**Laboratory facilities**

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| Numberaudience | The name of discipline in which  performedlaboratorywork | State laboratory | The number of student places | Area (sq.m.) |
| **Lab.205 MMC** | **Automation of technological systems:**  1.Lab. Defining the parameters of the semiconductor diode and the construction of its current-voltage characteristics  2.Lab. Defining the parameters of the Zener diode and the construction of its current-voltage characteristics  3.Lab. Study inclusion schemes transistors with common collector and emittrom  4.Lab. Study of inverting amplifier. Research circuits operational amplifiers  5.Lab. Rectifiers secondary power sources  **Automation of typical electrical installations:**  1.Lab. Defining the parameters of the semiconductor diode and the construction of its current-voltage characteristics  2.Lab. Defining the parameters of the Zener diode and the construction of its current-voltage characteristics  3.Lab. Study inclusion schemes transistors with common collector and emittrom  4.Lab. Study of inverting amplifier. Research circuits operational amplifiers  5.Lab. Rectifiers secondary power sources  **Mathematics and computer modeling in the electric power:**  Lab.1 "An approximate solution of the equation by dichotomy (bisection) and the method of simple iterations"  Lab.2 "Solving systems of linear equations by Gauss'  Lab.3 "Solving systems of nonlinear equations of Newton's method"  Lab.4 "Linear programming problem"  Lab.5 "Scanning method as the method for solving linear programming problems"  **Industrial electronics:**  1 Lab. Design and management of the physical model of a gas turbine power plant. The survey gauges and Presentation  2. Lab. The study single-control system  3. Lab. Setting regulator CAP ET speed  4. Lab. Evaluation of the quality control process. Selecting the type of controller  5. Lab. Functional diagram of a gas turbine power plant automation  **Linear systems management:**  Lab.1 Introduction to the modeling program VisSim  Lab.2 Differential Equations  Lab.3 Synthesis of linear automatic control frequency method  Lab.4 Checking stability of dynamical systems on algebraic and frequency criteria  Lab.5 study the properties of the state observer  **Microprocessor tools and systems:**  Lab.1 study logic, the implementation of logic functions using logic elements  Lab.2 Synthesis of logic circuits that perform specified logic functions  Lab.3 study of the structure and algorithms of asynchronous and synchronous triggers  Lab.4 Research function transitions excitation of the main types of triggers, as well as the study of the interchangeability of different types of triggers  Lab.5 study of the structure and the study of the work of summing and subtracting counters.  Studying ways to counter Lab.6 conversion rate changes  **The theory of linear automatic control systems :**  Lab.1 Introduction to the modeling program VisSim  Differential Equations  Synthesis of linear automatic control frequency method  Check the stability of dynamical systems on algebraic and frequency criteria  Lab.2 study the properties of the state observer   Microprocessor technology:  Lab.3 Logic system and function  Lab.4 flip-flop  Lab.5 Counters  Lab.6 Research decoders  Lab.7 Research multiplexers  **Engineering and Computer Graphics:**  Lab.1 Projection methods: central and parallel, orthogonal (as a special case of parallel). Building a perspective view point. Construction of the complex drawing point and a straight line (diagrams Monge). Total direct and private position in space. The relative position of the lines. Solvingproblems.  Lab.2 Basic positional problem on the relative position of points, lines planes (Accessory, parallelism, intersection). Solving problems. Polyhedra. Graphic work  Lab.3 methods convert the drawing. replacement of the projection plane method. The decision metric problems (definition of distances and angles between geometric images).  Lab.4 surfaces. Build skeletons ruled surfaces and surfaces of revolution essays. Execution of drawings on a specialty. Operating and installation drawing of the PCB. Assembly drawing of the PCB. Drawing up specifications for the assembly drawing.  Lab.5 Introduction to AutoCad. Appointment possible fields of application. Input commands and parameters. Basic skills. Formation of two-dimensional primitives. Editing 2-dimensional primitives. Create a new layer, the purpose of the color, thickness and line type in a layer. MakingtechnicaldrawingsinAutoCadsystem. | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 16 seats | 30 sq.m. |
| **Lab.205aMMC** | **Power converters of energy:**  Lab.1. Full-scale simulation of AC mains  Lab.2. Defining characteristics of the regulated three-phase bridge controlled rectifier operating at the active-inductive load  Lab.3. Determination of the natural external characteristic of a three-phase bridge controlled rectifier.  Lab.4. Determination of the natural characteristics of the input three-phase bridge inverter dependent.  Lab.5. Full-scale simulation of parallel operation of single-phase bridge uncontrolled rectifier and inverter on the DC machine.  **Conversion equipment:**  Lab.1. Full-scale simulation of basic circuits uncontrolled and controlled rectifiers  Lab.2. Determination of adjusting the characteristics of three-phase bridge controlled rectifier operating in an active-inductive load  Lab.3. Determination of the natural external characteristic of a three-phase bridge controlled rectifier  Lab.4. Determination of parameters and indicators characterizing the operation of three-phase bridge inverter dependent  Lab.5. Full-scale simulation of parallel operation of single-phase bridge uncontrolled rectifier and inverter to the car DC | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 12 seats | 20,8 sq.m. |
| **Lab.217MMC** | **Electrical Engineering:**  Lab.1. Manual connection of synchronous generator Network precise synchronization method  Lab.2. Determination of the angular synchronous generator characteristics  Lab.3. Simulation of steady state operation of the electrical network with a single feed  Lab.4. Study scheme Connection measuring current transformers  Lab.5. Determination of the time limit off the short-circuit  **Electric power networks and systems:**  Lab.1. Construction elements of overhead and cable lines  Lab.2. Simulation of steady state operation with a dual feed phase mains  Lab.3. Simulation of steady state operation the three-phase mains single feed  Lab.4. Simulation of steady state operation phase of the long transmission line with a quarter of the wavelength of the electrical system connecting the load  Lab.5. Simulation of steady state operation long power line phase and a quarter wavelength connecting powerful electrical system  **Electric power plants and substations:**  Lab.1. current transformer connection schemes  Lab.2. voltage transformer connection schemes  Lab.3. Protection of power transformers  Lab.4. Protection of power generators  **Electrical power:**  Lab.1. current transformer connection schemes  Lab.2. voltage transformer connection schemes  Lab.3. Protection of power transformers  Lab.4. Protection of power generators  **Modes of power systems and power lines:**  Lab.1. Construction elements of overhead and cable lines  Lab.2. Simulation of steady state operation with a dual feed phase mains  Lab.3. Simulation of steady state operation the three-phase mains single feed  Lab.4. Simulation of steady state operation phase of the long transmission line with a quarter of the wavelength of the electrical system connecting the load  Lab.5. Simulation of steady state operation long power line phase and a quarter wavelength connecting powerful electrical system  **Stand-alone power supply system:**  Lab.1. Research schemes include secondary windings of the current transformers  Lab.2. Research overcurrent protection using an induction current relay  Lab.3. Study modes AC power line when the load power factor  Lab.4. protection relay test down tranformatora  Lab.5. protection relay test high-voltage motor  **Relay electrical protection:**  Lab.1. Transformer differential protection  Lab.2. Overcurrent protection transformer  Lab.3. Current protection of the transformer reverse sequence  Lab.4. Generator protection against overcurrent and overload  Lab.5. Maximum current protection of the induction motor  **Relay protection of power systems:**  Lab.1. Connection diagram of measuring current transformers  Lab.2. Overcurrent protection / cutoff of the two transmission lines with a single feed  Lab.3. The current directional protection of power lines in the ring  Lab.4. Breaker failure (circuit breaker failure protection)  Lab.5. Distance protection of transmission lines in the dual feed network  **Electrical Materials:**  Lab.1. The study of ferroelectrics  Lab.2. Determination of the electrical characteristics of dielectrics  Lab.3. Research magnet soft materials  Lab.4. Defining characteristics of semiconductors | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 11 seats | 30,7sq.m. |
| **Lab.223MMC** | **Electronics and microcircuitry:**  Lab.1. Design and management of the physical model of a gas turbine power plant. The survey gauges and Presentation  Lab.2. The study single-control system  Lab.3. Setting the automatic control system regulator frequency of rotation of the electric generator.  Lab.4. Evaluation of the quality control process. Selectingthetypeofcontroller  Lab.5. Functional diagram of a gas turbine power plant automation | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 12 seats | 20 sq.m. |
| **Lab. 16MMC** | **Information and measuring technology:**  Lab.1. Checking technical ammeter magneto system  Lab.2. Calibration of the system magneto-electric voltmeter  Lab.3. Verification wattmeter electrodynamic system  Lab.4. Verification of single-phase electric power meters Induction System  Lab.5. Enhanced measurement limits ammeter  **Electric cars:**  Lab.1. Studies of single-phase and three-phase transformers  Lab.2. The research groups of the compounds of three-phase two-winding transformer  Lab.3. Investigation of the induction motor with squirrel cage and slip ring  Lab.4. The study of three-phase synchronous generator, parallel operation with the network  Lab.5. The study of three-phase synchronous motor  **Fundamentals of electrical safety:**  Lab.1. Determination of the influence of the regime and its mains neutral on electrical conditions  Lab.2. Determination of describing phenomena at the current runoff into the ground through the protective earthing  Lab.3. Full-scale simulation of vanishing electrical  Lab.4. Insulation monitoring in electric networks with isolated neutral  Lab.5. Resistance to earth  **Power supply:**  Lab.1. Research schemes include secondary windings of the current transformers  Lab.2. Research overcurrent protection using an induction current relay  Lab.3. Study modes AC power line when the load power factor  Lab.4. protection relay test down tranformatora  Lab.5. protection relay test high-voltage motor | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 20 seats | 60 sq.m. |
| **Lab.29 MMC** | **Power converters of energy:**  Lab.1. Research uncontrolled rectifiers  Lab.2. The study controlled rectifiers  Lab.3. The study of the device operation and remove the pulse of the phase control system performance  Lab.4. Study AC voltage regulators  Lab.5. Study pulse controllers DC  **Electro mechanics and electrical equipment:**  Lab.1. Introduction to electrical engineering and elektromehanotroniku. Generalized electromechanical transducer. Design and construction principles elektromehanotronnyh systems  Lab.2. Electrical insulation and cable equipment  Lab.3. Electro technological installations and systems  Lab.4. Light and light sources  Lab.5. Electric drive and automation of technological complexes  **The theory of the automated electric drive:**  Lab.1. Investigation of DC motor.  Lab.2. Investigation of the characteristics of an induction motor.  Lab.3. Implementation of the typical elements of an induction motor control systems.  Lab.4. Formation of load diagrams of engines on test bench.  Lab.5. Investigation closed electric drive systems. | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 12 seats | 20sq.m. |
| **Lab.29aMMC** | **Electric vehicles:**  Lab.1. Research fuses  Lab.2. Research contactors AC and DC  Lab.3. Investigation electromagnetic relay time  Lab.4. breaker Research  Lab.5. Research overcurrent relay  S**witching devices, protection and management:**  Lab.1. Research contactors AC and DC  Lab.2. Research overcurrent relays.  Lab.3. Removing the time current characteristics of the automatic air circuit breaker.  Lab.4. Removing the time current characteristics of the fuse. Determination of error of current and voltage transformers  Lab.5. Removing the time current characteristic electrothermal relays.  Lab.6. Removing IDMT the installation of electromechanical timer. | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 20 seats | 62,2 sq.m. |
| **Lab.50aMMC** | **Theory of automated electric. Automatic electricity system.**  Lab 1 - Programming sequential chain. Develop a simple Grafcet.  Lab-2 -Structured, Grafcet (cycle). Building fronts (Trigger).  Lab-3 -Programming stroke and stop automatically.  Lab-4 -Programming stroke and stop manually. Initialization of the initial position.  Lab 5 -Emergency stop. Hot restore (import, export sections).  Lab 6 - Working with function blocks.  Lab-7 -Create arbitrary function blocks. Additionalfeaturescarrier-screen. | 12 laptops with programmable logic controllers M340  on modular training stands 16 inputs / 16 outputs, electrical facilities management "surface treatment", electro-object control "rotating arm" stand "workshop fault detection" for the study of the characteristics of the sensor, stand "produktis" (conveyor for filling vials)  for the study of the control and man-machine dialogue 2 subsystem "produktis" for packaging and corking bottles under the control of the programmable controller. | 12 seats | 95sq.m. |
| **Lab.173MMC** | **Electricity, Electro mechanics and electrical equipment, Electrical Power, Electricity supply companies, Relay protection of power systems, relay protection of electrical equipment, Electrical Fundamentals, Safety in electrical installations.**  Stand the engine is started, the selective protection Stand, Stand Mode neutrals, Booth encoder Stand Research harmonics Stand main cabinet of low voltage, engine start-up Stand, Stand ATV 31, ATV 71 Stand, Stand Research harmonics. Module 1: Lab -1 - Study of power circuits and control circuits Lab -2 - Practical study selectivity tuning Lab - 3 - Practical study razhima TT and TN Lab - 4 - Evaluation of positioning performance Lab -5 - Study of linear and non-linear loads - 4 hours Lab - 6 - The study of electrical circuits and commissioning.  2 module: Lab - 1 - Ways to Start an asynchronous dvitelya with KZ rotor. Lab - 2 - Frequency - regulated electric drive on the basis of the frequency converter ATV 31. Lab - 3 - frequency - regulated electric drive on the basis of the frequency converter ATV 71. Lab - 4 - Qualitative study of electromagnetic compatibility. Lab - 5 - Control of the main cabinet of low voltage via the Modbus network and UPS studies. | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 12 seats | 100sq.m. |
| **Lab.173bMMC** | **Learning Lab "Installation and design of electronic circuits."**  Laboratory stands 12 workplaces equipped with the standard grids and transformer for the control circuit  Used parts: rails, wiring ducts, wires, terminals, switches, fuses, contactors, thermal relays, terminals, control buttons ...  Standard insulated tools and production tools for stripping wires, crimping ...  , Training engines for testing electronic circuits  , Personal protective equipment: helmet with a shield, gloves, insulating carpet ...  , Voltmeters, and checking the absence of voltage tester to check for an open circuit | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 12 seats | 95 sq.m. |
| **Lab.48 MMC** | **Automatic Control in Power Engineering 2**  12 Laptop Programmable Logic   PLC controllers (PLC),  Language of Unity Pro programming language LADDER Programming, Programming in  Function blocks FBD, Instruction List IL, SFC Sequential Function Chart.  Lab - the vertical position of programming hoist.  Lab - Simulation of the swimming pool pump. Programming in FBD language. Programming in IL Instruction List Programming Structured Text (STRUCTURED TEXT). Simulationwork 3 pumps. | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 12 seats | 64,sq.m. |
| **Lab. 267MMC** | Stand "Review of explosion-proof equipment," Stand "Explosion-proof control and display positions" Stand "Explosion-proof fittings and cable glands" Stand "Explosion-proof power distribution cabinets," Stand "Explosion-proof light fittings," Stand "Explosion-proof displays, computers, terminals, display , network equipment, video surveillance, "Stand" Explosion-proof light and sound alarm devices and display "Stand" Box terminal connection Explosion-proof "Stand" Explosion-start motor control system, "Stand" Explosion system frequency regulation electric "Stand" Explosion control system obstacle lights with battery-buffered "Stand" Explosion control and display positions "Stand" Explosion-proof battery system buffered devices " | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 20 seats | 62,2 sq.m. |
| **Lab.147MMC** | **Theory of Electrical Engineering 1:**  Lab.1. Research DC circuits  Lab.2. The principle of superposition in linear chains  Lab.3. Equivalent transformations of complex linear circuits  Lab.4. Study of the simplest circuits sinusoidal current  Lab.5. Series connection of passive circuit elements sinusoidal current | State Cabinet satisfactory.  All computers in working condition, connected to the Internet.  Lighting OK. Grounding set.  There are safety magazines. | 12 seats | 30 sq.m. |
| **Lab.151MMC** | **Theory of Electrical Engineering 2:**  Lab.1. Research inductance circuits  Lab.2. Research non-sinusoidal current circuits  Lab.3. The study of two-line options  Lab.4. Lowpassfilters  Lab.5.Filtry treble | Satisfactory.  There are instructions when working on electrical installations and devices. Lightingandsafetymeetthestandards. Groundingset.  Therearesafetymagazines. | 8 seats | 30 sq.m. |
| **Lab.914 GAM** | **Physics 2:**  Lab.1. Determination of the horizontal component of the Earth magnetic field.  Lab.2. Removal of the hysteresis loop.  Lab.3. The study of forced oscillations in the oscillatory circuit.  Lab.4. Determination of the coefficient of mutual induction.  Lab.5. The study centered optical systems. | Grounding set.  The level of equipment is good laboratory equipment. There are safety magazines.  Updates: 2006, 2007 - 2 laboratory complex "Vladis" (Moscow Engineering Physics Institute, Russia);  2008 4-Phywe (Germany) company laboratory facilities.  Laboratory to certify, premises meet sanitary standards and safety | 6 seats | 25 sq.m. |
| **Lab.913 GAM**  **916 GAM** | **Physics 1:**  Lab.1. The mathematical processing of the results of measurement of physical quantities. The study of the laws of kinematics and dynamics of translational motion.  Lab.2. The study of the elastic and inelastic collision of bodies. Determination of the moment of inertia of the flywheel.  Lab.3. Determination of the gravitational acceleration using a mathematical pendulum. Determining the length of the sound waves by standing waves.  Lab.4. Determination of the gravitational acceleration using physical, revolving pendulum. DeterminationoftheadiabaticindexbyClementandDesormes.  Lab.5. Determination of liquid surface tension coefficient of account drops. Thestudyofelectrostaticfield. | 50 seats | 90 sq.m. |
| **Lab.925 GAM** | **Applied Physics:**  Lab.1. Analytical verification of the laws of kinematics and dynamics of translational motion  Lab.2. The study of the laws of conservation of momentum and energy for example balls collision  Lab.3. Defining the inert properties of the rotating body, the analytical verification of the basic law of dynamics of rotational motion  Lab.4. Determination of the coefficient of internal friction of liquid falling ball method (Stokes method)  Lab.5. Determination of the specific heat of gas | 32 seats  28 seats | 130sq.m.  90 sq.m. |
| **Lab.113GAM** | **Mechanics:**  Lab.1. The tensile test. Compression Testing ductile, brittle and anisotropic materials.  Lab.2. Determination of modulus of elasticity and Poisson's ratio.  Lab.3. Test cut steel and wood chipping samples. Torsional Testing of different materials.  Lab.4. A study of the law of distribution of normal stresses in lateral bending.  Lab.5. Test steel coil spring. Test on the stability of a straight rod. | The level of equipment is good laboratory equipment. Laboratory to certify, premises meet sanitary standards and safety. Therearesafetymagazines. | 24 seats | 54 sq.m. |
| **Lab. 53MMC** | **Occupational Safety and Health:**  Lab.1 First aid in case of accident.  Lab.2 Determination of harmful gas (vapor) in the air of industrial premises.  Lab.3 Determination industrial premises microclimate parameters.  Lab.4 Research and calculation of industrial noise on the premises.  Lab.5 Research and calculation of natural lighting.  Lab.6 Research and calculation of grounding devices parameters. Means of extinguishing fires in an active way. | The level of equipment is good laboratory equipment. Laboratory to certify, premises meet sanitary standards and safety.There are safety magazines. | 16 seats | 36 sq.m. |
| **Lab. 243MMC** | **Life Safety Fundamentals:**  Lab.1. Devices radiation, chemical detection and radiation monitoring. Assessment of radiation situation.  Lab.2. Prediction scale infection of highly potent toxic substances in case of accidents (destruction) on chemically hazardous objects and transport.  Lab.3. Determination of stability of economic facilities in emergency situations. Evaluation of engineering protection of workers and employees of facilities management.  Lab.4. Defining areas of emergency situations of natural and technogenic character. Providingpre-hospitalcare.  Lab.5. Evaluation of engineering, fire and medical conditions in the earthquake. | State lab satisfactory. There are instructions when working on electrical installations and devices. Lighting and safety meet the standards. Grounding set.There are safety magazines. | 30 seats | 187,2  sq.m. |