

Considered  
at the meeting of the Academic  
Council of the University  
Minutes No. \_\_\_\_  
from " \_\_ " \_\_\_\_ 2019

APPROVED  
Chairman of the Board  
"S. Seifullin Kazakh Agrotechnical  
University" JSC  
\_\_\_\_\_ A.K. Kurishbayev  
" \_\_\_\_ " \_\_\_\_\_ 2019

**EDUCATIONAL PROGRAM**  
**"Electrical Engineering"**

Code and classification of the field of education	6B07 Engineering, manufacturing and construction industries
Code and classification of areas of training	6B071 Engineering and engineering
International Standard Classification of Education Code	0710
Awarded degree	bachelor
Training period	4 years
Form of study	full-time
Language of instruction	state / Russian

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Educational program "Electrical Engineering"  
Considered at a meeting of the department "Power supply"  
Minutes No. 13 of 04/18/2019

Head of the Department of "Power supply" G.G. Tatkeeva

approved by the Faculty Council  
Minutes No. 12 of 04.24.2019

Dean of the Faculty of Energy S.S. Isenov

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# **1 Passport of the educational program**

## **1.1 The purpose of the educational program**

**The main purpose of the educational program** is to provide basic training in design and research activities in the field of electricity.

**Main goals** of educational program are:

- to train a specialist of a new formation with broad fundamental knowledge, with a high level of professional culture, possessing the technical skills of design, research in the field of electric power engineering, operation and repair of electrical equipment, as well as knowing the economic characteristics of the infrastructure of the electric power industry;

- to teach the student to make an engineering calculation of power supply systems and automation of electrical installations and technological complexes, to choose electrical equipment, to practically implement the installation, commissioning and operation of power supply systems and electrical devices, to conduct an engineering analysis of electrical energy issues, to solve organizational, managerial, design and research problems using information technologies;

- prepare a specialist with practical skills in reading electrical drawings, designing electrical, wiring and other circuits for various purposes, drawing up technical reports, setting the parameters for the optimal operation of electrical equipment;

- formation of profiling knowledge, abilities, skills and competencies in the field of electric power industry among trained specialists.

## **2 General characteristics of educational programs (relevance, features, competitive advantages, uniqueness, stakeholders, etc.)**

### **Competitive advantages**

The educational program "Electrical Engineering" was developed in accordance with the National Qualifications Framework and Professional Standards, agreed with the Dublin descriptors and the European Qualifications Framework, based on state general education standards of education at all levels of education (Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 604 ).

The educational program is aimed at training personnel for the implementation of professional activities in design, research in the field of electric power, determining the optimal production and technological modes work objects electric power industry, development of promising projects of electric power plants for various purposes, performing technological calculations for the selection and adjustment of electrical equipment, determination of operating modes and standardization of technological processes, control of operating modes of equipment of electric power enterprises, verification of measuring instruments.

In the system of activities, as the preferential activities of graduates in the educational program "Electrical engineering", design and technological activities are accepted. In addition to these main activities, graduates prepare for the basics of organizational, managerial and research professional activities. The emphasis on preparation for a specific activity is consistent with employers.

### 3 Competence model (portrait) of a graduate

#### 3.1 The areas of professional activity

The sphere of professional activity of the EP "Electrical Engineering" is the field of science and technology, which includes a set of means and methods of human activity aimed at creating conditions for the production, transmission, distribution and consumption of electricity.

#### 3.2 Professional activities

"Bachelor technicians and technologies " by educational program "Electrotechnical engineering" can carry out the following views of professional activity:

- design and technological
- design and survey;
- settlement and design;
- organizational and managerial.

At the same time, the professional and practical activities of the graduate are primarily associated with the use and use of modern scientific and technical information, hardware and measuring complexes and diagnostic tools, technical measures and preparation for the implementation of projects aimed at increasing reliability and reducing accidents in the electric power industry.

#### **Research activities:**

- study and analysis of scientific and technical information;
- using standard packages applied programs for research of processes and modes of operation of energy facilities;
- conducting experiments according to a given methodology, compiling a description of the research being carried out and analyzing the results;
- preparation of reviews and reports on the work performed.
- implement modern methodology at diagnostics and trial installations of electric power facilities.

#### **Design and technological and organizational and management activity:**

- collection and analysis of initial data for the design and modernization of technological processes;
- design of technological processes for the generation and transmission of electricity;
- conducting technical and economic justification design technological solutions;
- organization of the work of small teams of performers involved in the development of projects, technological processes and their implementation;
- conducting organizational and planning calculations by creating or reorganization of production sites;

- control over compliance with production and labor discipline, life safety requirements;
- participation in the development of projects to ensure energy supply in international energy systems, designed and operated facilities;
- implementation of measures for the environmental safety of the enterprise.

### **Objects of the graduate's professional activity:**

- scientific research and design institutions electric power facilities;
- electric stations and substations;
- electric power systems and networks;
- systems power supply cities, industrial enterprises, Agriculture;
- electrotechnical laboratories, measuring complexes.
- relay protection and automation of electric power systems;
- energy installation, power plants and complexes on the base renewable energy sources;

### **3.3 General educational competencies**

Possess a humanitarian culture, ethical and legal norms that regulate attitudes towards a person, society, and the environment. Possess a culture of thinking and organize your work on a scientific basis.

Demonstrate proficiency in one or more languages at the level of reading technical literature and speaking skills in their professional activities.

Navigate modern information flows. Know the forms of existence of special information and its sources, methods of collecting and analyzing such information. Be able to collect and organize information from multiple sources.

To be able to use office equipment and applied software packages for calculation, modeling and design automation of electric power systems.

Own the organizational framework for the protection of production personnel and the population from the possible consequences of accidents, disasters and environmental protection.

Possess the skills of joint activities in a team, the ability to find common goals, and contribute to a common cause.

To be able to look for non-standard solutions, participate in decision-making, take responsibility for their consequences, carry out actions and deeds based on the chosen goals.

### **3.4 Core competencies**

Know: the principles of building a drawing and the main provisions of ESKD standards for the implementation and execution of drawings and text documents.

Be able to: read and execute technical and electrical drawings, as well as textual documentation to them.

Possess: techniques and skills for performing graphic documentation using modern computer graphics.

Know: basic physical laws, phenomena and processes on which the principles of action of objects of professional activity are based.

Be able to: use the appropriate physical and mathematical apparatus for solving applied problems

Possess: the skills of mathematical description of physical processes and the solution of typical problems in the framework of professional activities, the ability and willingness to use regulatory legal documents in their professional activities

Possess: the skills of practical application of regulatory legal documents in their professional activities.

Know: methods of constructing circuits and engineering graphics, state standards used in the graphic representation of electrical schematic diagrams, functional and structural diagrams.

Be able to: develop electrical, functional and structural diagrams.

Possess: the skills of using specialized packages of applied computer programs.

### **3.5 Professional competencies**

Determine the technical characteristics, design features, operating modes and rules for the technical operation of power equipment;

Formulate the main technical and economic requirements, determine the parameters of the optimal operating mode; choose the composition of equipment and its parameters, as well as schemes of electric power facilities;

Control over the quality of functioning, modernization and improvement of technical and economic indicators of electrical installations;

Draw up and execute operational documentation provided for by the rules for the operation of equipment and organization of work;

Draw up and execute operational documentation when carrying out installation, commissioning, repair and maintenance work at electric power facilities.

Know the planning, organization and technology of installation, commissioning and repair work of electric power equipment;

Know the basics of developing project documentation, the methodology for typical electrical calculations;



#### **4 Base of passing professional practices (indicate all types of practices)**

Professional practice is the practical development of professional skills and abilities in production. Professional practice is carried out in three types: educational, industrial and pre-diploma.

Educational practice is designed to get acquainted with the specifics of future professional activities, acquire skills in solving practical professional problems.

The industrial practice has the goal of obtaining skills in the practical use of the theoretical professional knowledge.

In the pre-diploma practice, the student collects and systematizes the source materials for the implementation of the diploma project (work).

Due to the demand in the electric power infrastructure market and the needs of the society of undergraduate graduates in the educational program "Electrical Engineering", practical training is carried out at leading enterprises in the electric power industry in the Republic of Kazakhstan, such as "KEGOC" JSC, "Samruk Energo" JSC, "AREK" JSC, "Astana-REC" JSC, "KokshetauEnergo" LLP, "KaragandaZharyk" LLP, "Tavrida Electric Astana" LLP, "Astanaenergосervice" LLP, "Ekibastuz GRES" LLP, "MAEK-Kazatomprom" LLP, "Kazakhenergoexpertiza" JSC and others.

## 5 The structure of the educational program

No	Names of cycles and disciplines	Total labor intensity	
		in academic hours	in academic credits
1	2	3	4
1	<b>Cycle of general education disciplines (OOD)</b>	<b>1680</b>	<b>56</b>
1)	Required component	1530	51
	Modern history of Kazakhstan	150	five
	Philosophy	150	five
	Foreign language	300	10
	Kazakh (Russian) language	300	10
	Information and communication technologies (on English language)	150	five
	Culturology and Psychology	120	four
	Political Science and Sociology	120	four
	Physical education	240	eight
2)	Component of choice	150	five
	Introduction to Electricity	150	five
2	<b>Cycle of basic disciplines (DB)</b>	<b>4020</b>	<b>134</b>
1)	University component	3090	103
	Professional Kazakh (Russian) language	120	four
	Professionally oriented foreign language	120	four
	Mathematics I	150	five
	Mathematics II	120	four
	Physics	120	four
	Engineering graphics	120	four
	applied mechanics	90	3
	Theoretical Foundations of Electrical Engineering I	240	eight
	Engineering thermodynamics	150	five
	Solving problems in engineering	120	four
	Electrotechnological drawings and application packages electricity programs	90	3
	Industrial electrotechnical installations enterprises	150	five
	Industrial electronics	150	five
	Electrical measurements	150	five
	Theoretical Foundations of Electrical Engineering II	180	6
	Automated control systems in power supply	150	five
	Relay protection and automation of electric power systems	210	7

	Economics of energy enterprises	90	3
	Internship	540	eighteen
	Study practice	thirty	one
2)	Component of choice	930	31
	Electricity quality and metering	90	3
	Operation of electrical equipment	150	five
	Reliability of electrical power equipment	150	five
	Isolation and overvoltage	120	four
	Electrical Materials	90	3
	Power converting technology	150	five
	Safety in power plants	180	6
3	<b>The cycle of profiling disciplines (PD)</b>	<b>1440</b>	<b>48</b>
1)	University component	810	27
	Electric cars	180	6
	Electrical networks and systems	240	eight
	Power supply for industrial enterprises and cities	150	five
	Design and installation of engineering systems	240	eight
2)	Component of choice	630	21
	Transient Processes in Power Engineering	150	five
	CAD in the power industry	150	five
	Power stations and substations	180	6
	Power supply for agricultural enterprises and settlements	150	five
4	Additional types of education (FEB)		
1)	Component of choice		
5	<b>final examination</b>	<b>360</b>	<b>12</b>
1)	<b>Writing and defending a thesis (project) or preparation and passing of a comprehensive exam</b>	<b>360</b>	<b>12</b>
	<b>Total</b>	<b>7500</b>	<b>250</b>

















## Appendix 3 Description of the disciplines of the OOD cycle

<b>Basic information about the discipline:</b>	
<b>1.Name of the discipline</b>	Modern history of Kazakhstan
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	School basic knowledge
<b>4. Post-requisites:</b>	cultural studies, political science, philosophy, sociology
<b>5. Competencies:</b>	Demonstrate knowledge of the main periods of the formation of an independent Kazakhstani statehood; to relate the phenomena and events of the historical past with the general paradigm of the world-historical development of human society through critical analysis; master the techniques of historical description and analysis of the causes and consequences of events in the modern history of Kazakhstan; to propose a possible solution to modern problems based on the analysis of the historical past and reasoned information; analyze the security and importance of the modern Kazakhstani development model; to determine the practical potential of intercultural dialogue and respect for the spiritual heritage; substantiate the fundamental role of historical knowledge in the formation of Kazakhstani identity and patriotism; to form their own civic position on the priorities of mutual understanding, tolerance and democratic values of modern society.
<b>6. Course author</b>	Department of History of Kazakhstan
<b>7. Main literature</b>	1. Modern history of Kazakhstan [Text]: a textbook for students of non-historical specials. (bachelor's degree) higher. study. institutions / B. G. Ayagan [and others]. ; ed. B.G. Ayagan; Institute of history of the state-va M-va education and science of the Republic of Kazakhstan. - Almaty: Rarity, 2010, 2. Aminov T.M. Modern history of Kazakhstan. Tutorial. Almaty., 2017 3. Nazarbayev N.A. The era of independence. - Almaty: ҚАЗАҚ-парат, 2017. 4. Nurtazina R.A. National security of the Republic of Kazakhstan: textbook. - Almaty: Bastau, 2014 5. Ertlesova J. Reforms of the 90s: interviews with key participants in the events. - Almaty, Atamura. - 2016.
<b>8. Content of the discipline</b>	Introduction to the discipline. Kazakhstan on the way to independence stages of formation of the idea of a national state. Civil and political confrontation. Implementation of the Soviet model of state building. Contradictions and consequences of Soviet reforms in Kazakhstan in the second half of the twentieth century. The policy of "perestroika" in Kazakhstan. Kazakhstan model of economic development. Social modernization is the basis for the well-being of society. Ethno-demographic processes and strengthening of interethnic harmony. Socio-political development prospects and spiritual modernization. The policy of forming a new historical consciousness of the people of the Great Steppe. Kazakhstan is a state recognized by the modern world. N.A. Nazarbayev - personality in stories. Formation of a nation of a united future.

<b>Basic information about the discipline:</b>	
<b>1.Name of the discipline</b>	Philosophy
<b>2.Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	Political science, Culturology and psychology, Modern history of Kazakhstan
<b>4. Post-requisites:</b>	History and philosophy of science
<b>5. Competencies:</b>	Formation of openness of consciousness, understanding of one's own national code and national self-awareness, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, cult of knowledge and education.
<b>6. Course author</b>	Department of Philosophy
<b>7 main literature</b>	1. Petrova V.F., Khasanov M.Sh. "Philosophy". - Almaty: Evero, 2014. 2. Bertrand R. "History of Western Philosophy" - M.: Publisher Litres, 2018. - 1195 p. 3. Kenny A. New History of Western Philosophy. Volume 1-4. - Oxford University Press, 2006 - 2010. (Kenny A. New History of Western Philosophers. Volum 1-4 - Oxford University Press, 2006-2010)

<b>8. Content of the discipline</b>	The emergence and development of philosophy. Fundamentals of a philosophical understanding of the world. Consciousness, soul and language. Being. Ontology and metaphysics. Philosophy a person and the world of values. "Mangilik El" and "Rukhani Zhagyr" are the philosophy of the new Kazakhstan.
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<b>Basic information about the discipline:</b>	
1. Name of the discipline	Foreign language
2. Number of credits	<b>10</b>
3. Prerequisites:	Foreign language school course
4. Post-requisites:	Professionally oriented foreign language
5. Competencies:	Based on the results of mastering the program, the student, depending on the level preparation, the student at the time of completion of the course reaches the level B1- (IELTS 4.0-5.0) or B2- (IELTS 5.5-6.0)
6. Course author	Department of Foreign Languages
7. Main literature	<ol style="list-style-type: none"> <li>1. Julie Lachance (July 21, 2015). Practice Makes Perfect Premium: Basic English. McGraw-Hill Education; 2 edition</li> <li>2. Chris Lele. (March 20, 2018) The Vocabulary Builder Workbook: Simple Lessons and Activities to Teach Yourself. Zephyros Press; Workbook edition</li> <li>3. Deborah Capras (01 Jan 2015). Small Talk: B1 +. HarperCollins Publishers.</li> <li>4. Mark Hancock (27 Apr 2017). English Pronunciation in Use Intermediate Book with Answers and Downloadable Audio. CUPRESS.</li> <li>5. Katie Fofouti (28 Dec 2017). Oxford Skills World: Level 4: Reading with Writing Student Book / Workbook. Oxford University Press</li> <li>6. Herbert Puchta, Jeff Stranks, Peter Lewis-Jones (31 Oct 2015). Think (SB + audio, WB + audio, TB, Tests - levels 1, 2, 3, 4).</li> <li>7. British National Corpus: <a href="http://www.natcorp.ox.ac.uk">http://www.natcorp.ox.ac.uk</a></li> <li>8. The Corpus of Contemporary American English (COCA): <a href="http://www.americancorpus.org">http://www.americancorpus.org</a>.</li> </ol>
<b>8. Content of the discipline.</b> The course program is designed for the volume of teaching - 300 hours, of which: 90 hours - for classroom work and 180 hours - for independent work. The course ends with a comprehensive exam. The course is designed for 2 semesters. Active dictionary-1200-1500 words, passive dictionary 1500-1800. Formation of reading skills with almost complete understanding of authentic without special vocabulary in the presence of 10% of unfamiliar words. The formation of the ability to independently write a note, a private letter, a greeting card, a questionnaire, a form, a customs declaration, a message plan (more than 20 sentences without a dictionary). Formation of the ability to listen to authentic messages up to 2 minutes with an understanding of the plot and the speaker's point of view. Formation of the skill of oral communication with a duration of 2-3 in a monologue and the ability engage in spontaneous dialogue).	

<b>Basic information about the subject</b>	
1. Name of the item	Kazakh language
2. Number of credits	<b>five</b>
3. Prerequisites	A1, A2 - theoretical and practical knowledge corresponding to the basic levels
4. Post-requisites	Professional Kazakh language
5. Competencies	Studying the language system of the Kazakh language and its ways through cultural and intercultural activities, improving the speech skills of language learners based on texts on everyday, social topics, the formation of lexical and grammatical skills.
6. Information about teachers	Department of Kazakh and Russian languages

<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Abduova B.S., Asanova U.O. Kazakh language: A guide for Russian-speaking groups. - Astana, 2017.-282b.</li> <li>2. Aitbaeva B.M. Kazakh language textbook (level B1). - Karaganda, 2014. -- 205 p.</li> <li>3. Bozbaeva-Hung A.T., Balabekov A.K., Dosmambetova G.K., Salykova B.O., Khazimova A.Zh. Kazakh language: middle-level textbook. National Testing Center. - Astana: 2017.</li> <li>4. Dosmambetova G.K., Balabekov A.K., Bozbaeva-Hung. - Astana, 2014.</li> <li>5. A.T. Seisenova Kazakh language: an entry-level textbook. National Testing Center. - Astana, 2016.</li> <li>6. Kuzekova Z.S., Baitelieva Yu.D. Kazakh language: middle-level textbook. - Astana, 2016.</li> <li>7. Keksekova Z.S., Baytelieva Yu.D. Kazakh language: textbook for universities. - Astana,</li> </ol>
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	2016. 8. Rezuanova G. K. Kazakh language. - Astana. 2016.2017
<b>eight. Brief description of disciplines</b>	This subject is intended for first-year university students. Educational the methodological complex consists of a text and several practical tasks in depending on the text. Linguistic peculiarities and nationalities are taken into account cognitive qualities of the Kazakh language. Since the Kazakh language course is based on typical curriculum, topics are taught in this program. Studying discipline, the student is used to speaking competently, culturally in the Kazakh language, express your point of view freely and as accurately as possible.

<b>Basic information about the discipline:</b>	
<b>1. Description of the discipline</b>	Russian language
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	School Russian language course
<b>4. Post-requisites:</b>	Professional Russian
<b>5. Competencies:</b>	<p><b>Know:</b> Foundations of the theory of speech communication; speak correctly and clearly; know the rules of the Russian language. Freely and correctly express your thoughts in oral and written form; argue your point of view; in the process of studying the Russian language, students will be able to freely formulate conclusions, build their own argumentation, express and substantiate their position.</p> <p><b>Be able to:</b> to learn the foundations of the theory of argumentation, logic, the basic rules of the Russian language, the norms of the Russian literary language and speech etiquette; in the field of communication - students should improve their skills and abilities of practical knowledge of the Russian language.</p> <p><b>Master:</b> to develop students' in-depth linguistic and communicative competence based on the language of the specialty, methods of argumentation, norms of the modern literary language; experience in presenting information in the process of communication in the field of the chosen profession; form speech and communicative competence.</p>
<b>6. Course author</b>	Department of Kazakh and Russian languages
<b>7. Main literature</b>	<p>1. "Russian language. Textbook for students of Kazakh departments of universities (bachelor's degree)" - Edited by Akhmedyarov K.K., Zharkynbekova Sh.K., Mukhamadiev Kh.S. - Almaty, Kazakh university, 2012.</p> <p>2. Mukhamadiev Kh.S. "A guide to the scientific style of speech. Russian language". - Almaty: Kazakh university, 2011. -- 181 p.</p> <p>3. "Fundamentals of Scientific Speech": A textbook for students of non-philological higher educational institutions / N.A. Bure, M.V. Fast, S.A. Vishnyakova and others; Edited by V.V. Khimik, L.B. Volkova. - St. Petersburg. : Faculty of Philology St. Petersburg State University; M.: Publishing Center "Academy", 2003. - 272 p.</p> <p>4. Pavlova TV, Adskova "Instrumental case. Russian language: scientific style. Working with text ": A textbook for students specialties 5B070800 "Oil and Gas a business", 5B072100 "Chemicaltechnology of organic substances ", 5B070600" Geology and exploration</p> <p>5. Albekova A.Sh. Russian language. - Astana, 2005.</p>

**8. Content of the discipline.** Language and its main functions. Language as a means of communication and its role in the life of society. Russian language as one of the world languages and its role in the modern world. Legal and regulatory framework for the functioning of the Russian language in Kazakhstan (the Constitution of the Republic of Kazakhstan, the Law on the Languages of the Republic of Kazakhstan, State programs for the development and functioning of languages in the Republic of Kazakhstan). Text as the main unit of communication. Types and forms of speech activity. Functional and semantic types of speech. Written and oral form of the language. Types of texts and their functional and stylistic variety. Functional and semantic types of speech: description, narration, reasoning. Textual model of scientific reasoning. Functional styles of the language. Art style. The individual artistic style of the writer. Conversational style. Language features of the spoken style. Formal and business style. Service documentation for internal use. Service documentation for internal use. Scientific style. Characteristic features of the scientific style. Text as the main unit of verbal communication. Textual model of scientific description. Scientific storytelling as a source of information. Textual model of scientific narration. Types of scientific information. The essence of the subject and its function. Structural and semantic analysis of a scientific text. Elements of structural and semantic analysis of the text. Monologue and dialogical speech. Forms of educational and scientific discussion. The communicative task of a scientific text. Logical-semantic relations in a sentence. This and new information of the scientific text. Forms of expression of new information in the text. Ways to develop information Characteristic features of the scientific style. Text as the main unit of verbal communication. Textual model of scientific description. Scientific storytelling as a source of information. Textual model of scientific narration. Types of scientific information. The essence of the subject and its function. Structural and semantic analysis of a scientific text. Elements of structural and semantic analysis of the text. Monologue and dialogical speech. Forms of educational and scientific discussion. The communicative task of a scientific text. Logical-semantic relations in a sentence. This and new information of the scientific text. Forms of expression of new information in the text. Ways to develop information Characteristic features of the scientific style. Text as the main unit of verbal communication. Textual model of scientific description. Scientific storytelling as a source of information. Textual model of scientific narration. Types of scientific information. The essence of the subject and its function. Structural and semantic analysis of a scientific text. Elements of structural and semantic analysis of the text. Monologue and dialogical speech. Forms of educational and scientific discussion. The communicative task of a scientific text. Logical-semantic relations in a sentence. This and new information of the scientific text. Forms of expression of new information in the text. Ways to develop information The essence of the subject and its function. Structural and semantic analysis of a scientific text. Elements of structural and semantic analysis of the text. Monologue and dialogical speech. Forms of educational and scientific discussion. The communicative task of a scientific text. Logical-semantic relations in a sentence. This and new information of the scientific text. Forms of expression of new information in the text. Ways to develop information The essence of the subject and its function. Structural and semantic analysis of a scientific text. Elements of structural and semantic analysis of the text. Monologue and dialogical speech. Forms of educational and scientific discussion. The communicative task of a scientific text. Logical-semantic relations in a sentence. This and new information of the scientific text. Forms of expression of new information in the text. Ways to develop information in the text. Unidirectional and multidirectional scientific texts. Microtheme of the scientific text. Main and

additional information in the text. Fundamentals of scientific text compression. Basic and additional information of the text. Types of additional information. Plan as a structural and content component of a scientific text. Annotating a scientific text. Types of annotation. Referencing the scientific text Language of the specialty and professional culture of speech. Educational and scientific communication Speech aspects of business communication. Types and causes of language errors and communication failures. Typology of speech errors. Ethics and etiquette of business speech and professional communication.

<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Information and Communication Technologies (in English)
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	High School Computer Science Course
<b>4. Post-requisites:</b>	Algorithmization and programming on the languages high level; Programming in telecommunications and radio electronic systems
<b>5. Competencies:</b>	<p>Know:</p> <ul style="list-style-type: none"> <li>- major trends in information and communication technology;</li> <li>- economic and political factors contributing to the development of information and communication technologies;</li> <li>- features of various operating systems.</li> </ul> <p>- use information resources to search and store information</p> <p>Be able to:</p> <ul style="list-style-type: none"> <li>- work with spreadsheets, perform data consolidation, build graphs;</li> <li>- work with databases;</li> <li>- apply methods and means of protecting information;</li> <li>- design and create websites;</li> <li>- to process vector and raster images;</li> <li>- create multimedia presentations;</li> <li>- use different social platforms for communication.</li> </ul> <p>Master:</p> <ul style="list-style-type: none"> <li>- skills of using modern information technologies in everyday life and in educational activities.</li> </ul>
<b>6. Course author</b>	Department of Information and Communication Technologies
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Shynybekov D. Information and communication technologies. Part 1. - Almaty: MUIT., 2017. -- 587 p. (In the KATU library)</li> <li>2 .. Shynybekov D. Information and communication technologies. Part 2. - Almaty: MUIT., 2017. -- 587 p. (In the KATU library)</li> <li>3. Nurpeisova, TB Information and Communication Technologies: textbook / T. B. Nurpeisova, IN Kaidash: Ministry of Education and Science of the Republic of Kazakhstan. - Almaty: Bastau, 2017. -- 480 p. (In the KATU library)</li> <li>4. Williams Brian K., Sawyer Stacey C. Using Information Technology: A Practical Introduction to Computers &amp; Communications. Complete Version. - New York: Mc Graw Hill, 2013. -- 576 p.</li> <li>5. Microsoft Excel 2010, EXAM 77-885: textbook Hoboken: John Wiley &amp; Sons, Inc., 2012. -- 247 p.</li> <li>6. Microsoft Access 2010, textbook. Hoboken: John Wiley &amp; Sons, Inc., 2012. -- 225 p.</li> <li>7. Rose, K. Learn by yourself Adobe Photoshop Eng.: popular science literature / K. Rose, K. Binder; Trans. with English. - M.: ID Williams, 2008. -- 512 p. (In the KATU library)</li> <li>8. Peter L Dordal An Introduction to Computer Networks. Department of Computer Science. Loyola University. Chicago. 2015. -- 621 p.</li> <li>9. Olifer V., Olifer N. Computer networks. Principles, technologies, protocols: a textbook. St. Petersburg: Piter, 2016. - 992 pp. (In the KATU library).</li> <li>10. Gary David Bouton CorelDRAW X7: The Official Guide. 11.th Edition. Corel Corporation. London, 2013. -- 657 p.</li> </ol>
<b>8. Content of the discipline.</b>	Data analysis. Data management. Database systems. Networks and telecommunications. Cyber security. Internet technologies. Cloud and mobile technologies. Multimedia technology. Smart Technologies: IoT, Big Data, Block chain. Artificial Intelligence. Green technologies in ICT. Teleconference. E-technology. E-business. E-learning. E-government. Professional information technology. Industrial ICT.

<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Culturology and Psychology
<b>2. Number of credits</b>	<b>four</b>
<b>3. Prerequisites:</b>	Basic school knowledge
<b>4. Post-requisites:</b>	Philosophy, history and philosophy of science



<b>5. Competencies:</b>	algorithmically represent the use of scientific methods and
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	research techniques in the context of a specific academic discipline and in the procedures for interaction of disciplines of the module; reasonably and reasonably provide information about the various stages of development of the Kazakh society, political programs, culture, language, social and interpersonal relations; analyze various situations in different spheres of communication from the standpoint of correlation with the system of values, social, business, cultural, legal and ethical standards of the Kazakh society.
<b>6. Course author</b>	Department of Philosophy
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Akimbekov S.M. History of the steppes: the phenomenon of the state of Genghis Khan in the history of Eurasia. - Almaty: Institute of Asian Studies LLP. 2nd edition, revised and enlarged, 2016.</li> <li>2. Grushevitskaya T.G. Culturology: textbook. allowance / T.G. Grushevitskaya, A.P. Sadokhin. - M.: Alpha-M: INFRA-M, 2015.</li> <li>3. Danilyan O.G. Culturology: textbook / O. G. Danilyan, V. M. Taranenko. - 2nd ed. - M.: INFRA-M, 2014.</li> <li>4. Myers D. Aleumettik psychology. Social Psychology. / D. G. Myers, J. M. Tuenge; aud. G. K. Aykynbaeva [female tb.]. - 12-bass. - Astana: "Ittyk audarma burosy" KQ, 2018. - 559 b.</li> <li>5. Psychology of Individual Differences / Ed. Yu.B. Gippenreiter, V. Ya. Romanov. - 3rd ed., Rev. and add. - M.: AST: Astrel, 2008. -- 720 p.</li> <li>6. Rudenko A.M. Psychology in diagrams and tables: a tutorial. - M: Phoenix, 2016. -- 379 p.</li> <li>7. Shultz D. Kazirgi psychology of tarikhi. A History of Modern Psychology: / D. Schultz, S. E. Schultz; aud. B. K. Aqyn [zhone tb.]. - 11-bass. - Astana: "Ittyk audarma burosy" KQ, 2018. - 447 [1] b.: sur. - (Rukhani zhagyru).</li> </ol>
<b>8. Content of the discipline</b>	The discipline "Culturology" is aimed at the development of a social and humanitarian worldview as the basis for the modernization of public consciousness through the formation of cultural identity, the ability to analyze and evaluate cultural situations based on understanding the nature of cultural processes, the specifics of cultural objects, the role of cultural values in intercultural communication. The discipline "Psychology" is designed to improve the general psychological culture of a future specialist, to understand his past, present and future from a psychological standpoint, as well as to master the knowledge of social and psychological patterns of personality behavior in interpersonal communication, necessary for formation / modernization of consciousness in accordance with the challenges of the time in the context of the program of Spiritual Revival of Kazakhstan, Leader of the Nation N.A. Nazarbayev.

<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Political Science and Sociology
<b>2. Number of credits</b>	<b>four</b>
<b>3. Prerequisites:</b>	Basic school knowledge
<b>4. Post-requisites:</b>	Philosophy, history and philosophy of science
<b>5. Competencies:</b>	<p>explain and interpret subject knowledge (concepts, ideas, theories) in all fields of science that form the academic disciplines of the module (sociology, political science, cultural studies, psychology); explain the socio-ethical values of society as a product of integration processes in the systems of basic knowledge of the disciplines of the socio-political module;</p> <p>explain the nature of situations in various spheres of social communication based on the content of theories and ideas of scientific spheres of the studied disciplines; analyze the features of social, political, cultural, psychological institutions in the context of their role in the modernization of Kazakhstani society;</p> <p>to correctly express and reasonably defend their own opinions on issues of social significance.</p>
<b>6. Course author</b>	Department of Philosophy
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Nazarbayev N.Ә. Kazakhstan Zholy - 2050: Bir maksat, bir madde, bir bolashak. Kazakhstan Respublikasyny President N.N. Nazarbayevtyk Kazakhstan khalgyna Zholdauy. 2014 zhylyhy 17 karatar.</li> <li>2. Nazarbayev N.Ә. "Kazakhstannyk ushinshi zhangyruy: zhagandyk bosekege kabilettilik" 31 March 2017.</li> <li>3. Nazarbayev N.Ә. Memleket bashysynyn "Bolashaka bardar: rukhani</li> </ol>

	<p>zhagyru "12 September 2017.</p> <p>4. Absattarov R.B. Sayasattan not_zderi. - 2 volumes - Almaty: Karasai, 2011.</p> <p>5. Heywood A. Politics. - N.-Y. : Palgrave Macmillan, 2013.</p> <p>6. Mýsataev S.Sh. Sayasi bilik: Ohu uraly. Almaty: Kazakh University. - 2014</p> <p>7. Alemdik sayasattana anthologies. "Madeni mýra " memlekettikbardarlamasy. - Almaty: Kazakhstan. - 2005-2009. - T. 1-9.</p> <p>8. Kazakhstan way - 2050. -3 t. / Ed. Sultanova B.K. - Almaty: KISI, 2014.</p>
<p><b>8. Content of the discipline.</b> The module involves the study of four scientific disciplines - sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; the methodological integrity of the research approaches of these disciplines; commonality of results-oriented learning methodology; a single system presentation of the typology of learning outcomes as formed abilities.</p>	

<b>Basic information about the discipline:</b>	
<b>1.Description of the discipline</b>	"Physical education"
<b>2.Number of credits</b>	<b>eight</b>
<b>3.Prerequisites</b>	biology, anatomy, human physiology, hygiene,
<b>4.Post-requisites</b>	The program of the course "Physical culture" develops the abilities and skills in the field of physical culture of students, forms the needs for a healthy lifestyle, preservation and strengthening of health, improves the level of physical fitness for the implementation of their abilities in the process of daily activities.
<b>5.Competence</b>	Ensuring a sufficient level of physical readiness of future specialists, a high level of efficiency; development of professionally significant physical and psychomotor abilities; own methods and means of physical culture to increase the adaptive reserves of the body and strengthen health; possess knowledge and skills of a healthy lifestyle, methods of maintaining and strengthening health and applying them to preserve health.
<b>6 course author</b>	Shkurkov A.S., Satbaev E.K.
<b>7 main literature</b>	<ol style="list-style-type: none"> <li>1. IN AND. Ilyinich. Physical culture of the student. Moscow, 2001</li> <li>2. G. D. Ivanov, A.K. Kulnazarov. Physical education of students. Almaty, 2002 g.</li> <li>3. Theory and methodology of physical education. Under total. ed. A.P. Matveev and D. Novikov. M., 2005.</li> </ol>
<p><b>8. Content of the discipline.</b> Formation of a positive attitude, interest and need for physical education and sports. Improving the physical health of students on the basis of increasing the arsenal of motor abilities, professionally applied and methodological readiness. Preparation and participation in mass sports and recreation events and competitions in sports, providing for the wide involvement of students in active physical education. Complex use of physical culture and sports means by the type of general physical training. Improving the level of physical and functional condition. Preventive use of physical culture means for health-improving purposes. The acquisition by students of additional, necessary knowledge on the basics of psychological, pedagogical, independent exercise and "lifelong" sports.</p>	

## Appendix 4 Description of disciplines of the DB cycle

<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Mathematics I
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	School course Algebra and the beginning of analysis. Geometry
<b>4. Post-requisites:</b>	Mathematics II. Engineering mathematics
<b>5. Competencies:</b>	<p><b>Know:</b> the student must know and understand the basics of the studied mathematics course in the number of hours of the work program.</p> <p><b>Be able to:</b> be able to apply the knowledge gained in practice; be able to independently solve problems with further generalization of the results obtained.</p> <p><b>Master:</b> master the technique of solving various types of computational problems, analyze theoretical data, clearly and clearly convey information, ideas, problems, the future specialist must freely navigate the information flow and be able to apply the knowledge, skills and abilities gained when solving applied problems in the relevant spheres of human life; in solving engineering problems, in using the achievements of fundamental science for the successful study of general theoretical and special engineering disciplines, the development of mathematical thinking and logic for use in chemistry, physics, descriptive geometry.</p>
<b>6. Course author</b>	Dyusembaeva L.K.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. N.S. Piskunov. Differential and integral calculus. M. 2008. vol. 1, 2.</li> <li>2. N.V. Efimov. A short course in analytical geometry. M. 2007.</li> <li>3. V.P. Minorsky. Collection of problems in higher mathematics. M. Science. 2008</li> <li>4. V.S. Shipachev. Higher mathematics. M. 2001.</li> <li>5. I.I. Likholetov. The highest mathematics, theory probabilities and math statistics. Minsk. 2007.</li> </ol>
<b>8. Content of the discipline</b>	<p>Determinants of the second and third order, their properties and calculation. Determinants of the nth order. Matrix concept. Types of matrices, operations on matrices. Inverse matrix. Solving systems of linear equations by Cramer's method. Matrix method for solving systems of linear equations. Gauss method. Application of elements of linear algebra in radio engineering. The simplest problems of analytical geometry on a plane. Equations of a straight line on a plane. Vectors. Linear operations on vectors. Scalar, vector and mixed product of vectors. Surface equation. General equation of the plane. Study of the general equation of the plane. Conditions for parallelism and perpendicularity of planes. Equation of a straight line in space. The use of analytical geometry in radio engineering. Functions. Methods for setting a function. Basic elementary functions, their properties and graphics. Function limit. Basic theorems on limits. Infinitely small and infinitely large quantities. Remarkable limits. Derivative of the function. The geometric and mechanical meaning of the derivative. Derivative table of basic elementary functions. Differential function. Higher order derivatives. Rolle's, Lagrange's, Cauchy's theorems. L'Hôpital's rule. Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Infinitely small and infinitely large quantities. Remarkable limits. Derivative of the function. The geometric and mechanical meaning of the derivative. Derivative table of basic elementary functions. Differential function. Higher order derivatives. Rolle's, Lagrange's, Cauchy's theorems. L'Hôpital's rule. Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Infinitely small and infinitely large quantities. Remarkable limits. Derivative of the function. The geometric and mechanical meaning of the derivative. Derivative table of basic elementary functions. Differential function. Higher order derivatives. Rolle's, Lagrange's, Cauchy's theorems. L'Hôpital's rule. Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Remarkable limits. Derivative of the function. The geometric and mechanical meaning of the derivative. Derivative table of basic elementary functions. Differential function. Higher order derivatives. Rolle's, Lagrange's, Cauchy's theorems. L'Hôpital's rule. Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Remarkable limits. Derivative of the function. The</p>

geometric and mechanical meaning of the derivative. Derivative table of basic elementary functions. Differential function. Higher order derivatives. Rolle's, Lagrange's, Cauchy's theorems. L'Hôpital's rule. Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Derivative table of basic elementary functions. Differential function. Higher order derivatives. Rolle's, Lagrange's, Cauchy's theorems. L'Hôpital's rule. Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Derivative table of basic elementary functions. Differential function. Higher order derivatives. Rolle's, Lagrange's, Cauchy's theorems. L'Hôpital's rule. Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties Taylor's formula with a remainder in the Lagrange form. Examining a function using a derivative. Application of elements of differential calculus in radio engineering. Antiderivative. Indefinite integral and its properties. Integral table. Direct integration methods. Integration by change of variables and by parts. Integration of rational, trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties trigonometric and irrational functions. Problems leading to the concept of a definite integral. The definite integral as the limit of integral sums. Basic properties definite integral. Newton-Leibniz formula Improper integrals. Applications of a definite integral to the solution of problems in radio engineering.

<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Physics
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	School base of natural sciences
<b>4. Post-requisites:</b>	Basic disciplines
<b>5. Competencies:</b>	know: - the basic laws of classical and modern physics and physical phenomena; - methods of physical research; have an idea of: - the limits of applicability of various physical concepts, phenomena of laws and theories to solving technical problems; be able to: - use modern physical phenomena and laws in practice and interpret the results of physical experiment;

	have practical skills: - solving specific problems of physics; - conducting a physical experiment and evaluating the results obtained; be competent in problem setting and physical interpretation of laws and phenomena.
<b>6. Course author</b>	Murzalinov D.O.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Tyurin Yu.I., Chernov I.P., Kryuchkov Yu.Yu. Physics part 2. Electricity and Magnetism: A Textbook for Technical Universities. - Tomsk: Publishing house of Tomsk University, 2003.-- 738 p.</li> <li>2. Saveliev I.V. General Physics Course: Textbook. In 3 vols. Vol.2: Electricity and magnetism. Waves. Optics. 7th ed., Erased. - SPb.: Publishing house "Lan", 2007. - 496 p.:</li> <li>3. Detlaf A.A., Yavorsky B.M. Physics course: textbook for technical colleges. - 4th ed., Rev. - M.: Higher. shk., 2002.-- 718 p.</li> <li>4. Trofimova T.I. Physics course: textbook. manual for universities. - Ed. 9th, revised and add. - M.: Publishing Center "Academy", 2004. - 560 p.</li> <li>5. Irodov I.E.: Electromagnetism. Basic laws. - 5th edition -M.: BINOMIAL. Knowledge Laboratory, 2006 - 319 p.</li> </ol>
<b>8. Content of the discipline:</b> The laws of physics. Fundamental sections of physics, incl. physical foundations of mechanics, molecular physics and thermodynamics, electricity and magnetism, optics, atomic and nuclear physics.	
<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Mathematics II
<b>2. Number of credits</b>	<b>3</b>
<b>3. Prerequisites:</b>	Mathematics I
<b>4. Post-requisites:</b>	Engineering mathematics
<b>5. Competencies:</b>	<p>Know and understand: the student must know and understand the basics of the mathematician course being studied and in the number of hours of the work program.</p> <p>Be able to: be able to apply the acquired knowledge in practice; be able to independently solve problems with further generalization of the results obtained.</p> <p>Possess the skills: master the technique of solving various types of computational problems, analyze theoretical data, clearly and clearly convey information, ideas, problems, the future specialist should be free to navigate the information flow and be able to apply the acquired knowledge, skills and abilities in solving applied problems in the relevant human spheres' life activity. in solving engineering problems, in using the achievements of fundamental science for the successful study of general theoretical and special engineering disciplines, the development of mathematical thinking and logic for use in chemistry, physics, descriptive geometry.</p>
<b>6. Course author</b>	Dyusembaeva L.K.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. N.S. Piskunov. Differential and integral calculus. M. 2008. vol. 1, 2.</li> <li>2. N.V. Efimov. A short course in analytical geometry. M. 2007.</li> <li>3. V.P. Minorsky. Collection of problems in higher mathematics. M. Science. 2008</li> <li>4. V.S. Shipachev. Higher mathematics. M. 2001.</li> <li>5. I.I. Likholetov. The highest mathematics, theory probabilities and math statistics. Minsk. 2007.</li> <li>6. N.N. Privalov. Analytic geometry. M. 1964.</li> <li>7. A.A. Gusak Higher mathematics. Textbook. Minsk. Vol. 1.2. 2003, 2004.</li> <li>8. A.A. Gusak. Problems and exercises in higher mathematics. Minsk. vol. 1.2. 2008.</li> </ol>
<b>8. Content of the discipline.</b> Functions of several variables, scope. Function limit. Continuity. Partial derivatives. Full differential. Differentiation of implicit functions. Extremum of a function of two variables. Finding the largest and smallest value of a function in a given area. Application of the theory of extrema to solving problems of radio engineering. Problems leading to the concept of differential equations. Differential equations of the first order. The theorem on the existence and uniqueness of the solution to the Cauchy problem. Differential equations of higher order. Equations admitting lowering of order. Application to solving problems of radio engineering. Linear differential equations, homogeneous and inhomogeneous. General solution concept. Linear differential equations with constants coefficients. Method of variation of arbitrary constants. Application of differential equations in	

solving problems of radio engineering. Number series. Convergence and sum of a series. Necessary condition for convergence. Sufficient conditions for the convergence of positive series. Alternating rows. Leibniz's theorem. Absolute and conditional convergence. Functional rows. Convergence region. Power series. Abel's theorem. Convergence radius. Expansion of functions in power series. Taylor series. Fourier series. Fourier expansion of functions.

<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Isolation and overvoltage
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	Mathematics. Physics. Theoretical foundations of electrical engineering-1.2. Automatic theory management. Electrotechnical materials. Electrotechnological installations of industrial enterprises.
<b>4. Post-requisites:</b>	Knowledge, received by assimilation discipline, are necessary at fulfillment bachelor's final qualifying work and studying the disciplines of the specialty.
<b>5. Competencies:</b>	<ul style="list-style-type: none"> <li>- have an idea of high voltage electrical installations, the operation of external and internal insulation and the principles of insulation design, protection against overvoltage;</li> <li>- Know and understand (descriptor A): the main mechanisms of breakdown of various dielectrics; methods of monitoring the state of insulation of high-voltage equipment; the physical nature of the occurrence of overvoltage and how to protect against them.</li> <li>- be able (descriptor B): to use the acquired knowledge in mastering the educational material of subsequent disciplines. Experimentally determine the parameters of high-voltage electric-discharge installations, choose the optimal conditions for the reliable functioning of the insulation of electrical equipment, carry out experiments with subsequent processing and analysis of the results in the field of electric power.</li> <li>- to master (descriptor C, D, E): experience in using the basic methods of organizing self-study and self-control.</li> <li>- to acquire practical skills (descriptor C, D, E): application of methods for calculating overvoltage in linear and nonlinear electrical circuits. Possess the skills of working with reference literature and regulatory technical materials.</li> </ul>
<b>6. Course author</b>	Leznaya O.N.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Borisov V.N. High voltage technology. Overvoltage and isolation: Textbook / V.N. Borisov; Ministry of Education and Science of the Republic of Kazakhstan: AIPET.- Almaty: AIPET, 2006.-74 p.</li> <li>2. Borisov V.N. High voltage technology. Overvoltage and isolation: Textbook / V.N. Borisov; Ministry of Education and Science of the Republic of Kazakhstan: AIPET.- Almaty: AIPET, 2006.-74 p.</li> <li>3. Larionov V.P. High voltage technology (insulation and overvoltage in electrical installations): Textbook / V.P. Larionov, V.V. Bazutkin, Yu.G. Sergeev; Ed. V.P. Larionov. - M.: Energoizdat, 1982. -296s</li> <li>4. Bazutkin V.V. and others. Technique of high voltages: Isolation and overvoltage in electrical systems: Textbook for universities / V.V. Bazutkin, V.P. Larionov, Yu.S. Pintal; Under total. Ed. V.P. Larionov. - 3rd ed., Rev. and additional - M.: Energoatomizdat, 1986.-463 p.</li> </ol>
<b>8. Content of the discipline:</b> 1. General characteristics of the external insulation of electrical installations. 2. Characteristics of the corona on DC and AC lines. Energy losses for the corona, ways to reduce the losses for the corona. 3. The principles of building internal insulation. 4. General characteristic of internal overvoltage. 5. Thunderstorm overvoltage and lightning protection of electrical installations. Internal overvoltage in electrical systems with long transmission lines. 6. Characteristic of switching overvoltage. Overvoltage when disconnecting capacitors and unloaded lines. 7. Coordination of isolation.	

<b>Basic information about the discipline:</b>	
<b>1. Name of the discipline</b>	Study practice
<b>2. Number of credits</b>	<b>one</b>
<b>3. Prerequisites:</b>	
<b>4. Post-requisites:</b>	Industrial practice, pre-diploma practice
<b>5. Competencies:</b>	Have the skills to independently perform practical work, collect and analyze the necessary material. Gaining experience in execution

	major production processes on the objects Chairs orenterprises.
<b>6. Course author</b>	Tatkeeva G.G.
<b>7. Main literature</b>	Professional Practice Program.
<b>8. Content of the discipline.</b> Safety briefing. Practice in research institutes, at the department may consist in acquainting: with the most significant scientific results of the research institute, with methods of interpreting the results obtained, with unique experimental radio-electronic systems and complexes of this research institute, with software environments used in computer modeling, with processing technology information, with other questions (in the specialty). Practice at an enterprise, in an organization can be an introduction to: with the production tasks of the enterprise, with methods of solving them, with instruments, equipment, electronic systems and complexes used or manufactured at the enterprise, with production automation systems, with information technologies used in the organization, with other areas of the enterprise (within the specialty).	

<b>Basic information about the discipline:</b>	
1. Name of the discipline	Internship
<b>2. Number of credits</b>	<b>eighteen</b>
<b>3. Prerequisites:</b>	Educational practice. Final examination.
<b>4. Post-requisites:</b>	Undergraduate practice.
<b>5. Competencies:</b>	know - features labor activities by specialties "Electric Power Engineering"; be able to - navigate in problems solvable in sphereelectric power industry; own - ideas about the directions of possible application of their future professional knowledge.
<b>6. Course author</b>	Tatkeeva G.G.
<b>7. Main literature</b>	Professional Practice Program.
<b>8. Content of the discipline.</b> Preparatory stage. Introductory stage. Safety briefing. Work briefing, safety studies and on-the-job training. Acquaintance with the enterprise and its energy saving and automation system. Production stage. Execution of production assignments. Study of theoretical material. Independent work with literature and technical documentation. Collection, processing, systematization and analysis of factual and literary material. The final stage.	

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Electrical materials
<b>2. Number of credits</b>	<b>2</b>
<b>3. Prerequisites:</b>	For successful mastering of the course "Electrical Materials Science" knowledge of physics, chemistry, theoretical foundations of electrical engineering is required.
<b>4. Post-requisites:</b>	The knowledge and skills acquired by students in the course of studying this course will be used in the future in the study of disciplines: electrical machines, power plants and substations, electrical systems and networks, repair of electrical equipment, operation of electrical equipment.
<b>5. Competencies:</b>	- know and understand: the structure and properties of electrical materials, materials; areas of application of materials; classification and labeling of basic materials; methods of corrosion protection; methods of processing materials. - The student should be able to: correctly assess the appropriateness of the choice and use of electrical materials, work on laboratory equipment; - The student must know: the classification of modern electrical materials, their behavior in an electromagnetic field and under the influence of various factors, the properties of materials, their application, test methodology and defining the main characteristics of the most common electrical materials.
<b>6. Course author</b>	Gerasimenko T.S.



<b>7. Main literature</b>	<ol style="list-style-type: none"><li data-bbox="587 76 1506 136">1. Bogoroditsky N.P., Pasynkov V.V., Tareev B.M. Electrotechnical materials - L. : Energoatomizdat, 1985.304 p.</li><li data-bbox="587 136 1305 197">2. Koritsky Yu.V. Electrical materials. –L. : Energoatoizdat, 1985. - 319p.</li></ol>
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	3. Antipov B.L., Sorokin V.S., Terekhov V.A. Electronic engineering materials. Tasks and questions. - M.: Higher school, 1990. -- 208 p. 4. Bekmagambetova K.M. Electrical materials science. Lecture notes, 2006
<b>8. Content of the discipline</b>	The components of the discipline are the following sections: dielectric materials, conductive materials, semiconductor materials, magnetic materials. The discipline studies the basic physical phenomena occurring in materials when exposed to electromagnetic fields, the properties of materials, production technology, application in electrical engineering.

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Theoretical Foundations of Electrical Engineering I
<b>2. Number of credits</b>	<b>eight</b>
<b>3. Prerequisites:</b>	Mathematics I, Mathematics II, Physics I, Physics II, Informatics
<b>4. Post-requisites:</b>	Electrical Machines, Theoretical Foundations of Electrical Engineering I, power supply and other specialized disciplines
<b>5. Competencies:</b>	- to know and understand (descriptor A): to independently calculate the parameters of the operation of various types of protection, build selectivity maps, analyze the actions of protections and automation in various modes of the system, choose circuit solutions for their implementation; - be able to (descriptor B): Acquisition and application of practical skills in the design of protection equipment and automation of electric power systems; - master, acquire practical skills (descriptor C, D, E): the ability to compare, analyze the operation of protection and automation devices in different modes of operation of the electric power system, draw conclusions based on the results of the analysis.
<b>6. Course author</b>	Alpeisov E.A.
<b>7. Main literature</b>	Tuganbaeva I.T., Gorbunov A.N. and others - Theoretical foundations of electrical engineering., Almaty, 2012
<b>8. Content of the discipline</b>	1. Linear DC electric circuits. 2. Methods of calculation. 3. Bipolar 4. Electric circuits of single-phase sinusoidal current. 5. Three-phase circuits. Symmetrical and unbalanced modes. 6. Non-sinusoidal currents. Calculation of circuits with non-sinusoidal currents. Resonance with non-sinusoidal currents.

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Theoretical Foundations of Electrical Engineering II
<b>2. Number of credits</b>	<b>6</b>
<b>3. Prerequisites:</b>	Mathematics I, Mathematics II, Physics I, Physics II, Informatics
<b>4. Post-requisites:</b>	Electrical Machines, Theoretical Foundations of Electrical Engineering I, power supply and other specialized disciplines
<b>5. Competencies:</b>	- to know and understand (descriptor A): to independently calculate the parameters of the operation of various types of protection, build selectivity maps, analyze the actions of protections and automation in various modes of the system, choose circuit solutions for their implementation; - be able to (descriptor B): Acquisition and application of practical skills in the design of protection equipment and automation of electric power systems; - master, acquire practical skills (descriptor C, D, E): the ability to compare, analyze the operation of protection and automation devices in different modes of operation of the electric power system, draw conclusions based on the results of the analysis.
<b>6. Course author</b>	Alpeisov E.A.
<b>7. Main literature</b>	Tuganbaeva I.T., Gorbunov A.N. and others - Theoretical foundations of electrical engineering., Almaty, 2012

<b>8. Content of the discipline</b>	<p>The course "Theoretical Foundations of Electrical Engineering 2" (TOE2) is the basis for all subsequent electrical engineering disciplines. The course takes the main place among the general technical disciplines that determine the theoretical level of professional training of bachelors of electrical power engineering. Contains a general theory of circuits and electromagnetic fields and engineering methods for their calculation, analysis and synthesis. It is of exceptional importance for</p>
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	the formation of the scientific outlook of specialists in the electric power industry, and all electric power disciplines are based on it.
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<b>1. Basic information about the discipline:</b>	
Name of the discipline	Electrical measurements
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	The material of the discipline is based on the knowledge and skills (competencies) obtained in the study of disciplines: physics, mathematics, information and communication technologies (computer science), electrical drawings, theoretical foundations of electrical engineering - 1.
<b>4. Post-requisites:</b>	The knowledge and skills (competencies) obtained after studying the discipline are necessary for studying the disciplines of the professional module (PD) of various MOPs in the specialty, in particular: power plants and substations, power grids and systems, transients in the power industry, relay protection and automation of power systems, design of power supply systems. Also, the acquired competencies in the discipline are necessary when performing the final qualifying work of a bachelor (VKRB) and in the practical activities of a graduate.
<b>5. Competencies:</b>	<ul style="list-style-type: none"> <li>- Know: basic concepts of measurements and units of physical quantities; main types of measuring instruments and their classification; the main methods of measuring the parameters of electrical circuits, as well as the foundations of the construction and operation of electrical measuring instruments.</li> <li>- Be able to: apply the basic methods and principles of measurements; choose means of electrical measurements; measure electrical quantities with a given accuracy; determine the value of the measured value and the measurement accuracy indicators; use computer facilities for processing and analyzing measurement results.</li> <li>- Have: the skills of using basic physical and mathematical laws and principles in the field of electrical measurements; methods of correct operation of the main instruments and equipment of a modern technical laboratory; methods of processing and interpreting results experiment.</li> </ul>
<b>6. Course author</b>	Rozhkov V.I.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Metrology, standardization, certification and electrical measuring technology: study. manual for universities / KK Kim [and others]: ed. K. K. Kim, p. (stamp UMO).</li> <li>2. Thermal measurements and devices: textbook. for universities in the direction of "Heat power" / G. M. Ivanova, N. D. Kuznetsov, V. S. Chistyakov. - 2nd ed., Rev. and add. - M.: Publishing house of MEI, p. (stamp UMO).</li> <li>3. Radkevich, Yakov Mikhailovich. Metrology, standardization and certification [Electronic resource]: textbook. for bachelors / Ya.M. Radkevich, A.G. Skhirtladze, 2012 (EBS)</li> </ol>
<b>8. Content of the discipline</b>	1. Introduction to the discipline. 2. Modern metrology. 3. Measurement process. 4. Measurement error. 5. Processing and presentation of the measurement result. 6. Measuring instruments for static measurements. 7. Measuring instruments for dynamic measurements. 8-10. Analog measurements of basic, derived electrical quantities. 11. Digital measurements: computer measurement methodology. 12. Digital measurements of electrical quantities. 13. Digital registration of measurements. 14. Information-measuring systems and complexes. 15. Automation of measurements.

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Industrial electronics
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	Mathematics. Physics. Theoretical fundamentals of electrical engineering-1
<b>4. Post-requisites:</b>	The knowledge gained by mastering the discipline is necessary when performing the bachelor's final qualifying work and studying the disciplines of the specialty.
<b>5. Competencies:</b>	After completing the study of the discipline, students must: <ul style="list-style-type: none"> <li>- have an idea of modern and promising areas</li> </ul>

	<p>development of electronics; on the field of application of various electronic devices.</p> <p>-know and understand (descriptor A): The laws of electrical engineering; principle of operation and design features of electronic devices; physical phenomena occurring in electronic devices; the main characteristics of electronic devices.</p> <p>-be able to (descriptor B): experimentally determine the parameters and characteristics of electronic devices and devices; to measure electrical quantities in semiconductor devices; make a preliminary calculation of the parameters and the selection of the main elements of the electronic circuit.</p> <p>-to master, acquire practical skills (descriptor C, D, E): the ability to analyze the operation of electronic devices; discussion skills and vocabulary terminology; possess information about the technical parameters of equipment for use in the design of electronic devices; skills in the use of information in the design of power electronics.</p>
<b>6. Course author</b>	Leznaya O.N.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Gusev V.G., Gusev Yu.M. Electronics and microprocessor technology: Textbook for universities - M.: Higher. shk., 2006, - 799 p.</li> <li>2. Bulychev A.L., Lyamin E.S., Tulinov E.S. Electronic devices. –M.: LightLtd. 2000, - 416 p.</li> <li>3. Lachin V.I., Savelov N.S. Electronics: Textbook. manual-Rostov n / a: Phoenix, 2005.-704 p.</li> <li>4. Reg J. Industrial electronics: [textbook] -M.: DMK-Press, 2011.-lane from English. 1137s.</li> </ol>
<b>8. Content of the discipline:</b>	<ol style="list-style-type: none"> <li>1. Semiconductor devices with one pn junction.</li> <li>2. Transistors (bipolar, field, IGBT).</li> <li>3. Switching devices (dinistor, trinistor, triac).</li> <li>4. Optoelectronic devices (photoresistance, photodiode, light-emitting diode, optocoupler).</li> <li>5. Amplifying cascades of electrical signals.</li> <li>6. Integrated circuits.</li> <li>7. Secondary power supplies.</li> <li>8. Pulse operation of semiconductor devices.</li> </ol>

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Electro-technological installations of industrial enterprises
<b>2. Number of credits</b>	<b>3</b>
<b>3. Prerequisites:</b>	Mathematics. Physics. Theoretical foundations of electrical engineering-1.2. Automatic control theory. Electrical materials.
<b>4. Post-requisites:</b>	Knowledge, received by assimilation discipline, are necessary at performing bachelor's final qualifying work, studying disciplines of the specialty, as well as in professional practice.

<p><b>5. Competencies:</b></p>	<p>After completing the study of the discipline, students must:  have an idea of modern and promising directions of designing electrical installations of the power supply system; about the features of the application of various EGS.</p> <p>know and understand (descriptor A):</p> <ul style="list-style-type: none"> <li>➤ main sources of scientific and technical information on electrotechnical processes and electrotechnical equipment;</li> <li>➤ materials used in the construction of electrical installations, their classification;</li> <li>➤ the purpose of various ETU SES, their area applications, design, principle of operation, main technical parameters;</li> <li>➤ measures of labor protection and environmental safety during the operation of electrical installations.</li> </ul> <p>-be able to (descriptor B):</p> <ul style="list-style-type: none"> <li>➤ search and analyze scientific technical information about computer and microprocessor means and choose the necessary information materials;</li> <li>➤ use software tools for calculating and modeling electrical technological processes;</li> </ul>
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	<ul style="list-style-type: none"> <li>➤ choose the types of electrical installations for implementation of various technological processes based on technological, economic, energy and environmental indicators.</li> <li>own, acquire practical skills (descriptor C, D, E):</li> <li>➤ have experience in using the basic methods of organizing self-study and self-control;</li> <li>➤ master the skills of discussion on professional topics;</li> <li>➤ know the terminology in the field of electrotechnological processes and installations;</li> <li>➤ master the skills of calculating and designing electrical installations;</li> <li>➤ acquire practical application skills</li> </ul> <p>the information obtained in the design of electrical engineering installations.</p> <ul style="list-style-type: none"> <li>➤ have the skills to work with reference literature and regulatory and technical materials.</li> </ul>
<b>6. Course author</b>	Leznaya O.N.
<b>7. Main literature</b>	<p>1. Special issues of electrical technology: Textbook for universities / BB Utegulov, IV Zakharov, AD Izhikova; Ed. B.B. Utegulova. - Pavlodar: NPF EKO LLP, 2009.-326 p.</p> <p>2. Induction heating installations: Textbook for universities / A.E. Slukhotsky, V.S. Nemkov, N.A. Pavlov, A.V. Bamuner; Ed. A.E. Slukhotskiy.-L .: Energoizdat, 1981.- 328 p.</p> <p>3.Bolotov A.V., Shepel G.A. Electrotechnological installations: Textbook. For universities on specials. "Power supply for industrial enterprises ". M .: Higher school, 1998.-336 p.</p> <p>4.Kuvaldin A.B. The theory of induction and dielectric heating: Textbook. - M .: Publishing house MEI, 1999.-80 p.</p> <p>5. Rubtsov V.P., Batov N.G. Electrotechnological installations for special purposes: Textbook.- M .: Publishing house MEI, 2006.-64 p.</p>
<b>8. Content of the discipline:</b>	<p>1. Classification of electrical installations. (materials of electrical installations of SES. Specificity of work of structural materials in electrical installations. Refractory, heat-resistant structural materials and requirements for them).</p> <p>2. Power supply for electrical installations. Transmission of electricity to the consumer (categories of receivers in terms of power supply reliability; elements of electrical equipment. Safety in electrical installations and various electrical installations.</p> <p>3.Electric resistance furnaces (designs of electric resistance furnaces; EPS heat transfer. EPS power supply). 4. Classification, applications and technical and economic characteristics of induction and dielectric heating installations. 5. Electrolysis installations. Electrochemical processes (electrolysis). 6. Electron-ion technology (deposition in an electric field; artificial ionization and calculation of ionizers. Application of ultrasound. Purpose, device and principles of operation of industrial electrostatic precipitators). 7. Installations of special types of electric heating (purpose, designs and power supplies vacuum arc furnaces. Laser technological installations. Electron Beam Technological Plants</p>

<b>1. Basic information about the discipline:</b>	
Name of the discipline	<b>Power converting technology</b>
<b>2. Number of credits</b>	<b>five</b>
<b>3. Prerequisites:</b>	Mathematics. Physics. Theoretical basics electrical engineering-1.2. Theory automatic control. Electrical materials. Industrial electronics. Automatic control theory. Electrical measurements
<b>4. Post-requisites:</b>	Automated electric drive. Electric cars. Relay protection and automation of electric power systems. The knowledge gained by mastering the discipline is necessary when performing a bachelor's final qualifying work, studying the disciplines of the specialty, as well as when professional practice.
<b>5. Competencies:</b>	<p>After completing the study of the discipline, students must:</p> <p>to have an idea of modern and promising directions of development of power converting technology.</p> <p>-Know and understand (descriptor A): The laws of electrical engineering; principle of operation and design features of electronic devices; types of power converting devices, their brief characteristics and purpose;</p>

	<p>physical phenomena occurring in the electrical circuits of the SPU; fundamentals of the theory of transformation of an electric field; methods of analysis and calculation of converters in normal and emergency modes; ways of constructing electrical circuits of power converters; principles of operation of converting devices.</p> <p>- be able to (descriptor B): independently choose converter circuits, calculate the main elements (diodes, transistors, thyristors) of converting equipment, analyze electromagnetic processes, develop control system circuits for converters, read drawings of electrical connection diagrams of converters.</p> <p>-to master, acquire practical skills (descriptor C, D, E): acquisition of skills in solving problems of application, adjustment, selection of basic operating modes, operation and improvement of power converting equipment used in industrial enterprises; the ability to analyze the operation of electronic devices; discussion skills and vocabulary terminology; possess information about the technical parameters of equipment for use in the design of electronic devices; skills in applying information in design power electronics.</p>
<b>6. Course author</b>	Leznaya O.N.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Zinoviev G.S. Fundamentals of Power Electronics: Textbook. manual.- Ed. 3rd, rev. and additional - Novosibirsk: Publishing house of NSTU, 2004.-672s.</li> <li>2. Zinoviev G.S. Fundamentals of power electronics: Textbook. - Novosibirsk: Publishing house of NSTU, 1999. Part 1 - 199s.</li> <li>3. Zinoviev G.S. Fundamentals of power electronics: Textbook - Novosibirsk: Publishing house of NSTU, 2000. Part 2 - 197s.</li> <li>4. Power converting equipment and power supplies of electrotechnical installations: Textbook / V.N. Mukazhanov, S.V. Kon'shin: AIPET. Almaty, 1999.- 80s.</li> <li>5. Yu.K. Rozanov Fundamentals of power converting technology - M.: Energiya, 1979.- 392 p.</li> <li>6. Bobrovnikov L.Z. Electronics: Textbook for universities. - SPb.: Peter, 2004. -- 560 p.</li> </ol>
<b>8. Content of the discipline:</b>	<p>1. Classification of controlled converters electrical energy. 2. Single-phase controlled rectifiers. 3. Rectification of three-phase current. 4. Peculiarities of rectifiers operation for capacitive load and back-EMF. 6. External characteristics of rectifiers. 7. Filters. 8. Grid-driven inverters. Characteristics and modes of their operation (single-phase inverter with a midpoint; three-phase bridge inverter). 9. Autonomous inverters. 10. Frequency converters.</p> <p>Lesson 12. Thyristor voltage regulators (TRN). 13. Power supplies with ballasts (active, inductive, capacitive). 14. Parametric power supplies. 15. Power supplies with feedback.</p>

<b>1. Basic information about the discipline:</b>	
<b>Name of the discipline</b>	<b>Automated process control systems</b>
<b>2. Number of credits</b>	<b>2</b>
<b>3. Prerequisites:</b>	physics, mathematics, information and communication technologies, electrotechnical blueprints, information-measuring Technics, mathematical problems and computer modeling
<b>4. Post-requisites:</b>	Design of power supply systems, Relay protection and automation of EPS, as well as the implementation of diploma design and production graduate activities
<b>5. Competencies:</b>	<p>After completing the study of the discipline, the student must</p> <p>- have an idea of the structure of automated control systems (ACS) and the principles of organizing ACS by technological processes (TP) of electrical installations; about the design features of the elements and the principles of their functioning as part of local automatic control systems (ACS); about typical ACS TP of power supply systems; know and understand (descriptor A): the hierarchy of the APCS and the requirements for its organization (NTD); professional terminology (glossary) in the field of automation and automation of control objects (OU); design and principle of operation of ACS elements, including a programmable logic controller (PLC); rules for reading and constructing automation schemes (SA) of typical technological processes of electrical installations;</p> <p>-be able (descriptor B): to analyze the initial data when organizing and</p>



	operation of automated process control systems for electrical installations; configure (programming) the industrial controller for its intended purpose; read and draw up an automation diagram (CA) of a typical TP, including an algorithm for its functioning; - to have practical skills (descriptor C, D, E): discussions on professional topics using the terminology in the field of automation and automation; installation of a CA using a PLC; selection and programming of intelligent electronic devices (IEDs) during the organization and operation APCS for electrical installations
<b>6. Course author</b>	Rozhkov V.I.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Trofimov A.V., Polyakov A.M. Fundamentals of the organization of microprocessor-based automated control systems for technological processes of electrical installations; tutorial. - M.: Publishing house MEI, 2015.</li> <li>2. Denisenko V.V. Computer control of technological process, experiment, equipment. - M.: Hot line - Telecom, 2009.</li> <li>3. Barashko O.G. Automation, automation and automated control systems: a course of lectures. - Minsk: BSTU Publishing House, 2011.</li> <li>4. Belyaev A.V., Royac M.Sh. Automated systems management electricity supply on the base digital terminals Relay protection. - M.: NTF "Energoprogress", 2015.</li> <li>5. Shabad M.A. Automation of electrical distribution networks using digital relays. - M.: NTF "Energoprogress", 2003.</li> <li>6. Programmable controllers: a manual for an engineer / E. Parr. - M.: BINOM. Knowledge Laboratory, 2007.</li> <li>7. Chichev S.I., Kalinin V.F., Glinkin E.I. Monitoring and control system for electrical equipment of substations. M.: Publishing House "Spectrum", 2011.</li> <li>8. IEC 61850-6-2009 (GOST). Communication networks and systems at substations. Part 6. Configuration Description Language for Communication between IEDs</li> <li>9. LOGO! Operation manual: A5Y00119092.02, version 04. SIMENS. SIMATIC. - <a href="http://www.siemens.com/logo.pdf">www.siemens.com/logo.pdf</a></li> </ol>
<b>8. Content of the discipline</b>	<p>The discipline provides for the study of material in three modules:</p> <p>module 1 "Fundamentals of the organization of APCS", which is aimed at mastering the hierarchy of building typical automatic control systems as part of the APCS of electrical installations of power supply systems (SES), as well as studying professional terminology in the field of automation and automation of TP electrical installations of SES on the basis of regulatory and technical documents (NTD); module 2 "Technical means of local automatic control system automation", which is aimed at mastering the structural features of the local automatic control system elements and the principles of their operation, including PLC in the implementation of the main tasks of the automatic process control system of electrical installations: starting and stopping machines, measuring and signaling, regulation and protection;</p> <p>module 3 "Typical solutions of APCS for electrical installations of SES", which is aimed at mastering the features of the implementation of the main tasks of APCS in various nodes of connection (by voltage) of electrical installations during their operation by consolidating the skills of reading and building automation schemes and requirements for programming of MP IED.</p>

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Safety in power plants
<b>2. Number of credits</b>	<b>3</b>
<b>3. Prerequisites:</b>	The material of the discipline "Fundamentals of safety in electrical installations" is based on the knowledge gained in the disciplines: theoretical foundations of electrical engineering and professional disciplines: power supply, power plants and substations, high voltage technology.
<b>4. Post-requisites:</b>	The knowledge and skills acquired in the study of this discipline are necessary for coursework and diploma design, and also in production process
<b>5. Competencies:</b>	<ul style="list-style-type: none"> <li>- know and understand (descriptor A): know and understand situations in which situations there is a danger of electric shock, choose safety measures of a technical and organizational plan, perform calculations for the choice of electrical safety equipment;</li> <li>- be able to (descriptor B): the acquisition and application of practical skills in the design of protection against electric shock</li> </ul>

	shocked In various electrical installations; - master, acquire practical skills (descriptor C, D, E): the ability to analyze the danger of electric shock in various electrical installations and apply technical and organizational measures security.
<b>6. Course author</b>	Anisimov Yu.V.
<b>7. Main literature</b>	1 Safety rules for the operation of electrical installations RK RD 34.03.202.- 04. Almaty, 2008 2 Dolin P.A. Fundamentals of safety in electrical installations. - M.: Energoatomizdat. 1984. -- 400s 3 Sipkin Yu.D., Sipkin M.Yu. Electrical safety in the operation of electrical installations of industrial enterprises. □ M.: Publishing Center "Academy". 2004.- 240s. 4 Methodical recommendations for testing electrical equipment and electrical apparatus, Moscow Energoservice, 2003 5 Rules for the construction of electrical installations of the Republic of Kazakhstan. - Astana: 2008. - 592 6 Valleys P.A. Directory by technique security. - M.: Energoatomizdat, 1987 7 Directory electrical protection funds and safety devices. - M.: Energoatomizdat, 1984 8 Khomyakov A.M. Protective equipment for workers used in electrical installations. - M.: Energoatomizdat, 1981 9 Lukovnikov A.V., Shkrabak V.S. Labor protection), Moscow: Agropromizdat, 1991, 319p. 10 S.L. Kostruba Measurement of parameters of the earth and grounding devices. - M.: Energoatomizdat, 1983 11 Anisimov Yu.V. Methodological instructions for laboratory work in the discipline "Fundamentals of safety in electrical installations" and "Safety Engineering in Power Plants" for specialties "Electric Power Engineering" and "Energy Supply for Agriculture"
<b>8. Content of the discipline</b>	Provide students with the relevant knowledge necessary to: -skills of choice funds electrical safety in specific electrical installation; - application in course and diploma design; - making competent decisions when justifying the use of electrical safety equipment in various electrical installations.

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Operation of electrical equipment
<b>2. Number of credits</b>	2
<b>3. Prerequisites:</b>	Mathematics, physics, installation and adjustment electrical equipment, electrotechnical materials, TOE, electrical measurements, electronics, electrical machines.
<b>4. Post-requisites:</b>	Knowledge in this discipline is necessary for the implementation of course and diploma projects and the practical activities of specialists.

<p><b>5. Competencies:</b></p>	<p>a) humanitarian and social competences (GSK)</p> <ul style="list-style-type: none"> <li>• willingness to cooperate with colleagues, work in a team (GSK - 2);</li> <li>• the ability to find organizational and managerial solutions in non-standard conditions and in conditions of different opinions and the willingness to take responsibility for them</li> <li>• readiness for independent, individual work, decision-making within the framework of their professional competence (GSK-5);</li> </ul> <p>b) professional competence (PC)</p> <ul style="list-style-type: none"> <li>• the ability and willingness to use regulatory legal documents in their professional activities (PC-1);</li> <li>• the ability to calculate the operating modes of electric power plants for various purposes, to determine the composition of equipment and its parameters, schemes of electric power facilities (PC-5);</li> <li>• the ability to use technical means to measure the main parameters of electric power and electrical</li> </ul>
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	<p>objects and systems and processes occurring in them (PC-6);</p> <ul style="list-style-type: none"> <li>• the willingness to substantiate technical solutions in the development of technological processes and choose technical means and technologies, taking into account the environmental consequences of their use (PC-8);</li> <li>• the ability to control the operating modes of the equipment of electric power facilities (PC-11);</li> <li>• readiness to study scientific and technical information, domestic and foreign experience on the research topic (PC-13);</li> <li>• the ability to apply test methods for electrical equipment and objects of electric power and electrical engineering (PC-17);</li> </ul>
<b>6. Course author</b>	Pyastolova I.A.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Eroshenko G.P. and others Operation of electrical equipment. Textbook. - M.: KolosS, 2008. - 344 p.</li> <li>2. Ermolaev S.A., Muntyan V.A., Kyurchev V.N. Operation and repair of electrical equipment and automation equipment in the AIC system. - Kiev: NPF Altur, 1997. - 415p.</li> <li>3. Pyastolova I.A. Theoretical foundations of operation. - Astana, KazATU, 2008 - 84 p.</li> <li>4. Pyastolova I.A. Technical operation of electrical equipment. - Astana, KazATU, 2009 - 174 p.</li> <li>5. Pyastolova I.A. Repair and maintenance of electrical equipment. Astana, Folio, 2008 - 202 p.</li> <li>6. Pyastolov A.A., Eroshenko G.P. Operation of e-mail equipment. -M.: Atomizdat, 1990 - 287 p.</li> <li>7. Butorin V.A. Charykov IN AND. Scientific and practical basics of electrical equipment operation. - Chelyabinsk, 2011. - 235</li> </ol>
<p>8 General questions of the operation of electrical equipment. Basic concepts and definitions of the theory of exploitation. Operational properties of electrical equipment. Reliability properties. Brief description of rural power supply and its reliability. The influence of the quality of electricity on the operation of electrical consumers. Features of the operating conditions of electrical receivers in the agricultural sector. and their impact on the operation of electrical equipment. Operational reliability of electrical equipment in agriculture. The theory of acquisition and diagnostics of electrical equipment. General questions of overhaul of equipment. Technology of overhaul of direct current electric machines. Technology of overhaul of AC electrical machines. Testing of AC machines after repair. Power transformer overhaul technology. Methods for drying transformer windings. special purpose.</p>	

## Appendix 5 Description of the disciplines of the PD cycle

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Electrical networks and systems
<b>2. Number of credits</b>	<b>four</b>
<b>3. Prerequisites:</b>	The material of the discipline "Electrical networks and systems" is based on the knowledge gained during the study: - physics, theoretical foundations of electrical engineering, electrical drawings, information and measuring technology, electrical materials science, electrical machines, power plants and substations.
<b>4. Post-requisites:</b>	Knowledge and skills acquired in the study of this discipline, are necessary for diploma design, but also introduction activities of the graduate.
<b>5. Competencies:</b>	-know and understand (descriptor A): be able to use the knowledge gained in practice, understanding of the physical processes occurring under various operating modes of electrical networks of various voltage levels. - be able to (descriptor B): the acquisition and application of practical skills in the design of electrical networks, power supply systems, the use of advanced technical solutions. -to master, acquire practical skills (descriptors C, D, E): the ability to compare, analyze different schemes and modes electrical networks, build your own argumentation, formulate conclusions based on the results of calculations.
<b>6. Course author</b>	Krasnikov V.I.
<b>7. Main literature</b>	1 Electrical systems. Ed. V.A. Venikov. -M.: Higher school, 1971. 2 Melnikov N.A. Electric networks and systems.- Moscow: Energiya, 1975. 3 Markovich I.M. Modes of Power Systems.- M.: Energiya, 1975. 4 Handbook for the design of electrical systems. Edited by M.S. Rokotyan and I.A. Shapiro. -M.: Energy, 1977. 5 Venikov V.A., Zhukov L.A., Pospelov G.E. Electrical systems. Operating modes of electrical systems and networks. Ed. Venikova V.A. - M.: Higher school, 1975. 6 Idelchik V.N. Electrical systems and networks. - Textbook for universities. -M.: Energoatomizdat, 1989. 7 Blok V.M. Electrical networks and systems. -M.: Higher school, 1986. 8 Electrical systems t-2. Electricity of the net. Edited by V.A. Venikov - M.: Higher School, 1971. 9 Venikov V.A., Ezhkov V.V., Zelenokhat N.I. and other Electric power systems in examples and illustrations. Under. ed. Venikova V.A.-M.: Energoatomizdat, 1983. 10 Kryukov K.P., Novgorodtsev B.P. Structures and mechanical calculation of power lines.-Leningrad: Energy, 1979. 11 Borovikov V.A., Kosarev V.K., Khodot G.A. Electric networks and systems.-M-L.: Gosenergoizdat, 1963. 12 Ryabkov A.Ya. Electric networks.-M-L.: Gosenergoizdat, 1960. 13 Soldatkina L.A. Electric networks and systems.-M.: Energy, 1972. 14 Krasnikov V.I. Methodological manual for the course work on the discipline "Electrical networks and systems for students of energy faculty specialties 5B071800-Electricity". -Astana, S. Seifullin KazATU, 2015.
<b>8. Content of the discipline</b>	The discipline "Electrical networks and systems" is the main, special, designed to form the professional training of bachelors - in the specialty 5B071800 "Electrical power engineering". The general characteristics of the transmission and distribution of electrical energy, the voltage of the elements of the electrical network, the principles of the design of the power transmission line, the characteristic and calculation of the parameters of the circuits of the network elements are considered. Calculation and analysis of steady-state modes of open and closed electrical networks, methods of calculation, analysis of losses of electrical energy and voltages in

	electrical networks. The basics of constructing diagrams of transmission and distribution systems of electrical energy, the choice of the cross-section of wires and cable cores, indicators and norms of the quality of electricity, the balance of active and reactive power, the level of frequency and voltages are considered. in the electric power system, the basics of regime regulation.
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<b>1. Basic information about the discipline:</b>	
Name of the discipline	Power supply systems design
<b>2. Number of credits</b>	four
<b>3. Prerequisites:</b>	-physics; -theoretical foundations of electrical engineering; -electric cars; - installation technology; -electric stations and substations; -Electricity of the net; -electricity supply.
<b>4. Post-requisites:</b>	- diploma design.
<b>5. Competencies:</b>	<ul style="list-style-type: none"> <li>- Know and understand (Descriptor A) design regulations, design stages and design stages.</li> <li>- Be able to (Descriptor B) calculate the consumer load, choose power supplies, modern electrical equipment and conductors of the power supply system.</li> <li>- Master (descriptors C, D, E) modern methods of calculating electrical loads and reactive power compensation at various stages of the power supply system, the principles of choosing substation transformers.</li> <li>- Acquire practical skills (descriptors C, D, E) of constructing and choosing the optimal option for the power supply scheme of the facility, choosing the main electrical equipment, ensuring the required quality of electricity, reliability and service safety.</li> </ul>
<b>6. Course author</b>	Slipchenko S.A.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Konyukhova E.A. Power supply of objects. - M.: Publishing house "Mastery", 2013.</li> <li>2. Guzhov N.P., Olkhovsky V.Ya. Power supply systems. - Rostov n / a: Phoenix, 2011.</li> <li>3. Kudrin B.I. Power supply of industrial enterprises. - M: Internet Engineering, 2012.</li> <li>4. Fedorov A.A., Starkova L.E. Textbook for course and diploma design.- M.: Energoatomizdat, 1987.</li> <li>5. Lipkin B. Yu. Power supply of industrial enterprises and installations. - M.: Higher school, 1990.</li> <li>6. Rules for the design and safe operation of electrical installations of the Republic of Kazakhstan (PUE, PTE, PTB). - Novosibirsk: Sib. univ. publishing house, 2006.</li> <li>7. Ivanov V.S., Sokolov V.I., Modes of consumption and quality of electricity in power supply systems of industrial enterprises, Moscow: Energoatomizdat, 1987.</li> <li>8. Opoleva G.N. Power supply circuits and substations. - M.: ID "Forum" - Infra-M, 2009.</li> <li>9. Handbook on power supply and electrical equipment: 2 vol. / Under total. ed. A.A. Fedorov. - M.: Energoatomizdat, 1986.</li> <li>10. Power Supply Design Handbook / Ed. SOUTH. Barybina and others - M.: Energoatomizdat, 1990.</li> <li>11. Vinoslavsky V.N., Dwarf A.V. Design systemspower supply. - Kiev: Vishcha school, 1981.</li> <li>12. Calculation of short circuits and the choice of electrical equipment. / Ed. I.P. Kryuchkov and V.A. Starshinova. - M.: Ed. center "Academy, 2005.</li> <li>13. Greysukh M.V., Lazarev S.S. Calculations by electricity supplyindustrial enterprises. - M.: Energy, 1977.</li> <li>14. Handbook on the power supply of industrial enterprises. / Under total. ed. A.A. Fedorov and G.V. Serbinovsky. In 2 books. - M.: Energy, 1973.</li> </ol>

	<p>15. Handbook on the design of electrical networks and electrical equipment. / Ed. SOUTH. Barybina et al. - M.: Energoatomizdat, 1991.</p> <p>16. Rekus G.G. Electrical equipment of production. - M.: Higher. school, 2007.</p> <p>17. Anastasiev P.I., Branzburg E.Z. Design of cable networks and wiring. - M.: Energy, 1980.</p> <p>18. Guidelines for the calculation of short-circuit currents and the selection of electrical equipment. / Ed. B.N. Neklepaeva. - M.: Publishing house of NTs ENAS, 2004.</p>
<b>8. Content of the discipline</b>	to prepare students to complete the entire list of tasks related to the design of both individual elements of the power supply system and the entire complex of project issues, introducing new technologies, taking into account the accumulated experience in the design, installation and operation of electrical installations and ensuring high reliability power supply at standardized power quality.

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Relay protection and automation of electrical power systems
<b>2. Number of credits</b>	<b>four</b>
<b>3. Prerequisites:</b>	The material of the discipline "Relay protection and automation of electric power systems" is based on the knowledge gained in the study of disciplines: "Theoretical foundations of electrical engineering", "Electric machines", "Power stations and substations", "Power supply", "Information measuring equipment".
<b>4. Post-requisites:</b>	The knowledge and skills acquired during the study of the discipline are necessary for course and diploma design, as well as in the process production activities.
<b>5. Competencies:</b>	<ul style="list-style-type: none"> <li>- to know and understand (descriptor A): to independently calculate the parameters of the operation of various types of protection, build selectivity maps, analyze the actions of protections and automation in various modes of the system, choose circuit solutions for their implementation;</li> <li>- be able to (descriptor B): Acquisition and application of practical skills in the design of protection equipment and automation of electric power systems;</li> <li>- master, acquire practical skills (descriptors C, D, E): the ability to compare, analyze the operation of protection and automation devices in various modes of operation of the electric power system, draw conclusions based on the results of the analysis.</li> </ul>
<b>6. Course author</b>	Anisimov Yu.V.
<b>7. Main literature</b>	<p>1 Chernobrovov N.V., Semenov V.A. Relay protection of energy systems: A textbook for technical schools.- M.: Energoatomizdat, 1998-798 p. 2 Shabad M.A. Calculations of relay protection and automation of distribution networks - St. Petersburg.: Energoatomizdat, 2002 - 349 p.</p> <p>3 Shabad M.A. Selection of characteristics and settings of digital current protections of the SPACOM and RE_5XX series. - St. Petersburg, 2002.</p> <p>4 Andreev V.A. Relay protection automation in power supply systems - M.: Higher school, 2008 - 639p.</p> <p>5 Electrical Installation Code RK-Astana, 2008</p> <p>6 Solovyov A.L. Methodology for calculating SEPAM settings. Schneider Electric technical collection. Issue 3.- St. Petersburg, 2005.</p> <p>7 Recommendations for the selection of settings for transformer protection devices</p> <p>Sirius T and Sirius T3 (Sirius UV) - Cheboksary: ZAO Radius Avtomatika, 2002.</p> <p>8 Guidelines for the selection of settings "Sirius DZ-35" - Cheboksary.: CJSC "Radius Automatics", 2004.</p> <p>9 SIPROTEC. 7SJ600 Digital Overcurrent Terminal - Technical Description. - ABB Relay - Cheboksary, 2005.</p> <p>10 Transformers and autotransformers 35-220 kV. Differential current protection. Payment settings. Methodical directions. STC "Mekhanotronika" .- St. Petersburg</p> <p>11 Methodical instructions for practical and laboratory work on discipline "Relay protection and automation electric powersystems "Astana, 2015.</p>

	12 Methodical instructions for laboratory work on relay protection and automation at the educational and laboratory complex "Model of an electrical system with a complex load node" for students of the specialty "Electric Power Engineering" - Astana, 2006. 13. Barzam Arp. B. System Automation - Moscow: Energiya, 1973
<b>8. Content of the discipline</b>	provide students with the relevant knowledge necessary for independent use in the design of relay protection and automation of electric power systems using modern digital devices.

<b>1. Basic information about the discipline:</b>	
Name of the discipline	Electric cars
<b>2. Number of credits</b>	<b>3</b>
<b>3. Prerequisites:</b>	The study of the course "Electrical Machines" is based on the following disciplines: physics, mathematics, electrical materials, theoretical foundations of electrical engineering.
<b>4. Post-requisites:</b>	The knowledge and skills acquired by students in the course of studying this course will be used in the future in the study of disciplines of the energy profile: operation of electrical equipment, design of electrification systems, design of systems power supply, diploma design, automated electric drive.
<b>5. Competencies:</b>	<ul style="list-style-type: none"> <li>- the ability and willingness to analyze scientific and technical information, to study domestic and foreign experience on the research topic (PC-6);</li> <li>- the ability to develop simple designs of power and electrical facilities (PC-9);</li> <li>- the ability to use modern information technologies, manage information using business applications; use network computer technologies, databases and application packages in their subject area (PC-19);</li> <li>- the ability to self-study and master new knowledge and skills for the implementation of their professional career (NPK2);</li> </ul>
<b>6. Course author</b>	Gerasimenko T.S.
<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Design of electrical machines. / Edited by I.P. Kopylov. M.: Higher school, 2002.</li> <li>2. Ivanov-Smolensky A.V. Electric cars. In two volumes. 3-edition.-M.: Publishing house MEI, 2006-652 (656) b.</li> <li>3. Katsman M.M. Electric cars. 5th edition, revised and supplemented.-M.: Publishing Center "Academy", 2003.-496 b.</li> <li>4. Bespalov V.Ya., Kotelenets N.F. Electrical machines.-M.:MPEI Publishing House, 2006-320 b.</li> </ol>
<b>8. Content of the discipline</b>	The study of this discipline will allow students to acquire knowledge and skills in the calculation, design of electrical machines necessary in further practical activities, as well as raising the professional level through the magistracy.

<b>1. Basic information about the discipline:</b>	
Name of the discipline	<b>Transient processes in the electric power industry</b>
<b>2. Number of credits</b>	<b>four</b>
<b>3. Prerequisites:</b>	physics, mathematics, information and measuring technology, theoretical foundations of electrical engineering - 1 and 2, mathematical problems and computer modeling
<b>4. Post-requisites:</b>	Design of power supply systems, Relay protection and automation EES, as well as the implementation of diploma design and production activities of the graduate



<b>5. Competencies:</b>	After completing the study of the discipline, the student must - have an idea of the physics of transient processes (TP) and modes in electrical installations SES (systems power supply),
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	<p>classification signs and methods for calculating the PP both analytically and with the use of a PC for the subsequent design and operation of electrical installations (EP);</p> <p>-Know and understand (descriptor A): the main sources of scientific and technical information (STI) and guidance documents (RD) on the calculation of transient processes in ES; modern IT-technologies (software and algorithms) for building models (equivalent circuits) of power plants and subsequent calculation of the PP; analytical method for calculating electromagnetic and electromechanical PP, as well as measures and means of limiting the negative impact of PP on the normal operation of the power plant;</p> <p>- be able to apply knowledge (descriptor B): fulfill the requirements of the RD when calculating the PP, analyze the design conditions (initial data and basic conditions); analytically or on a PC, draw up equivalent circuits for power plants and implement the calculation of a typical PP (short circuit); based on the results of the PP calculations, draw conclusions and determine measures to limit the negative consequences of the PP in the form of submitting a technical report with its public protection;</p> <p>- master the skills (descriptor C, D, E): discussions using professional terminology, fundamental provisions and laws of the physical, mathematical and electrical apparatus; the use of various methods (analytically or with the use of IT technologies) and methods for calculating the PP; analysis of the results of calculating the PP in SPP in order to design the power plant (check for durability and stability) and their operation (setting up relay protection and automation)</p>
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<b>6. Course author</b>	Rozhkov V.I.
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<b>7. Main literature</b>	<ol style="list-style-type: none"> <li>1. Rules for the Installation of Electrical Installations of the Republic of Kazakhstan (PUE) / Approved by the Government of the Republic of Kazakhstan No. 1355 dated 24.10.2012.</li> <li>2. Guidelines for the calculation of short-circuit currents and the selection of electrical equipment. RD 153-334.0-20.527-98 / Ed. B.N. Neklepaeva. - M.: Publishing house NTs ENAS, 2000.</li> <li>3. Kulikov Yu.A. Transient processes in electrical systems. - Novosibirsk: Publishing house of NSTU, 2006.</li> <li>4. Ulyanov S.A. Electromagnetic transients in electrical systems. - M.: Energy, 1970.</li> <li>5. Short circuits and the choice of electrical equipment / Ed. I.P. Kryuchkova, V.A. Starshinova V.A. - M.: MPEI Publishing House, 2012.</li> <li>6. Gotman V.I. Short circuits and unbalanced modes in electrical systems. - Tomsk: TPU Publishing House, 2011.</li> <li>7. Venikov V.A. Transient electromechanical processes in electrical systems: a textbook for electrical power specialties of universities. - M.: Higher school, 1985.</li> <li>8. Kravchenko A.A. Transient processes in the electric power industry: educational and methodological complex of the discipline. - Astana: KATU, 2010.</li> </ol>
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<p><b>8. Content of the discipline</b></p> <p>The discipline provides for the study of material in two modules:</p> <p>module 1 "Electromagnetic PP", which is aimed at mastering professional terminology for the course, classification signs of typical modes and processes (occurring in the plant), a general algorithm for calculating any type of short circuit and consolidating the concept of physics of the flow of software by considering typical problems of calculating symmetric and asymmetric types of short circuit at an arbitrary moment in time in a high voltage power plant, including the conditions for bringing and converting various types of equivalent circuits;</p> <p>Module 2 "Electromechanical PCBs", which is aimed at consolidating the skills of calculating various types of short circuits in medium and low voltage electrical installations, as well as mastering the general principles, requirements and methods of calculating electromechanical PCBs by considering typical tasks for calculating stability in the analysis of starting and self-starting of electric motors.</p>
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<b>1. Basic information about the discipline:</b>	
Name of the discipline	Power stations and substations
<b>2. Number of credits</b>	<b>four</b>
<b>3. Prerequisites:</b>	<p>The material of the discipline "Power Plants and Substations" is based on the knowledge gained during the study:</p> <p>- physics, theoretical foundations of electrical engineering -1, theoretical foundations of electrical engineering -2, electrotechnical blueprints, informational measuring technology, insulation in electrical installations...</p>

<b>4. Post-requisites:</b>	The knowledge and skills acquired in the study of this discipline are necessary for course and diploma design, as well as in the study of the following disciplines: -electricity supply, electrical networks and systems, relay protection and automation of electrical power systems.
<b>5. Competencies:</b>	-Know and understand (descriptor A): be able to use the knowledge gained in practice, understanding of physical processes, equipment designs, electrical connection diagrams of power plants and substations. - be able to (descriptor B): the acquisition of practical skills for the design and production activities at facilities "Electric power industry". -to master, acquire practical skills (descriptor C, D, E): C-ability to compare, analyze different situations, build your own argumentation, formulate conclusions in designing and operation of electrical equipment of the station and substation. D - in the field of communication, the formation of a correct attitude towards various scientific schools and trends, various technical solutions to the problem being implemented. E - in the field of training, the ability to analyze and make the right technical decisions in design and practice at the facilities of the "electric power" modern scientific and technical trends of the studied discipline.
<b>6. Course author</b>	Krasnikov V.I.
<b>7. Main literature</b>	1 Electrical part of stations and substations: textbook / ed. Vasilyeva A.A. in 2 parts.- M.: Energoatomizdat, 1990. 2 Rozhkova L.D. Electrical equipment of power plants and substations: textbook / L.D. Rozhkova, L.N. Karneeva, T.V. Chirkova. - M.: Publishing Center "Academy", 2010. 3 Artyukhov I.I. Electrical equipment of power plants and substations: a tutorial / I.I. Artyukhov, V.D. Kulikov, V.V. Tyutmanova - Saratov: SSTU, 2006. 4 B.N. Neklepaev Electrical part of power plants: textbook / B.N. Neklepaev. - Moscow: Energy, 1977. 5 Ismagilov F.R. Ismagilov, T. Yu. Volkova, N. K. Potapchuk. - Moscow: Publishing Center "Academy", 2011. 6 Guidelines for the calculation of short-circuit currents and the selection of electrical equipment: instructions RD 153-34.0-20.527-98 / ed. Neklepaeva B.A. - M.: Publishing house of NTs ENAS, 2001. 7 Calculation of short circuits and selection of electrical equipment: study guide / I.P. Kryuchkov, B.N. Neklepaev, V.A. Starshinov and others; ed. I.P. Kryuchkov and V.A. Starshinova. - M.: Publishing Center "Academy", 2008. 8 A.V. Kabyshev Lightning protection of electrical installations of power supply systems: a tutorial / A.V. Kabyshev. - Tomsk: TPU Publishing House, 2006. 9 High voltage technique: textbook / IM Bogatenkov, Yu.N. Bocharov, NI Gumarova, GM Imanov and others; ed. G.S. Kuchinsky. SPb.: Energoatomizdat, 2003.
<b>8. Content of the discipline</b>	The discipline "Power Plants and Substations" is the main, special, designed to form the professional training of bachelors - in the specialty 5B071800 "Power Engineering". Master the basic scientific and technical principles and skills for studying the disciplines of post-requisite, graduate design, as well as for production activities.