

**NON-PROFIT JOINT STOCK COMPANY**  
**ALMATY UNIVERSITY OF POWER ENGINEERING AND**  
**TELECOMMUNICATIONS NAMED AFTER GUMARBEK DAUKEYEV**



Approving  
Vice-Rector for Research  
K. Alipbayev

2026 year.

**PROGRAM**

Entrance examination to the doctoral program in the direction  
Engineering and engineering work: D099 -«Energy and Electrical Engineering»

Almaty 2026

The program for the D099 group of educational programs – «Energy and Electrical Engineering» is based on standard and working curricula, as well as discipline programs.


The program was reviewed and approved at the meeting of the Department of Electric Power Engineering Protocol no. 10 of «19» 05. 2026y.

Head of the Department of Electric Power Engineering  Umbekulov E.K.

The program was reviewed and approved at the meeting of the Department of Electric Power Systems Protocol no. 10 of «19» 05. 2026y.

Head of the Department of Electric Power Systems  Oteshkalieva L.S.

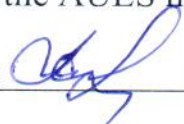
The program of the entrance exam for the group of educational programs D099 – «Energy and Electrical Engineering» was approved by the educational and Methodological Commission of the Institute of Energy and Green Technologies «01» 04 2026y. Protocol no. 5.

Director of the Institute of Energy and Green Technologies  Amitov E.T.

The program of the entrance exam to the doctoral program in the group of educational programs D099 – «Energy and Electrical Engineering» was approved by the Department of Science of the AUES named after G.Daukeev.

Director of the Department of Science  Kalieva N.B.

The program of the entrance exam to the doctoral program in the group of educational programs D099 – «Energy and Electrical Engineering» was approved by the Department of Academic Affairs of the AUES named after G.Daukeev.

Director of the AA Department  Baizakova S.M.

## I. General provisions

1. The program was compiled in accordance with the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 600 "On approval of the Model Rules for Admission to study in educational organizations implementing educational programs of higher and postgraduate education" (hereinafter referred to as the Model Rules), taking into account the amendments and additions.

2. The doctoral entrance exam includes an interview, essay writing, and an exam on the profile of a group of educational programs.

Block	Scores
1. The interview	30
2. The Essay	20
3. Examination according to the profile of the educational program group.	50
Total/pass-through	100/75

3. The duration of the entrance exam is 3 hours and 10 minutes, during which the applicant writes an essay and answers an electronic exam ticket. The interview is conducted at the university before the entrance exam.

## II. The order of the entrance exam

1. Applicants for doctoral studies in the D099 group of educational programs – «Energy and Electrical Engineering» write a problem / thematic essay. The length of the essay is at least 250 words.

The purpose of the essay is to determine the level of analytical and creative abilities expressed in the ability to build one's own argumentation based on theoretical knowledge, social and personal experience.

Types of essays:

– a motivational essay with the disclosure of motivations for research activities;

– a scientific and analytical essay substantiating the relevance and methodology of the planned research;

– a problem/thematic essay reflecting various aspects of scientific knowledge in the subject area.

2. The electronic examination card consists of 3 questions.

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## **1. ELECTRICAL NETWORKS AND SYSTEMS**

### **Topic 1. Improving the efficiency of voltage regulation in electrical networks**

Improving the efficiency of voltage regulation based on intelligent control of electrical network modes. The use of modern control algorithms to reduce power loss and improve the quality of electrical energy.

### **Topic 2. Improving the energy efficiency of electric networks by reducing electricity losses**

The causes of electricity losses in electrical networks and the development of methods to reduce them. Technical and operational factors affecting the loss rate, including line overload, uneven loads, low power factor, and equipment wear. Modern ways to increase energy efficiency include optimizing network operation modes, reactive power compensation, and the use of energy-efficient equipment and digital monitoring technologies.

### **Topic 3. Means and methods of increasing the stability of electric power systems**

Methods and technical means to ensure stable and reliable operation of electric power systems under various operating conditions. Factors affecting the stability of energy systems, including emergency disturbances, load changes, short circuits, and the integration of renewable energy sources. Modern ways to increase static and dynamic stability, the use of reactive power compensation devices, automatic control systems, emergency automation, FACTS devices and digital control technologies.

### **Topic 4. Increasing the capacity of power transmission lines**

Methods of increasing the capacity of power transmission lines to ensure reliable and efficient transmission of electric energy in conditions of increasing loads and developing power systems. Factors limiting the capacity of lines, including thermal conditions of wires, power losses, system stability and permissible voltage levels. Modern ways to increase the throughput of high-temperature wires, reactive power compensation devices, FACTS technologies, digital monitoring systems and optimization of network operation modes.

### **Topic 5. The main problems of operation of electrical networks and systems in modern conditions**

Actual problems of operation of electric grids and electric power systems in the context of increasing energy consumption, digitalization and integration of modern technologies. The main factors affecting the reliability and efficiency of networks, including equipment wear, overload of transmission lines, loss of electricity, deterioration of electricity quality and increased requirements for the stability of power systems. Automation and implementation of intelligent control

systems, integration of renewable energy sources and improvement of cybersecurity of electric power facilities.

## THE LIST OF RECOMMENDED LITERATURE

### *Major literature*

1. Gerasimenko, Alexey Alekseevich. Electric power industry. Designing electrical networks: a textbook/A. A. Gerasimenko, V. N. Girenkov, G. S. Timofeev; rec.: A.V. Bastron, V. B. Neshataev, 2024. - 232 p.; 15.0 conl. p. l. - Text: electronic. URI: [https://elib.sfukras.ru/handle/2311/154231?utm\\_source=chatgpt.com](https://elib.sfukras.ru/handle/2311/154231?utm_source=chatgpt.com)

2. Gerasimenko, A. A. Electrical systems and networks: textbook. manual / A. A. Gerasimenko, V. T. Fedin. Rostov-on-Don : Phoenix, 2023. 473 p.: ill., tables, diagrams. – (Higher education) (Complies with the Federal State Educational Standard).

3. Vorotnitsky V.E. Reduction of electric power losses in distribution electric networks / V.E. Vorotnitsky, A.V. Mogilenko - M.: Infa-Engineering, 2023. - 308c.

4. Shvedov G.V. Losses of electric power during its transport via electric networks: calculation, analysis, rationing and reduction: a textbook for universities.V. Shvedov, O.V. Sipacheva, O.V. Savchenko; edited by Yu.S. Zhelezko. Moscow: Publishing House of the MEI, 2022. 424 p.

5. Dolgov, A. P. Transitional regimes and stability of electric power systems: textbook / A. P. Dolgov. Novosibirsk: NSTU, 2022. - 258 p. – ISBN 978-5-7782-4678-2. – Text: electronic//Lan: electronic library system. – URL: <https://e.lanbook.com/book/306263>

6. Vanteev A.I., Maintenance of electrical substations: theory and practice: textbook. the manual / A.I. Vanteev. Moscow: Infra-Engineering, 2021; Vologda. – 368

7. Barybin Yu.G. Operation of electrical networks and systems. Moscow: Akademiya Publ., 2021.

8. Savina N.V. Regulation of voltage and reactive power in electrical networks. Novosibirsk: NSTU, 2021.

9. Fedoseev A.M. Energy saving in power supply systems. – St. Petersburg: Lan, 2021.10.

New reference materials on high-voltage alternating current switches and disconnectors. Textbook / G.H. Khozhin, Yu.A. Lenkov, Zh.N. Tasybayeva, D.S. Zaurbekova. – Almaty: NAO "Gumarbek Daukeev AUES", 2021 – 64 p.: table 9, ill. 17, bibliogr. -10 titles.

11. Lykin, A.V. Electric power systems and networks : a textbook for universities/A.V. Lykin. Moscow : Yurait Publishing House, 2020. 360 p. (Universities of Russia). – ISBN 978-5-534-04321-1. – Text: electronic// Educational platform Yurayt [website]. – URL: <https://urait.ru/bcode/413782>

12. Glazunov A.A. Stability analysis of electric power systems. – St. Petersburg: Lan Publ., 2020.

Additional literature

13. Guk Yu.B. Theory of reliability in the electric power industry. – St. Petersburg: Lan Publ., 2020.

14. Agafonov A.I., 3. Modern relay protection and automation of electric power systems: textbook. manual / A.I. Agafonov, T.Y. Brostilova, N.B. Jazovsky. - 2nd ed., revised and add. - Moscow : Infra-Engineering, 2020; Vologda. - 300 p.: ill., tab.

15. Faybisovich D.L. Modern electrical networks and systems. Moscow: ENAS, 2020.

16. Mikhalkova E.G. 4. Polishchuk V. I., Operation, diagnostics and repair of electrical equipment: textbook. manual/V.I. Polishchuk. - M.: INFRA-M, 2020. - 203s. - (Higher education: Bachelor's degree)

17. Bulatov Yu.N. Control of modes of electric power systems. Moscow: MEI, 2020.

18. Berkovich M.A. Energy efficiency of electric networks. Moscow: MEI, 2020.

19. Markov V.S., Main electrical circuits and power supply circuits for own needs of electrical installations and substations: textbook. manual / V.S. Markov. Moscow: Infra-Engineering, 2020; Vologda. - 192s.: ill., tab.

20. Nemirovskiy A. E., Electrical equipment of electric networks, stations and substations: textbook. manual / A.E. Nemirovsky, I.Y. Sergievskaya, L.Y. Krepysheva. - 4th ed., supplement - Moscow: Infra-Engineering, 2020; Vologda. - 174 p .

21. Pospelov G.E. Increasing the capacity of electric networks. Moscow: Energoatomizdat, 2019.

22. Zhezhelenko I.V. Quality of electricity at industrial enterprises. Moscow: Energoatomizdat, 2019.

23. Handbook on Reducing Electricity Losses in Electric networks / Edited by Yu.S. Zhelezko. Moscow: Energoatomizdat, 2019.

## 2. ELECTRIC DRIVE AND AUTOMATION OF TECHNOLOGICAL COMPLEXES

**Topic 1. Composition and structure of modern automated electric drive.**  
Mechanics of the electric drive. Characteristics of mechanisms and engines. Equation of motion of the electric drive. Conclusion and analysis.

**Topic 2. Energy saving in technological processes by means of an electric drive.**

Possible ways of energy saving, basic concepts and definitions. Adjustable electric drive, as a means of energy saving. Evaluation of the energy efficiency of electric drives.

**Topic 3. Frequency converters for controlling AC motors.**

The principle of operation. Schematic solutions. Energy indicators. Frequency-controlled electric drive. The laws of frequency regulation as an energy saving factor.

**Topic 4. Automated DC electric drive.**

Classification, principle of operation, design, characteristics. Modern schemes. Development prospects.

**Topic 5. Analysis of methods of speed control.**

Regulation of the rotation speed of electric motors by changing their sliding. Frequency-controlled electric drive of centrifugal pumps. Cascade control schemes.

### THE LIST OF RECOMMENDED LITERATURE

#### Major

1. Epifanov A.P., Vasiliev N.V. Electric drive: Textbook for universities. SPO.: - «Lan», 2025. - 332 p.
2. Sysenko V.T., Popov N.S., Domakhin E.A. Automated electric drive: a textbook, NSTU, 2025.-99 p.
3. Vichkutkina A.P., Utepov G.N. Electric drive: a textbook, West Kazakhstan ATU named after Zhangir Khan, 2024.-104 p.
4. Lapina, L.M., Karakulin, M.L. Automated electric drive: a textbook. . Part 1. Almaty: Epigraph, 2021. 116 p.
5. Chernyshev A.Y. Alternating current electric drive : textbook. manual / Tomsk Polytechnic University. Moscow : Yurait, 2022. 214 p.

#### Additional

6. Vasiliev, B.Y. Electric drive. Electric drive power engineering.- M.: Solon-Press, 2015. - 272 p.
7. Energy-saving electric drive of centrifugal pumps [Text]: textbook.manual / M.A. Mustafin, N.K. Almuratova, S.S. Tabultaev; Ministry of Education of the

Republic of Kazakhstan, NAO AUES.- Almaty: AUES, 2016.- 90c: 6th academic ed.L.12 Moskalenko, V.V. Automated electric drive control systems [Text]: textbook / V.V. Moskalenko. Moscow: INFRA-M, 2011.- 208p.

8. Krasovsky, A.B. Fundamentals of electric drive [Text] : textbook.manual / A.B. Krasovsky, Moscow : Bauman Moscow State Technical University, 2015

9. Anuchin, A.S. Control systems of electric drives [Text] : textbook for universities / A.S. Anuchin. - M.: MEI, 2015

10. Tergemes K.T. Fundamentals of electric drive: textbook; KGUTI named after Sh.Yesenov, 2014 – 158p.

11. Yu.A Tsyba, Yu.V. Kuzmin, Darkenbayeva E.B. Elements of an automated electric drive. The training manual. AUES.Almaty, 2018.

12. Leznov B.S. Frequency-controlled electric drive of pumping units. Moscow: Mashinostroenie, 2013.176p.

13. Moskalenko V.V. Automatic control systems of electric drive: Moscow: INFRA-M, 2021.208p.

### 3. ELECTRICITY SUPPLY AND RENEWABLE ENERGY SOURCES

**Topic 1. The system of state support within the framework of the Law of the Republic of Kazakhstan «On support for the use of renewable energy sources».**

To reveal the essence of the Law of the Republic of Kazakhstan «On support for the use of renewable energy sources». Goals and objectives of the Strategy «Kazakhstan-2050» in the field of energy security and decarbonization of the economy. Analyze the impact of the National Development Plan of the Republic of Kazakhstan until 2025 on the development of renewable energy sources.

**Topic 2. Introduction of the auction mechanism for renewable energy projects in Kazakhstan.**

The concept of transition of the Republic of Kazakhstan to a «green economy». Ways to economically stimulate the development of renewable energy in the Republic of Kazakhstan. Introduction of an auction mechanism for renewable energy projects.

**Topic 3. Problems with financial support of renewable energy power plants and possible solutions.**

Suggest ways to increase the investment attractiveness of renewable energy projects. Reveal the specifics of regulating tariffs for electricity produced by renewable energy facilities. The main problems and solutions for financial support of renewable energy power plants in Kazakhstan.

#### THE LIST OF RECOMMENDED LITERATURE

##### Major

1. The Law of the Republic of Kazakhstan «On Amendments and Additions to some Legislative Acts of the Republic of Kazakhstan on support of the use of renewable energy sources and electric power industry» dated December 7, 2020.

2. The Law of the Republic of Kazakhstan dated July 4, 2009 No. 165-IV «On support for the use of renewable energy sources» (with amendments and additions as of 07.03.2022) (auction price - the purchase price by the settlement and financial center for the support of renewable energy sources).

3. The Law of the Republic of Kazakhstan dated July 9, 2004 No. 588-II «On Electric Power industry» (with amendments and additions as of 07.03.2022).

##### Additional literature

4. National Development Plan of the Republic of Kazakhstan until 2025.

5. The concept of the transition of the Republic of Kazakhstan to a «green economy».

6. Land Code of the Republic of Kazakhstan dated June 20, 2003 No. 442.

7. Code of the Republic of Kazakhstan dated January 2, 2021 No. 400-VI «Environmental Code of the Republic of Kazakhstan».

8. The Civil Code of the Republic of Kazakhstan (General Part), adopted by the Supreme Council of the Republic of Kazakhstan on December 27, 1994.

9. Law of the Republic of Kazakhstan dated April 16, 1997 No. 94-I «On housing relations».

10. Law of the Republic of Kazakhstan No. 204-VI «On Natural Monopolies» dated December 27, 2018.

11. Law of the Republic of Kazakhstan dated July 16, 2001 No. 242 «On architectural, urban planning and construction activities in the Republic of Kazakhstan».