratory equipment - Methods of concrete strength control»



Ultrasonic control of concrete structures





Ultrasonic control of metals (UZK-PK1), hardware and software complex



Study and analysis of X-ray images



Ultrasonic control of polyethylene pipes



**Interactive manuals (CD) and classroom posters**

- Materials Science
- Corrosion and protection of metals
- Composite materials
- Construction materials technology
- Tolerances and technical measurements
- Technical measurements. Metrology, standardization and certification
- Industrial & occupational health & safety

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



AWS Flaw detector-radiologist

# MECHANICAL EQUIPMENT REPAIR

## Study labs and demonstration equipment



Installation and connection of hydraulic and mechanical measuring instruments (MP-KIP-GM-017-60LR)



Hydraulic system assembly and installation (SiM-GS-019)



Installation and testing of pipeline connections, repair of pipelines (Mil-TS-RTr-020-4LR)

### Training stand

- «Repair and testing of a hydraulic cylinder, hydraulic motor and valves» (RI-Hz-Gm-019)
- «Installation and connection of hydraulic and mechanical measuring instruments» (MP-KIP-GM-017-60LR)
- «Repair and testing of gear and plate pumps» (RI-NSh-NPL-019)
- «Repair and testing of valves, valve cocks and gates» (RI-KZA-019)
- Hydraulic system assembly and installation (SiM-GS-019)
- Assembly and testing of hydraulic cylinders (SiIGc-019)
- Assembly and installation of pneumatic systems (SiM-PS-019)
- «Assembly and installation of a pneumatic actuator and electro-pneumatic automation systems» (SiM-PPiSEPA-019)
- «Testing of a gear pump of lubrication systems» (SI-NDZ-015 SI-NMSh-015)
- «Testing and adjustment of the dispenser pump» (SI-NDZ-015)
- «Repair and testing of a centrifugal pump of type "K"» (RI-NC-K-019)
- «Pipeline repair, training stand-mock-up»
- «Installation and testing of pipeline connections, repair of pipelines, training stand» (Mil-TS-RTr-020-4LR)
- «Repair of threaded holes and connections, training stand»
- «Repair of shaft seals, training stand»
- «Keyed connection repair, training board-stand»
- «Repair of gears, , training board-stand»
- «Diagnosis of gear defects, training stand» (DM-DDZP-014-ZLR)
- «Balancing alignment and vibration diagnostics, training stand» (BVV-019)
- «Alignment of shafts in the horizontal plane, training stand» (CVGP-015)
- «Shaft alignment methods, training stand»
- «Equipment diagnostics according to alignment and vibration parameters, training stand» (DO-PSV-019)
- «Diagnostics of mechanical equipment based on vibration analysis, educational complex» (DMO-OV-020)
- «Friction in device rolling bearings, training stand» (TrOKP-021-2LR)
- «Friction in device sliding bearings, training stand» (TrOSP-021-2LR)
- «Errors in transmission gears, training stand» (PPZ-021-2/ 1P)
- «Installation, commissioning, testing and diagnostics of gears with a flexible link, educational complex» (MNID-PGZ-020)



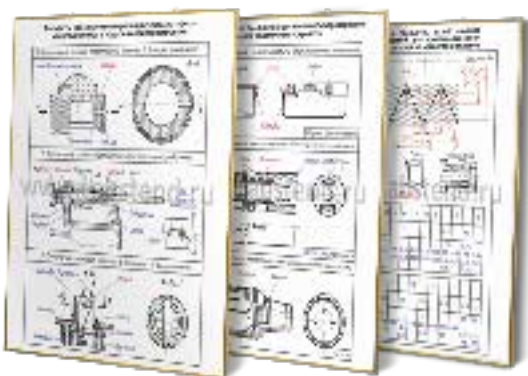
Fundamentals of mechanical transmissions and gears OMTF-022



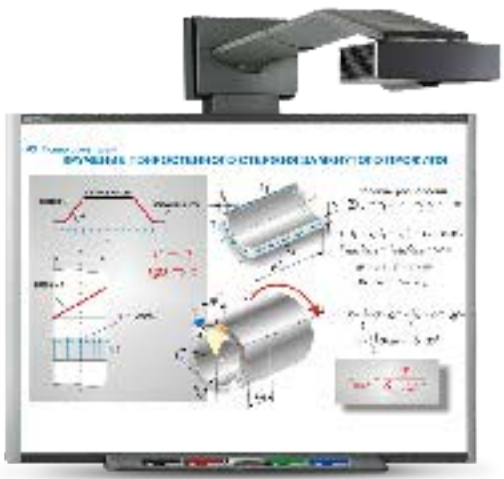
Pipeline repair



Balancing, alignment and vibration diagnostics BVV-019



Diagnosis of gear defects DM-DDZP-014-3LR



**Interactive manuals (CD) and classroom posters**

- Engineering drawing
- Materials Science
- Technical mechanics
- Strength of materials
- Tolerances and technical measurements
- Vehicle parts
- Theory of mechanisms and vehicles

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Alignment of shafts in the horizontal plane CVGP-015

# AUTOMOTIVE AND ROAD CONSTRUCTION EQUIPMENT

## Study labs and demonstration equipment



Cars, trucks and tractors (VAZ, GAZ, URAL, MTZ, KAMAZ)



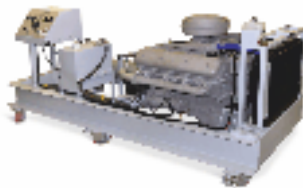
Operating processes of diesel/gasoline internal combustion engines with a motor-generator or hydraulic loading unit



Operating processes of a 4-cylinder gasoline/diesel engine with a motor-generator or hydraulic loading unit



Multiplexer CAN gasoline engine control system



Actual engines (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins)



Training simulators of internal combustion engines of their units and assemblies



Electronic systems of trucks, buses, construction and agricultural machinery, diagnostic complex

### Complete vehicles

- «Stands-simulators or in the section»
- «Cars, trucks and tractors» (VAZ, GAZ, URAL, MTZ, KAMAZ)
- «Snowmobiles, ATVs, jet skis»

### Internal combustion engines

#### Laboratory complexes

- «Operating processes of diesel/gasoline internal combustion engines with a motor-generator or hydraulic loading unit»
- «Laboratory of testing and running-in of internal combustion engines»
- «Operating processes of a 4-cylinder gasoline/diesel engine with a motor-generator or a hydraulic loading unit»

#### Lab stands

- «Gas dynamics, educational and laboratory stand COMMON RAIL diesel engine control system»
- «Multiplexer CAN gasoline engine control system «
- «Diagnostics of the battery fuel supply system of the KAMAZ engine»
- «Diagnostics and adjustment of fuel injection pump»
- «Diagnostics of diesel fuel injectors and plunger pairs»
- «Motor-tester, diagnostic complex»
- «VAZ engine cooling system»
- «Electronic systems of trucks, buses, construction and agricultural machinery, diagnostic comple»
- «Actual engines» (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins)

#### Training stands (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins)

- «Training simulators of internal combustion engines of their units and assemblies»
- Board-stand with actual parts, light-dynamic (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins) valve train, crankgear
- Lubrication systems, fuel supply (diesel/gasoline) and air, HBO, cooling
- Split internal combustion engine static/dynamic (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins, John Deere)
- Internal combustion engine units and assemblies in the static/dynamic section (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins, John Deere)
- Training sets of internal combustion engine components and parts (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins, John Deere)
- Timing, KShM
- Lubrication systems, fuel supply (diesel/gasoline) and air, HBO, cooling

### Transmission

- «Laboratory complexes»
- «Operating processes of friction clutch»
- «Operating processes of power distribution mechanisms of drive axles»
- «Operating processes of a hydrodynamic transformer»



Split internal combustion engine static/dynamic (VAZ, GAZ, ZMZ, KAMAZ, YAMZ, MTZ, Cummins, John Deere)



Lubrication systems, fuel supply (diesel/gasoline) and air, HBO, cooling



Transmissions Manual / Automatic/ DSG/Variator



Operating processes of power distribution mechanisms of drive axles



Manual gearbox, computerized training complex



Dynamic/static characteristics of an automobile wheel



Clutches



Transmissions Manual / Automatic/ DSG/Variator

#### Lab stands

- «Friction clutch» (static/dynamic)
- «Transmissions Manual /Automatic/ DSG/Variator2
- «Transfer boxes»
- «Cardan drives»
- «Drive axles and its mechanisms»

#### Training stands (VAZ, GAZ, UAZ, ZIL, URAL, YAMZ, MTZ, KAMAZ)

- «Manual gearbox, computerized training complex»
- «Transmissions Manual /Automatic/ DSG/Variator»
- «Transfer boxes»
- «Cardan drives»
- «Drive axles and its mechanisms»

#### Board-stands with actual parts (VAZ, GAZ, UAZ, ZIL, URAL, YAMZ, MTZ, KAMAZ)

- «Clutches»
- «Driving wheel drives»
- «Automatic gearboxes»

#### Light-dynamic board-stands

- «Mechanical transmissions»
- «Automatic transmission control systems»
- «Transmission control systems of motor vehicles»

#### Split-type products (VAZ, GAZ, UAZ, ZIL, URAL, YAMZ, MTZ, KAMAZ)

- «Transmission of a front-wheel drive/rear-wheel drive car»
- «Clutches»
- «Transmissions Manual /Automatic/ DSG/Variator»
- «Transfer boxes»
- «Cardan drives»
- «Drive axles and its mechanisms»

#### Undercarriage

#### Laboratory complexes

- «Operating processes of the automobile wheel»
- «Working processes of passenger vehicle suspensions»
- «Operating processes of shock absorbers of passenger cars»
- «Adaptive suspension workflows»

#### Lab stands

- «Dynamic/static characteristics of an automobile wheel»
- «Lever of the "MacPherson" type suspension» (static/dynamic)
- «Elastic suspension elements»
- «Spring suspension» (static/dynamic)



Drive axles and its mechanisms



Working processes of passenger vehicle suspensions



Shock absorbers (gas, hydraulic, pneumatic, hydropneumatic, adjustable)



Suspension control systems (hydraulic, pneumatic, hydropneumatic)



Suspension (MacPherson, lever, spring)



Car brake systems (classic, ABS, ESP)



Car brake systems (classic, ABS, ESP)

#### Training stands

- «Balancing the wheels of cars/trucks and tractors»
- «Tire work of cars/trucks and tractors»
- «Suspensions (such as "MacPherson", lever, spring) Board- stands with actual parts»
- «Wheels of cars/trucks and tractors»
- «Shock absorbers» (gas, hydraulic, pneumatic, hydropneumatic, adjustable)

#### Light-dynamic board-stands

- «Chassis» (passenger, truck, tractor, snowmobile, ATV)
- «Suspension control systems» (hydraulic, pneumatic, hydropneumatic)

#### Split-type items

- «Wheels» (passenger cars, trucks, tractors)
- «Shock absorbers» (gas, hydraulic, pneumatic, hydropneumatic, adjustable)
- «Suspension» (MacPherson, lever, spring)
- «Driving controlled axles and beams»

#### **Brake system (hydraulic, pneumatic, hydropneumatic)**

#### Laboratory complexes

- «Brake stands of passenger cars, trucks»
- «Power stands of passenger cars, trucks»

#### Lab stands

- «Car brake systems» (classic, ABS, ESP)

#### Training stands

- «Brake system units and assemblies»

#### Board-stands with natural parts

- «Car brake systems» (classic, ABS, ESP)
- «Brake system units and assemblies»

#### Light-dynamic board-stands

- «Car brake systems» (classic, ABS, ESP)
- «Brake system units and assemblies»

#### Split-type items

- «Car brake systems» (classic, ABS, ESP)
- «Brake system units and assemblies»

#### **Steering (trucks, cars and tractors)**

#### Laboratory stands, simulator stands, board stands with natural parts and light-dynamic, split-type items

- «Steering control with or without a hydraulic, electric booster»
- «Steering units and components with or without a hydraulic, electric booster»

#### Demonstration stands (quantorium)

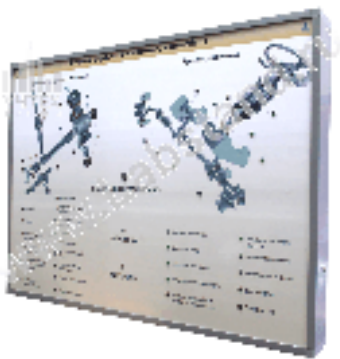
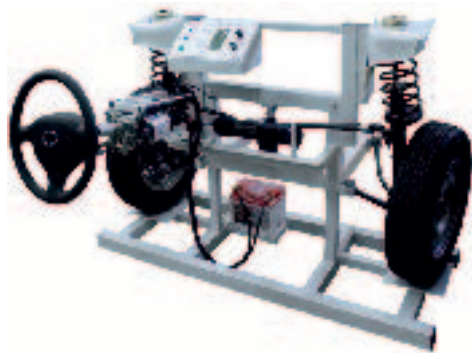
- «Steering geometry»
- «Adjustable wheel mounting angles»
- «Suspension arms of different lengths»
- «Wheel alignment adjustment»
- «Steering wheel. Steering wheel axis»
- «Wheel mounting angles»
- «Rolling shoulder»
- «Body, electrical equipment»

#### Lab stands

- «Hydraulic and pneumatic systems of cars and tractors»
- «Sensors and actuators of cars and tractors»
- «Car alarm system»
- «Multiplexer CAN control systems» (lighting devices, power window and mirror drives, windshield wiper and washer drives, audio system, door lock drives, air conditioning)
- «Electrical equipment of the KAMAZ/MTZ tractor»
- «Piston engine ignition systems and generator set»



Brake system units and assemblies



Laboratory stands, simulator stands, board stands with actual parts, light-dynamic, split views

Training stands (bodies and frames of a car/truck, tractor)

Light-dynamic board- stands with movable elements

- «MTZ Bulldozer/Tractor Attachments»

Light-dynamic board-stands

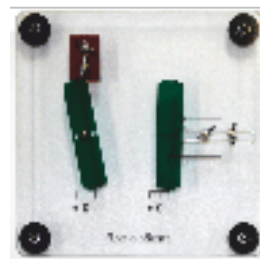
- «Excavator / Bulldozer / Roller / Scraper / Grader / Tractor Device»
- «ATV/ Snowmobile Electrical equipment»
- «Split-type items»
- «Tractor attachment system»

**Operational materials**

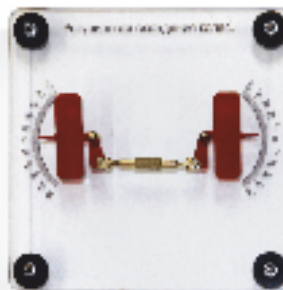
**Samples of vehicle operational materials, board-stands**

**Training simulators and laboratories**

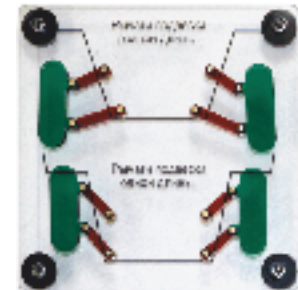
- «Viscometer, hydrometer, titrator, viscometric bath, refrigeration unit for determining the low-temperature properties of fuels and lubricants»



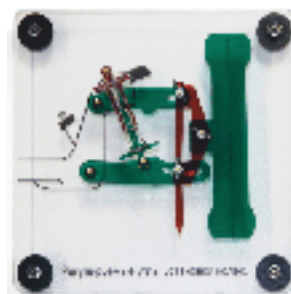
Rolling shoulder



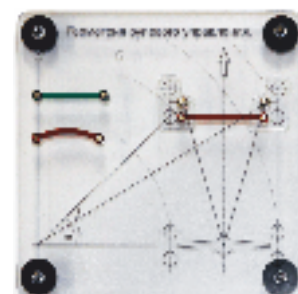
Wheel alignment adjustment



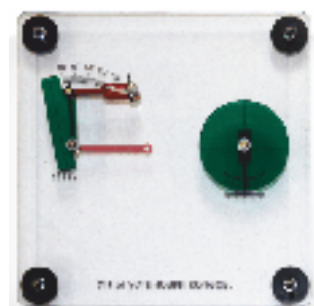
Suspension arms of different lengths



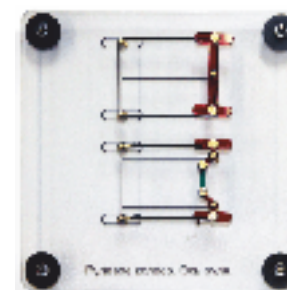
Adjustable wheel mounting angles



Steering geometry



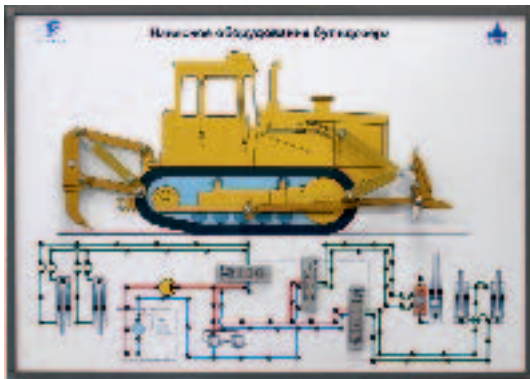
Wheel mounting angles



Steering wheel. Steering wheel axis



Electric equipment of the KAMAZ, training simulator



MTZ Bulldozer/Tractor Attachments



Samples of vehicle operational materials, board-stands



Testing and adjustment of fuel injection pump

- «Analysis of oils and fuels»
- «Estimating fuel pollution»
- «Oil drip test»

Equipment for fuel sampling and operational acceptance analysis

#### Equipment for vehicle maintenance and repair

##### Training simulators

##### Control of vehicle electrical equipment

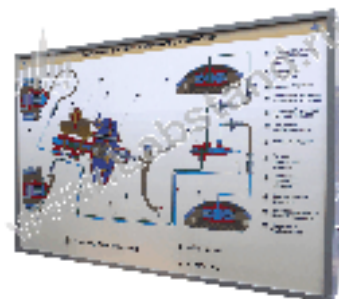
- «Diagnostics of gasoline/diesel injectors»
- «Checking and cleaning spark plugs»
- «Testing and adjustment of fuel injection pump»
- «Lifting equipment»
- «Diagnostics, assembly/disassembly of internal combustion engines and transmissions of passenger cars»
- «Checking and adjusting the wheels alignment angles»
- «Inspection line»
- «Cleaning of fuel systems»
- «Car CAN tire scanners»
- «Hand tool kits and tool carts»
- «Battery maintenance tool set»
- «Digital tachograph»

##### Training complexes

- «Tire work»
- «Dry and wet car cleaning»
- «Operational fluids»



Multiplexer CAN control systems



Car brake systems (classic, ABS, ESP)

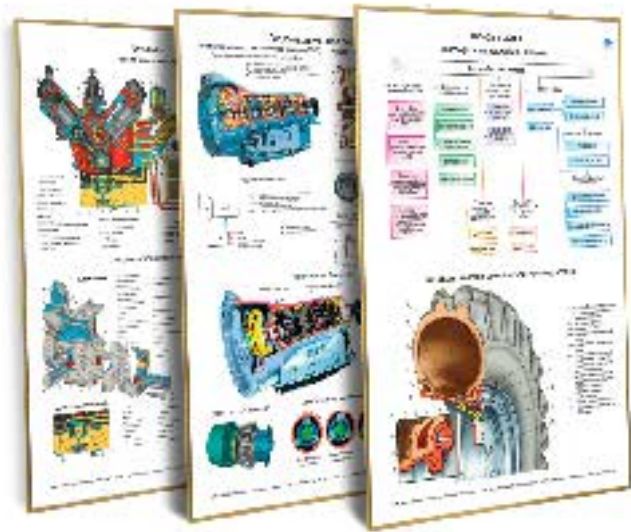




Car CAN tire scanners



Control of vehicle electrical equipment



#### Interactive manuals (CD) and classroom posters

- Vehicle configuration
- Road construction machines
- Agricultural machinery
- Electrical equipment of the car
- Internal combustion engines
- Tractors
- Tractor diesels
- Car maintenance
- Automotive operational materials
- Maintenance and repair of machinery in agriculture
- Traffic rules
- Transportation of hardous goods
- Logistics
- Technology and organization of road construction
- Armored weapons and equipment

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Tire work



Operational fluids

# ELECTRIC TRANSPORT. VEHICLE ELECTRIC EQUIPMENT AND ELECTRONICS

## Study labs and demonstration equipment



Electric vehicle model, stationary version of EM-MV-S



Functional model of an electric car



Traction batteries of electric vehicles



Innovative electrical switches

### Electric transport Vehicle configuration

- «Electric vehicle model, laboratory stand, stationary version» (EM-MV-S)
- «Working model of the Nissan Leaf electric car»

### Training stand

- «The power plant of an electric vehicle based on an asynchronous motor»
- «Electric vehicle power plant based on synchronous jet engine»
- «Power plant of a golf car based on a brushless DC motor»
- «Electric vehicle battery cooling system»
- «Model of the electric vehicle power units cooling system»
- «Electric vehicle insulation resistance monitoring system»
- «High-frequency 3-phase electric vehicle converter»
- «Electric vehicle synchronous jet engine control system»
- «Electric vehicle asynchronous motor control system»
- «Electric vehicle power contactor control system»
- «Electric vehicle sensor system»
- «Electric vehicle information bus»
- «Tesla electric door opener»
- «Tesla Autopilot system»
- «Electric vehicle power supply system»
- «Electric vehicle traction battery balancing system»
- «Electric vehicle interior heating and ventilation system»
- «Diagnostics of electric vehicle electrical equipment, simulator»
- «Working model of Toyota Prius hybrid car»

### Electric vehicle batteries

- «Traction batteries of electric vehicles, lab stand»

### Training stand

- «Internal resistance of lithium-ion batteries»
- «Internal resistance of lithium-titanium batteries»
- «Internal resistance of lithium-iron-phosphate batteries»
- «Internal resistance of lithium polymer batteries»
- «Internal resistance of nickel-metal hydride batteries»
- «Electric vehicle power battery control system, lab stand»
- «Assembly of an electric vehicle traction battery with 3» different types of drives, training set»
- «Electric vehicle charging station, lab stand»

### Electrical engineering of electric vehicles

- «Innovative electrical switches, lab stand»
- «Types of electric vehicle charging connectors, training stand»

### Board-stand

- «Contactor SP-EK-K»
- «Protective shutdown device SP-EK-RCD»
- «Circuit breaker SP-EK-AV»
- «Electromagnetic relay SP-EK-ER»

### Board

- «Contactor P-EK-K»
- «Protective shutdown device P-EK-RCD»



Valve engine SP-ED-VD

Protective shutdown device  
P-EK-UZO, boardAsynchronous motor with a short-circuited rotor  
P-ED-ADKR, board-stand

Asynchronous motor with phase rotor SP-ED-ADFR, board-stand



Linear actuator LD, standard training equipment set



Motor wheel MK, lab stand

Study of the construction of cars using alternative fuel,  
virtual training complex

- «Circuit breaker P-EK-AV»
- «Electromagnetic relay P-EK-ER»

#### Electric motors

- «Valve engine, research stand»

#### Board-stand

- «DC motor» (SP-ED-DPT)
- «Asynchronous motor with a short-circuited rotor» (SP-ED-ADKR)
- «Asynchronous motor with phase rotor» (SP-ED-ADFR)
- «Valve engine» (SP-ED-VD)

#### Board

- «DC motor» (P-ED-DPT)
- «Asynchronous motor with a short-circuited rotor» (P-ED-ADKR)
- «Asynchronous motor with phase rotor» (P-ED-ADFR)
- «Split view of the traction asynchronous motor of an electric vehicle»
- «Split view of a traction synchronous jet engine of a hybrid car»

#### Linear actuator

- «Linear actuator LD, standard training equipment set»

#### Motor-wheel

- «Motor wheel MK, lab stand»

#### Virtual training complexes (electric transport)

##### Virtual laboratory stand

- «Technologies and equipment for the production of electric energy storage devices» (VUK-TOPNEK)
- «Study of the design of modern electric vehicles»
- «Study of the car designs using alternative fuel types»
- «Trolleybus»
- «Tram»
- «Electric loader»
- «Electric locomotive»
- «Electric train»

#### Electrical equipment of a vehicle

##### Lab stand

- «VAZ1118 injection engine control system SUID-1118»
- «LADA XRAY injection engine control system SUID-XRAY»
- «RENAULT Logan injection engine control system SUID-Logan»
- «TOYOTA V8 injection engine control system SUID-V8»
- «Distributed gasoline engine injection system»
- «FSI direct fuel injection system»
- «Car ignition system»
- «Car power supply system»
- «Car starter system»
- «Vehicle on-board control system»
- «Car lighting and alarm system»
- «Truck lighting and alarm system»
- «Windshield wiper and washer»
- «Instrumental methods used to monitor the technical condition of car lighting and alarm devices»
- «Interior heating and ventilation system»
- «Car audio system»



Study of modern car designs, virtual training complex



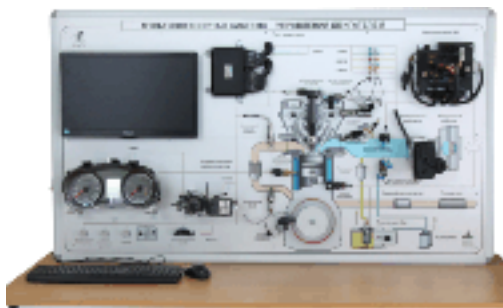
Technologies and equipment for the production of electric energy storage devices, virtual training complex



VAZ1118 injection engine control system SUID-1118



Distributed gasoline engine injection system



Gasoline engine control system



Car power supply system



SRS Security System

- «Control and measuring devices of the car»
- «SRS Security System»
- «Car security alarm system»
- «Car multimedia system»
- «Intelligent car lighting and alarm system»
- «Intelligent car climate control system»
- «Car keyless access system»
- «Electric car air suspension control system»
- «Electric car equipment, mobile training simulator»

**Multiplexer**

- «(CAN) control systems»
- «Gasoline engine control system»
- «COMMON RAIL diesel engine control system»
- «CAN control system for lighting devices»
- «CAN control system for power window and mirror drives»
- «CAN control system for door lock actuators»

**Electronics**

**Laboratory module**

- «Electric parking brake drive»
- «Electric drive of car mirrors»
- «Tire pressure sensor»
- «The characteristics of car coolant temperature sensors» (three types of sensors+pyrometer)
- «The characteristics of the idling regulator of injection power systems and internal combustion engine control with an oscilloscope»
- «The characteristics of the mass air flow sensor»
- «The characteristics of the throttle position sensor»
- «The characteristics of an inductive crankshaft position sensor with an oscilloscope»
- «External light-signalling devices (lamps) soundness control system»
- «Study of a typical turn signals and emergency alarms connection scheme»
- «The principles of car power supply system control relays with a multimeter»
- «General principles of the injection engine control system operation»
- «Car immobilizer»
- «Speed sensor research with an oscilloscope»
- «ABS sensor research with an oscilloscope»
- «Investigation of the steering wheel rotation sensor»

**Virtual laboratory stands (electrical equipment of cars).**

**Configuration options**

**Virtual booth**

- «Vehicle safety and traffic control system»
- «Electronic engine and transmission control systems of passenger cars»
- «Starter start system of passenger cars»
- «Lighting, light and sound alarm systems of passenger cars»
- «Passenger car power supply system»
- «Ignition system of passenger cars»
- «Information and entertainment systems Car climate control system»
- «Truck power supply system»
- «Auxiliary electric drive of passenger car elements»
- «Electric car air suspension control system, virtual lab stand»
- «Electric equipment of trucks (8 in one), virtual simulator»



Car starter start system



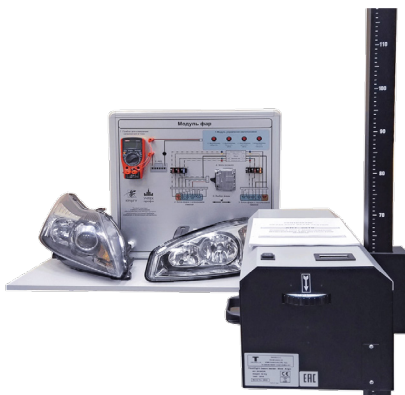
Vehicle on-board control system



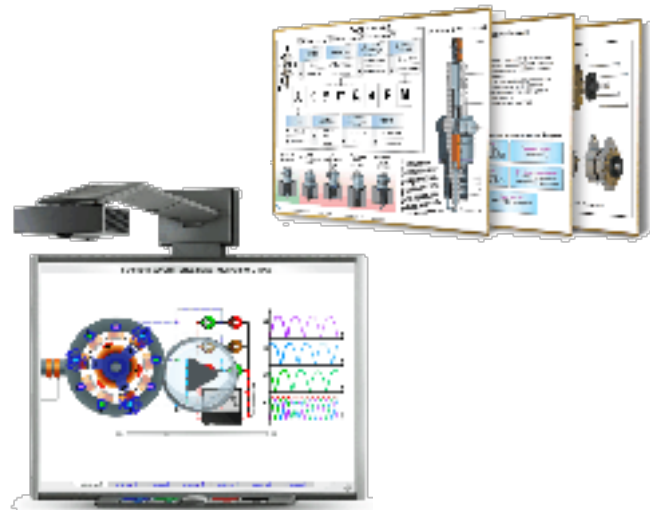
Car lighting and alarm system



Windshield wiper and washer



Instrumental methods used to monitor the technical condition of car lighting and alarm devices

**Interactive manuals (CD) and classroom posters**

- Electrical equipment of the car
- Vehicle configuration
- Internal combustion engines
- Tractors. Tractor diesels
- Car maintenance
- Maintenance and repair of machines in rural areas.
- Agricultural machinery
- Road construction machines

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Intelligent car climate control system

## AVIATION EQUIPMENT AND TECHNOLOGIES. DRONES AND UAVS

### Study labs and demonstration equipment



Boeing 737, virtual simulator

#### Flight and operation skills simulators

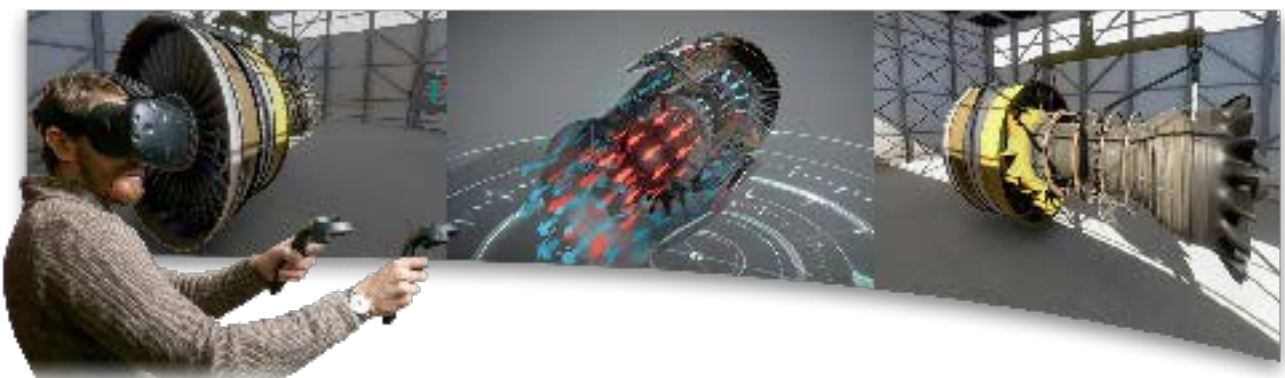
- «Procedural flight simulator-an entry-level piloting simulator»
- «Design, equipment and maintenance of the Boeing 737 cAACFM-56 family aircraft»
- «Technical operation and operational maintenance for Boeing 737 family aircraft with CFM-56 AD»
- «Design, equipment and systems of the Sukhoi Superjet 100 aircraft»
- «Technical operation of the Sukhoi Superjet 100 aircraft»
- «Technical operation and operational maintenance for Airbus 320 series family aircraft with IAEPW-1100 series engines»
- «Design, equipment and systems of the Airbus 320 series family aircraft with IAE PW-1100 series engines»
- «Design, equipment and systems of the IL-76MD90 aircraft»
- «Interactive training module – flight mechanics and the study of aircraft mechanization»
- «CFM-56-7b turbojet engine, functional model»



Technical operation and operational maintenance for Boeing 737 family aircraft with CFM-56 AD



Interactive training module – mechanics of flight and the study of aircraft mechanization



Turbojet engine configuration and operation principle



Simulator of a light-engine aircraft "Tecnam Sierra P2002"



Garmin 1000 computer simulator (based on a simulator device)



Procedural flight simulator-an entry-level piloting simulator



Procedural simulator of cadets-navigators' workstations, hard- & software complex



Design, equipment and systems of the IL-76ML90 aircraft, virtual software package



Garmin 1000, computer simulator (based on a touch monitor)

### Aircrafts and their systems

- «Simulator of a light-engine aircraft "Tecnam Sierra P2002"»
- «Simulator of a light-engine aircraft "Tecnam P2006 Twin"»
- «Boeing 737, virtual simulator»
- «Garmin 1000, computer simulator» (based on a touch monitor)
- «Garmin 1000 computer simulator» (based on a simulator device)
- «Simulator device "G1000"»
- «Garmin 430 computer simulator (based on a simulator device)»
- «Garmin 530 computer simulator (based on a simulator device)»
- «Simulator device "GNS430"»
- «Simulator device "GNS530"»
- «Preparation and life support systems of aircraft launch complexes»
- «Cessna-172 Simulator»
- «Cessna-172 simulator (Ultra Lite package)»
- «Delta-1-UP flying mini-vehicle, simulator»
- «Aircraft hydropneumoseystems»
- «Turbojet engine configuration and operation principle»
- «Airplane flap» (ST-GS-ZS-016-6LR-PC)
- «Tracking electrohydraulic steering actuators» (ST-GS-SEGRP-016-5LR-PC)
- «Pumping units of the main hydraulic system of a twin-engine aircraft» (ST-GS-NA-OGDS-016-9LR-PC)
- «Tracking hydromechanical steering drives» (ST-GS-GMRP-016-5LR-PC)
- «Aircraft chassis ST-GS-SHS-016-6LR-PC UAV»
- «Flying wing UAVs»
- «Multicopter UAVs»
- «UAV electronics and equipment»
- «UAV Piloting Simulator»
- «UAV and Microcontroller Assembly and Programming Laboratory»
- «Educational and research laboratory complex. Multichannel electrohydraulic redundant tracking drive» (SGU-MREGSP-016-36LR-01)



### Interactive manuals (CD) and classroom posters

- Launch and technical complexes of rockets and spacecraft
- Aircraft structures
- Flight operation of aircraft

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Wind tunnel (closed)



Laboratory of Aerodynamics and Aeromechanics with wind tunnel & special software



Configuration, principles of operation, functional processes of the PS-90 turbojet engine; turboshaft TVZ-117, etc.



Interactive models of aircraft engines

**Wind tunnels**

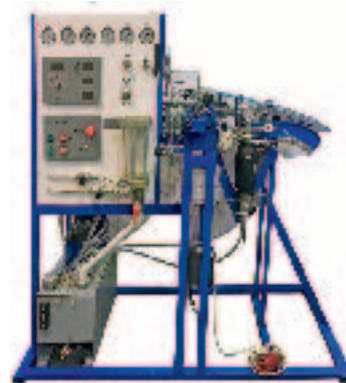
- «Wind tunnel (closed)»
- «Straight-flow wind tunnel»
- «Aerodynamics and Aeromechanics lab with wind tunnel & special software»
- «Educational and research laboratory complex "Multichannel electrohydraulic tracking redundant drive"» (SGU-MREGSP-016-36LR-01)

**Piloting skills simulators**

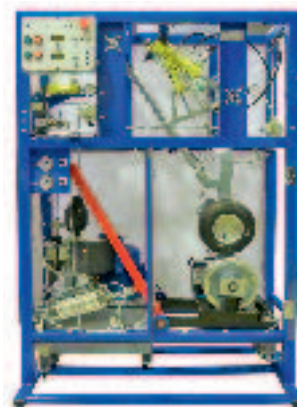
- «UAV piloting simulator (3 options)»
- «Assembly and programming of various UAVs»
- «UAV Prototyping Laboratory»
- «Diagnostics and repair of multirotor UAVs»
- «Diagnostics and repair of a wing-type UAV»
- «Multirotor type F450 UAV»
- «UAV electronics and equipment»
- «VR simulator - Hardware and operation of the Tachyon unmanned aviation complex»
- «Laboratory of Aerodynamics and Aeromechanics»



Aircraft meeting and visual signal testing, virtual simulator



Airplane flap ST-GS-ZS-016-6LR-PC



Aircraft chassis ST-GS-ShS-016-6LR-PK





Virtual simulator for procedural training of special cases during the flight on the MI-28N helicopter



Virtual training complex - Configuration and operation of radio-electronic equipment of the MI-28N helicopter



Complex-simulator for conducting operational maintenance forms of the Mi-8-MTB helicopter



Virtual training complex Design, configuration and systems of the Mi-8 helicopter



Configuration and design of the Mi-24 helicopter, virtual software package



Virtual training complex - Configuration and operation of radio-electronic equipment of the MI-8 MTV5 helicopter equipment



Procedural flight simulator-piloting simulator of the beginner level, hardware and software complex



Teaching & training stand – visual aid MI-28NE crew cabin (suspended wall version)



Virtual simulator for procedural training of special cases during the flight by Mi-8 helicopter

## DRONES AND UAVS

Study labs and demonstration equipment. Kits. Stands. Simulators



Remote control operator of a robotic electric transport device

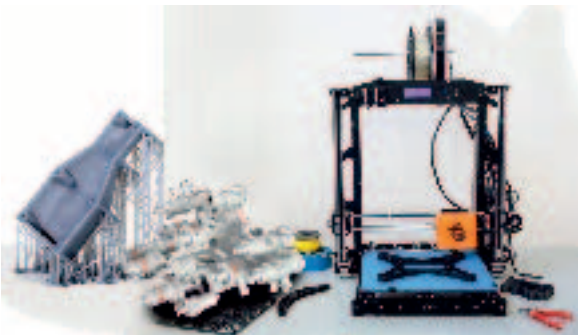


Multirotor type F450 UAV

- «A450 multirotor UAVs»
- «Flying wing UAVs»
- «Multicopter UAVs»
- «Assembly and programming of various UAVs»
- «UAV Programming Lab»
- «UAV piloting simulators (3 options)»
- «UAV electronics and equipment»
- «UAV Piloting Simulator»
- «UAV and Microcontroller Assembly and Programming Laboratory»
- «Educational and research laboratory complex. Multichannel electrohydraulic redundant tracking drive» (SGU-MREGSP-016-36LR-01)
- «Diagnostics and repair of multirotor UAVs»
- «Diagnostics and repair of a wing-type UAV (WSR)»
- «Material part and operation of the unmanned aircraft complex "Tachyon", VR SIMULATOR»
- «Gimbal Drone Test Bench, multirotor UAV testing, testing stand»
- «Automation, programming, control and assembly of UAVs»
- «Interactive models of aircraft engines»



Assembly and programming of various UAVs



UAV Prototyping Laboratory



Diagnostics and repair of a wing-type UAV



VR simulator - Hardware and operation of the Tachyon unmanned aviation complex



Flying wing UAVs



UAV piloting simulator (3 options)



UAV Piloting Simulator



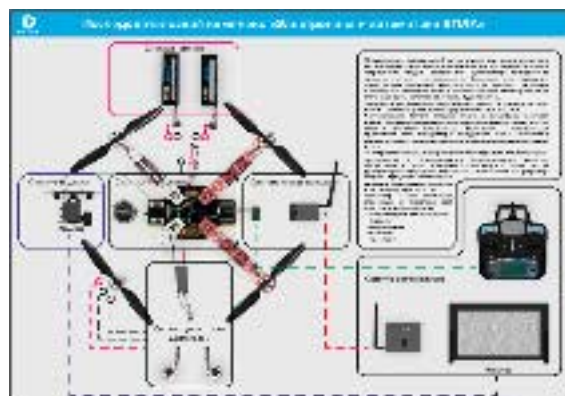
Laboratory of Aerodynamics and Aeromechanics



Automation, programming, control and assembly of UAVs



Simulator Operator of various UAV types



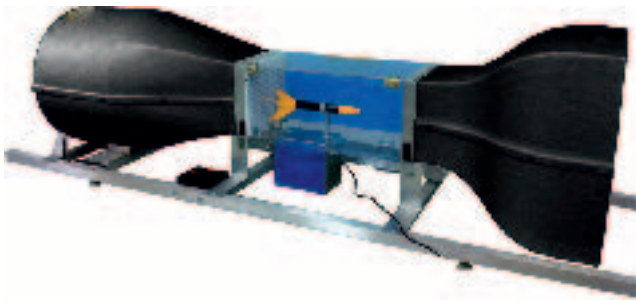
UAV electronics and equipment

## ROCKET AND SPACE TECHNOLOGY

### Study labs and demonstration equipment



Mock-ups of rocket technology with sections



A set of equipment for aerodynamic prototyping of model tests



Logistics, design and equipment of ground-based spacecraft complexes, virtual software package



Interactive demonstration of historical missions and launches, as well as promising space mission projects, virtual software package

### Aircraft engines (virtual simulators)

- «Configuration, principle of operation and working processes of the LRE, virtual training complex»
- «Configuration, principle of operation and working processes of RTTT, virtual training complex»
- «Turbopump units of liquid rocket engines, virtual software package»
- «Laboratory of flaw detection and internal non-destructive testing of GTE, virtual training complex»
- «LRE mock-up»

### Rocket and space complexes and equipment (virtual simulators)

- «Configuration and design of the Energia launch vehicle, virtual training complex»
- «Configuration and design of the SATURN V launch vehicle, virtual software complex»
- «Application of the emergency rescue system during the launch of spacecraft of the Soyuz series, virtual training complex»
- «Composition of the International Space Station, virtual training complex»
- «Logistics, design and equipment of ground-based spacecraft complexes, virtual software package»
- «Interactive demonstration of historical missions and launches, as well as promising space mission projects, virtual software package»

### Astronomy and Celestial mechanics (virtual simulators)

- «Interactive three-dimensional model of the Solar system, virtual stand»
- «Visualization of the concept of jet propulsion, Tsiolkovsky formula, virtual software package»
- «Fundamentals of Celestial Mechanics, Kepler's laws and universal gravitation, virtual software package»

### Physical operating models of rocket and space technology

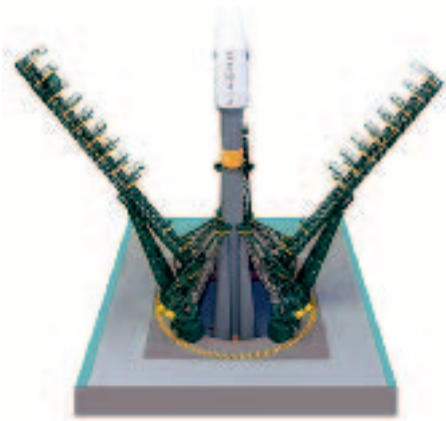
- The current mock-up of the «Vostochny cosmodrome»
- The current mock-up of the «launch site of the Soyuz-2 launch vehicle»
- Mock-ups of «Rocket technology with sections»
- «Current models of turbopump units of the LRE»

### Prototyping and mocking-up in rocket and space technology

- «Laboratory complex of digital design and prototyping of spacecraft»
- «Laboratory of Structural and Layout Design and Prototyping of Spacecraft»
- «A set of equipment for aerodynamic prototyping of model tests»
- «UAV Prototypes Laboratory»

### Rocket and space complexes and equipment (virtual simulators)

- «Structure and the design of the operational tactical missile R17, virtual training complex»



- «The structure and design of Proton family launch vehicles, virtual training complex»
- «Configuration and principle of operation of various ballistic missiles, virtual training complex»
- «Design and construction of ballistic missiles by the example of the R2 rocket, virtual training complex»
- «Spacecraft design by the example of SOYUZ TMA, virtual training complex»
- «Configuration, design and principle of operation of Soyuz-2 missiles, virtual training complex»
- «Three-dimensional atlas of modern military equipment, virtual training complex»
- «Three-dimensional atlas of modern military equipment with a VR module, virtual training complex»

#### Models

- Interactive operating model of the radar station by the example of the radar complexes of the "Nebo" series"



Device, principle of operation and working processes of liquid rocket engines (RD-180 LRE), emulator



The current mock-up of the Vostochny cosmodrome



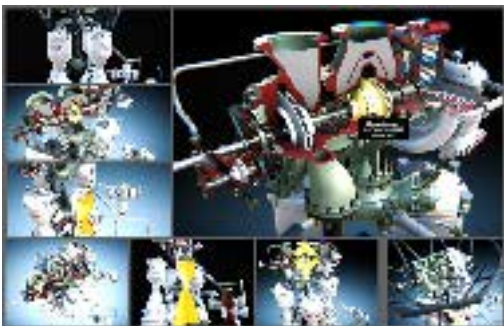
Rocket Engine Testing System, emulator



Configuration, principle of operation and working processes of the LRE, virtual training complex



LRE mock-up



Turbopump units of liquid rocket engines, virtual software package



Current models of turbopump units of the LRE



TE pumps and turbopump units of LRE, emulator



Design, principles of operation and LRE working processes, emulator



Design, operating principle and working processes of solid-fuel rocket engines, emulator

- Large-scale interactive mock-up of the PK-24 Yars - 15P155M Missile system»
- Mock-up of the «15V180 combat control vehicle of the RS-24 Yars missile system»
- Mock-up of the «15V190 communication vehicle of the RS-24 Yars missile system»
- Mock-up of the «Combat duty support vehicle 15V240 of the RS-24 Yars missile system»
- Mock-up of «PU 9K720 OTRK Iskander-M»
- Mock-up of the «PU 9K720 OTRK Iskander-M in the starting position»
- Mock-up of the «3M24 Kalibr-K2 Missile Container Complex with X-35UE missiles»
- Mock-up of the «Club-K missile weapon container complex
- Mock -up of the «BPRK Bal machine»
- Mock-up of the «Bal missile system monted on MAZ-543»
- Mock-up of the «launcher 2P16 of the Luna complex»
- Mock-up of the «Luna-M missile system»
- Mock-up of the «Topol missile system»
- Mock-up of «MS Topol branding S7»
- Mock-up of the «Combat duty support vehicle PGRK Topol»
- Mock-up of the «Tochka missile system»
- Mock-up of the «Operational-tactical missile system Oka»



Turbopump units of liquid rocket engines, emulator



Control systems and high-precision missile (projectile) guidance, emulator

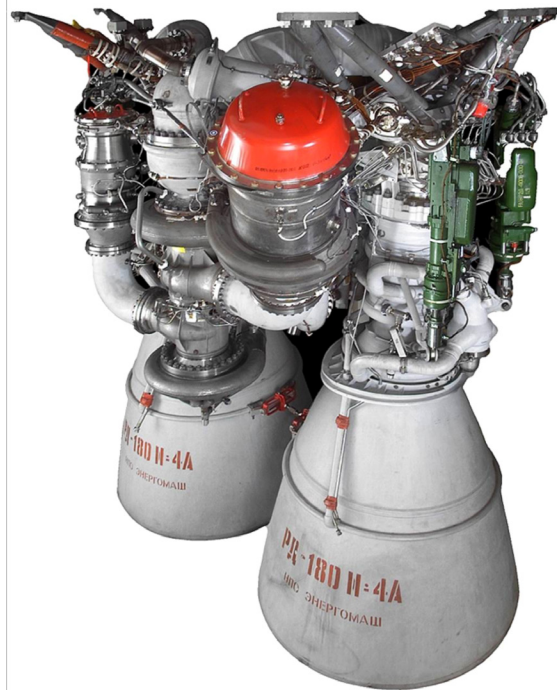


Stellar correction and missile guidance systems, emulator

- Mock-up of the «OTRK Elbrus based on the unit 2P19»
- Mock-up of the «9K72 Elbrus tactical missile system»
- Mock-up of the «SKAD missile system»
- «Research of gyroscopic sensors, standard set of educational equipment:
  - desktop version with laptop, IGD-NN
  - desktop version with laptop IGD-NN or IGD2-NN;
  - computer stand version IGD-SK or IGD2-SK»
- «Servo drive and stabilization systems, standard set of educational equipment, stand design»



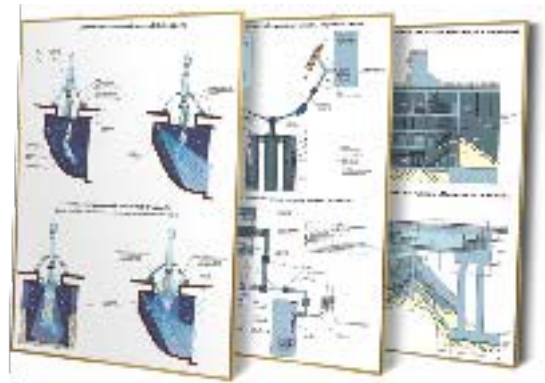
Logistics, configuration and equipment, emulator of a launch complex of the cosmodrome, emulator



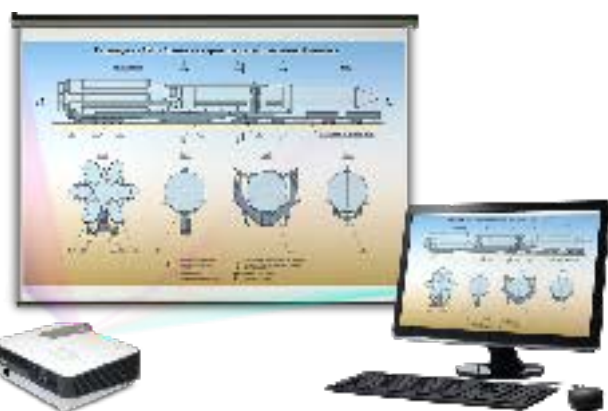
Liquid rocket engine, emulator



Methods of preparation and refueling with liquid components of special products, laboratory complex



Tracking systems for managing heavy loads, laboratory complex



#### Interactive manuals (CD) and classroom posters

- Launch and technical complexes of rockets and spacecraft

#### Demonstration complexes

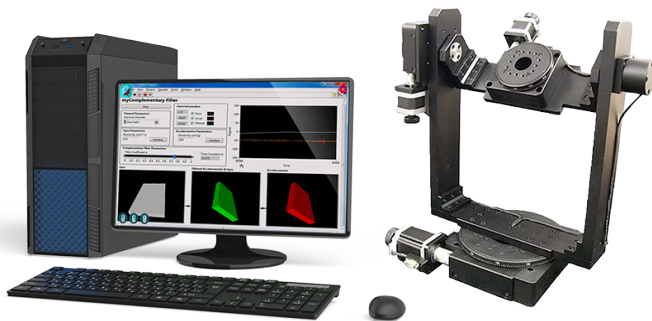
- Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# GYROSCOPY. NAVIGATION AND AIRCRAFT MOTION CONTROL SYSTEMS

Study labs and demonstration equipment



Laboratory of dynamics, inertial navigation and aircraft control



Micromechanics, lab workshop

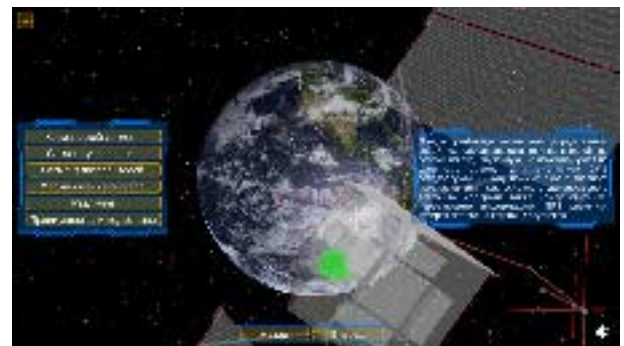


The design and the principle of operation of various flight and navigation devices



Design and principles of stellar correction in ICBMs

- Dynamics, navigation and control**
- «Laboratory of dynamics and semi-natural simulation of aircraft flight»
  - «Euler angles during the movement of a movable coordinate system, laboratory unit»
  - «Micromechanics, lab workshop»
  - «The configuration and principle of operation of various flight navigation devices»
  - «Design and principles of stellar correction in ICBMs»
  - «Hardware and software complex for the study of navigation and guidance methods based on optical sensors»
  - «Methods to represent the spatial position of objects»
  - «Physical visual aids and current mock-ups»
  - «Servo drive and stabilization systems – 2 (SST2-SK)»



GPS Security, virtual tutorial



Servo drive and stabilization systems — 2 (SST2-SK)





Research of gyroscopic sensors (IGD-NN, IGD-SK)



Research of gyroscopic sensors-2  
(IGD2-NN, IGD2-SK)



Physical visual aids and current mock-ups



Study of the principle of operation of a laser gyroscope



Hardware and software complex for the study of navigation and  
guidance methods based on optical sensors



Gyroscope, laboratory stand

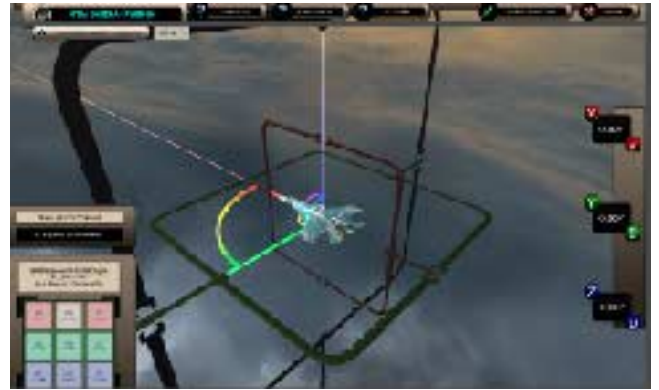
- «Study of homing methods using various sensors and vision techniques»
- «Design and principles of operation of inertial navigation systems based on a three-axis gyro stabilizer»
- Investigation of optical navigation methods using CV methods»
- «Design, composition and principle of operation of free-form navigation systems (BINS)»

#### Gyroscopes

- «Research of gyroscopic sensors» (IGD-NN, IGD-SK)
- «Investigation of gyroscopic sensors-2» (IGD2-NN, IGD2-SK)
- «Virtual laboratory of gyroscopic sensors and inertial navigation systems of rockets»
- «Measurement of gyroscope parameters, laboratory unit
- «Gyroscope, laboratory stand»
- «Principle of operation of a laser gyroscope (study of the Sagnac effect), laboratory stand»
- «Laser gyroscope, virtual visual aid»
- «Virtual simulator of the operation of a solid-state wave gyroscope»
- «Virtual visual aid Fiber-optic gyroscope»

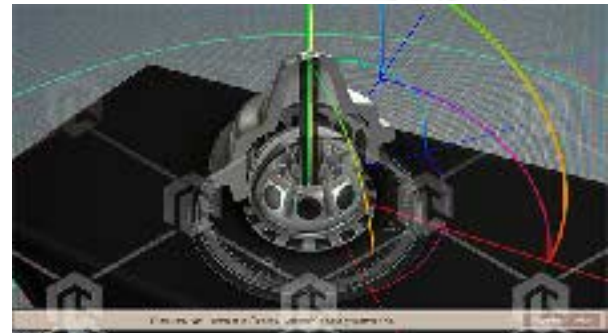
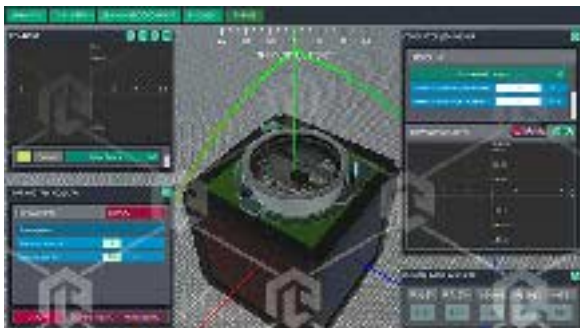


Device and principles of inertial navigation systems based on triaxial hydraulic stabilizer



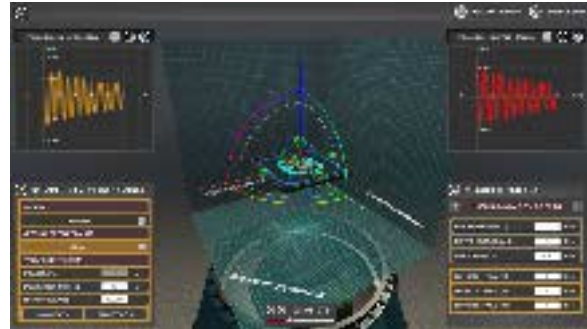
Virtual laboratory of gyroscopic sensors and inertial navigation systems of rockets

Ways of representing the spatial position of objects (Euler angles and quaternions)



Fiber Optic Gyroscope

Solid-state wave gyroscope



Device and principle of operation of various ANN sensors

Laser gyroscope



Measurement of gyroscope parameters



Euler angles (TM-DM-UE-014)



Principle of operation of a laser gyroscope (study of the Sagnac effect), laboratory stand



**Training and methodological complexes (didactic software, electronic and printed posters, laptop, projector):**

- Fundamentals of gyroscopy and navigation LP
- Navigation systems and ways to suppress LP-Nvg
- Navigation applications of space technology LP-Ksm
- Infrared reconnaissance and search facilities LP-IKRP

# RAILWAY TRANSPORT AND TRACK FACILITIES

## Study labs and demonstration equipment



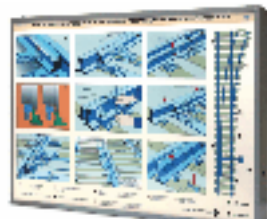
Storage cabinet for board stands



Classification of defects and damages of switch elements



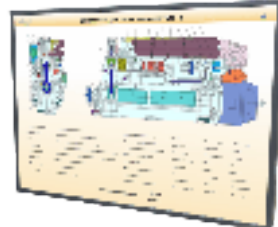
Engineer's crane



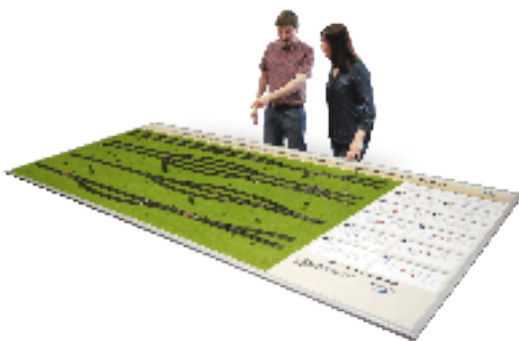
Malfunctions of switches requiring urgent elimination



Scheme of track development at the stage and station



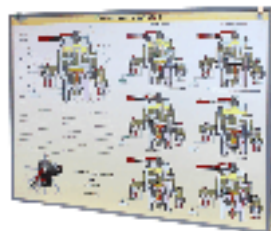
Diesel engine of the TEM-18 diesel locomotive



Fencing of obstacles for the movement of the train and places of work



Trucks of freight cars, their malfunctions



Engineer's crane

### Path and track facilities

#### Board-stands (16+ varieties)

- «Storage cabinet for board stands»
- «Classification of defects and damages of switch elements»
- «Trackwork on a jointless track»
- «Malfunctions of switches requiring urgent elimination»
- «Scheme of track development at the stage and station»

#### Demo mock-ups

- «Fencing of obstacles for the movement of the train and places of work»

### Traction rolling stock

#### Training stands

- «Locomotive braking system»

#### Board-stands (80+ varieties)

- «Diesel engine of the TEM-18 diesel locomotive»
- «Engineer's crane»

#### Split-type items

- «TK-41 turbocharger, ChME3 diesel locomotive truck, combined diesel regulator, diesel locomotive fan hydraulic drive, gas distribution mechanism and limiting governor»

#### Demo mock-ups

- «Fuel, oil and water systems of diesel D100, oil, water and fuel system of diesel 1A-9D, fuel, oil and water systems of diesel D50»

### Wagons and wagon facilities

#### Training stands

- «Freight car brake system»

#### Board-stands (35+ varieties)

- «Trucks of freight cars, their malfunctions»
- «Automatic coupling device and its malfunctions»
- «Solid-rolled wheel»
- «SAUT-CM interaction with wayside facilities»

#### Demo mock-ups

- «Automatic coupling of the car SA-3»
- «Trolley 68-4096 with disc brakes»

### Facilities and devices of the SCB

#### Training stands

- «SCB electric motor, SCB transformer, track box, installation, commissioning and testing of light alarm devices»

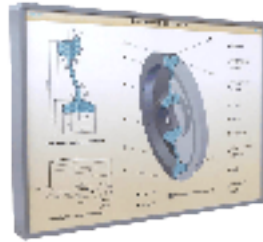
### Railway special equipment

#### Board-stands (10+ varieties)

- «Trolleys, motor vehicles, motor vehicles and their characteristics, inspection of the motor vehicle, trolley, motor vehicle at the reception and delivery of the shift, malfunctions of the crew part, hydraulic transmission UGP-230, lifting crane MPT-4, snowplow SM-2, Control circuit, power supply and lubrication of hydraulic transmission, etc.»



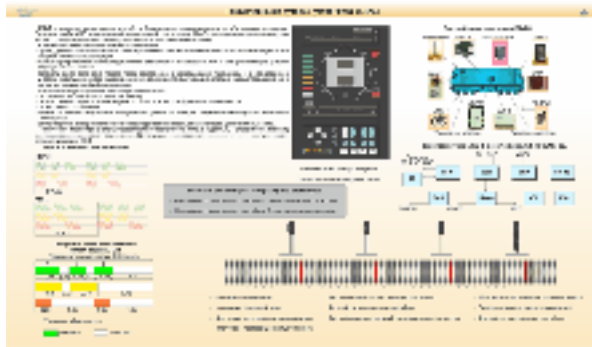
Automatic coupling device and its malfunctions



Solid-rolled wheel



SAUT-CM interaction with wayside facilities



Locomotive and track devices CLUB



Traffic light alarm system (computer controlled)



Driver of the VL11M electric locomotive

### Traffic safety

#### Board-stands (10+ varieties)

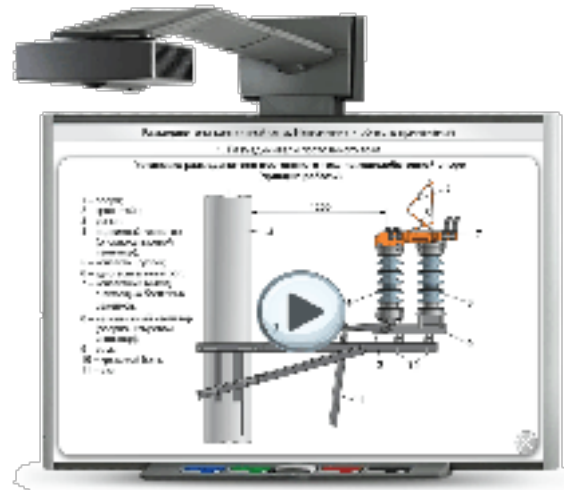
- «Locomotive and track devices CLUB»Traffic light alarm system (computer controlled)

#### Training simulators (more than 18 names)

- «Driver of the VL11M electric locomotive»
- «Driver of the TEM2 shunting locomotive»



Driver of the TEM2 shunting locomotive



#### Interactive manuals (CD) and classroom posters

- Electric substations of electrified railways
- High voltage technology
- Power supply networks design and maintenance
- Rolling stock design, maintenance and repair

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# MARINE AND RIVER EQUIPMENT. SHIPBUILDING

## Study labs and demonstration equipment



Vibration testing of vessels



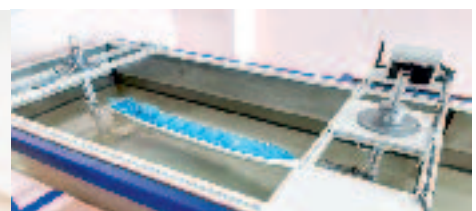
Virtual simulator for managing small vessels



Steam turbine power plants, VLS



Rowing electric devices with propulsion and steering complexes, training stand



Laboratory of hull ship design and prototyping

### Ship design

- «The structure and design of the Arctic Class I icebreaker 8 nuclear fuel tank»
- «Study of architectural and structural types of modern timber-package trucks»
- «Study of architectural and structural types of modern bulk carriers»
- «Study of the Aframax class tanker design and its special systems»
- «Study of the architectural and structural type of a vessel by the example of a vessel of the type Helmet Alice/Izvestia»
- «Basic concepts of the geometry of the hull shape (ship surface)»
- «Design of the main elements of a ship power plant, distribution of electricity to current consumers, virtual stand»
- «Structural elements of ship systems of tankers»
- «Design and construction of the ship's hull»
- «Determination of ship stability, physical stand»
- «Vibration testing of vessels, training stand»
- «Principle of operation and arrangement of ballast tanks, training stand»
- «Laboratory of Hull Ship Design and Prototyping»
- «V.U.K. Logistics of modern shipbuilding complexes, laboratory»

### Ship management

- «Virtual simulator for managing small vessels»
- «Simulator of a gantry crane (port)»
- «Ship management, vessel towing and anchoring, virtual laboratory»
- «Marine power systems and units»
- «Marine electric power generators, VLS»
- «Ship electrical energy converters, VLS»
- «Ship power plant with a halogen generator set, training stand (or emulator)»
- «Ship power plant with valve generator sets, training stand (or emulator)»
- «Diesel power plants, VLS»
- «Gas turbine power plants, VLS»
- «Steam turbine power plants, VLS»
- «Nuclear power plants, VLS»
- «Emergency sources of electric energy, VLS»
- «Ventilation and air conditioning, VLS»



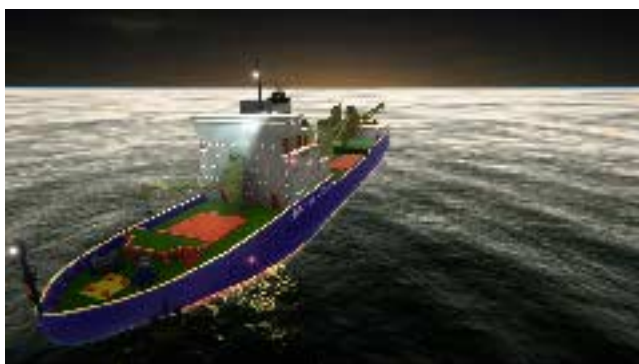
Tools and apparatuses of ship systems



Electric drives of ship systems



Operation and repair of shipboard electrical equipment

Shipboard cable network.  
Diagnostics of shipboard electric cables and networks

Shipboard lighting and alarm systems



Shipboard electric equipment

### Electric drives, equipment and instrumentation

- «Rowing electric devices with propulsion and steering complexes, training stand»
- «Lateral thrusters with adjustable and fixed pitch screws, training stand»
- «Electric rowing units, VLS»
- «Electric drives of ship systems, VLS»
- «Emergency engines and batteries, VLS»
- «Electrical equipment of vessels, VLS»
- «Devices, tools and apparatuses of ship systems, VLS»
- «Systems of control, diagnostics and automatic control of ship systems, VLS»
- «Diagnostics of ship power plants, VLS»

### Marine power systems and units

- «Marine electric power generators, virtual laboratory stand»

### Electric drives of devices and critical mechanisms, instrumentation and control

- «Electric drives of ship systems, virtual laboratory stand»
- «Electric drives of deck mechanisms, virtual laboratory stand»

### Electrical equipment of ship systems

- «Electrical equipment of ships, virtual laboratory stand»
- «Ship cable network, virtual laboratory stand»
- «Tools and units of ship systems, virtual laboratory stand»
- «Ship power plant with a shaft generator set, virtual laboratory stand»

### Automation of ship systems

- «Remote control of the main ship power plant, virtual laboratory stand»

### Diagnostics and repair of ship systems

- «Diagnostics of ship electrical cables and networks, virtual laboratory stand»
- «Operation and repair of ship electrical equipment, virtual laboratory stand»



### Interactive manuals (CD) and classroom posters

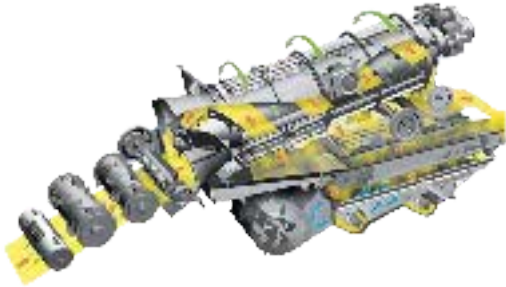
- River vessels

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# AGRICULTURAL MACHINERY AND TECHNOLOGY

## Study labs and demonstration equipment



Don Torum combine thresher

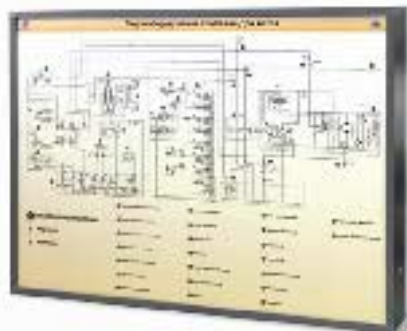


Working bodies of the cultivator KPM-b

Working body of the plow PLN-3-35



Seeding machines



Combine Don Acros

### Tillage machines

#### Lab stands

- «Soil channel»

#### Training stands

- «Cultivator KLDN-4»

#### Board-stands with natural parts

- «Working bodies of the cultivator KPM-b»
- «Working body of the plow PLN-3-35»
- «Working body of the cultivator KPE-3.8»
- «Working bodies of the fertilizer machine RUN-0.8»
- «Working bodies of the cultivator KON-2.8»
- «Working bodies of the BDN-3.2 harrow»

### Sowing machines

#### Training stands

- «Seeder for beet sowing SST-12»
- «Potato planting machine KSM-6»
- «Grain seeder SZ-3»

#### Board-stands

#### Board-stands with natural parts

- «Sowing machines»
- «Working bodies of the potato planter KSM-6»
- «Working bodies of the grain-grass seeder SZ-3.6»

### Harvesting machines

#### Lab stands

- «Don Torum combine thresher»
- «Don Acres Combine thresher»

#### Training stands

- «Controls of the combine harvester Don Acros»
- «Potato digger KST-1.4»
- «Harvester ZhVN-6»
- «POWER STREAM header»
- «Board-stands with natural parts»
- «Working bodies of the harvester ZhVN-6A»
- «Working bodies of the KS-6B root harvester»
- «Cutting machine with planetary gear SHUMACHER»
- «Light-dynamic board-stands»
- «Electric equipment of the combine Don Acros»
- «Hydraulic equipment of the combine Don Acros»
- «Combine Don Acros»

### Machine and tractor park

#### Lab stands

- «DT-75 crawler tractor attachments»
- «Belarusian-800 tractor attachments»
- «K-700 tractor attachments»

### Mechanization of animal husbandry

#### Lab stands

- «Milk separator. Design, technological process»
- «Milking machine»

#### Training stands

- «Straw chopper POON-5A»
- «Seed cleaning machine SM-4»
- «Scraper conveyor»
- «Board-stands»
- «Board-stands with natural parts»

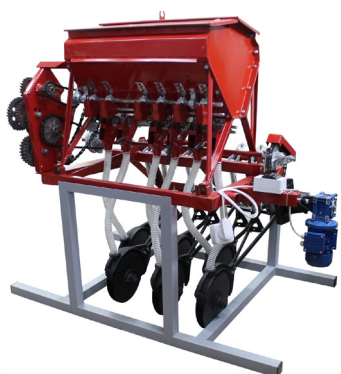




Milk separator. Design, technological process



Agronomist-Field Expert



Grain seeder SZ-3.6



Control systems of the dairy post of milking cows



Operation of the automatic control system of the granary equipment

- «Milking machine»
  - «Working bodies of the straw shredder PUN-5A»
  - «Milk separator»
  - «Shearing machine»
  - «Equipment for outdoor poultry keeping»
- Light-dynamic board-stands
- «Centralized vacuum system of a dairy farm»
  - «Technological process of preparation of feed for cattle»

#### Agronomy

##### Lab stands

- «Agronomist-field expert»
- «Agrochemical soil survey»

#### Automation of industrial processes in agriculture

##### Lab stands

- «Technological circuits, equipment and schemes of automatic control of watering plants»
- «Ventilation and air conditioning systems of poultry houses»
- «Air purification and disinfection systems in poultry houses»
- «Operation of a set of equipment for outdoor poultry keeping»
- «Operation of the lighting control system in the poultry house»
- «Control systems of dairy cow milking station»
- «Operation of the automatic control system of the granary equipment»
- «Operation of the automation system of grain cleaning and sorting processes»

#### Agricultural equipment and appliances

##### Lab stands

- «Animal feed analysis»



#### Interactive manuals (CD) and classroom posters

- Agricultural machinery
- Tractors. Tractor diesels
- Road construction machines
- Vehicle configuration
- Electrical equipment of the car
- Internal combustion engines
- Automotive operational materials
- Maintenance and repair of machines in rural areas.

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# MINING MACHINES AND TECHNOLOGIES

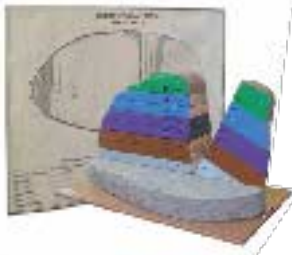
## Study labs and demonstration equipment



Tunneling combine



Portable perforators, telescopic, Pneumatic support PPZ, Pneumatic drill, etc.



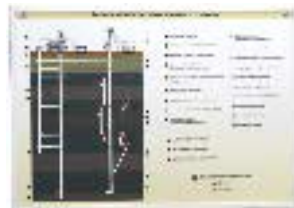
Horizontal occurrence of rocks



Open mining of mineral deposits



Elements of the occurrence of layers



Technological schemes of a mining enterprise



Automation of continuous transport systems

### Physico-chemical properties of rocks

#### Stands with natural parts

- «Classification of rocks on the scale by M. M. Protodyakonov»
- «Collections of minerals and rocks»

#### Light-dynamic board-stands

- «Shifting of rocks under the influence of mining»
- «Stability of the quarry sides and slopes»
- «Methods of calculating reserves of mineral deposits»

#### Demo models/mock-ups

- «Elements of the occurrence of layers»
- «Horizontal occurrence of rocks»
- «Forms of intrusive bodies»

#### Educational laboratory equipment

- «Mills, Laboratory tablet press, Heating incubator, Dielectric testing apparatus»

### Drilling machines and installations

#### Training simulators

- «Portable perforators, telescopic, Pneumatic support PP3, Pneumatic drill, etc.»

#### **Board-stands**

- «Impact drilling machine – portable perforator, Air distribution devices of perforators, Drill bits of perforators, Jackhammer»
- «Rotary drilling machine (core drill EBG1/Boart Longyear)»

### Mining machines and complexes

- «Cutting tools of ploughs, cleaning and tunneling combines»
- «Cleaning and tunneling combines, Coal plow, Mechanized support»
- «Loading-transporting and drilling-loading machines»
- «Coal-mining mechanized plow and combine complexes»
- «Shield tunneling and tunnel combine complexes»

### Mining vehicles

#### Training simulators

- «Inclined and straight belt conveyors»
- «Roller system driven»
- «Screw conveyor»

### Mining technology

#### Board-stands

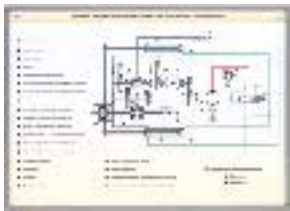
- «Technological schemes of a mining enterprise, ore and mine lifting, mine degassing and drainage of mine fields, in the pit bottom and on the mine surface»
  - «Stationary mine units»
  - «Charge designs: solid core, dispersed core, boiler»
  - «Transfer of the altitude mark to the min»
  - «Centrifugal pump design»
  - «Piston compressor»
  - «Scheme for controlling the operation of pumps depending on the water level in the catchment area»
- #### Demo models/mock-ups
- «Explosive quarry block»
  - «Underground mining of mineral deposits»



Screw conveyor



Roller system driven



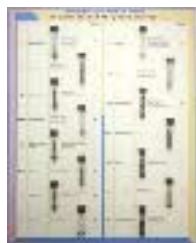
Rotary drilling machine (core drill EBG1/Boart Longyear)



Mining machines and technological processes in the mine



Elements of the occurrence of layers



Classification of rocks on the scale by M. M. Protodyakonov



Screen, Slurry centrifugal pump type Warman 6/4

### Automation of continuous transport systems

- «Centrifugal pump design»
- «Piston compressor»
- «Scheme for controlling the operation of pumps depending on the water level in the catchment area»
- «Axial fan demo mock-up»

### Open-pit mining/Mineral enrichment

- «Modeling of ore drawing, training stand»
- Board-stands
- «PKU front loader, EKG quarry excavator, Quarry Grader, Quarry bulldozer, BelAZ type quarry dump truck, Ground drilling rig for blasting in sections»
  - «Technological schemes of coal mining, mineral processing, open-pit coal mining»
  - «Heavy suspension separator, Light Fraction Screen, Demagnetizer, Thickener, Magnetic Separator, Hydrocyclone, Jigging Machine, Heavy Fraction Screen, etc.»

### Demo models/mock-ups

- «Open mining of mineral deposits»
- «Screen, Slurry centrifugal pump of the Warman 6/4 type, Enrichment plants in a heavy-medium cyclone/by flotation, Conveyor belt, Horizontal centrifuge, Classification Hydrocyclone, etc.»

Posters: screw centrifuge; wedge, slide, ball valves; dewatering vibrating centrifuge

### Interactive stands/virtual reality/software and methodological complexes

- «Open-pit mining, e-textbook»
- «EKG Excavator, Dragline, Rotary Excavator»
- «Mining machines and technological processes in the mine»
- «Mine compressors, pumps, lifts, trolleys»
- «Coal, Copper-zinc ores, Production of iron ore pellets, Gold, Appatite-nepheline ores»

### Simulators

- «Quarry bulldozer, EKG excavator, SBSH-250 drilling rig»
- «Boomer, Simba drilling machine «
- «Caterpillar loader and transporter»
- «Ural-20R continuous heading machine»



### Interactive manuals (CD) and classroom posters

- Electric drive and automation of mining operations
- Internal combustion engines
- Hydraulics, hydraulic drive and hydraulic automation
- Pneumatic drive and pneumatic automation
- Industrial & occupational health & safety

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

## OIL AND GAS. MINING, TRANSPORTATION AND STORAGE

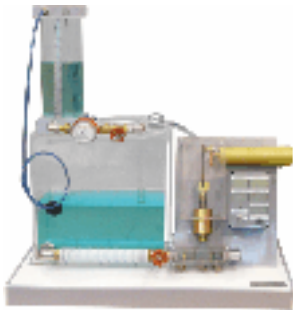
## Study labs and demonstration equipment



Model of a rod pumping unit  
(NFT-MShNU-010-5LR-01)



Hydraulic piston pumping unit  
model (NFT-MHPNU-010-5LR-01)



Piston pump (SGU-NP-010-  
4LR-01-R)



Gazlift (NFT-GZL-010-7LR-  
01-R)



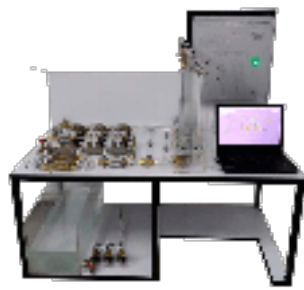
Piston compressor (PK-010-  
4LR)



Pumping stations of petroleum  
products transportation systems  
(NFT-NS-010-5LR-01-R)



Hydraulic characteristics of the  
oil reservoir model (NFT-MNP-  
GKh-011-4LR-01-PK)



Oil pumping station and oil  
storage tank farm

**Oil production**

- «Model of a rod pumping unit» (NFT-MShNU-010-5LR-01)
- «Model of a hydraulic piston pumping unit» (NFT-MGPNU-010-5LR-01)
- «Model of pneumatic piston pumping unit» (NFT-MPPNU-010-5LR-01)

**Piston pumps**

- «Piston pump» (SGU-NP-010-4LR-01-R)
- «Piston pump» (SGU-NP-010-5LR-01-PC)
- «Automation of a pumping station with a piston pump» (ANS-PN-6LR-10-01)

**Lifting oil with the use of a gas lift**

- «Gazlift» (NFT-GZL-010-7LR-01-R)
- «Gazlift» (NFT-GZL-010-7LR-01-PK)

**Compressors and vacuum pumps**

- «Piston compressor» (PK-010-4LR)
- «Operating processes of a reciprocating compressor» (RPPK-010-5LR)
- «Vacuum piston pump» (PVN-010-4LR)
- «Operating processes of a reciprocating vacuum pump» (RPPVN-010-5LR)
- «Automation of a compressor station with a reciprocating compressor» (AKS-PK-6LR-10-01)

**Hydraulic characteristics of the oil reservoir model**

- «Hydraulic characteristics of the oil reservoir model» (NFT-MNP-GKh-011-4LR-02-R)
- «Hydraulic characteristics of the oil reservoir model» (NFT-MNP-GKh-011-4LR-01-PK)
- «Hydraulic characteristics of the oil reservoir model» (NFT-MNP-GKh-010-6LR-02-R)

**Oil and gas transportation**

- «Oil pumping station and oil storage tank farm»
- «Fluid Mechanics – hydraulic shock» (MZh-GU-10-6LR-01)
- «Pumping stations of petroleum products transportation systems» (NFT-NS-010-5LR-01-R)
- «Automation of pumping stations of petroleum products transportation systems» (NFT-NS-010-13LR-01-PK)
- «Pumping station control system»
- «Oil separation»
- «Gas pressure regulator of the RDO type (LP-GA2), automated training system»



Gas pressure controller of the RDO type LP-GA2,  
automated training system



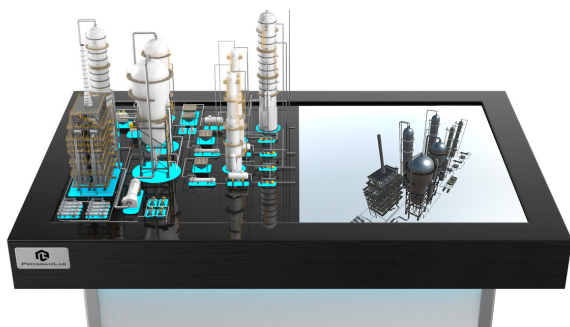
Automation of pumping stations of petroleum products transportation systems (NFT-NS-010-13LR-01-PK)



Pumping station control system



Oil separation



Oil and gas refining, interactive mock-up set

- «Natural gas supercharger 398-23-1LSM (LP-GA2), automated training system»

#### Oil and gas refining, interactive mock-up set

- «Atmospheric block»
- «Vacuum unit»
- «Isomerization Unit»
- «ELOU Block»
- «Catalytic cracking unit»
- «Catalytic reforming unit»
- «Hydrotreating unit»
- «Gasoline re-distillation»
- «Stabilization column»

#### Visual and functional mock-ups

- «Reservoir park»
- «Strainer rectification column»
- «Unit of oil separation from gas and water»
- «Unit of secondary distillation of gasoline»
- «Atmospheric oil distillation column»
- «Gasoline stabilization column»



Visual and functional mock-ups

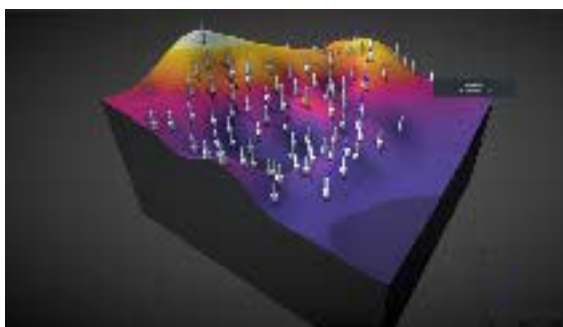
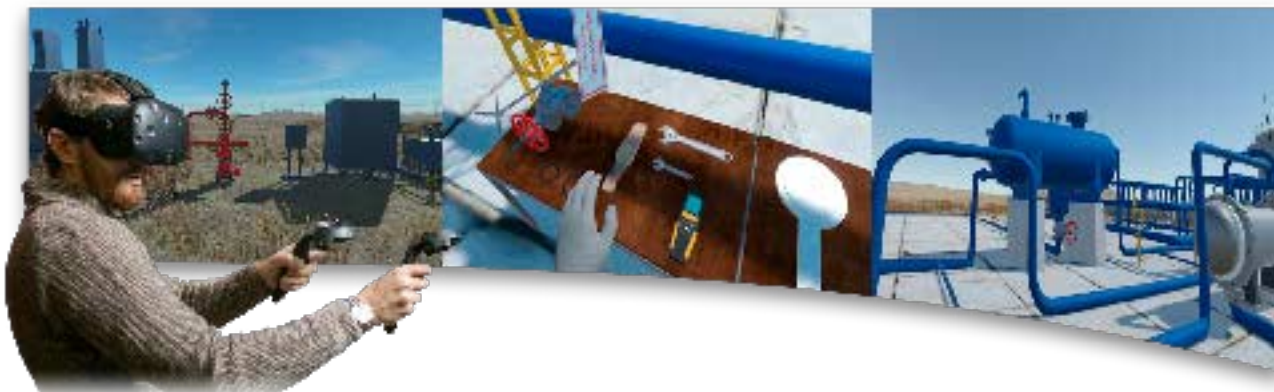


#### Interactive manuals (CD) and classroom posters

- Pumps and pumping units
- Compressor and vacuum equipment
- Hydraulics and hydraulic drives
- Industrial & occupational health & safety

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



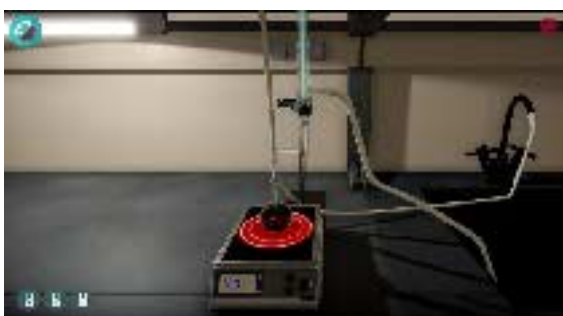
Geology and oil and gas production



Oil and gas treatment and processing



Oil and gas transportation and storage



Petrochemistry

### Geology and oil and gas production

- «Construction and analysis of the facial map»
- «Principle of geophysical research of wells»
- «Migration of hydrocarbons in the Earth's crust»
- «Simulator of well drilling technology»
- «Drilling rig design and equipment»
- «Operation of gas wells»
- «Training simulator of hydraulic fracturing technology»
- «Operation of wells with rod pumps»

### Oil and gas treatment and processing

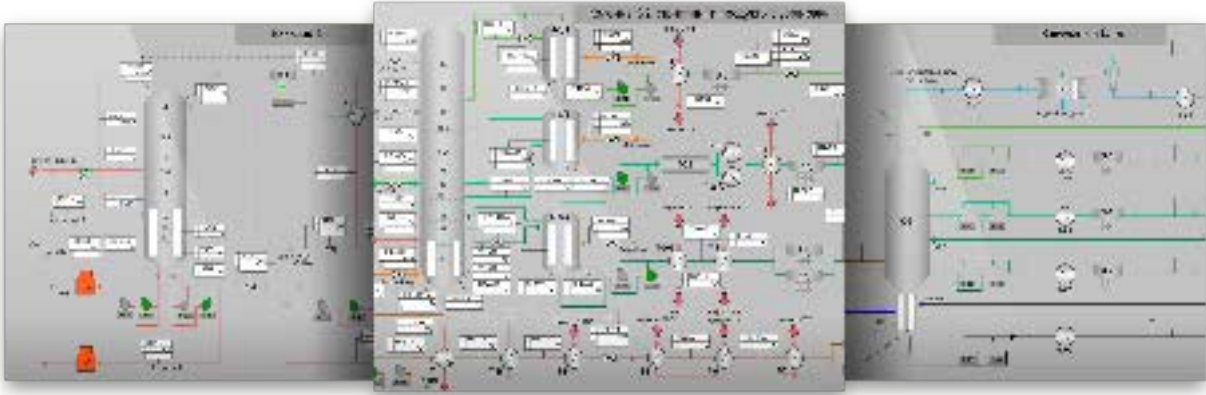
- «Design of gas compressors»
- «Design of a radiant convection tube furnace»
- «Arrangement of heat exchangers»
- «Design of the heat recovery boiler»
- «Features of primary oil refining» (ELOU-AVT)
- «Technological features of catalytic cracking»
- «Technological features of hydrotreating»
- «Technological features of catalytic reforming»

### Oil and gas transportation and storage

- «Laying of the oil and gas pipeline» (underground, ground)
- «Deep-sea offshore pipeline systems»
- «Gas liquefaction»
- «Features of types of transportation of oil and gas products»
- «Fittings of the oil and gas pipeline»
- «Bypass and detection of defects of the oil and gas pipeline section»
- «Gate replacement»
- «Replacement of flange connection gaskets»

### Petrochemistry

- «Dewaxing»
- «Pyrolysis»
- «Determination of viscosity of oil and petroleum products»
- «Determination of the fractional composition of oil»
- «Determination of oil density»
- «Determination of the water content in the composition of oil»
- «Determination of the content of chloride salts and oil»
- «Determination of low-temperature characteristics of the properties of oil and petroleum products»



Simulator of the technological unit of primary oil refining



Digital production processes AR-training courses for personnel of the Automated Control System "Transneft"



Digital twin of the gas compression shop of JSC "Taneco"



Gazprom Turbine

# CONSTRUCTION MATERIALS. MACHINES AND TECHNOLOGIES

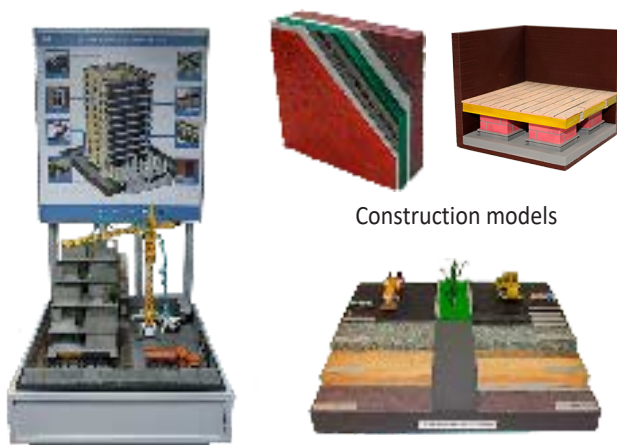
## Study labs and demonstration equipment



Construction materials, machines and technologies



Asphalt concrete plant mock-up



Construction models

Construction of a residential building

Road works



Crane operator simulator

### Mock-ups of construction plants

- «Concrete plant mock-up»
- «Asphalt concrete plant mock-up»
- «Cement plant mock-up»
- «Construction of a residential building, interactive model»

### Construction production technology

- «Reinforcement work technology»
- «Technology of shuttering works»
- «Masonry technology»
- «Technology of work on the device of protective and insulation coatings»
- «Technology of finishing works»
- «Slinging operations»

### Road works (technology and organization of construction)

- «Cement concrete and airfield coatings»
- «Road interchanges»
- «Automobile bridges»
- «Automobile overpasses»
- «Automobile overhead roads»
- «Automobile tunnels»
- «Railway overpasses»
- «Quality control of road works and road markings»

### Construction demonstration kits

- «Nails, wall pins and anchors»
- «Types and groups of building mortars»
- «Various options of plastering works for interior and exterior decoration»
- «Concrete production»
- «Production of cement, lime and gypsum»
- «Measuring instruments used in construction»

### Construction materials

- «Sound insulation materials»
- «Thermal insulation materials»
- «Mechanical testing of materials»
- «Rods and beam»
- «General bent rod stability»
- «Model of load-bearing structures of an industrial building»
- «Longitudinally compressed rod stability»

### Construction machines

- «Crane operator simulator» (simulator)
- «Electrical equipment and electronics of lifting mechanisms of a tower crane»
- «Sensors in lifting mechanisms systems»
- «Mechanized model of a tower crane with a control panel» (metal; plastic)
- «Simulator of the DIGGER ZAXIS240 single-bucket hydraulic excavator»
- «Simulator of a quarry excavator EKG 8»
- «Bulldozer simulator»
- «Safety devices for lifting mechanisms»
- «Engines of construction machines of type A-41»



### Electrical installation

- «Installation and commissioning of electrical equipment of enterprises and civil structures»
- «Electrical installation in residential and office premises»
- «Installation and commissioning of electric circuits of electric motors and automation»

### Electrical devices

#### Automation tools

- «Elevator automation and control tools»
- «Residential automation, control and security, fire and emergency alarm systems (Smart house)»

#### Water supply and sewerage systems

- «Management of pumping station in water supply systems»
- «Automation of pumping stations in water supply systems»
- «Automation in water supply and sanitation»
- «Distribution and regulation principles in heating systems»

- «Sequential and parallel operation of pumping units»
- «Plumbing equipment installation»
- «Hydraulic resistances of water fittings»
- «Sewerage system installation and maintenance»

#### Water purification and treatment systems

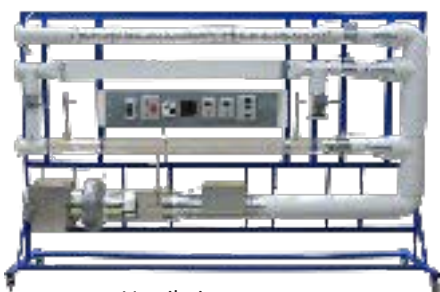
- «Wastewater treatment»
- «Reverse osmosis water desalination»
- «Water filtration»
- «Water treatment system: coagulation and flocculation»
- «Horizontal settling tanks»
- «Aerotank-sump with jet aerator»

#### Heating and ventilation systems

- «Ventilation systems»
- «Heat & gas supply and ventilation systems automation» (ATGSV-09-11LR-01)
- «Application of automation and dispatching tools in heating units of district heating systems of buildings»
- «Thermal and hydraulic characteristics of heating devices» (TGKhPTO-9LR-010)
- «Heat supply and heating devices» (PSTN-ST-13LR-10)
- «Autonomous automated heating system»
- «Automated liquid and gaseous fuel boiler house»
- «Automated heating unit»



Automation, control and security systems-  
fire and emergency alarm of premises



Ventilation systems



Principles of distribution and regulation  
in heating systems



Installation of plumbing equipment



#### Interactive manuals (CD) and classroom posters

- Geodesy
- Building structures
- Construction materials
- Construction machines
- Sliding operations
- Technology of construction processes
- Technology of carpentry, carpentry and glass works
- Roofing works
- Installation of sanitary systems and equipment
- Heat and gas supply and ventilation
- Installation and commissioning of electrical equipment for industrial and residential buildings
- History of Architecture

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# CRANES, EXCAVATORS, LIFTING AND TRANSPORT MACHINES

## Study labs and demonstration equipment



Crane operator simulator



Crane operator simulator PROFESSIONAL -TK3-CNC



Hydraulic drive of road construction and lifting transport vehicles SGU-GP-DSIPTM-010-12LR-01

### Simulators. Simulator

- «Crane operator simulator PROFESSIONAL-TK3-CNC»
- «Simulator of a car crane»
- «Hydraulic drive of road construction and lifting transport vehicles» (SGU-GP-DSIPTM-010-12LR-01)
- «Electric crane equipment» (EO-PK-ShN)
- «Hydraulic reloading manipulator» (SGU-GPM-RU-011)
- «Hydraulic drive of lifting and transport vehicles» (SGU-GP-PTM-KR-016-15LR-01)
- «Hydraulic reloading manipulator» (SGU-GPM-EGSP-011)
- «Electrical equipment and electronics of lifting mechanisms of a tower crane»
- «Tower crane electronics»
- «Sensors in lifting mechanisms systems»
- «Safety devices for lifting mechanisms»
- «Mechanized model of a tower crane with a control panel»
- «Simulator of the DIGGER ZAXIS240 single-bucket hydraulic excavator»
- «Simulator of a quarry excavator EKG 8»
- «Bulldozer simulator»
- «Slings operations»



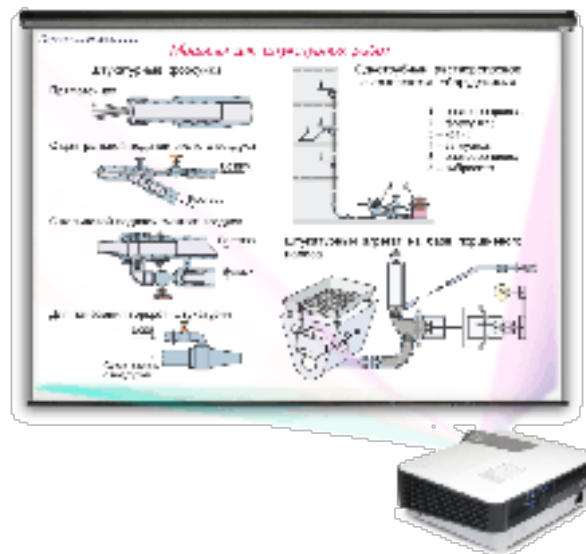
Simulator of a car crane



Hydraulic reloading manipulator (SGU-GPM-EGSP-011)



Electric crane equipment (EO-PK-ShN)

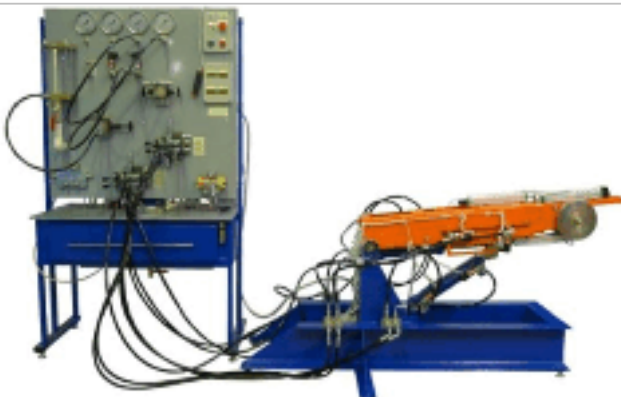


#### Interactive manuals (CD) and classroom posters

- Construction machines
- Slings operations
- Construction production technology
- Building structures
- Machine parts and design basics
- Hydraulics and hydraulic drives
- Electronics
- Basics of electric drives
- Health & safety
- health and safety
- Installation and operation of electrical equipment

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Hydraulic drive of lifting and transport vehicles  
(SGU-GP-PTM-KR-016-15LR-01)



Sensors in lifting mechanisms systems

# UTILITY SYSTEMS. WATER , ENERGY AND HEAT SUPPLY

## Study labs and demonstration equipment



Application of automation tools and dispatching in water supply systems



Metering and control devices in water supply systems



Pressure, flow and temperature measurements in water and gas supply systems



Hydraulics of multi-storey buildings

### Water supply systems

- «Application of automation and dispatching in water supply systems, standard set of educational equipment» (PSAiD-SV-015-16LR-PK)
- «Metering and control devices in water supply systems, standard set of educational equipment» (PUIK-SV-015-9LR-R)
- «Metering and control devices in water supply systems, standard set of educational equipment» (PUIK-SV-015-15LR-PK)
- «Hydraulics of water supply systems of housing and communal services» (GSV-ZhKh-011-07LR-01)
- «Pressure and flow measurements in water supply systems» (ZhKH-09-6LR-01)
- «Measurements of pressures, flow rates and temperatures in water and gas supply systems» (ZhKH-09-16LR-02)
- «Measurements of pressures, flow rates and temperatures in gas supply systems» (ZhKH-012-11LR-R)
- «Flow, pressure and temperature sensors in the housing and communal services system»
- «Automatic pressure boosting station»
- «Automation in water supply and sanitation»
- «Hydraulics of complex pipeline systems» (GSTS-011-10LR-01)
- «Hydraulics of multi-storey buildings» (GSMZ-011-16LR-01)

### Technologies and means of water purification

- «Wastewater treatment»
- «Research of water purification methods from suspended particles»
- «Research of water purification methods from petroleum products»
- «Sediment specific resistance»
- «Reverse osmosis water desalination»
- «Water treatment system: coagulation and flocculation»
- «Clarification of water by the method of contact clarifiers»
- «Clarification of water by coagulation and flocculation. Process Parameters»
- «Horizontal settling tanks»
- «Vertical settling tanks»
- «Water filtration»
- «Design and principle of operation of a thin-walled sump»
- «Design and principle of operation of pressure filters»
- «Aerotank-sump with jet aerator»
- «Aerotank with tubular aerator»
- «Aerotank with a poppet aerator»
- «Design and the principle of operation of the aerotank-sump»
- «Aerated sand trap»
- «Water treatment and disinfection system for swimming pools and water parks»
- «Recycled water cooling system by air method»

### Pumping units and water fittings

- «Hydraulic resistances of water fittings»
- «Sequential and parallel operation of pumping units»
- «Determination of the performance characteristics of a centrifugal pump»
- «Centrifugal pumps» (SGU-CNS-012-6LR)
- «Pumping stations of water supply systems of housing and communal services» (NSSV-019-6LR-01-R)
- «Control of pumping station of water supply systems» (SU-UNPSSV-01)
- «Automation of pumping stations of water supply systems» (SU-ANSSV-015-17LR-01)
- «Pumping stations in water supply systems in multi-storey buildings» (NS-MNEZ-011-10LR-01-PK), (standard set of educational equipment)



Determination of performance characteristics of a centrifugal pump



Thermal and hydraulic characteristics of heating devices



Control of the pumping station of the water supply systems

### Heating systems

- «Heat supply and heating devices» (PSTN-ST-13LR-10)
- «Thermal and hydraulic characteristics of heating devices» (TGKhPTO-9LR-010)
- «Autonomous automated heating system» (ASO-03)
- «Configuration, operation and accounting in building heating systems»

### Installation and commissioning of housing and communal services systems

- «Installation, commissioning and repair of water supply and heating systems»
- «Sewerage system installation and maintenance»
- «Configuration, operation and accounting in building sewerage systems»
- «Installation and commissioning of electrical units up to 1,000 V in power supply systems» (desktop version)
- «Energy audit in the housing and communal services»
- «Automatic control and management of sanitary equipment of buildings»
- «Energy-saving technologies in housing and communal services»
- «Automated liquid and gaseous fuel boiler house» (AK-1)
- «Automated heating unit» (ATP-01)

### Model mock-ups

- «Water supply and sanitation system of a multi-storey residential building»
- «Sewage collectors»
- «Fire-fighting water supply»
- «Water supply of industrial companies»
- «Potable water supply to the city»
- «Urban treatment plants»



Water supply and sanitation system of a multi-storey residential building

### Interactive manuals (CD) and classroom posters

- Construction production technology
- Technology of carpentry, carpentry and glass works
- Roofing works
- Installation of sanitary systems and equipment
- Heat and gas supply and ventilation
- Natural and wastewater treatment technologies and instruments
- Metalwork

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

# ECOLOGY. WASTE MANAGEMENT, DISPOSAL AND RECYCLING

## Study labs and demonstration equipment



Coagulation and flocculation



Wastewater treatment



Horizontal settling tanks



Water treatment system: coagulation and flocculation

### Water purification

- «Horizontal settling tanks»
- «Wastewater treatment»
- «Recycled water cooling system by air method»
- «Reverse osmosis water desalination»
- «Water filtration»
- «Water treatment system: coagulation and flocculation»
- «Horizontal settling tanks»
- «Aerotank-sump with jet aerator»
- «Water clarification by contact clarification»

### Waste recycling laboratory

- «Plastic waste recycling laboratory»
- «Laboratory of solid waste processing for use in construction production»
- «Assessment of air dustiness»

### Mini-express laboratory for educational environmental research Bee-U with modifications

#### Software and hardware training complexes in "Technosphere security"

- «Basic physical and chemical properties of waste»
- «Study of solid waste crushing methods»
- «Processing of slag from metallurgical industries»
- «Classification and characterization of industrial emissions»
- «Calculation of the maximum permissible emission»
- «Cleaning of exhaust gases by electroflotation»
- «Fundamentals of electrofilters calculation»
- «Waste water neutralization»
- «Analysis of sludge waters»
- «Gravitational deposition of spherical particles»

### Backpack field laboratory for the study of reservoirs "NKV-R" with modifications

- «NKV-R (basic version)»
- «NKV-R/m (shortened version)»

### General and engineering ecology

- «Environmental workshop»
- «Research of water purification methods from petroleum products»
- «Research of water purification methods from suspended particles»

### Virtual training complexes

- «Potable water treatment plants»
- «Wastewater treatment plants»
- «Methods of combating oil pollution in water bodies»
- «Waste gas dust cleaning technology»
- «Waste disposal technology»
- «Waste recycling technology»
- «Technology of waste recycling»
- «Recycling of environmental management waste»



Wastewater treatment plants



Waste recycling laboratory



Waste disposal technology



Calculation of the maximum permissible emission



Basic physical and chemical properties of waste



Assessment of air dustiness



Water filtration



Basic physical and chemical properties of waste



Reverse osmosis water desalination

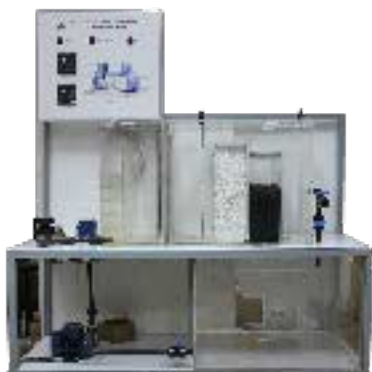


**Interactive manuals (CD) and classroom posters**

- General ecology
- Ecology for engineers
- Unconventional and renewable energy sources
- Natural and wastewater treatment technologies and instruments

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Research of water purification methods from petroleum products

## LABS. PROFESSIONAL LEVEL/WSR – YOUNG PROFESSIONALS

## Study labs and demonstration equipment



Radio arrangement lab (RMR)



Brewing



Welding simulator TSV-03



Industrial mechanics and installation

**Design & supply of workshops for the following areas**

- «Railway transport»
- «Consumer goods industry»
- «Mechanical Engineering, Aviation and Shipbuilding»
- «Construction»
- «Electrical engineering»
- «Nuclear industry»
- «Water transport»
- «Land transport»
- «Medicine»
- «Radio-electronics»
- «Fuel and energy complex»
- «Metallurgy»
- «Pharmaceuticals»
- «Information technologies»
- «Forestry & Timber production»
- «Agriculture»
- «Chemical industry»
- «Mining»
- «Industrial mechanics and installation»

\* Design and supply of other classrooms as requested by the customers



# TECHNOLOGY CLASSROOMS AND LABS

## Study labs and demonstration equipment



### Technology classrooms and labs

- «Technology classroom»
- «3D modeling and prototyping classroom»
- «Metalwork workshop»
- «Locksmith and mechanical workshop (CNC)»
- «Electrical installation, laboratory-workshop»
- «Robotics, laboratory-workshop»
- «CNC machines, laboratory-workshop»
- «Automotive equipment, laboratory-workshop»
- «Power engineering and alternative energy sources, laboratory-workshop»
- «Agricultural machines and technologies, laboratory»
- «Electric Transport, laboratory»
- «Oil & gas. Production and transportation, lab»
- «Construction, laboratory»
- «Medicine, laboratory-workshop»
- «Ecology. Cleaning and recycling, laboratory»
- «Food equipment and technologists, laboratory-workshop»
- «Aviation, unmanned aerial vehicles, laboratory»
- «Low-current networks, laboratory-workshop»

\* Design and supply of other professional level / WSR workshops as requested by the customers



### Interactive manuals (CD) and classroom posters

- Metalwork
- Mechanical engineering technology
- Construction materials technology
- Fundamentals of cutting theory and tools
- Metal-cutting machines
- Metal-cutting machines safety

### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

## MILITARY EQUIPMENT AND TECHNOLOGIES

### Study labs and demonstration equipment



Simulator for driving infantry fighting vehicle BMP, software and hardware complex



Physical booby traps mock-ups (functional simulator), training complex



SMF models



Military uniform, virtual stand Armed Forces of the Russian Federation and NATO member states

#### Simulators of military equipment

- «Material part and operation of the unmanned aircraft complex "Tachyon", VR simulator»
- «Training complex-simulator for practicing navigation skills in the areas of GDP and VP according to GIMS»
- «Simulator for driving infantry fighting vehicle BMP, software and hardware complex»
- «Automobile engine, virtual training complex»
- «T-72 tank maintenance, virtual complex»
- «UAZ-3151 Maintenance, virtual complex»
- «UAZ-3151 driving simulator, lab complex»
- «KAMAZ-5350/4350 driving simulator, lab complex»
- «URAL-4320 maintenance, lab complex»
- «URAL-4320 driving simulator, lab complex»
- «ZIL-131 maintenance, lab complex»
- «ZIL-131 driving simulator, lab complex»
- «Virtual simulator for training the swinging and preparation for the flight of various types of UAVs, virtual training complex»

#### Educational mockups and dummies

- «Interactive model of terrains for tactical interaction and transport logistics classes for different armed forces»
- «Physical booby traps mock-ups (functional simulator), training complex»
- «Physical visual aids for hidden improvised explosive devices dummies, training complex»
- «Large-scale interactive mock-up of the RS-24 „Yars-15P155M” Missile system»
- «Mock-up of the 15V180 combat control vehicle of the RS-24 „Yars” missile system»
- «Mock-up of the combat duty support vehicle 15V240 of the RS-24 „Yars” missile system»
- «Mock-up of the 15V190 communication vehicle of the RS-24 „Yars” missile system»
- «Mock-up of the SKAD missile system»
- «Mock-up of MS Topol branding S7»
- «Mock-up of „Oka” operational missile system»
- «Mock-up of the „Bal” missile system mounted on MAZ-543»
- «Mock-up of the combat duty support vehicle PGRK „Topol”»

#### General military training

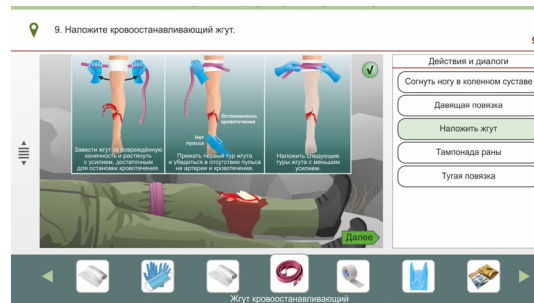
- «Three-dimensional atlas of modern military equipment with a VR module»
- «Military uniform, virtual stand Armed Forces of the Russian Federation and NATO member states»
- «Training to work with portable and basic radio stations, VLC»
- «Virtual simulator for standard ammunition neutralization, Hardware and software complex»
- «Neutralization of standard ammunition, virtual simulator-laboratory»



Interactive model of terrains for tactical interaction and transport logistics classes for different armed forces



First aid in military environment, virtual stand



Interactive training manual  
Tactical medicine



Neutralization of standard ammunition, virtual simulator-laboratory



Orders and medals, virtual stand



Software and hardware complex T-72 tank driving and shooting simulator

- «Simplified laser shooting range for initial military preparation, training complex»
- «Tactical simulator of combat situations in virtual reality, software and hardware complex»
- «First aid in military environment, virtual stand»
- «Orders and medals, virtual stand»
- «Hybrid laser-pneumatic interactive shooting range, virtual stand»
- «Tactical training, virtual training complex»
- «Information transmission using Morse code, training complex»
- «An RSL air-to-air missile, virtual training complex»
- «Small weapons: configuration, operation and handling, virtual training complex»
- «Ammunition»
- «Radio relay communication»
- «Simulator-emulator Military chemical intelligence device» (LP-VPHR)
- «Simulator-emulator Tactical training»
- «Simulator-emulator Drill training»
- «Military Science, poster set»



**Training and methodological complexes (didactic software, electronic and printed posters, laptop, projector):**

- Management of military units and formations (LP-UV)
- Management of troops technical maintenance (LP-UT)
- Radiation reconnaissance and control equipment (LP-DP-5V)

## FOOD PRODUCTION

Educational laboratory and demonstration equipment. Stands. Trainers. Mannequins



Water treatment in food production



Flour sorting and sifting



Technologies of grain processing, preparation of flour products



Automated liquid dosing and packaging line  
(AL-DUZH-13LR-01)

- Grain processing**
- «Flour sorting and sifting»
  - «Preparation and kneading of dough»
  - «Pasta production, pressing, molding, extrusion»
  - «Automated pasta production line»
  - «Technologies of grain processing, preparation of flour products»
  - «Elevator, flour milling, grain and feed production»

- Meat and fish processing**
- «Meat-chopping machines»
  - «Automated sausage production workshop»
  - «Technology of meat processing and meat products»

- Processing of milk and dairy products**
- «Milk normalization & pasteurization»
  - «Cottage cheese and cheese production»
  - «Butter production»
  - «Technologies of milk processing and dairy products»

- Food technologies. Brewing**
- «Complex heat treatment of raw materials and semi-finished products»
  - «Water treatment in food production»
  - «Drying, normalization and cooling»
  - «Sorting and packaging»
  - «Brewing»
  - «Automated liquid dosing and packaging line»  
(AL-DUZH-13LR-01)
  - «Automated bulk materials dosing and packaging line»  
(AL-DUSM-10LR-01)
  - «Automatic flow, pressure and liquid level control»  
(AU-RDUJ-010-30LR-01)
  - «Food preservation technologies»

- Teaching & production laboratories:**
- «Food preservation technologies»
  - «Elevator, flour milling, grain and feed production»
  - «Technologies of grain processing, preparation of flour products»
  - «Technologies of milk processing and dairy products»
  - «Technology of meat processing and meat products»



Food preservation technologies



Brewing



Technologies of milk processing and dairy products



Elevator, flour milling, grain and feed production



Sorting and packaging



Technologies of grain processing, preparation of flour products



#### Interactive manuals (CD) and classroom posters

- Catering products technology
- Bakery, flour and confectionery products production
- Public catering equipment
- Food production processes and equipment
- Introduction to Commodity Science
- Food science

#### Demonstration complexes

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

## BIOENGINEERING AND MEDICAL TECHNOLOGY

Educational laboratory and demonstration equipment. Stands. Trainers. Mannequins



Research Lab Rehabilitation of post-stroke patients



Laboratory of MIO Technologies and Cyber Prototyping



### Modern high-tech medical labs

- «Research Lab Rehabilitation of Post-stroke Patients»
- «Interactive teaching games lab for the patient's limbs motor function rehabilitation»
- «Laboratory of MIO Technologies and Cyber Prototyping»

### Equipment — medicine

- «Lung ventilation, standard teaching aids set»
- «Visual field analyzer, standard teaching aids set»
- «Determination of human reaction time, standard teaching aids set»
- «Human eye colors perception, standard teaching aids set»
- «Training cardiognostic simulator for functional diagnosticians»
- «Training cardiac surgery simulator for cardiac surgeons»
- «Training cardiognostic simulator for sports cardiologists»

### Interactive and virtual stands (medicine)

- «Interactive 3D human anatomy atlas»
- «Virtual simulator for placing a 15-channel EC1»
- «Software and hardware simulator of Ilizarov compression-distraction apparatus mounting»
- «Virtual patient, virtual training complex»
- «Dentistry, virtual training complex»
- «Virtual therapist, Simulator-expert system for medical staff training and testing»
- «Heart anatomy and demonstration, virtual software package»
- «Virtual Surgery, virtual training complex»
- «Visual Biology, virtual training complex»

### Software and methodological complexes (medicine)

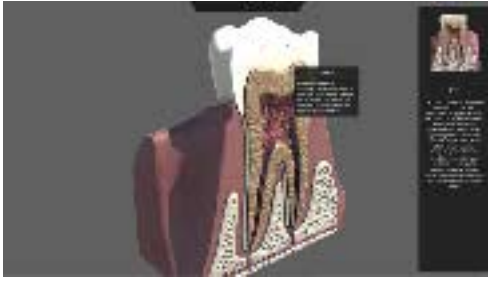
- «3D models of viruses»
- «Skin structure»
- «Structure of animal and plant cells»
- «Human digestive system structure»
- «General animal anatomy of an animal»
- «Human teeth structure»
- «3D molecules construction kit»
- «ENT organs anatomy»

### Training dummies

- «Training complex First aid. Adult torso dummy»
- «Training complex First aid. Foreign body removal. Adult torso dummy»
- «Training complex First aid. Child dummy»

### Visual aids

- «Human heart structure, visual aid»
- «Human teeth structure, visual aid»



Human teeth structure, visual aid



Human heart structure, visual aid



Determination of human reaction time, standard teaching set



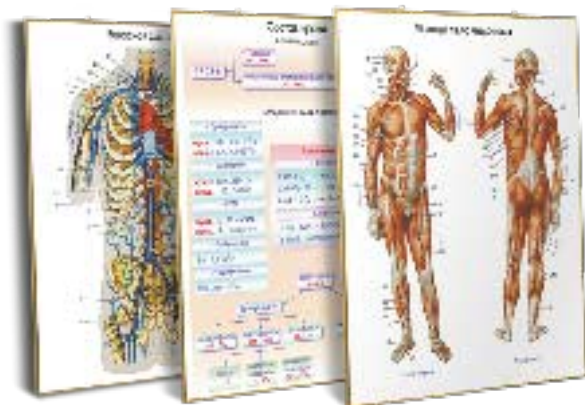
Heart anatomy and demonstration, virtual software package



Training cardiologist simulator for functional diagnosticians



Interactive 3D human anatomy atlas

**Interactive manuals (CD) and classroom posters**

- Central nervous system anatomy
- Biology
- Normal Human Anatomy
- Pediatrics. Healthy child
- Pediatric infections

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.

## VETERINARY MEDICINE (EQUIPMENT AND TECHNOLOGIES)

### Study labs and demonstration equipment



Interactive anatomical table - veterinary PL-VetAnatomy Tab, virtual training complex



Interactive three-dimensional atlas of animal anatomy PL-VetAnatomy



Pig anatomy atlas



Frog anatomy atlas

#### Virtual veterinary training complexes

- «Interactive anatomical table - veterinary PL-VetAnatomy Tab, virtual training complex»
- «Interactive three-dimensional atlas of animal anatomy PL-VetAnatomy, virtual training complex»
  - Frog anatomy atlas
  - Dog anatomy atlas
  - Cat anatomy atlas
  - Horse anatomy atlas
  - Pig anatomy atlas
  - Cattle anatomy atlas
- «Veterinarian simulator, virtual training complex»

#### Interactive laboratory stands and simulators

- «Laboratory of Agriculture and Veterinary Medicine, interactive training class»
- «Cattle milking skills training, interactive complex»
- «Studying and practicing veterinary and surgical skills, training complex»
- «Cow rectal examination and artificial insemination, interactive training complex»
- «Horse Anatomy, interactive training complex»
- «Cow Anatomy, interactive training complex»
- «Pig Anatomy, interactive training complex»
- «Studying and practicing helping animals in labor, training complex»
- «Practicing intravenous procedures, interactive training complex»
- «Pharmacologist, interactive computer-controlled complex»

#### Models and training mock-ups

- «Methods and devices for fixing cattle, training hardware»
- «Skull of a domestic sheep»
- «Sheep's Skull» (scale 1:2)
- «Skeleton of a horse, scale model» (scale 1:2)
- «Skeleton of a cow, scale model» (scale 1:2)
- «Electric mock-up of a cow on a frame»
- «Skeleton of a dog, scale model» (scale 1:2)
- «Skeleton of a cat, scale model» (scale 1:2)

#### Crop growing complexes

- «Smart greenhouse lab complex»
- «City-farmer - vertical hydroponic installations, lab complex»

#### Board-stands

- «Substances primarily impacting the central nervous system»
- «Respiratory organs of farm animals»
- «Circulatory system of farm animals»
- «Aseptic and purulent inflammatory processes»
- «Epizootology»
- «Acute drug poisoning of animals»
- «Typical pathological processes in animal organisms»
- «Antimicrobial and antiparasitic agents»

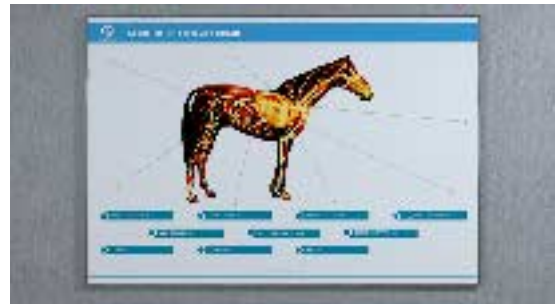




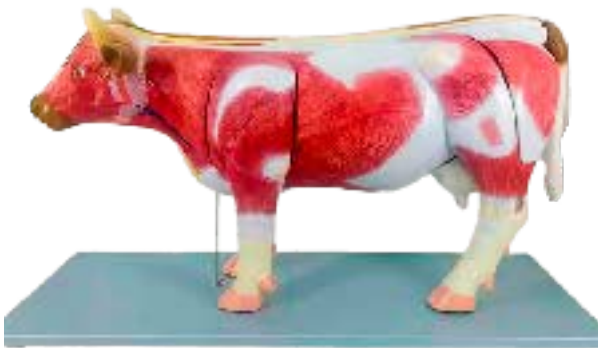
Horse Anatomy, interactive training complex



Veterinarian simulator, virtual training complex



Circulatory system of farm animals



Cow Anatomy, interactive training complex



Electric mock-up of a cow on a frame

**Interactive manuals (CD) and classroom posters**

- Technology of livestock products production (1 part)
- Technology of livestock products production (2 part)
- Mechanization, electrification and automation of agriculture

**Poster set**

- Agronomy
- Basics of agronomy
- Agricultural machines
- Cattle breeding
- Crop production

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



City-farmer - vertical hydroponic installations, lab complex

# HOUSEHOLD APPLIANCES. CONSUMER GOODS INDUSTRY

## Study labs and demonstration equipment



PC



Peripheral device interfaces



Microwave oven



Maintenance of heat exchangers



Sewing machine

## Computers

- «PC»
- «Peripheral device interfaces»

## Automation and computer technology systems elements

### Radio-electronic equipment

- «DVD player»
- «GOS 620 Oscilloscope»

### Household appliances

- «Microwave oven»
- «Sewing machine»
- «Vacuum cleaner»
- «Electric stove»
- «Washing machine»
- «Refrigerator»
- «Freezer»
- «Air conditioner»
- «Maintenance of heat exchangers»
- «Gas leaks identification»
- «Repair and charging of a household refrigerator»
- «Assembly and disassembly of a compressor»
- «Maintenance of heat exchangers»
- «Split model for a refrigeration equipment compressor»

### Training stands

- «Washing machine, Electric stove, Vacuum cleaner»
- «Freezer»
- «Refrigerator-1», «Refrigerator-2»
- «Air conditioner»
- «Sewing machine»
- «Chest freezer»
- «Electric stove»



Chest freezer



Washing machine, Electric stove  
Vacuum cleaner



Electric stove



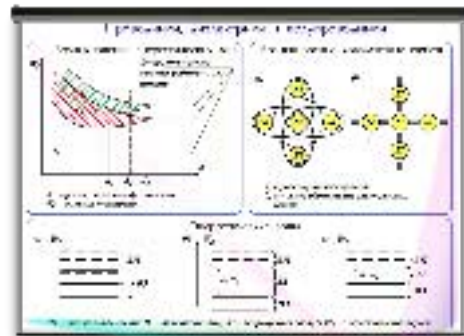
Freezer



Refrigerator



Refrigerator-1



**Interactive manuals (CD) and classroom posters**

- Electronics
- Sewing production equipment
- HGSV
- Public catering equipment

**Demonstration complexes**

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Refrigerator-2

## LANGUAGE LABS. SIMULTANEOUS TRANSLATION SYSTEMS

### Study labs and demonstration equipment



Lingua multimedia language lab



Multimedia class based on digital tape recorders "Lingvo-digital V", 6-N workstations

### Language labs

- Class based on digital tape recorders "Lingvo-digital", 6-N workstations
- Multimedia class based on digital tape recorders "Lingvo-digital V", 6-N workstations
- A class based on a PC network and a Lingua switchboard, 6-N workstations
- Multimedia class based on a PC network and a Lingua switchboard, 6-N workstations
- Simultaneous translation system

### Interactive manuals (CD) and classroom posters

- English
- German
- The USA: Country Studies

Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed interactive posters set.



Simultaneous translation system

# DEMONSTRATION COMPLEXES. CONFERENCE SYSTEMS

## Study labs and demonstration equipment



3D demo complexes. Virtual Reality Equipment



Demo-MP & Z + OS demonstration complex for 32 workstations (multimedia projector, sound amplifier system, feedback system)

### Demonstration complexes

- «Demo-PP demonstration complex for up to 32 people based on a 50" plasma TV receiver»
- «Demo-MP demonstration complex for a up to 75 people based on a multimedia projector»
- «Demo-MP & Z Demonstration complex for up to 150 people» (multimedia projector, sound amplifier system)
- «Demo-MP & Z + OS demonstration complex for 32 workstations» (multimedia projector, sound amplifier system, feedback system)
- «Demo CD-PE demonstration complex based on a multimedia projector» (laptop with a pre-installed set of electronic posters)
- «Demo CD-ID demo complex based on an interactive whiteboard» (laptop with a pre-installed set of electronic posters)
- «Comprehensive technical equipment of conference halls, meeting rooms, classrooms»

### Visual aids

- Electronic posters CD sets and classroom posters (subjects):
  - English
  - German
  - The USA: Country Studies

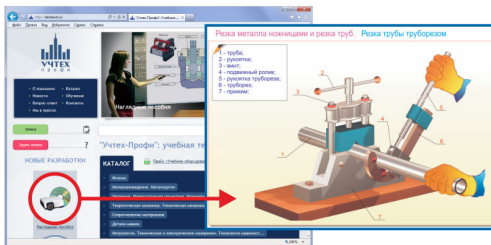
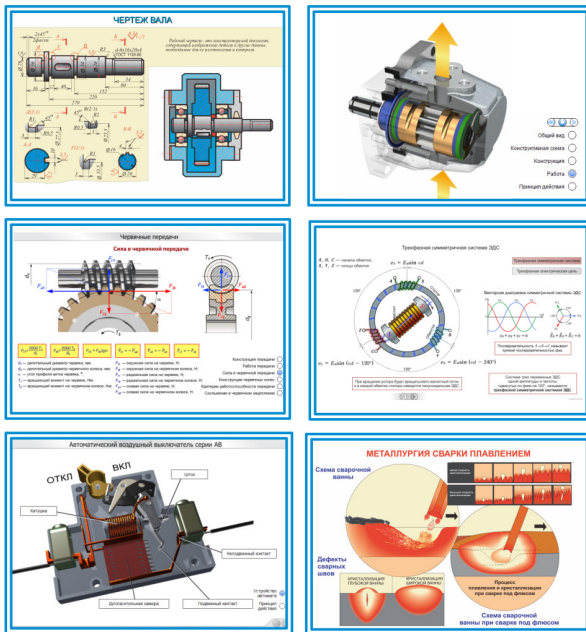
Basic equipment: projector, screen or interactive whiteboard, laptop, pre-installed set of electronic posters.



Comprehensive technical equipment of conference halls, meeting rooms, classrooms

# INTERACTIVE VISUAL AIDS. POSTERS (FOR OFFICES, LABORATORIES AND CLASSROOMS)

## Study labs and demonstration equipment



### Natural sciences

- Physics (250)
- General chemistry (234)

### Socio-economic studies

- Marketing (166)
- Statistics
- Management (163)
- Educational psychology 2 parts (263/267)
- History of Russia (153)

### General professional disciplines

- Engineering graphics (101)
- Engineering drawing (188)
- Descriptive geometry (100)
- Materials Science (110/205)
- Technical mechanics (110)
- Composite materials (483) **New!**
- Theoretical mechanics (95)
- Strength of materials (205)
- Theory of mechanisms and machines (156)
- Machine parts and design basics (200)
- Hydraulics, hydraulic drive and hydraulic automation (188)

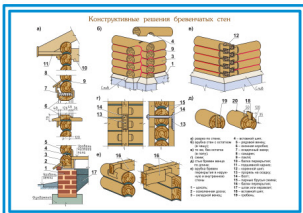
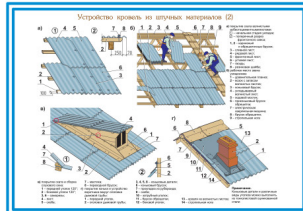
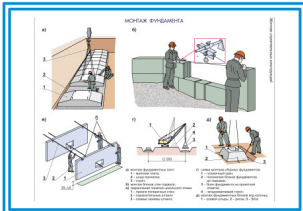
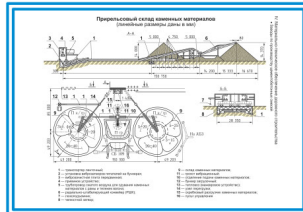
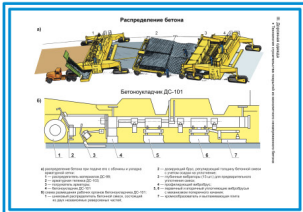
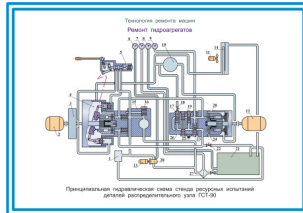
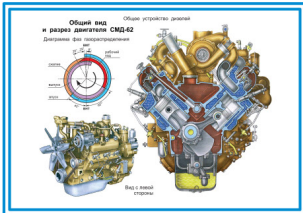
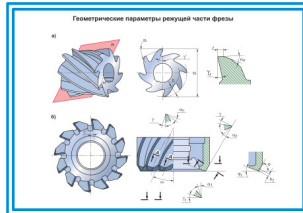
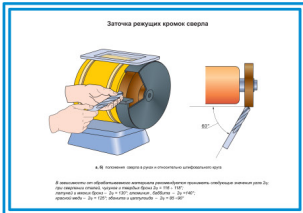
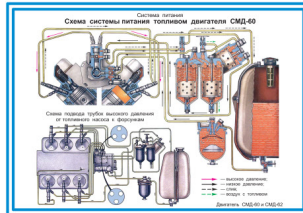
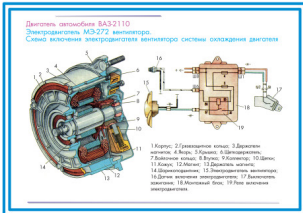
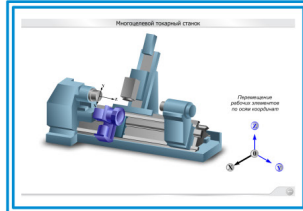
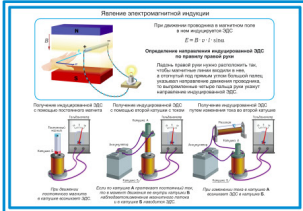
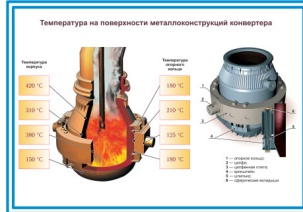
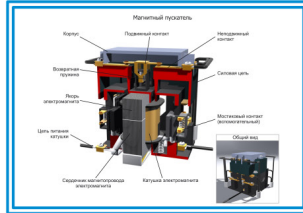
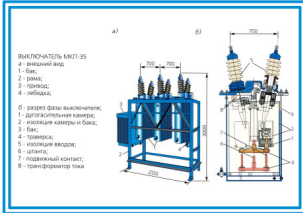
### Pneumatic actuators and pneumatic automation.

- Compressor equipment (167)
- Heat engineering. Technical thermodynamics (86)
- Heat and mass transfer (122)
- Industrial health & safety (114)
- Ecology for Engineers (178) **New!**
- Civil defense and emergency situations

### Electrical engineering, electronics and power engineering

#### Electrical engineering (85)

- Theoretical foundations of electrical engineering (100)
- Electronics (181)
- Fundamentals of metrology and electrical measurements (136)
- Basics of electric drives (68)
- Electric drive control systems (61)
- Automated electric drive control systems
- Technological processes automation (105)
- Mechatronics (81)
- Theory of automatic control (87)
- Interfaces of peripheral devices. Microcontrollers
- Electrical materials (58)
- Electrical devices (35)
- Power supply of industrial and residential buildings (107)
- Electric machines (131)
- Electrical switches (91)
- Electrical equipment of industrial and residential buildings (41)
- Installation and operation of electrical equipment (96)
- Power supply of industrial and residential buildings (107)
- Operation of electric networks and equipment of stations and substations (126)
- Relay protection basics (226)



- Unconventional and renewable energy sources (121)
- Computer networks (47)
- Radio circuits and signals are **New!**
- Mechanical engineering and metallurgy**
- Steel metallurgy and ferroalloy production (116)
- Metallurgical technologies (169)
- Mechanical engineering technology (186)
- Metalwork (105)
- Construction materials technology (100)
- Welding and cutting of metals: equipment, machinery and technology (100/157)
- Foundry (128)
- Corrosion and protection of metals (115) **New!**
- Pressure metal forming machines and technologies (130)
- Fundamentals of cutting theory and tools (156)
- Cutting materials (163)
- Metal cutting machines (120/125)
- CNC machines (automated equipment programming) (202)
- Metal-cutting machines safety (37)
- Technological equipment of metal-cutting machines (102)
- Tolerances and technical measurements (124)
- Technical measurements. Metrology, standardization and certification (76)
- Fundamentals of robotics (286) **New!**
- Cars, tractors and agricultural machinery**
- Motor vehicle design (105/147)
- Motor vehicle electrical equipment (149)
- Internal combustion engines (198)
- Transmission (110)
- Analysis of an internal combustion engine design (162)
- Motor vehicle maintenance (2 parts) **New!**
- Car maintenance supplies (81)
- Tractors (224)
- Tractor diesels (154)
- Machinery maintenance and repair in rural areas (162)
- Agricultural machinery (2 parts)
- International road transportation of hazardous goods (182) **New!**
- Logistics (56)
- Traffic rules (76)
- Military equipment**
- Ammunition. Aircraft guns structure and performance: physical properties (156)
- Fundamentals of armored and tank weapons and equipment of the Russian Army (40)
- Gyroscopy and navigation (33)
- Rockets and spacecraft launch and technical complexes (393)
- Construction machines, materials and technologies**
- History of Architecture (130)
- Road construction vehicles (130)
- Construction machines (71)
- Road construction technology and management (161)
- Geodesy (129)
- Building structures (85)
- Sheet structures construction technology (110)
- Construction materials (42)
- Slings operations (51)
- Technology of construction production (155/191)
- Technology of carpentry, carpentry and glass works (155)

- Roofing works (72)
- Operation of gas distribution and gas consumption systems (153) **New!**
- Installation of sanitary systems and equipment (111)
- Heat and gas supply and ventilation (118)
- Natural and wastewater treatment technologies and instruments (84)
- Finishing and construction works, drywall (22)

#### Oil and gas

- Natural gas supercharger (54)
- Gas pressure regulator (139)

#### Sea and river transport

- River vessels (27)

#### Railway transport

- Electric substations of electrified railways (347) **New!**
- High voltage technology
- Power supply networks design and maintenance
- Rolling stock design, maintenance and repair

#### Food and consumer goods industry

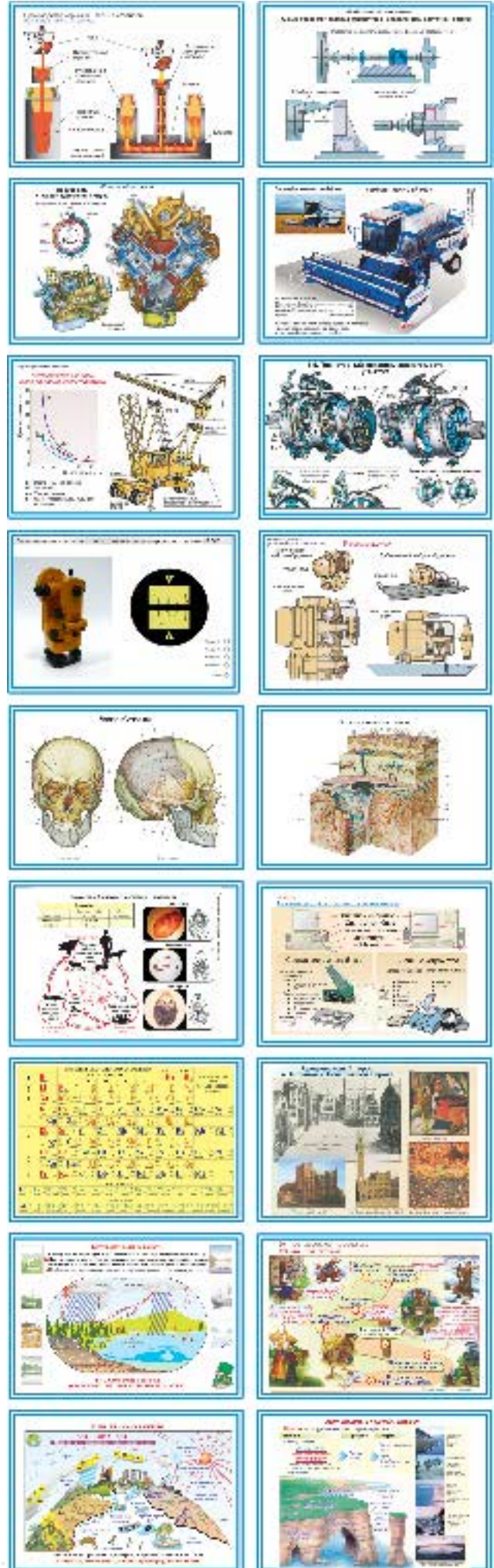
- Pastry chef (7 parts) **New!**
- Bakery, flour and confectionery products (2 parts)
- Public catering equipment (85)
- Food production processes and equipment (145)
- Introduction to Commodity Science (48)
- Food science (200)
- Clothing design (82)
- Sewing production technology (45)
- Sewing production equipment (157)
- Sewing production material (56)

#### Medicine

- Normal Human Anatomy (97)
- Central nervous system anatomy 2 parts (184/228)
- Pediatrics, healthy child (59)
- Pediatric infections (155)
- High School Kits
- Physics (202)
- Astronomy (88)
- Chemistry (169)
- Russian (190)
- Literature (139)
- World culture (106)
- Mathematics (154)
- Computer Science (74)
- Biology (150)
- General ecology (73)
- Geography of Russia (168)
- History of the Ancient World and the Middle Ages (61)
- History of Russia (90)
- English (66)
- German (52)
- Life Safety fundamentals (85)
- Drawing (52)
- Handicraft (cooking) (20)
- Industrial technologies. Metal processing technologies (179)
- Household technologies

#### Elementary School Kits

- Mathematics (132)
- Russian (71)
- Reading and primary literature (63)
- World around us Nature Studies (72)
- Traffic rules (66)
- Lego modeling (4 parts)







Certificates of conformance

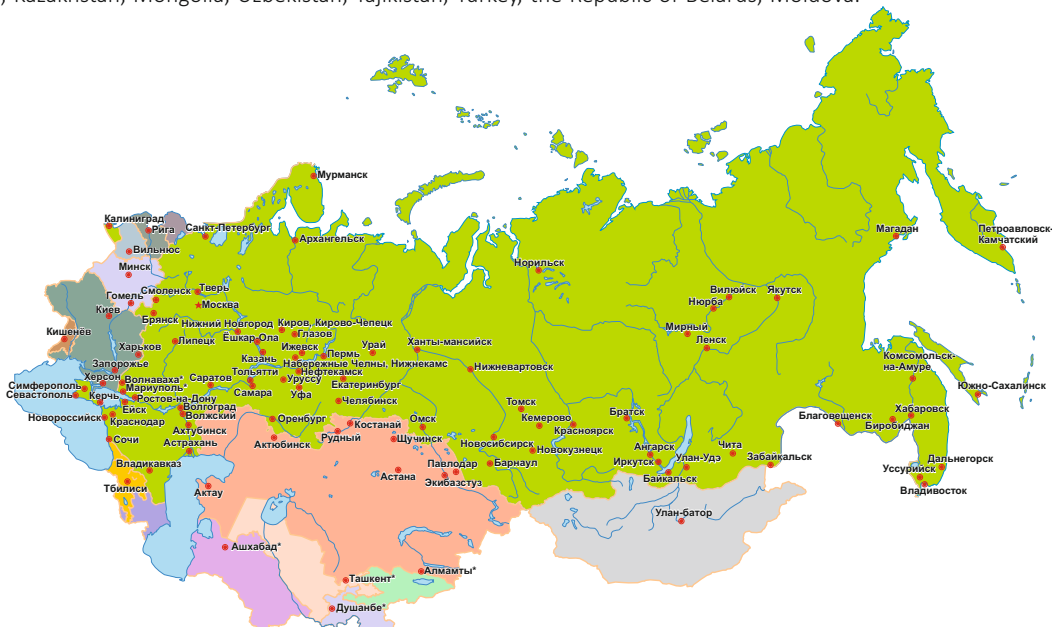


Patents and copyright certificates for equipment and software



- Patents and copyright certificates, software registration certificates — 73 pcs.
- GRAND PRIX Cup (Moscow All-Russian Exhibition Center) as the best organization in Russia forming a contemporary educational environment
- GRAND PRIX Cup (Moscow All-Russian Exhibition Center) in the competition of innovative solutions in the field of material and technical support of educational institutions
- Crystal Cup (MARPUT — Moscow) for the best solutions in teaching equipment for higher professional education
- Diplomas of Honor and Laureate Diplomas — 21 pcs.
- Gold, silver and bronze medals of VDNKh (All-Russian Exhibition Center, Sokolniki) — 52 pcs.

Our main customers are more than 2,800 federal, national research, state and technical universities, agricultural, land reclamation, pedagogical and engineering and economic universities, vocational schools, colleges, lyceums and specialized schools in Russia, Kazakhstan, Mongolia, Uzbekistan, Tajikistan, Turkey, the Republic of Belarus, Moldova.



We provide consultations on how to equip educational laboratories and prepare the technical specifications for tenders. Our products comply with the requirements of educational standards, modern digital technologies (VR, AR, 3D) and design, reliability and safety, visibility and informativity are the fundamental distinctive features of the products manufactured by RDC Uchtekh-Profi.



RDC Uchtekh-Profi, 147 Kommuny Street, Chelyabinsk, 454080

Order office

Tel./fax (351) 729-90-11

E-mail: [RNPO@labstand.ru](mailto:RNPO@labstand.ru); [www.Labstand.ru](http://www.Labstand.ru)



The products by RDC Uchtekh-Profi are a system integration of modern scientific, software, hardware and teaching concepts that ensures the high-quality of training, boosting the students' innovative growth and professional mobility.



RDC Uchtekh-Profi,  
147 Kommuny Street,  
Chelyabinsk, 454080



[www.Labstand.ru](http://www.Labstand.ru)



Order office  
[RNPO@labstand.ru](mailto:RNPO@labstand.ru);  
[Labpro@mail.ru](mailto:Labpro@mail.ru)



(351) 729-90-11  
(812) 602-65-11