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
"Power supply of industrial enterprises, cities and agro-industrial complex"

Code and classification of the field of education	7M07 Engineering, manufacturing and construction industries
Code and classification of areas of training	7M071 Engineering and Engineering
International Standard Classification of Education Code	071
Qualification	Master of Technical Sciences in the educational program "7M0718-Power supply of industrial enterprises, cities and agro-industrial complex"
Training period	2 years / 1.5 years

Nur-Sultan, 2019

The team of authors:

1. Tatkeeva Galiya Galymzhanovna	Doctor of Technical Sciences, Head of the Department of Power Supply, “S. Seifullin Kazakh Agrotechnical University” JSC
2. Uakhitova Aigul Botanovna	Candidate of Technical Sciences, Associate Professor of the Department of "Power Supply" of “S. Seifullin Kazakh Agrotechnical University” JSC
3. Akhmetzhanov Amangeldy Allabergenovich	Expert, Head of the Department of Technical Accounting and Control of Astana Energo Holding Company LLP

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No. 932-N dated 12.12.2018

Educational program " Power supply of industrial enterprises, cities and agro-industrial complex "
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

Content

1Passport of the educational program

1.1 Purpose of the educational program

The purpose of the educational program "Power supply of industrial enterprises, cities and agro-industrial complex" is to train highly qualified specialists with in-depth scientific and pedagogical training, capable of formulating and solving modern scientific and practical problems in science and in production related to the process of power supply of industrial enterprises, cities and agro-industrial complexes.

The main objectives of the educational program:

– formation of a theoretical knowledge base for mastering professional competencies;

– the ability to apply the knowledge gained to solve relevant problems;

– obtaining by undergraduates' practical skills in solving specific professional problems in the design of power supply systems for objects;

– acquaintance with the real production processes of industrial enterprises, cities and agro-industrial complexes and research and design activities.

2 General characteristics of the educational program

The educational program "Power supply of industrial enterprises, cities and agro-industrial complex" was developed in accordance with the National Qualifications Framework and Professional Standards, coordinated with the Dublin descriptors and the European Qualifications Framework.

A special feature of the profile "Power supply of industrial enterprises, cities and agro-industrial complex" is the training of graduates who have an idea of: power systems of various hierarchical levels, design of power supply systems for facilities, calculation and analysis of operating modes of power supply systems, organization of installation, adjustment, maintenance, diagnostics and testing, repairs electrical equipment of power supply systems.

3 Competence model (portrait) of a graduate Master

student must be competent:

- in the field of research methodology;
- in the field of scientific and scientific-pedagogical activity in higher educational institutions;
- in matters of modern educational technologies;
- in fulfillment scientific projects and research in professional area;
- in ways securing permanent renewal knowledge, enlargement professional skills and abilities.

3.1 The areas of professional activity

The areas of professional activity of masters in this direction include a set of technical means, methods and methods of human activity for the production, transmission, distribution, transformation, use of electrical energy, energy flow control, development and manufacture of elements, devices and systems that implement these processes.

3.2 Professional activities

The objects of professional activity of the graduate are the power supply systems of industrial enterprises, cities and the agro-industrial complex, as well as regulatory and technical documentation and standardization systems, methods and means of testing and quality control of products of the electrical industry, electrical equipment and power supply systems.

The subjects of professional activity of the Master in the educational program "Power supply of industrial enterprises, cities and agro-industrial complex" are: power plants and substations; relay protection and automation of distribution networks, power supply systems for industrial enterprises, cities and the agro-industrial complex.

The types of professional activities of a graduate are:

- design and engineering;
- production and technological;
- organizational and managerial,
- research;
- installation and commissioning;
- service and operational.

3.3 General educational competencies

Based on the results of mastering the educational program "Power supply of industrial enterprises, cities and agro-industrial complex", a graduate of the magistracy must have the following competencies:

General cultural competencies:

– the ability to generalize, analyze, perceive information, set a goal and choose ways to achieve it;

– the ability to written and oral communication, the ability to logically correctly, reasonably and clearly build oral and written speech; readiness to use one of the foreign languages;

– willingness to cooperate with colleagues, work in a team;

– 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;

– the ability and readiness to understand the driving forces and laws of the historical process, the place of man in the historical process, political

organization of society, to the analysis of political events and trends, to responsible participation in political life;

– the ability, in the context of the development of science and changing social practice, to reassess accumulated experience, analyze their capabilities, readiness to acquire new knowledge, use various means and technologies of education

3.4 Core competencies

General professional competencies:

– the ability and willingness to use information technology, including modern computer graphics in their subject area;

– the ability to demonstrate basic knowledge in the field of natural sciences and the readiness to use the basic laws in professional activity, to apply the methods of mathematical analysis and modeling, theoretical and experimental research;

– the readiness to reveal the natural-scientific essence of the problems arising in the course of professional activity, and the ability to attract the appropriate physical and mathematical apparatus for their solution;

– the ability and willingness to use regulatory legal documents in their professional activities;

– possession of the basic methods of protecting production personnel and the population from the consequences of possible accidents, catastrophes, natural disasters;

– the ability and willingness to analyze scientific and technical information, to study domestic and foreign experience on the research topic;

– the ability to form a complete idea of the decisions made and the results obtained in the form of a report with its publication (public defense).

3.5 Professional competencies

Profiled specialized competencies:

– the ability to choose the structure and parameters of the elements of power supply systems;

– the ability to draw up equivalent circuits of elements of power supply systems for subsequent calculations;

– the willingness to use knowledge of the peculiarities of the operating modes of electrical receivers and consumers of electricity and production technologies in the design of power supply systems;

– the ability to calculate the electrical loads of electricity consumers and their integral characteristics;

– the ability to calculate indicators of the quality of electricity at electrical consumers;

– the ability to calculate the level and indicators of the reliability of power supply to consumers;

– the ability to assess the undersupply of electricity.

– the ability to build a relay protection scheme and automation of electric power systems;

– the ability to calculate the parameters of electric power devices and electrical installations, power supply systems, relay protection and automation.

4 The base of passing professional practices

In order to consolidate the theoretical knowledge obtained by undergraduates at the university and acquire practical work skills, the undergraduate must master the following types of professional practice:

1 Teaching practice.

The goal of pedagogical practice is to consolidate and deepen knowledge in psychological, pedagogical, methodological and profiling disciplines, as well as to form pedagogical skills, skills and competencies on the basis of theoretical knowledge. Pedagogical practice is aimed at combining general scientific, didactic, methodological, subject and psychological and pedagogical training.

Practice objectives: the program of pedagogical practice is aimed at the implementation of theoretical knowledge and improvement of practical skills and abilities of working with a student group.

In the course of passing pedagogical practice, it is necessary: to get acquainted with the tasks, content and features of educational, methodological and educational work at KATU named after From Seifullin; to study the real state of the integral pedagogical process of the university; to study the age characteristics of bachelor students; curricula, work programs in the subject of their specialty and other educational and methodological documentation of the department; practically master all forms of organization of education at the university, draw up lecture notes, plans for seminars, practical and laboratory classes.

2 Research practice.

The purpose of the research practice is to master the basic methods of conducting research work and the formation of a professional worldview in this area, in accordance with the profile of the EP "Power supply of industrial enterprises, cities and agro-industrial complex".

Practice objectives

This type of practice solves the following tasks:

1) to form a comprehensive understanding of the specifics of the activities of a scientist in the direction of "Power supply of industrial enterprises, cities and agro-industrial complex";

2) master the research methods that best match the profile of the educational program;

3) improve the skills and abilities of independent research activities;

4) improve the personality of a future scientist specializing in the field of electric power.

A graduate of this educational program can prove themselves as:

– Highly qualified specialist in the operation of power supply systems of industrial enterprises and transport systems.

– Highly qualified specialist in the design of power supply systems for industrial enterprises and transport systems.

– Highly qualified specialist in organizations designing cable lines, power transformers, high-voltage switching devices.

Organization of our own private production and installation of electrical systems for the design of power supply systems.

Undergraduates undergo training at large enterprises in the electric power industry in the Republic of Kazakhstan: KEGOC JSC, Samruk Energo JSC, AEDK JSC, Astana-REC JSC, Kokshetauenergo LLP, Karagandy Zharyk LLP, Tavrida Electric LLP Astana ", " Astanaenergoservice " LLP, " Kazelektromontazh " LLP, " Ekibastuz GRES " LLP, "MAEK-Kazatomprom" LLP, "Kazakhenergoexpertiza" JSC and others.

5 The structure of the educational program of the magistracy in the scientific and pedagogical direction

P / p No.	The name of the cycles of disciplines and types of activities	Total labor intensity	
		in academic hours	in academic credits
1	2	3	4
1.1	**Cycle of basic disciplines (DB)**	**1050**	**35**
1)	*University component (VK):*	*630*	*21*
	including:		
	History and philosophy of science	150	five
	Foreign language (professional)	150	five
	Higher education pedagogy	90	3
	Psychology of management	150	five
	Teaching practice	90	3
2)	*Optional component (CV)*	*420*	*fourteen*
	Alternative and renewable energy sources	90	3
	Information technology in the electric power industry	150	five
	Energy efficiency of electricity conversion	180	6
1.2	**The cycle of profiling disciplines (PD)**	**1620**	**54**
1)	*University component (VK)*	*960*	*32*
	Theory and practice of technical experiment in the electric power industry	120	four
	Special issues of relay protection and automation	180	6
	Special issues of power supply	150	five
	Mathematical modeling in the electric power industry	180	6
	Scientific and technical problems of the electric power industry	150	five
	Stability of electrical power systems	180	6
2)	*Optional component (CV)*	*660*	*22*
	Optimization of power supply systems for rural, industrial and energy enterprises	150	five
	Optimization of power supply systems for industrial enterprises	150	five
	Research practice	360	12
2	**Research work**	**720**	**24**
1)	Research work of a master student, including an internship and a master's thesis (NIRM)	720	24
3	Additional types of education (FEB)		
4	**Final certification (IA)**	**360**	**12**
1)	Registration and defense of a master's thesis (OiZMD)	360	12
	Total	**3750**	**125**

The structure of the master's educational program in the profile direction

P / p No.	The name of the cycles of disciplines and types of activities	Total labor intensity	
		with a training period of 1.5 years	
		in academic hours	in academic credits
1.1	**Cycle of basic disciplines (DB)**	**420**	**fourteen**
1)	*University component (VK)*	*180*	*6*
	including:		
	Foreign language (professional)	60	2
	Management	60	2
	Psychology of management	60	2
2)	*Optional component (CV)*	*240*	*eight*
1.2	**The cycle of profiling disciplines (PD)**	**1350**	**45**
1)	*University component (VK)*	*1050*	*35*
2)	*Optional component (CV)*	*300*	*10*
3)	**Internship**	**180**	**6**
2	**Experimental researchWork**	**540**	**eighteen**
1)	Experimental research work of a master student, including an internship and the implementation of a master's project (EIRM)	540	eighteen
3	Additional types of education (FEB)		
4	**Final certification (IA)**	**360**	**12**
1)	Registration and defense of the master's project (OiZMP)	360	12
	Total	**2850**	**95**

Appendix 1. Academic calendar

Министерство сельского хозяйства Республики Казахстан
Казахский агротехнический университет им. С.Сейфуллина

«Согласовано»

Заведующий кафедры
Радиотехника, электроника и
телекоммуникации«
Хамзина Б.Е.
" " 2019 г. "

Академический календарь на 2019-2023 учебный год
по образовательной программе «Радиоэлектронные технологии и системы» по направлению подготовки 7М062 Инженерия и инженерное дело
(научно-педагогическое)
Степень: магистр технических наук

Сентябрь				Октябрь					Ноябрь				Декабрь				Январь					Февраль				Март				Апрель					Май				Июнь				
2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29
6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	3
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
П/зд	.	.	.	./рк	.	.	.	./рк	Пп	Пп	::	::	д/з	зд/зс	=	=	=	.	.	.	.	./рк	.	.	.	.	./рк	::	зд/зс/=	нс	нс	.	.	.	.	::	нп	нп	нп	нп	=/Л	=/Л	=/Л
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Презентация П | Теоретич. обуч. . | Экзамен. сессия :: | Каникулы = | Исслед практика нп | Летний сем. Л | науч стажировка нс | Итоговая аттестация Ит

Праздничные дни

День знаний	1 сентября	Международный женский день
День независимости РК	16 - 17 декабря	Праздник "Наурыз"
Новый год	1-2 января	День единства народов Казахстана
День Конституции РК	30 августа	День защитника Отечества
		День победы

Appendix 3 Description of disciplines of the DB cycle

1. Basic information about the discipline: 385073010

Basic information about the discipline:	
1.Name of the discipline	History and philosophy of science
2. Number of credits	5 (scientific and pedagogical)
3. Prerequisites:	Philosophy. Political Science and Sociology.
4. Post-requisites:	Knowledge of the history and philosophy of science will contribute to the formation of master students' knowledge in the disciplines of specialization and methodology of scientific knowledge, skills and abilities research activities.
5. Competencies:	Know and understand: basic epistemological models, the nature of transformations of the concept of rationality; forms and methods of pre-scientific, scientific and extra-scientific knowledge, modern methods of knowledge. To be able to: formulate and solve problems arising in the course of research work and requiring in-depth professional knowledge; choose the necessary research methods, modify existing and develop new methods based on the tasks of a particular research. Master the skills of applying methodological and methodological knowledge in scientific research and pedagogical work. Have the skills of conducting independent research and scientific-pedagogical activities, requiring broad education in the relevant direction; writing scientific theses, articles; speeches at scientific forums, methodology of socio-humanitarian and natural science knowledge.
6. Course author	Department of Philosophy
7. Main literature	1.History and philosophy science. Under. ed. Kryaneva Yu.V.,Motorinsky L.E., - M; INFA-M, 2011 .-- 416 p. 2.Myrzaly S.K. Ylymnuң tarikhy men of philosophy. - Almaty: Bastau, 2014. 3.Stepin V.S. History and philosophy of science. –M: Academic project, 2011. –423 p. 4.Khasanov M. Sh., Petorova V.F. History and philosophy of sciences. - Almaty: Kazakh University, 2013, –150 p.
8. Content of the discipline	The study of the discipline "History and Philosophy of Science" is to familiarize undergraduates with the structure of scientific knowledge, with the methods of scientific research, with the functions of scientific theories and laws; expanding their world outlook; developing ideas about the criteria for scientific character and the requirements that scientific research and its results must meet, as well as developing a style of scientific thinking based on the study of history and philosophy of science.

Basic information about the discipline:	
1.Name of the discipline	Foreign language (professional)
2. Number of credits	five
3. Prerequisites:	Foreign language (bachelor's degree). English for Specific Purposes. Professionally oriented foreign language.
4. Post-requisites:	Disciplines by specialties on the English language. Academic writing.
5. Competencies:	To know the functional and stylistic characteristics of the scientific presentation of the material in the studied foreign language, the general scientific terminology and the terminological sublanguage of the relevant specialty in a foreign language, the basics of business correspondence in the framework of international cooperation. Be able to freely read, translate the original literature in the chosen specialty with subsequent analysis, interpretation and evaluation of the extracted information, explicate scientific information in writing (abstract, abstract, summary), participate in professional discussion, scientific debate; Have the skills to make a presentation of scientific research (at seminars, conferences, symposia, forums), listen and understand public speaking in direct and indirect communication (lectures, reports, television and Internet programs);
6. Course author	Department of Foreign Languages
7. Main literature	1 Belousova A.R., Melchina O.P. English for Agricultural Students, 2010. 2.Principles of Management, By: Mason Carpenter, Talya Bauer, Berrin Erdogan and Jeremy Short, Version: 2.0 Pub Date: March 2013 3.Team of Teams: New Rules of Engagement for a Complex World Hardcover - May 12, 2015
8. Content of the discipline. What is agriculture? Knowledge of the subject. Tools and equipment. Functions. What should you read? Bank of authentic materials. Work skills. Identification of the culture of the place of work. Identification of target events. Organizational structure. Job descriptions. Job interview. To-do lists. Organization of fairs and conferences. Job change.	

Basic information about the discipline:	
1.Name of the discipline	Higher education pedagogy
2. Number of credits	3 (scientific-ped.)
3. Prerequisites:	Philosophy. Political science and sociology. Culturology and psychology.
4. Post-requisites:	Pedagogical practice. Implementation activities teacher higher professional education and management of the pedagogical process.
5. Competencies:	As a result of studying the discipline "Pedagogy of Higher Education" master student - will learn: topical problems of pedagogical science; the essence of the pedagogical activity of a university teacher; -will master the skills: selection of pedagogical facts, phenomena, events from the surrounding reality and their description in the language of pedagogical science, relying on the laws of pedagogical theories, explanation, forecasting and development; designing the educational process, based on new concepts of teaching and upbringing. Will be competent: in teaching and in solving problems of higher pedagogical education and the prospects for its further development; in the application of effective teaching technologies in higher educational institutions; solutions to urgent psychological and pedagogical problems, assessment of the results achieved;
6. Course author	Department of Vocational Training (Sagalieva Zh.K., Zhusupova A.A., Shakhmetova D.S., Seilkhan G.I.)
7. Main literature	1. Zavada G. V., Bushmina O. V. Pedagogy of higher education: Textbook. allowance. - Kazan: KSPEU, 2008. 2. Kuznetsov I. N. Handbook of a practicing teacher: Textbook. allowance. - M .: GrossMedia: ROSBUKH, 2008. 3. Esekeshova M. D., Sagalieva Zh.K. Higher school pedagogy: Textbook. allowance. - Astana: Foliant publishing house, 2018.
8. Content of the discipline	Fundamentals of higher education pedagogy. The subject and tasks of higher education pedagogy. Methodology and methods of pedagogical research in higher education. Higher school didactics. Pedagogical process in higher education. Laws, patterns and principles of teaching. Methods, forms and means of teaching in higher education. The current state of higher education in the Republic of Kazakhstan. Professional development of a higher school teacher. The process of education in higher education. The purpose of education as a pedagogical problem. Educational and educational staff as the form of functioning of the integral pedagogical process. Management of the pedagogical process.

Basic information about the discipline:	
1.Name of the discipline	Psychology of management
2. Number of credits	5 (scientific-ped.), 2 (prof.)
3. Prerequisites:	Philosophy. Political science and sociology. Culturology and psychology.
4. Post-requisites:	Pedagogical practice. Research practice. Psychological escorts management activities; methods of working with functional states in the activities of a manager. Methodological foundations of scientific research.
5. Competencies:	As a result of mastering the discipline, the master student must: Know: 1. socio-psychological content and structure of management activities; and management functions; psychological characteristics of the leader's personality; psychological patterns of joint activities to achieve organizational goals; 2. basic approaches to solving managerial problems and the rules for solving them in the conditions of actually operating production structures methods work from functional states in manager's activities, optimization of management processes; Be able to: 1. apply the knowledge gained during the course; freely operate with psychological concepts; use psychological knowledge when explaining phenomena in the field of psychology management and group processes. 2. analyze the professional activity of a manager from the point of view of ensuring his psychological effectiveness; apply methods, techniques aimed at developing the professionalism of management personnel, the personality of the manager Master: 1. professional skills of psychological analysis of the professional activity of a manager, phenomena in the world of work and joint activities to achieve organizational goals; 2. practical skills of psychological support of management activities; methods of working with functional states in activities manager; skills in the use of developmental technologies aimed at improving the professionalism of management personnel and team leadership; **Be competent** in readiness to lead a team in the field of their professional activities, tolerantly perceiving social, ethical, confessional and cultural differences.
6. Course author	Zhusupova A.A., Sagalieva Zh.K., Shakhmetova D.S., Seilkhan G.I.
7. Main literature	1. Stolyarenko A.D. "Psychology of Management" Rostov - on - Don Phoenix 2007. 2. Stolyarenko A.D. "Psychology of business communication and management" Rostov - on - Don "Phoenix" 2008. 3. Volkogonova O.D., Tooth A.T. "Management psychology"Moscow Publishing House "Forum" - Infra - M 2007.
8. Content of the discipline	Fundamentals of Psychology. Psychological aspects of small groups and collectives. "Socio-psychological foundations of the leader's activity."

Basic information about the discipline:	
1.Name of the discipline	**Teaching practice**
2. Number of credits	2
3. Prerequisites:	
4. Post-requisites:	
5. Competencies:	**Have an idea of** - forms of organization of educational and scientific activities at the university; - modern educational information technologies; - content and building classes taking into account the modern requirements of didactics (scientific approach); **Know and understand**: - State educational standard and educational program; - educational and methodological literature, laboratory and software for the recommended disciplines of the curriculum; - foundations of philosophy and methodology of science **Be able to**: - prepare and conduct training sessions on the instructions of the head of the practice, visit and analyze the classes of experienced teachers and their colleagues; - formulate and solve their problems arising in the course of pedagogical activity. - analyze and assess the levels of their competencies in combination with the ability and willingness to self-regulate further education and professional mobility; - analyze professional information, highlight the main thing in it, structure, formalize and present in the form of analytical reviews with substantiated conclusions and recommendations; **Master:** - a culture of thinking, the ability to build a logic of reasoning and statements based on the interpretation of data, integrated from different fields of science and technology, to make judgments based on incomplete data - methodology for preparing and conducting various forms of conducting classes; - methodology for analyzing training sessions; **Acquire practical skills:** - conducting practical and laboratory classes with students on the recommended topics of academic disciplines; - conducting trial lectures in student audiences under the supervision of a teacher on topics related to the research work of the undergraduate.
6. Course author	Department of Power Supply
7. Main literature	**List of main literature** 1 Model rules for the activities of organizations of higher and postgraduate education. Approved by the Resolution of the Government of the Republic of Kazakhstan dated May 17, 2013 No. 499. 2 State compulsory standard of postgraduate education. Approved by the decree of the Government of the Republic of Kazakhstan dated August 23, 2012 № 1080. Rules for the organization of the educational process on the credit technology of education. Approved

	by order of the MES RK dated April 20, 2011 No. 152. 1. Smirnov S.D. Pedagogy and psychology of higher education: Textbook: from activity to personality / S.D. Smirnov. - M.: Aspect Press, 2011 .-- 271 p. 2. Smirnov S.D. Pedagogy and psychology of higher education: from activity to personality [Text]: textbook for universities / S.D. Smirnov. - M .: Academy, 2003 .-- 304 p. 3.Yakunin V.A. Educational psychology: textbook / V.A. Yakunin. - 2nd ed .. - St. Petersburg. : Publishing house of Mikhailov V.A., 2000 .-- 349 p. 4. Pedagogy: textbook for universities / ed. P.I. Pidkasistogo. - M .: Ped. Society in Russia, 2014 .-- 608 p. 5. Practical psychology: textbook / ed. M.K. Tutushkina. - M.: ASV; SPb. : Didactics Plus, 1997 .-- 336 p.
8. Content of the discipline. Acquaintance with the structure of the educational process in a higher educational institution and the rules for maintaining the reporting documentation by the teacher; familiarization with the program and content of the courses taught; familiarization with the organization and conduct of all forms of training sessions; independent preparation of plans and abstracts of classes in academic disciplines; study and application of innovative teaching methods in the educational process; selection and analysis of basic and additional literature in accordance with the topics and objectives of the classes; development of the content of educational material at the modern scientific and methodological level; methodically correct conduct of various types of training sessions (lectures, practical, seminar and laboratory classes); scientific and methodological analysis of conducted classes.	

Basic information about the discipline:	
1.Name of the discipline	**Alternative and renewable energy sources**
2. Number of credits	4 (3)
3. Prerequisites:	Electricity supply, Electric networks and systems, Power stations and substations
4. Post-requisites:	Theory and practice of technical experiment in power industry
5. Competencies:	Know: informational, mathematical and methodological support for the calculation of different categories of the potential of hydro and wind resources; domestic and foreign experience in the field of hydropower and wind energy, as well as the prospects for their development; purpose, classification, design and physical foundations of the operation of the main power equipment of hydropower and wind power plants (HPP, MHPP, PSPP, wind turbine); main energy, environmental and economic characteristics of different types of hydropower and wind power plants (hydroelectric power station, small hydroelectric power station, pumped storage power plant, wind turbine); basic technical schemes for the use of hydro and wind energy for power supply of centralized and decentralized consumers; features and methods of calculating the operating modes of hydropower and wind power plants (hydroelectric power plants, small hydroelectric power plants, pumped storage power plants, wind turbines) for power supply to centralized and decentralized consumers; features of the choice of parameters and composition of the main power equipment of hydropower and wind power plants (hydroelectric power plants, small hydroelectric power plants, pumped storage power plants, wind turbines) for power supply to centralized and decentralized consumers. Be able to: use modern domestic and foreign information support for hydro and wind resources; perform calculations to determine the main categories of the potentials of hydro and wind resources, taking into account social and environmental factors; use modern domestic and foreign software for the selection of parameters of hydropower and wind power plants (HPP, MHPP, PSPP, wind turbine) for power supply to centralized and decentralized consumers; search, analyze and select scientific and technical information.
6. Course author	Department of Electrical Equipment Operation

7. Content of the discipline Information, mathematical and methodological support for the calculation of different categories of the potential of hydro and wind resources; domestic and foreign experience in the field hydropower and wind energy, as well as the prospects for their development; purpose, classification, design and physical foundations of operation of the main power equipment of hydropower and wind power plants; main energy, environmental and economic characteristics of different types of hydropower and wind power plants; basic technical schemes for the use of hydro and wind energy for power supply to centralized and decentralized consumers; features and methods of calculating the operating modes of hydropower and wind power plants for power supply to centralized and decentralized consumers; features of the choice of parameters and composition of the main power equipment of hydropower and wind power plants for power supply of centralized and decentralized consumers.

Basic information about the discipline:	
1.Name of the discipline	Information technology in the electric power industry
2. Number of credits	6 (5)
3. Prerequisites:	Mathematics. Physics.
4. Post-requisites:	Optimization systems power supply rural, industrial and energy enterprises
5. Competencies:	The purpose of teaching the discipline: acquainting students with modern information technologies used in designing electrical and electric power facilities. Objectives of studying the discipline: mastering the basic concepts, definitions and classifications of information technology means; study of the basic means of implementing various information technologies; brief information on the use of information technology in various spheres of human activity; mastering the means of implementing various information technologies, including familiarization with software products that allow accelerating the design processes of electrical and electric power equipment.
6. Course author	Department of Power Supply
7. Main literature	1. Rules for the device of electrical installations. - SPb .: Publishing house DEAN, 2001 .-- 928 p. 2. Design of industrial electric networks. / Ed. IN AND. Krupovich et al., 2nd ed., Trans. and add. - M .: Energiya, 1976 .-- 328 p. 3. Reference book for designing electric lighting. / Ed. G.M. Knorring. - L .: Energiya, 1976 .-- 384 p. 4. Electrical handbook: In 3 volumes. Vol. 3: book. 7. Use of electric energy. / Under total. red. MPEI professors: N.N. Orlova (chap. Ed.) And others - 7th ed., Rev. and add. - M .: Energoatomizdat, 1988 .-- 616 p. 8 Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p. 9 Electrical Design Handbook. / Ed. SOUTH. Barybina and others - M .: Energoatomizdat, 1990 .-- 576 p.
8. Content of the discipline Information about the modern information technologies used in the design of electrical and electric power facilities. Objectives of studying the discipline: mastering the basic concepts, definitions and classifications of information technology means; study of the basic means of implementing various information technologies; brief information on the use of information technology in various spheres of human activity; mastering the means of implementing various information technologies, including familiarization with software products that help speed up processes design of electrical and power equipment...	

Basic information about the discipline:	
1.Name of the discipline	**Energy efficiency of electricity conversion**
2. Number of credits	6
3. Prerequisites:	Power supply, Electrical the network and systems, Electrical stations and substations, Relay protection and automation of power supply systems
4. Post-requisites:	Optimization systems power supply rural, industrial and energy enterprises
5. Competencies:	Demonstrate knowledge and understanding in the field of study, formed on the basis of general secondary education, and include certain aspects related to the most advanced knowledge in the field of study. Know: basic electrical and switching equipment of power plants and substations; diagrams of electric power systems and networks, constructive implementation of overhead and cable power transmission lines; fundamentals of power supply systems for industrial enterprises and transport systems; principles of construction of relay protection and automation of electric power systems; physical processes of electrical breakdown in various environments, principles of implementation and testing of high voltage insulation Know: informational, mathematical and methodological support for calculating energy efficiency of different categories of consumers; domestic and foreign experience in this area, as well as the prospects for their development; purpose, classification, design and physical foundations of the main power equipment operation; the main energy, environmental and economic characteristics of different types of installations. Applying knowledge and understanding in a way that demonstrates a professional approach to work or profession, and have competencies, usually demonstrated through the formation and substantiation of arguments and problem solving within the field of study. Collect and interpret information to make judgments based on social, ethical and scientific considerations. Communication skills: communicate information, ideas, problems and solutions to both professionals and non-specialists. Be able to: use modern domestic and foreign information support; perform calculations taking into account social and environmental factors; use modern domestic and foreign software for the selection of parameters for power supply to centralized and decentralized consumers; search, analyze and select scientific and technical information.
6. Course author	Department of Electrical Equipment Operation
7 main literature	1. Rules for the device of electrical installations. - SPb .: Publishing house DEAN, 2001 .-- 928 p. 2. Design of industrial electric networks. / Ed. IN AND. Krupovich et al., 2nd ed., Trans. and add. - M .: Energiya, 1976 .-- 328 p.

	3. Electrical handbook: In 3 volumes. Vol. 3: book. 7. Use of electric energy. / Under total. red. MPEI professors: N.N. Orlova (chap. Ed.) And others - 7th ed., Rev. and add. - M .: Energoatomizdat, 1988 .-- 616 p. 4. Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p. 5. Electrical Design Handbook. / Ed. SOUTH. Barybina and others - M .: Energoatomizdat, 1990 .-- 576 p.
8. Content of the discipline: Electrical and switching equipment of power plants and substations; Diagrams of electric power systems and networks, design of overhead and cable power lines; fundamentals of power supply systems for industrial enterprises and transport systems; Principles of construction of relay protection and automation of electric power systems; physical processes of electrical breakdown in various media, principles of performance and testing of high voltage insulation.	

Appendix 4. Description of the disciplines of the PD cycle

Basic information about the discipline:	
1.Name of the discipline	Research practice
2. Number of credits	nine
3. Prerequisites:	NIRM
4. Post-requisites:	NIRM, master's thesis
5. Competencies:	**Know and understand**: - patent and literary sources on the topic being developed for the purpose of their use in the performance of the final qualifying work; - rules for the operation of devices and installations; - physical and mathematical models of processes and phenomena related to the investigated object; - information technology in scientific research, software products related to the professional field; - principles of organizing computer networks and telecommunication systems; - the requirements to registration scientific and technical documentation; - the procedure for the implementation of the results of research and development; - methods research andholding experimental works; methods of analysis and processing of experimental data; - **Be able to**: analyze, organize and generalize scientific and technical information on the topic of research; - analyze the reliability of the results obtained; - to analyze the scientific and practical significance of the research being carried out, as well as the technical and economic efficiency of the development; - compare the results of the study of the object of development with domestic and foreign analogues; **Master:** - theoretical or experimental research methods within the framework of the assigned tasks, including a mathematical (imitation) experiment; - skills in preparing patent or grant applications. **Acquire practical skills:** - formulation of goals and objectives of scientific research; - selection and justification of research methods; - work with applied scientific packages and editorial programs used in research and development; - registration of the results of scientific research (preparation of a report, writing scientific articles, abstracts); - work on experimental installations, instruments and stands.
6. Course author	Department of Power Supply
7. Main literature	**List of main literature**

	1.Model rules for the activities of organizations of higher and postgraduate education. Approved by the Resolution of the Government of the Republic of Kazakhstan dated May 17, 2013 No. 499. 2. State compulsory standard of postgraduate education, approved by the decree of the Government of the Republic of Kazakhstan dated August 23, 2012 No. 1080, entered into force on September 1, 2013 3 Rules for organizing the educational process on credit technology of education. Approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. No. 152. 4. Law of the Republic of Kazakhstan on Education (with amendments and additions as of 09.01.2012) 5. GOSO RK 5.04.034 - 2011. Postgraduate education. Master's degree. Basic provisions. 6 GOST 7.1-2003 "Bibliographic record. Bibliographic description. General requirements and rules for drawing up".
8. Content of the discipline. The content of research practice is determined by the topic of the master's thesis and is implemented in accordance with the individual plan within the time frame determined by the curriculum. Research work on a master's program must meet the following requirements: correspond to the main research problems on which the master's thesis is being defended; be relevant, contain scientific novelty and practical significance; be based on modern theoretical, methodological and technological achievements of science and practice in the field of synthesis of organic compounds; be based on modern methods of data processing and interpretation using computer technology; performed using modern scientific research methods; contain research (methodological, practical) sections on the main provisions to be protected.	

Basic information about the discipline:	
1.Name of the discipline	Special issues of relay protection and automation
2. Number of credits	6
3. Prerequisites:	Power supply, Electrical the network and systems, Electrical stations and substations, Relay protection andautomation of power supply systems
4. Post-requisites:	-
5. Competencies:	To know the principles of implementation of relay protection devices, to have methods for calculating their basic parameters, to know the design features of the performance, to be able to choose circuit solutions for their implementation. To acquire practical skills in testing and checking complete relay protection devices for power supply system elements. Possess the basics of designing automation tools, be able to use methods for calculating the triggering parameters of automation devices, make intelligent decisions when justifying the use of automation tools in various power supply systems.
6. Course author	Uakhitova A.B.
7. Main literature	1 Dictionary of energy. Second Edition Cutler J. Cleveland Boston University, Boston, Massachusetts, United States of America ISBN: 978-0-08-096811-7. Elsevier. 2015. - 680 p. 2 Keller, KJ (Kimberley J.) Electrical safety code manual: a plain language guide to National electrical code, OSHA, and NFPA 70E / Kimberley Keller. Library of Congress Cataloging-in-Publication Data. Elsevier- 2010.384 p. 3 Electricity transmission, distribution and storage systems Edited by ZiadMelhem.Woodhead Publishing Series in Energy: Number 38. 2013.503 p. 4 Energy Efficiency Towards the End of Demand Growth Edited by Fereidoon P. Sioshansi Menlo Energy Economics. 2013.651 p. 5 MN Wilson, 'Stabilization, protection and current density: some general observations and speculations', Cryogenics, vol. 31, 449-503 (1991).
8. Content of the discipline Modern problems of relay protection and automation. Requirements for RzA. Circuits used in the energy enterprises of Kazakhstan of modern microprocessor-based protection and automation units. Calculation methods and algorithms for the operation of relay protection and automation devices. Relay protection principles. Functional diagram of digital protection and the purpose of its elements. Applied current microprocessor protection. Features of differential protection of a power transformer. Selection of settings for directional high-frequency microprocessor protection of the SHE 2607 031 line. Automation of electric power systems.	

Basic information about the discipline:	
1.Name of the discipline	Theory and practice of technical experiment in power industry
2. Number of credits	6
3. Prerequisites:	Power supply, Electrical the network and systems, Power stations and substations
4. Post-requisites:	Special issues of relay protection and automation
5. Competencies:	know the basics of modeling, the basics of the theory of functions of a complex variable, topological methods for calculating electrical networks, methods for solving optimization problems, methods of statistical processing of experimental results, methods for analyzing the stability of systems; be able to - independently choose calculation methods, choose the necessary software, solve problems on a computer, analyze the results obtained and draw conclusions oncalculation results; navigate the flow of scientific and technical information on the theory of electrical calculations. to acquire practical skills in the development of mathematical models, the choice of software and the analysis of the results obtained.
6. Course author	Department of Power Supply
7. Main literature	1. Rules for the device of electrical installations. - SPb .: Publishing house DEAN, 2001 .-- 928 p. 2. Design of industrial electric networks. / Ed. IN AND. Krupovich et al., 2nd ed., Trans. and add. - M .: Energiya, 1976 .-- 328 p. 3. Reference book for designing electric lighting. / Ed. G.M. Knorring. - L .: Energiya, 1976 .-- 384 p. 4. Electrical handbook: In 3 volumes. Vol. 3: book. 7. Use of electric energy. / Under total. red. MPEI professors: N.N. Orlova (chap. Ed.) And others - 7th ed., Rev. and add. - M .: Energoatomizdat, 1988 .-- 616 p. 5. Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p. 6. Electrical Design Handbook. / Ed. SOUTH. Barybina and others - M .: Energoatomizdat, 1990 .-- 576 p.
8. Content of the discipline Fundamentals of modeling, fundamentals of the theory of functions of a complex variable, topological methods for calculating electrical networks, methods for solving optimization problems, methods of statistical processing of experimental results, methods analysis of the stability of systems; calculation methods, choose the necessary software, solve problems on a computer, analyze the results obtained and draw conclusions based on the results of calculations; scientific and technical information on the theory of electrical calculations. Skills in developing mathematical models, choosing software and analysis of the results obtained.	

Basic information about the discipline:	
1.Name of the discipline	Special issues of power supply
2. Number of credits	**6**
3. Prerequisites:	Power supply, Electrical the network and systems, Electrical stations and substations, Relay protection and automation of power supply systems
4. Post-requisites:	Special issues of relay protection and automation
5. Competencies:	Know: circuits and main electrical and switching equipment of power plants and substations; diagrams of electric power systems and networks, constructive implementation of overhead and cable power transmission lines; fundamentals of power supply systems for industrial enterprises and transport systems; principles of construction of relay protection and automation of electric power systems; physical processes of electrical breakdown in various environments, principles of implementation and testing of high voltage insulation. Be able to: apply, operate and select electrical devices, machinery, equipment for power plants and substations, power systems and networks, power supply systems. Master: methods of performing calculations in relation to the use of electrical and structural materials; methods of analyzing the operating modes of electric power and electrical equipment and systems; skills in conducting standard tests of electric power and electrical equipment and systems; methods for calculating the parameters of electric power devices and electrical installations, power supply systems, relay protection and automation; methods of operation and testing of high voltage insulation
6. Course author	Department of Power Supply
7. Main literature	1. Rules for the device of electrical installations. - SPb .: Publishing house DEAN, 2001 .-- 928 p. 2. Knyazevsky B.A., Lipkin B.Yu. Electricity supply of industrial enterprises. 3rd ed., Trans. and add. - M .: Higher school, 1986, - 400 p. 3. Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p. 4. Electrical Design Handbook. / Ed. SOUTH. Barybina and others - M .: Energoatomizdat, 1990 .-- 576 p. 5. Electricity supply guide for industrial enterprises: in 2 tons / Ed. AA Fedorova, G.V. Serbinovsky. T.7. Industrial electric networks. - M .: Energiya, 1980 .-- 576 p. 6. Shekhovtsov V.P. Calculation and design of power supply circuits. Methodical manual for the course design. - M .: FORYM: INFRA - M, 200f - 214 p., Ill. - (Series "Professional education").
8. Content disciplines: Schemes and the main electrical and commutation	

equipment for power plants and substations; schemes of electric power systems and networks; fundamentals of power supply systems for industrial enterprises and transport systems; principles of construction of relay protection and automation of electric power systems; physical processes of electrical breakdown in various environments, principles of implementation and testing of high voltage insulation. Methods for performing calculations in relation to the use of electrical and structural materials; Methods for analyzing the operating modes of electric power and electrical equipment and systems; Methods for calculating the parameters of electric power devices and electrical installations, power supply systems, relay protection and automation; high voltage insulation operation and test methods

Basic information about the discipline:	
1.Description of the discipline	**Scientific and technical problems of the electric power industry**
2. Number of credits	four
3. Prerequisites:	Electricity supply, Electric networks and systems, Electric stations and substations
4. Post-requisites:	Special issues of relay protection and automation
5. Competencies:	know: modern analytical methods and models of complex engineering analysis; original design methods for the implementation of competitive engineering projects; modern software and hardware systems used in the power industry and the tasks solved by these complexes; reasons leading to the avalanche-like development of an accident, subsystems of emergency control automation, principles of design and selection of control actions at different stages of the development of an accident be able to: analyze information about the state of the EPS, obtained with the help of software and hardware systems; solve complex problems based on the integration of various methods and techniques in order to achieve a certain result; prepare initial data for a given real object in accordance with the formal rules of modern professional software systems for the choice of types and parameters of emergency automation equipment; develop a plan for carrying out computational experiments and analyze the results obtained; have experience: analysis of automatic control systems for technological processes in EPS; preparation of initial data for a given object in accordance with the formal rules of modern professional software systems; use of specialized software for solving professional problems; analysis of automatic control systems for transient processes in EPS.
6. Course author	Department of Power Supply
7. Main literature	1. Rules for the device of electrical installations. - SPb .: Publishing house DEAN, 2001 .-- 928 p. 2. Design of industrial electric networks. / Ed. IN AND. Krupovich et al., 2nd ed., Trans. and add. - M .: Energiya, 1976 .-- 328 p. 3. Electrical handbook: In 3 volumes. Vol. 3: book. 7. Use of electric energy. / Under total. red. MPEI professors: N.N. Orlova (chap. Ed.) And others - 7th ed., Rev. and add. - M .: Energoatomizdat, 1988 .-- 616 p. 4. Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p. 5. Electrical Design Handbook. / Ed. SOUTH. Barybina and others - M .: Energoatomizdat, 1990 .-- 576 p.
8. Content of the discipline. Introduction. The purpose and content of the course. The main objectives of the course, the role in the training of a specialist. Modern analytical methods and models for complex engineering analysis. Original design methods for the implementation of competitive engineering projects. Modern software and hardware systems used in the power industry and the tasks solved by these complexes. Causes leading to the avalanche-like development of an accident, subsystems of emergency control automation, principles of construction and selection of managers impacts at different stages of the accident development.	

Basic information about the discipline:	
1.Name of the discipline	**Mathematical modeling in power engineering**
2. Number of credits	five
3. Prerequisites:	Mathematical tasks andcomputer modeling in electric power industry, Electricity supply, Electric networks and systems...
4. Post-requisites:	Stability of electrical power systems
5. Competencies:	As a result of studying this discipline, the student must: - *Know* foundations of mathematical modeling, foundations of the theory of functions of a complex variable, topological methods for calculating electrical networks, methods for solving optimization problems, methods of statistical processing of experimental results, methods for analyzing the stability of systems; - *be able to* - independently choose calculation methods, choose the necessary software, solve problems on a computer, analyze the results obtained and draw conclusions oncalculation results;
6. Course author	Uakhitova A.B.
7. Main literature	1 Klee, H. (2007). Simulation of Dynamic Systems with MATLAB and Simulink, CRC Press, Boca Raton, FL. - This is a very detailed and comprehensive text, aimed slightly above the level of this course. For anyone with longer-term interests in dynamic systems, this text is highly recommended. 2 Abeldina Zh., Moldumarova Zh. Radiophysics. Astana: KATU, 2015. - 136p 3 Koxegen AE Methodical instructions for independent works On Informatics Discipline. For students of technical specialties. Astana: KATU, 2015.-33 p. 4 Daripbayeva SZ The course of lectures on discipline of "Informatics" Astana: KATU, 2013. -98 p. 5 Seifullina AO COMPUTER SCIENCE for technical specialties. Astana: KATU, 2015. -154 p. Supplementary literature The following textbooks are suggested, rather than prescribed, for the course: 1 Gershenfeld, N. (1999). The Nature of Mathematical Modeling, Cambridge University Press, Cambridge, UK - This book gives some good intuition concerning a wide range of mathematical models, including some covered in this course, but with few examples. 2 Akzhigitov E. A., Takabayev K. K., Tlepiyev M. Sh., Iliasova B. A., Gripp E. A., Kadirbayeva Zh. M. Methodical instructions are worked out according to the requirements of the curriculum and the program of discipline. Astana: KATU, 2013.43 pages.
8. Content of the discipline. Introduction. Fundamentals of Mathematical Modeling. The theory of functions of a complex variable. Topological methods for calculating electrical networks, methods for solving optimization problems. Methods for statistical processing of experimental results. Methods analysis of the stability of systems.	

Basic information about the discipline:	
1.Name of the discipline	**Stability of electrical power systems**
2. Number of credits	**6**
3. Prerequisites:	Electric networks and systems, Power supply, Transient processes in the electric power industry
4. Post-requisites:	Optimization systems power supply rural, industrial and energy enterprises
5. Competencies:	Know: equivalent circuits for the main elements of the system, engineering methods for calculating transient processes, basic calculation formulas characterizing the quantitative relationships between the parameters of transient modes. And also must be able to apply theoretical knowledge in practice, in particular: to carry out practical calculations of transients in electrical systems, to select the necessary measures and means to ensure the required quality of transients, to assess the quality of transients. apply approximate methods to analyze transient electromagnetic and electromechanical transients, and stability electric power systems.
6. Course author	Utegulov B.B.
7. Main literature	1. Design of industrial electric networks. / Ed. IN AND. Krupovich et al., 2nd ed., Trans. and add. - M .: Energiya, 1976 .-- 328 p. 2. Knyazevsky B.A., Lipkin B.Yu. Electricity supply of industrial enterprises. 3rd ed., Trans. and add. - M .: Higher school, 1986, - 400 p. 3. Epanshnikov M.M. Electric lighting. - M .: Energiya, 1973.- 352 p. 4. Electrical handbook: In 3 volumes. Vol. 3: book. 7. Use of electric energy. / Under total. red. MPEI professors: N.N. Orlova (chap. Ed.) And others - 7th ed., Rev. and add. - M .: Energoatomizdat, 1988 .-- 616 p. 5. Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p. 6. Electrical Design Handbook. / Ed. SOUTH. Barybina and others - M .: Energoatomizdat, 1990 .-- 576 p.
8. Content of the discipline. Replacement schemes for the main elements of the system. Engineering methods for calculating transient processes, basic calculation formulas characterizing the quantitative relationships between the parameters of transient regimes. Calculations of transient processes in electrical systems. Measures and means to ensure the required quality of transients, to assess the quality of transients. Approximate methods for the analysis of transient electromagnetic and electromechanical transients, and stability electric power systems.	

Basic information about the discipline:	
1.Name of the discipline	Optimization of power supply systems for rural, industrial and energy enterprises
2. Number of credits	6
3. Prerequisites:	Mathematical modeling in electric power industry. Information technology in the electric power industry
4. Post-requisites:	-
5. Competencies:	As a result of studying the discipline, the student must know: the classification of power supply systems of rural, industrial and energy enterprises, the advantages and disadvantages of existing systems, the main regulatory documents on the subject, the scientific foundations of design, manufacturing technology, installation and operation of the latest power supply systems of rural, industrial and energy enterprises, fundamentals of mathematical analysis of power supply systems and skills for solving optimization problems. The student must be able to: solve practical design, operational and management tasks aimed at solving the issues of optimizing the power supply of rural, industrial and energy enterprises.
6. Course author	Department of Power Supply
7. Main literature	1. Design of industrial electric networks. / Ed. IN AND. Krupovich et al., 2nd ed., Trans. and add. - M .: Energy, 1976. - 328 p. 2. Knyazevsky B.A., Lipkin B.Yu. Electricity supply of industrial enterprises. 3rd ed., Trans. and add. - M .: Higher school, 1986, - 400 p. 3. Epanshnikov M.M. Electric lighting. - M .: Energiya, 1973.- 352 p. 4. Electrical handbook: In 3 volumes. Vol. 3: book. 7. Use of electric energy. / Under total. red. MPEI professors: N.N. Orlova (chap. Ed.) And others - 7th ed., Rev. and add. - M .: Energoatomizdat, 1988 .-- 616 p. 5. Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p. 6. Electrical Design Handbook. / Ed. SOUTH. Barybina and others - M .: Energoatomizdat, 1990 .-- 576 p.
8. Content of the discipline Classification of power supply systems for rural, industrial and energy enterprises. Advantages and disadvantages of existing systems. The main regulatory documents on the subject. Scientific foundations of design, manufacturing technology, installation and operation of the latest power supply systems for rural, industrial and energy enterprises, the basics of mathematical analysis of power supply systems and skills solving optimization problems.	

Basic information about the discipline:	
1.Name of the discipline	Optimization systems power supply industrial enterprises
2. Number of credits	6
3. Prerequisites:	Mathematical modeling in electric power industry. Information technology in the electric power industry
4. Post-requisites:	-
5. Competencies:	The purpose of the discipline: acquaintance with the methods of optimization of power supply systems of industrial enterprises. Students should know: issues of automation of individual design processes for reconstruction of objects; development and implementation of computer-aided design (CAD) systems for the construction and reconstruction of facilities, including automated production and processing of design documentation. Be able to: develop work schedules, make calculations for the formation of the numerical and qualification composition of teams and determine their production capabilities under various working conditions; organizational and technological modeling of construction and reconstruction of facilities; calculation of the need for material and technical resources, etc.
6. Course author	Department of Power Supply
7. Main literature	1. Design of industrial electric networks. / Ed. IN AND. Krupovich et al., 2nd ed., Trans. and add. - M .: Energiya, 1976 .-- 328 p. 2. Knyazevsky B.A., Lipkin B.Yu. Electricity supply of industrial enterprises. 3rd ed., Trans. and add. - M .: Higher school, 1986, - 400 p. 3. Epanshnikov M.M. Electric lighting. - M .: Energiya, 1973.- 352 p. 4. Electrical handbook: In 3 volumes. Vol. 3: book. 7. Use of electric energy. / Under total. red. MPEI professors: N.N. Orlova (chap. Ed.) And others - 7th ed., Rev. and add. - M .: Energoatomizdat, 1988 .-- 616 p. 5. Handbook on electrical supply and electrical equipment: in 2 volumes / Under total. red. AA Fedorova. T.7. Electrical equipment. - M .: Energoatomizdat, 1987 .-- 592 p.
8. Content of the discipline Introduction to the discipline. Methods for optimizing power supply systems for industrial enterprises. Automation of individual design processes for the reconstruction of objects. Development and implementation of computer-aided design (CAD) systems for the construction and reconstruction of facilities, including automated production and processing of design documentation. Work production schedules. Calculations for the formation of the numerical and qualification composition of teams and the determination of their production capabilities under various working conditions; organizational and technological modeling of construction and reconstruction of facilities; calculation of the need for material and technical resources, etc.	