Admission Prerequisite

Admission to a Bachelor's degree programme is open only to holders of a state certificate confirming complete general education or an equivalent document who are admitted in accordance with the procedure established by the legislation of Georgia.

Programme Objective

- Provide students with broad knowledge of modern technologies for producing, transmitting, distributing and consuming thermal and electrical energy and converting them into other forms of energy. This includes general engineering education; the design, installation, commissioning, testing and operation of thermal, hydro and electric power equipment, power stations and substations, electrical machines and apparatus, electrical materials, energy-efficient technologies and their components and assemblies; and economic and environmental aspects;

- Develop practical engineering skills to solve tasks and problems in industrial and commercial enterprises, and to install, maintain, repair and diagnose faults in electrical wiring and equipment in domestic settings;

- Equip graduates with competences compatible with labour market requirements in energy and establish a foundation for further study and professional development.

Learning Outcomes/Competences (General and Professional)

The Bachelor of Energy and Electrical Engineering:

1. Describes types of energy sources and conditions for their efficient use.

   Classifies energy facilities;
2. Explains the purpose and operating principles of thermal, hydro and electric power equipment. Masters modern methods of calculating their operating conditions;

3. Analyses electrical, thermal and hydrodynamic processes in energy equipment in accordance with predetermined instructions. Formulates appropriate conclusions;

4. Uses relevant knowledge of physics, mathematics and engineering, computer technologies, and modern practical engineering methods and tools to solve calculation and analysis tasks involving electrical equipment, facilities and systems;

5. Solves basic practical tasks in accordance with calculations of energy equipment operating conditions and characteristics;

6. In accordance with predetermined instructions, designs and/or

installs, commissions, tests and operates components of electric, thermal and hydropower equipment;

7. Determines methods of reducing fuel consumption and/or the energy balance of industrial facilities and energy consumption standards, considering electrical and thermal loads. Collects data for a facility's energy performance passport;

8. Modernises energy facilities and their individual equipment together with a group of specialists; works effectively in a team in a complex, unpredictable working environment, considering social and ethical standards;

9. Prepares a written report/presentation on ways of solving existing problems for both energy specialists and non-specialists, using modern communication technologies;

10. Conducts development-oriented activities in energy and electrical engineering in accordance with environmental and economic aspects, energy-efficient and energy-saving technologies, occupational safety, electrical safety and technical operation standards.

Plans continuous professional development and identifies learning needs.

Concentration 1. Thermal Power Engineering

1. On the basis of broad knowledge of the field, describes methods of generating and converting thermal energy, processes in thermal power equipment, its structural layouts, operating principles and conditions, and environmental impacts. Formulates the principal objectives of energy audits and methods of thermal diagnostics and energy saving.

2. In accordance with predetermined instructions and collected data, calculates the characteristics of thermal power equipment and formulates appropriate conclusions about its operating efficiency, considering energy-saving and environmental objectives. Participates in the operation and repair of thermal power equipment and apparatus, and scheduled and emergency shutdown and start-up work.

3. Observing professional ethics, prepares a report on the energy-efficient operation of thermal power equipment and presents it to both professional and interested public audiences.

Concentration 2. Power Stations, Networks and Systems

1. Describes types of relay protection and their purpose in electrical networks. Characterises equipment insulation systems. Explains the principal causes of transient processes in electrical systems, the nature of internal and external overvoltages and their negative effects. Formulates the basic principles and methods of electrical system design.

2. Calculates electrical operating conditions and short-circuit currents for small electrical systems, selects the main parameters of power distribution, switching and power equipment, and analyses the results in relation to energy efficiency. Models and simulates atmospheric and switching overvoltages. Selects relay protection settings in simple networks. Participates in equipment installation and operation.

3. Prepares a written report on solutions to technical challenges in electric power engineering. Creates and presents a presentation on normal and emergency operating conditions in electrical systems.

Concentration 3. Hydropower Engineering

1. On the basis of broad knowledge of hydropower engineering, describes methods of using and converting hydraulic energy, the operating principles of hydropower equipment and its structural layouts. Masters modern methods of determining the energy characteristics of various hydraulic machines and the principal hydrological indicators of rivers, and methods of calculating hydraulic machine operating conditions.

2. Calculates individual components of various hydraulic machines in accordance with a plan. Participates in installation, repair and rehabilitation work, operating hydroelectric generating units and preparing technical passport documentation for hydropower facilities. Analyses and drafts conclusions on problems involving hydraulic machines and river hydrological characteristics, considering environmental requirements.

3. Competently presents information to energy professionals or non-specialists about solutions to local problems relating to hydropower engineering.

Concentration 4. Electricity Supply and Electricity Consumption Technologies

1. Describes the operating principles of electrotechnological equipment complexes and automated electromechanical systems, electrical and electromechanical processes in their power components, and operating conditions. Selects protection circuits and control systems for their power sections and individual components.

2. Participates in designing normal and emergency electricity supply operating conditions at different voltage levels for electrotechnological equipment, complexes, cities and settlements; designing electric lighting networks; installing relay protection systems and selecting settings; and repair, commissioning and operation. Selects switching equipment and checks its thermal and dynamic withstand capability against expected short-circuit currents. Calculates the reactive power required by electrical equipment

from the network and determines the parameters of compensation equipment.

3. Observing professional ethics, prepares a written report on electricity supply and electricity consumption technologies and appropriately presents it to energy professionals or non-specialists.

Concentration 5. Electromechanics

1. Describes the structural characteristics and operating principles of electrical machines and apparatus, the physical process of energy conversion, and electromagnetic, electromechanical and thermal phenomena within them under various operating conditions. Characterises the operating conditions, operation rules, test types and standards of electrical machines and apparatus.

2. Calculates energy conversion parameters, structural and electrical parameters of the main assemblies of various electrical machines, and energy losses within them. Participates in the design, installation, testing and operation of electrical machines and apparatus.

3. Observing professional ethics, prepares a written report on electromechanics, including the conversion of electrical and mechanical energy, and appropriately presents it to energy professionals or non-specialists.

Student Knowledge Assessment System

Assessment is based on a 100-point scale.

Positive grades are:

• (A) - Excellent - 91-100 points;
• (B) - Very Good - 81-90 points;
• (C) - Good - 71-80 points;
• (D) - Satisfactory - 61-70 points;
• (E) - Sufficient - 51-60 points.

Negative grades are:

• (FX) - Did Not Pass - 41-50 points, meaning that the student needs more work to pass and is entitled to take one additional examination after independent study;
• (F) - Fail - 40 points or less, meaning that the work completed by the student is insufficient and the student must retake the course.

If a student receives an FX grade, an additional examination is scheduled no earlier than 5 days after the results are announced. The grade obtained in the additional examination is not added to the score obtained in the final assessment. Detailed information is available on the GTU website: Instruction on the Management of the Educational Process at Georgian Technical University.

https://www.gtu.edu.ge/uploads/2026/03/educational-process2.pdf

Course	Credits
Engineering Mathematics 1	5
General Physics A	4
General Chemistry A	4
Applied Informatics	4
Environmental Protection and Ecology	3
Introduction to the Specialisation	5
Compulsory Elective Foreign Language 1 (Choice of Language)	
English Language 1	5
German Language 1	
French Language 1	
Russian Language 1	
Engineering Mathematics 2	5
General Physics B	4
Engineering Thermodynamics	5
Using AutoCad Software to Solve Engineering Problems	5
Fundamentals of Economics and Marketing	3
Special Course in the State Language	5
Compulsory Elective Foreign Language 2 (Choice of Language)	
English Language 2	5
German Language 2	5
French Language 2	5
Russian Language 2	5
Elective Free Component (Humanities)	3
Compulsory Courses with Content Corresponding to the Main Field of Study	

Courses	
Engineering Mathematics 3	5
Theoretical Fundamentals of Electrical Engineering 1	5
Fundamentals of Applied Hydroaeromechanics	5
Theoretical Mechanics	3
Thermal Processes and Installations	5
Renewable Energy Sources	3
Occupational Safety in Energy	3
Theoretical Fundamentals of Electrical Engineering 2	5
General Electronics	4
Energy Economics	4
Fundamentals of Electromechanics	5
Electric Lighting	5
Elective Courses with Content Corresponding to the Main Field of Study]	
Fundamentals of Technical Mechanics	3
Electrical Measurements	3
Energy Conversion Technologies Using Hydropower Installations]	5
Thermal Energy Conversion Technologies 1	5
General Electricity Supply	5
Theoretical Fundamentals of Electrical Engineering 3	3
Electrical Apparatus	3
Power Electronics	5
Electrical Machines	5
Power Stations and Substations	4
Thermal Energy Conversion Technologies 2	5

Electricity Consumption Technologies	5
Electrical Engineering Materials	5
Hydropower and Hydromechanical Equipment of Hydroelectric Power Stations	5
Power Transmission Networks	5
Industrial Practice in Energy and Electrical Engineering	5
Bachelor's thesis	5
Free component	5
Free component	10
Free component	5
Elective Courses with Content Corresponding to the Main Field of Study	
Thermal Engineering Measurements	5
Switching Circuits and Operating Conditions of Power Stations and Substations	5
Hydroelectric Power Stations	5
Substations of Electricity Supply Systems	5
43.5 [Electrical Machines for Automatic Equipment]	5
Concentration 1 _ Thermal Power Engineering	
Steam Generators	5
Energy Audit	5
Environmental Impact of Thermal Power Installations and Environmental Protection	5
Non-Conventional Energy Technologies and Energy Conservation	5
Engineering Thermal Diagnostics and Instruments	5
High-Temperature Thermophysical Processes and Apparatus	5
Concentration 2 _ Power Stations, Networks and Systems	

Steady-State Operating Conditions of Electrical Systems	5
Relay Protection in an Electrical System	5
High-Voltage Engineering	5
Electromagnetic Transients	5
Design of Electrical Networks	5
Insulation Systems of High-Voltage Equipment	5
Digital Protection Systems	5
Concentration 3 _ Hydropower Engineering	
Vane Pumps and Pumping Installations	5
Hydraulic Turbines	5
Positive-Displacement Hydraulic Machines and Hydraulic Drives	5
Energy SCADA Systems	5
Hydrogenerators	5
Reversible Hydraulic Machines	5
Fundamentals of Hydraulic Turbine Repair and Operation	5
Electric Power Systems	5
Fundamentals of Hydraulic Turbine Installation	5
Hydrological Fundamentals of Hydropower Engineering	5
Fundamentals of Geodesy, Topography and Cartography	5
Concentration 4 _ Electricity Supply and Electricity Consumption Technologies	
Automated Electromechanical Systems	5
Electricity Supply to Electrotechnological Installations and Complexes	5
Control of Electromechanical Systems	5
Protection of Electrotechnological Installations and Electricity Supply Systems	5
Electrotechnological Installations and	5

Installation of Electricity Supply Systems	
Concentration 5 _ Electromechanics	
Operation and Repair of Electrical Machines	5
Electrical Energy Generators	5
Fundamentals of Electrical Machine Design	5
Electrical Apparatus for Low- and High-Voltage Switchgear	5
Testing of Electrical Machines	5
Electromechanical Apparatus for Automation	5
Power Transformers and Autotransformers	5
Free components (Elective)	
Fundamentals of Philosophy	3
Introduction to Sociology	3
Introduction to Psychology	3
History of Georgia	3
Elements of Academic Writing	3
Stages of Startup Development of a Small Energy Enterprise	5
Economic Fundamentals of Energy Resource Use	5
Fundamentals of Energy Market Formation	5
Fundamentals of Financial Information in Energy	5
Project Management	5
Engineering Management	5
Fundamentals of Systems Engineering	5
Technological Systems and Processes	5
Quality and Productivity Assurance	5
Creative Thinking	5

Physical Picture of the World	5
Fundamentals of Data Modelling	5
Intellectual Property	5
Accreditation and Certification	5
Modern Models of Energy Enterprise Management	5
Economic Aspects of Innovative Technologies in Energy	5
Marketing Management in Energy	5
History of Modern Architecture	5
Introduction to Colour Theory	5
Total:	240