Laboratory base of the Department of ETaST:

Laboratories of the Department of Electronics, Telecommunications and Space Technologies of IAIT

Audience 1002 a, NC	Laboratory of Circuit Design and Modeling of Modern Electronic Devices (SPiMSEU) of the Department of "Electronics, Telecommunications and Space Technologies" together with the Association "KazRENA"
Audience 618, GMC	Laboratory "Center for Testing and Control of Nanosatellites" (CIiUN)
Audience 340, GMC	Laboratory "Measurement of optical communication line parameters"
Audience 246, GMC	Laboratory "Telecommunication Systems and Networks"
Audience 261, GMC	Laboratory "Research of pulse and analog modulation processes"
Audience 152a, GMC	Laboratory "Electrical Engineering and fundamentals of Electronics"
Audience 152b, GMC	Laboratory "Electrical Engineering and fundamentals of Electronics"
Audience 127, GMC	Laboratory "Optical Amplifier Research"
Audience 147, GMC	Laboratory "Theoretical foundations of Electrical Engineering"
Audience 155, GMC	Laboratory "Radio transmission systems"
Audience 250, GMC	Laboratory "Physical foundations of optical wave propagation in fiber light guides"
Audience 151, GMC	Laboratory "Theory of electrical circuits"

Laboratory of Circuit Design and Modeling of Modern Electronic Devices (SPiMSEU) of the Department of "Electronics, Telecommunications and Space Technologies" together with the Association "KazRENA"

Audience 1002 a, NC

Figure 1. Laboratory mounting tables

Figure 2. Training in soldering and installation of electronic circuits

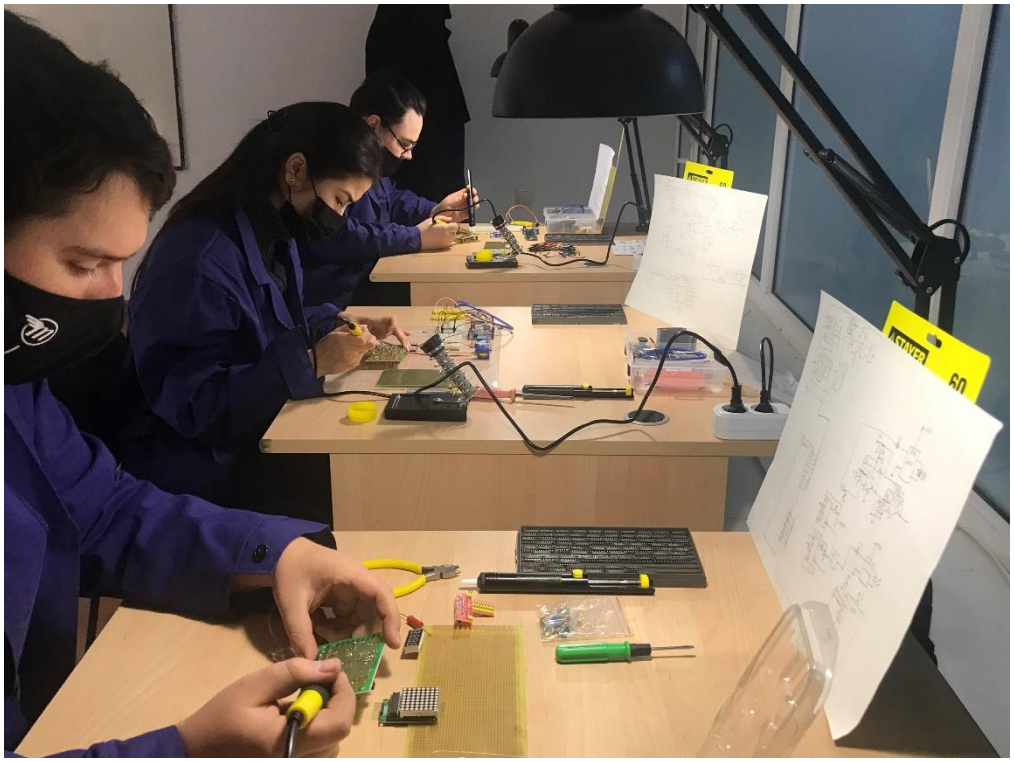

Figure 3. The process of soldering electronic components onto printed circuit boards

Functional capabilities of the SPiMSEU laboratory in the auditorium 1002 a NC

1. With the help of the advanced Arduino educational kit, you can design and assemble various electronic devices;

2. With the Stayer soldering kit, electronic components can be soldered onto printed circuit boards;

3. With the help of laboratory measuring devices, you can:

A) Observe various signals on the oscilloscope screen;

B) Measure the amplitude, frequency and phase of various signals;

C) Measure voltage, current, resistance, inductance, capacitance, loss angle tangent, Q-factor of various radio components and elements.

4. With the help of laboratory test devices, it is possible to: generate various signals at high and low frequency; to adjust, check and study the parameters of radio receivers and antenna-feeder devices;

5. The element base of the laboratory includes microcircuits (4511 pcs.), diodes (355 pcs.), transistors (432 pcs.), capacitors (1400 pcs.), resistors (1113 pcs.), which can be used in the assembly of electronic devices (https://drive.google.com/drive/folders/1SEgfLkAYkToyo4YRWVON2Iqmq4GhxGg2 ?usp=sharing);

6. With the help of CISCO equipment, you can design network technologies and the Internet of Things.

7. Satellite equipment can be used to study satellite communication technology.

8. Using the 3D printer Bulder V2, you can independently create real 3-dimensional objects and print them on a 3D printer.

The laboratory is designed for 5 workplaces with all the amenities for designing and modeling modern electronic devices. Each of which includes: a soldering kit, an Arduino UNO KIT (3 pcs) and a lamp.

GENERAL INFORMATION

Address: Almaty, Bostandyk district,

Satpayev str., 22, Oil building,

10th floor, office 1002 a

E-mail: y.tashtay@satbayev.university

Laboratory "Center for Testing and Control of Nanosatellites" (CIiUN)

Auditorium 618, GUK

Laboratory stands have been installed in the laboratory of GUK 618 "Nanosatellite Testing and Control Center":

- a stand for simulating relative motion and testing the orientation and stabilization systems of SX-025 nanosatellites.

Figure 5. Stand for simulation of relative motion and testing of orientation and stabilization systems of SX-025 nanosatellites

Figure 6. Work with the stands of nanosatellites, student of the specialty "Space engineering and technology" Suleev T.

Stand functionality

The stand is capable of performing the following functions with respect to the movement and testing of on-board orientation and stabilization systems of nanosatellites:

- simulation of a free (in three rotational degrees of freedom) orbital flight of a nanosatellite under the influence of external disturbances of a gravitational aerodynamic and magnetic nature, as well as under the influence of torques from the onboard devices of the nanosatellite;
- creation of three projections of the required magnetic field in a given volume;
- changing three projections of the magnetic field according to a user-defined law, the characteristics of the stand allow you to create a magnetic field equal to the magnetic field at any point above the Earth's surface at an altitude of 100 to 40,000 km, and ballistic calculation allows you to simulate the orbits of the satellite and change the magnetic field in accordance with how it happens during the flight of the satellite in orbit;
- simulation of solar radiation in the visible range of the spectrum in the nanosatellite passage zone inside the stand.

Laboratory "Measurement of optical communication line parameters"

Audience 340, MMC

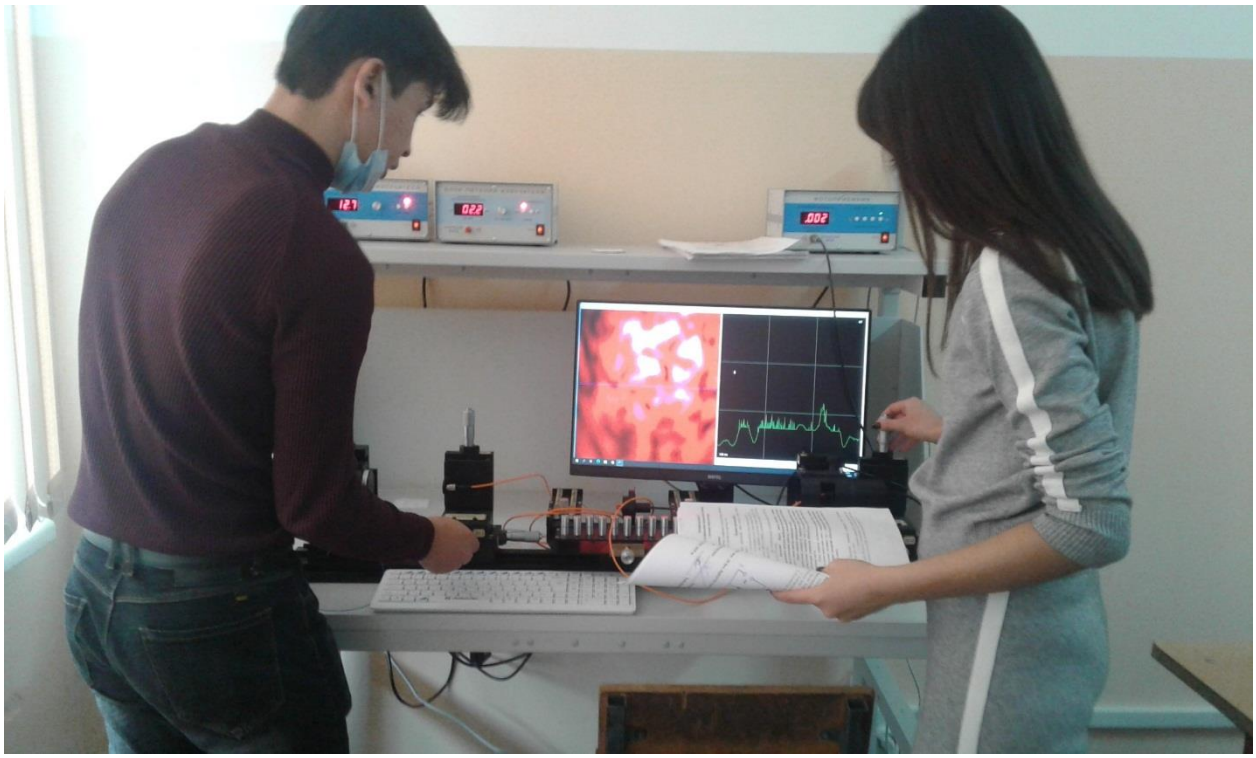

Figure 7. Educational laboratory installation "Study of the characteristics of optical fiber light guides"

Figure 8. Educational laboratory installation "Measurement of optical communication line parameters"

Laboratory stands have been installed in the laboratory of MMC 340 "Measurement of optical communication line parameters", allowing to produce:

1. Measurement of attenuation coefficients of fiber optical fibers using an optical tester
2. Determination of the optical communication line breakage using an optical tester
3. Investigation of the characteristics of detachable connectors
4. Study of the characteristics of attenuators
5. Measurement of technical characteristics of fiber-optic splitters.
6. Investigation of the technical characteristics of the optical circulator.
7. Measurement of the technical characteristics of the CWDM multiplexer /demultiplexer.
8. Investigation of the technical characteristics of the optical insulator.
9. Qualitative analysis of the mode structure of fiber light guides
10. Experimental determination of the numerical aperture of fiber optical fibers
11. Investigation of the dependence of the specific attenuation coefficient introduced by the bending of the light guide on its radius

Classes in the disciplines are held in the laboratory:

1. Methods of modeling and optimization in telecommunication systems;
2. Wireless sensor networks.

Training of specialists in the field of microelectronics, optical transmission systems, optical telecommunication systems.

Laboratory "Telecommunication Systems and Networks"

Auditorium 246, MMC

Figure 9. Stand "GPON optical network model"

Figure 10. Stand "Access Information Networks"

In the laboratory of MMC 246 "Telecommunication systems and networks" it is possible to study:

1. Passive optical network architecture;
2.Measure the characteristics of the optical linear path;
3. Troubleshooting in the linear path;
4.Weld the optical fiber using the Fujikura apparatus.

Classes in the disciplines are held in the laboratory:

1. Electronic converters and measuring systems;
2. Design of radio engineering and telecommunication systems;
3.Satellite navigation and sensing systems;
4.Backbone communication networks;
5.Satellite communication systems;
6. Theory of signal transmission;
7.Multichannel fiber-optic telecommunication systems;
8.Digital broadcasting systems;
9. Methods of modeling and optimization in telecommunication systems.

Training of specialists in the field of microelectronics, optical transmission systems, optical telecommunication systems.

Laboratory "Research of pulse and analog modulation processes"

Auditorium 261, MMC

Figure 11. Educational laboratory installation "Optical linear path model"

In the laboratory of MMC 261"The study of pulse and analog modulation processes" can be performed:

1. Investigation of the watt-ampere characteristics of a laser diode (LD) and a light-emitting diode (LED).

2. Investigation of the polarization properties of the laser and light-emitting diode.

3. Investigation of the dependence of the degree of coherence of the laser diode on the pumping current.

4. Investigation of pulse modulation processes of a laser diode.

5. Investigation of the processes of analog modulation of a laser diode.

6. Simulation of the waveform at the receiving end of a real optical communication line.

7.Measurement of the time of the group delay of the optical signal.

Conducting classes in disciplines:

1.Fourier Analysis in telecommunication systems

2.Electronic converters and measuring systems

3. Electromagnetic compatibility of radio-electronic means

4. Modeling of telecommunication networks and systems

5. Modeling of electronic circuits in the MatLab environment

6.Microelectronics

Training of specialists in the field of microelectronics, optical transmission systems.

Laboratory "Electrical Engineering and fundamentals of Electronics"

Auditorium 152a, MMC

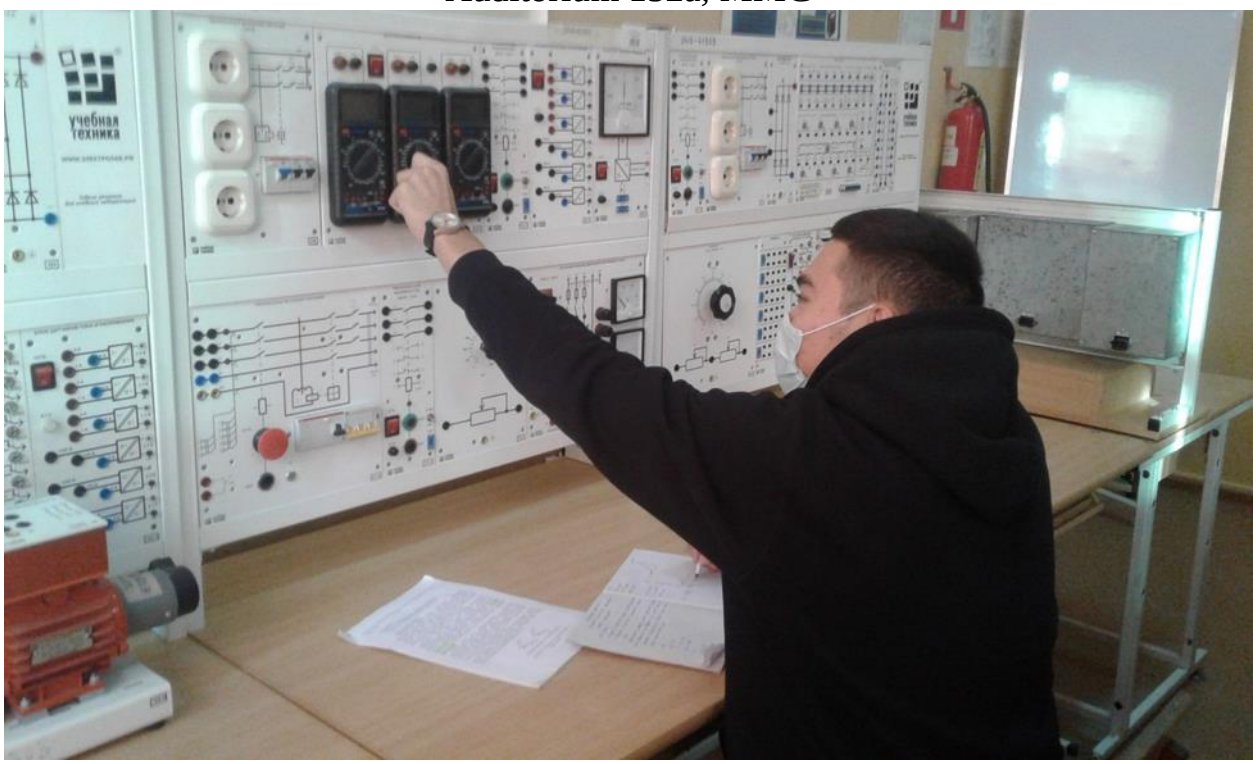

Figure 12. Stand "Electric machines"

In the laboratory of MMC 152a "Electrical engineering and fundamentals of electronics" it is possible to produce:

1. Investigation of linear DC electrical circuits using Ohm's and Kirchhoff's laws;

2. Calculation of electrical circuits by the overlay method;

3. Investigation of linear circuits of sinusoidal current;

4. Investigation of an unbranched sinusoidal current circuit. Voltage resonance;

5. Investigation of a branched sinusoidal current circuit. Resonance of currents;

6. Investigation of three-phase electrical circuits when connecting a consumer with a star.

Conducting classes in disciplines:

1. Fourier analysis in telecommunication systems;

2. Circuitry of electronic means;

3. Backbone communication networks;

4. Theory of signal transmission;

5. Microelectronics;

6. Theory of electrical circuits;

Training of specialists in the field of electrical engineering, electronics.

Laboratory "Electrical Engineering and fundamentals of Electronics"

Audience 152b, MMC

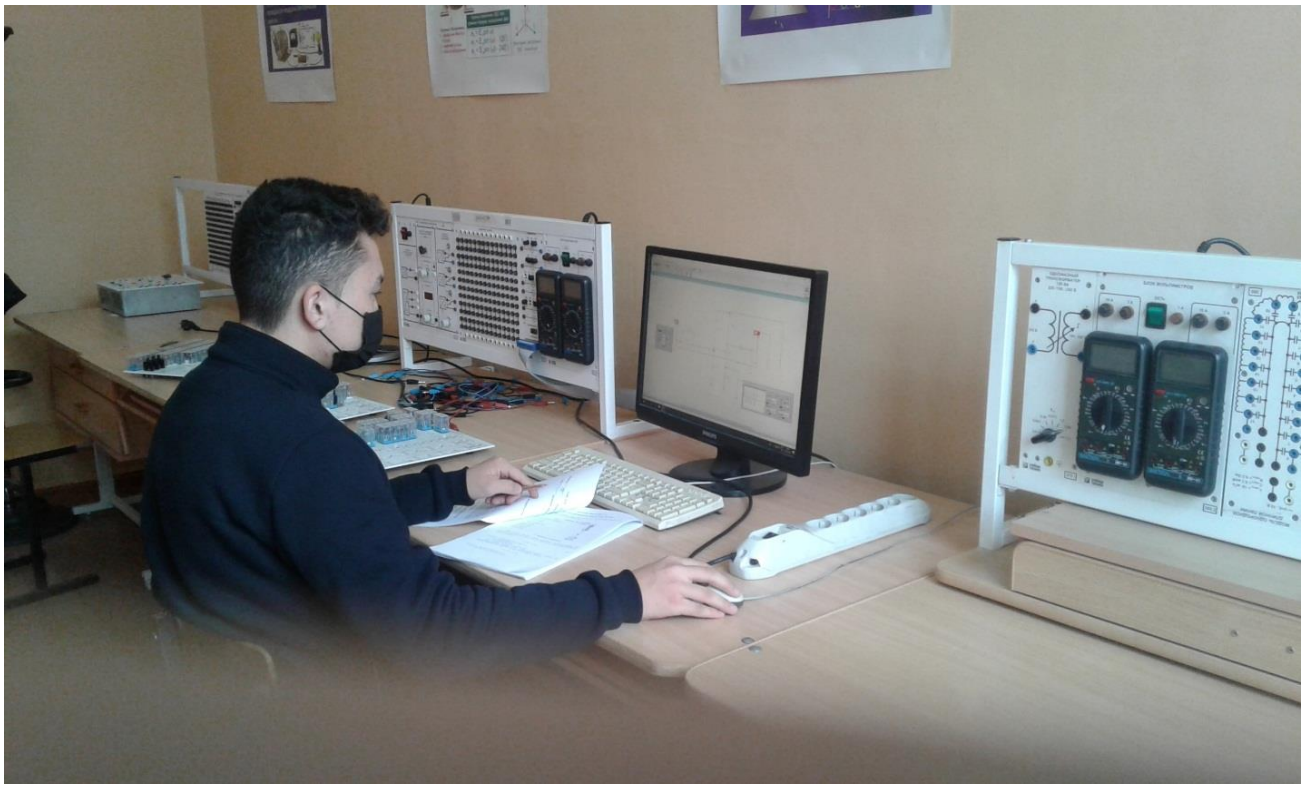

Figure 13. Educational and laboratory stand on the theoretical foundations of electrical engineering

In the laboratory of MMC 152b "Electrical engineering and fundamentals of electronics" it is possible to produce:

1. Research of semiconductor diodes;
2. Zener diode research;
3. Bipolar transistor research;
4. Investigation of the output characteristic of a field-effect transistor with a control p-junction for a common-source switching circuit;
5. Investigation of a branched sinusoidal current circuit. Resonance of currents;
6. Investigation of an unbranched sinusoidal current circuit. Voltage resonance;

Conducting classes in disciplines:

1.Fourier analysis in telecommunication systems;
2.Circuitry of electronic means;
3. Backbone communication networks;
4. Theory of signal transmission;
5.Microelectronics;
6. Theory of electrical circuits.

Training of specialists in the field of electrical engineering, electronics.

Laboratory "Optical Amplifier Research"

Auditorium 127, MMC

Figure 14. Educational laboratory installation "Optical amplifier research"

In the laboratory of MMC 127 "Optical amplifier research" can be performed:

1. Measurement of the power of the optical radiation source;

2. Determination of the parameters of the DWDM multiplexer /demultiplexer (DMUX), determination of the parameters of the radiation source;

3. Measurement of GFF filter parameters (filter corrector);

4. Measurement of optical insulator parameters;

5. Determination of optical splitter parameters;

6. Study of the EDFA optical amplifier circuit;

7. Determination of the gain of an optical amplifier in a "wide" and narrow wavelength range;

8. Study of spontaneous and forced radiation;

9. Study of backscattering and reflection effects;

10. Study of the operation of the power stabilization circuit and the temperature stabilization circuit of the EDFA amplifier.

Conducting classes in disciplines:

1. Theory of signal transmission;

2. Modeling of communication systems and networks.

Training of specialists in the field of electrical engineering, telecommunications, optical devices, radio engineering.

Laboratory "Theoretical foundations of Electrical Engineering"

Auditorium 147, MMC

Figure 15. Educational and laboratory stand on the theory of electrical circuits

In the laboratory of MMC 147 "Theoretical foundations of electrical engineering" it is possible to produce:

1. Investigation of linear DC electrical circuits using Ohm's and Kirchhoff's laws;

2. Calculation of electrical circuits by the overlay method;

3. Investigation of linear circuits of sinusoidal current;

4. Investigation of an unbranched sinusoidal current circuit. Voltage resonance;

5. Investigation of a branched sinusoidal current circuit. Resonance of currents;

6. Investigation of three-phase electrical circuits when connecting a consumer with a star;

Conducting classes in disciplines:

1. Multichannel fiber-optic telecommunication systems;

2. Backbone communication networks;

3. Circuitry of electronic means;

4. Theoretical foundations of electrical engineering;

5. Theory of electrical circuits.

Training of specialists in the field of electrical engineering, electronics, radio engineering.

Laboratory "Radio transmission systems"

Audience 155, MMC

Figure 16. Educational and laboratory stand on the theory of electrical circuits

In the laboratory of MMC 155 "Radio transmission systems" it is possible to produce:

1. Investigation of the characteristics of radio elements

2. Investigation of linear DC electrical circuits using Ohm's and Kirchhoff's laws

3. Calculation of electrical circuits by the overlay method

4. Investigation of linear circuits of sinusoidal current

5. Investigation of an unbranched sinusoidal current circuit. Voltage resonance

6. Investigation of a branched sinusoidal current circuit. Resonance of currents

7. Investigation of three-phase electrical circuits when connecting a consumer with a star

Conducting classes in disciplines:

1. Theoretical foundations of electrical engineering

2.Electrical materials

Training of specialists in the field of electrical engineering, electronics, radio engineering.

Laboratory "Physical foundations of optical wave propagation in fiber light guides"

Audience 250, MMC

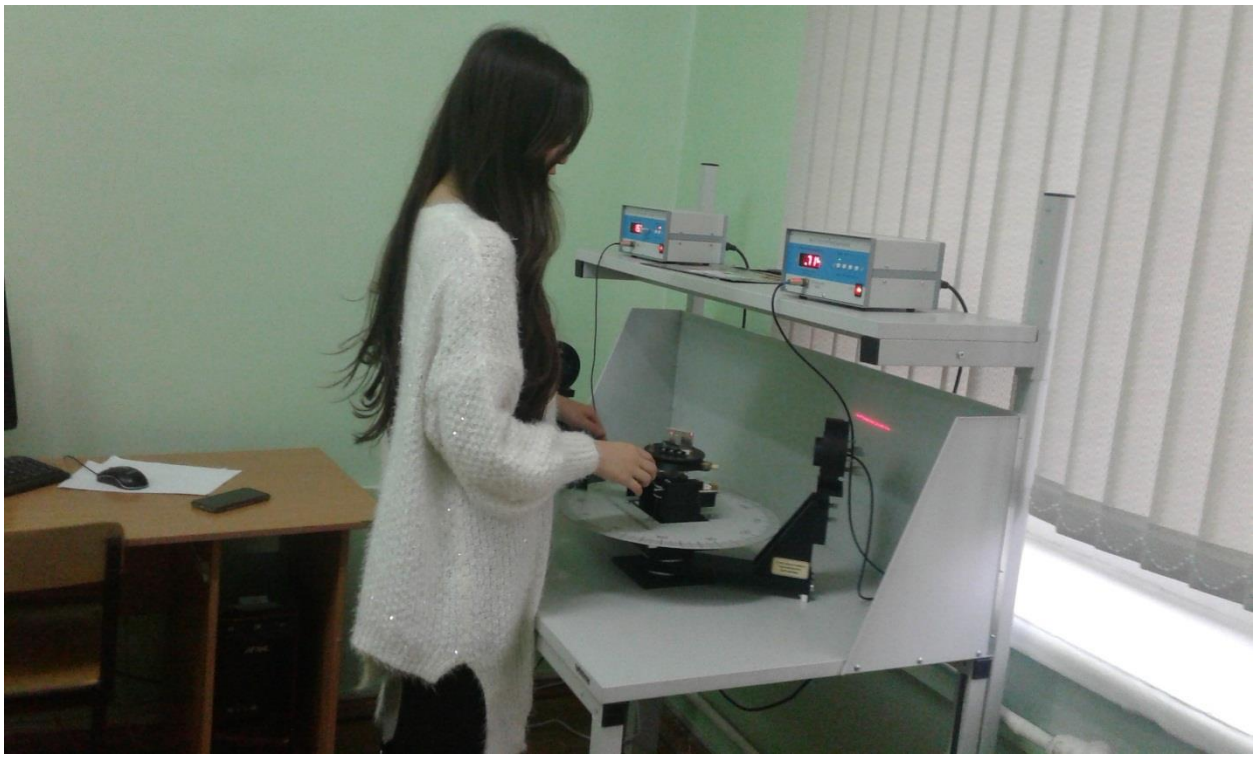

Figure 17. Educational laboratory installation "Physical foundations of optical wave propagation in fiber light guides"

In the laboratory of MMC 250 "Physical foundations of optical wave propagation in fiber light guides" it is possible to produce:

1. Measurement of the polarization coefficient of a fiber light guide;

2. Determination of the angle of total internal reflection and the Brewster angle of a fiber light guide;

3. Measurement of the reflection coefficient at the interface at n12<1.

Conducting classes in disciplines:

Microelectronics, optical networks

Training of specialists in the field of microelectronics, optical transmission systems.

Laboratory "Theory of electrical circuits"

Auditorium 151, MMC

Figure 18. Educational and laboratory stand on the theory of electrical circuits

In the laboratory of MMC 151 "Theory of electrical circuits" it is possible to produce:

1. Investigation of linear DC electrical circuits using Ohm's and Kirchhoff's laws;
2. Calculation of electrical circuits by the overlay method;
3. Investigation of linear circuits of sinusoidal current;
4. Investigation of an unbranched sinusoidal current circuit. Voltage resonance;
5. Investigation of a branched sinusoidal current circuit. Resonance of currents;
6. Investigation of three-phase electrical circuits when connecting a consumer with a star.

Conducting classes in disciplines:

1. Theoretical foundations of electrical engineering;
2. Guiding telecommunication systems;
3. Microelectronics;
4. Theory of electrical circuits;
5. Circuitry of electronic means.

Training of specialists in the field of electrical engineering, electronics.