NP JSC
«Kazakh National Research Technical University named after K.I. Satbayev»

Institute of Industrial Automation and Digitalization

Department of "Power Engineering"

Doctor of philosophy PhD in the educational program «ELECTRICAL POWER ENGINEERING»

on the basis of the following specialty of the invalidated Classifier of specialties:
"6D071800 –Power engineering"

1st edition
in accordance with the State Educational Standard of Higher Education 2018

Almaty 2020

The program is drawn up and signed by the parties:

From KazNRTU named after K.I.Satpayev:

1 Head of the Department of Power Engineering, PhD, associate professor — Ye. Sarsenbayev

2 Director of the Institute of Industrial Automation and Digitalization, PhD — B.Omarbekov

3 Chairman of the educational and methodological group of the Department of Power Engineering, Candidate of Technical Sciences, Associate Professor — Ye. Khidolda

From employers - Director LLP "Lighting Technologies Kazakhstan" — G.E.Abdykalykov

Approved at a meeting of the Educational and Methodological Council of the Kazakh National Research Technical University named after K.I. Satbayev. Minutes No. 4 dated 14.01.2020

Qualification:
Level 8 of the National Qualifications Framework:
8D071 Engineering and Engineering (PhD)

Professional competencies: Electric power engineering, electric power systems and networks, relay protection and automation, power supply, renewable energy

Brief description of the program

1 Objectives

The purpose of the educational program "Electrical Engineering and Power Engineering" is to teach doctoral students basic and specialized disciplines, preparation and defense of a thesis in the field of power engineering with the achievement of the relevant competencies.

2 Types of work

The model of a graduate in the educational program "Electrical Engineering and Energy" has the following competencies:

have an idea:

- about the main stages of development and the change of paradigms in the evolution of science; on the subject, ideological and methodological specifics of the natural (social, humanitarian, economic) sciences;

- about scientific schools of the relevant branch of knowledge, their theoretical and practical developments;

- on the scientific concepts of world and Kazakh science in the relevant field;

- on the mechanism of implementation of scientific developments in practice;

- about the norms of interaction in the scientific community;

- about the pedagogical and scientific ethics of the scientist-researcher.

know and understand:

- modern trends, directions and patterns of development of domestic science in the context of globalization and internationalization;

- methodology of scientific knowledge;

- achievements of world and Kazakh science in the relevant field;

- (to understand and accept) the social responsibility of science and education;

- perfect foreign language for scientific communication and international cooperation;

be able to:

- organize, plan and implement the process of scientific research; analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions;

- analyze and process information from various sources;

- to carry out independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;

- generate new scientific ideas, communicate their knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;

- to choose and effectively use modern research methodology;

- to plan and predict their further professional development.

have skills:

-critical analysis, evaluation and comparison of various scientific theories and ideas;

- analytical and experimental scientific activities;

- planning and forecasting research results;

- oratory and public speaking at international scientific forums, conferences and seminars;

- scientific writing and scientific communication;

- planning, coordinating the implementation and implementation of scientific research;

- a systematic understanding of the field of study and demonstrate the quality and effectiveness of the selected scientific methods;

- participation in scientific events, fundamental scientific domestic and international projects;

- leadership and team management;

- responsible and creative attitude to scientific and scientific-pedagogical activities;

- conducting patent search and experience in transferring scientific information using modern information and innovative technologies;

- protection of intellectual property rights to scientific discoveries and developments;

- free communication in a foreign language.

be competent:

- in the field of scientific and scientific-pedagogical activity in conditions of rapid renewal and growth of information flows;

- in carrying out theoretical and experimental scientific research;

- in the formulation and solution of theoretical and applied problems in scientific research;

- in conducting a professional and comprehensive analysis of problems in the relevant area;

- in matters of interpersonal communication and human resource management;
- in matters of university training of specialists;
- in the examination of scientific projects and research;
- in ensuring constant professional growth.

The types of work of graduates of doctoral studies in electrical engineering and energy must have competencies in accordance with the types of professional activity:

in the field of production and technological activities:

- be the head of the energy division for operation, maintenance, repair and adjustment of various enterprises;

in the field of organizational and management activities:

- to be the head of a scientific unit dealing with the problems of electrical engineering and energy, a university unit, a unit for operation, maintenance and repair of energy complexes and systems;

in the field of experimental research:

- be the head of a scientific laboratory for theoretical and experimental research of energy objects, systems and devices;

in the field of research and teaching:

- be a leading researcher or head of a scientific laboratory for the research and development of electrical systems and installations in various industries;
- to be a teacher of bachelor's, master's and doctoral studies in special disciplines in the field of electrical engineering, energy;

in the field of design and development activities:

- to be the head of the department for the development and design of electrical and energy facilities in various industries.

3 Objects of professional activity:

Graduates of this specialty can make a career:

- in research organizations;
- in the design and development area of activity;
- in organizations of higher and secondary technical education, for training undergraduate, graduate and doctoral students in special disciplines;
- in national, transnational energy companies and industrial enterprises.

During the training, research practice is provided at such enterprises as: NC KEGOC, JSC AZhK, JSC AlES, JSC Kazatomprom, Karachaganak Petroleum Operating and others.

Scientific internships at the Braunschweig Technical University (Germany), the Technical University of Dresden (Germany), the University of Applied Sciences Zittau / Görlitz (Germany), the Tomsk Polytechnic University (Russia), the Peter the Great St. Petersburg Polytechnic University (Russia) are also provided.

PASSPORT OF THE EDUCATIONAL PROGRAM

1 Scope and content of the program

The educational program for the preparation of a Doctor of Philosophy (PhD) has a scientific and pedagogical focus and involves fundamental educational, methodological and research training and in-depth study of disciplines in the relevant areas of science for the system of higher and postgraduate education and the scientific sphere. The educational program for the training of a doctor in the profile assumes fundamental educational, methodological and research training and in-depth study of disciplines in the relevant areas of science for the branches of the national economy, the social sphere: education, medicine, law, art, economics, business administration and in the field of national security and military affairs. Educational programs for doctoral studies in terms of vocational training are developed on the basis of studying the experience of foreign universities and research centers that implement accredited training programs for PhD doctors or doctors in the field. The content of the educational program of specialized doctoral studies is established by the university independently. The main criterion for the completeness of the educational process for the preparation of doctors of philosophy (PhD) (doctor in the profile) is the mastering of at least 180 academic credits by a doctoral student, including all types of educational and scientific activities. The term of study in doctoral studies is determined by the amount of acquired academic credits. Upon mastering the established amount of academic credits and achieving the expected learning outcomes for obtaining a PhD or profile, the doctoral education program is considered fully mastered. The training of personnel in doctoral studies is carried out on the basis of educational programs of the magistracy in two directions: 1) scientific and pedagogical with a training period of at least three years; 2) specialized with a training period of at least three years.

The professional activity of the graduates of the program covers the field of electric power industry, electric power networks and systems, power supply, relay protection and automation of power systems, electromechanics and renewable energy.

The direction of the program of specialty and specialization relates to engineering and engineering.

Objectives of the educational program:

Based on the achievements of modern science, technology and production, give knowledge and skills in the field of:

- electricity generation and substation;
- electric power networks and systems;- электроснабжения предприятий;
- automated electric drive;
- relay protection and automation of electric power systems;
- renewable energy.
- preparation and defense of a doctoral dissertation.

In case of successful completion of the full course of doctoral studies, defense and approval of a scientific dissertation in the Ministry of Education and Science of the Republic of Kazakhstan, the graduate is awarded the degree of "Doctor of Philosophy".

The educational program of doctoral studies "Electromechanics and Power Engineering" differs from the existing educational program in the specialty 6D071800 - "Power Engineering" by a complete renewal of the internal content of disciplines. It provides for the training of doctoral students in the specialization "Power Engineering". This is due to the need to deepen knowledge and skills in the field, obtained in the magistracy.

The educational program provides for the study of the following innovative disciplines:

- Methods for designing electric power and electrical engineering complexes;
- modern and advanced control systems for electric drives;
- finite element method and CAD in electrical engineering;
- microprocessor control systems for technological processes in the power industry;
- technology of energy and resource saving by means of electric drive.

In the process of mastering the educational program, the graduate must acquire the following key competencies:

- has the skills of public speaking and public speaking at international scientific forums, conferences and seminars;
- knows perfectly a foreign language for scientific communication and international cooperation;
- is able to use mathematical ways of thinking (logic, spatial thinking) and presentation (formulas, models, tables, etc.) in their professional activities.
- has the skills to conduct patent searches and experience in the transfer of scientific information using modern information and innovative technologies;
- has an idea of the main stages of development and the change of paradigms in the evolution of science, of scientific schools of the corresponding branch of knowledge, their theoretical and practical developments, on the mechanism for introducing scientific developments into practical activities, on pedagogical and scientific ethics;

is able to organize, plan and implement the process of scientific research, analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions, conduct independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;

- knows how to generate his own new scientific ideas, communicate his knowledge and ideas to the scientific community, expanding the boundaries of

scientific knowledge, choose and effectively use modern research methodology, plan and predict his further professional development;

- has the skills of critical analysis, assessment and comparison of various scientific theories and ideas, planning and forecasting research results;
- demonstrate the quality and effectiveness of the chosen scientific methods, participation in scientific events, fundamental scientific domestic and international projects;
- Competent in the field of scientific and scientific-pedagogical activity in conditions of rapid renewal and growth of information flows, in carrying out theoretical and experimental scientific research;
- Competent in matters of university training of specialists, in the examination of scientific projects and research;
- able to take responsibility, jointly develop a solution and participate in its implementation;
- knows how to prevent and remove conflicts, find compromises, correlate his opinion with the opinion of the team;
- has the skills of leadership management and team leadership, responsible and creative attitude to scientific and scientific-pedagogical activities;
- has an idea of the norms of interaction in the scientific community, is competent in matters of interpersonal communication and human resource management;
- has the basics of economic knowledge, has a scientific understanding of management, marketing, finance, etc., knows and understands the goals and methods of state regulation of the economy;
- knows how to generate ideas and predict the results of innovative activities, is able to think creatively and be creative in solving new problems and situations; has the skills of critical analysis, assessment and comparison of various scientific theories and ideas.

The educational program "Electrical Engineering and Energy" provides training for specialists in the following activities:

The types of labor activity of graduates of doctoral studies in electrical engineering and energy must have competencies in accordance with the types of professional activity:

in the field of production and technological activities:

- be the head of the energy division for operation, maintenance, repair and adjustment of various enterprises;

in the field of organizational and management activities:

- to be the head of a scientific department dealing with the problems of electrical engineering and energy, a university department, a department for operation, maintenance and repair of energy complexes and systems;

in the field of experimental research:

- be the head of a scientific laboratory for theoretical and experimental research of energy objects, systems and devices;

in the field of research and teaching:

- be a leading researcher or head of a scientific laboratory for the research and development of electrical systems and installations in various industries;
- to be a teacher of bachelor's, master's and doctoral studies in special disciplines in the field of electrical engineering, energy;

in the field of design and development activities:

- to be the head of the department for the development and design of electrical and energy facilities in various industries.

2 Requirements for applicants

Persons with a Master's degree and work experience of at least 1 (one) year or who have completed residency studies are admitted to doctoral studies.

Enrollment in the number of doctoral students is carried out by the admissions committees of universities and scientific organizations based on the results of the entrance exam for groups of doctoral programs and a certificate confirming proficiency in a foreign language in accordance with the common European competences (standards) of foreign language proficiency.

When enrolling in universities, doctoral students independently choose an educational program from the corresponding group of educational programs.

The enrollment of persons for the targeted training of doctors of philosophy (PhD) under the state educational order is carried out on a competitive basis.

The procedure for admitting citizens to doctoral studies is established in accordance with the "Standard rules for admission to training in educational organizations that implement educational programs of postgraduate education."

At the "entrance" the doctoral student must have all the prerequisites necessary for mastering the relevant professional doctoral curriculum. The list of required prerequisites is determined by the higher education institution independently.

In the absence of the necessary prerequisites, the doctoral student is allowed to master them on a paid basis. In this case, doctoral studies begin after the doctoral student has fully mastered the prerequisites.

Admission to the university is carried out at the request of the applicant who has completed the full course of the scientific and pedagogical magistracy in the program "Electrical Engineering and Energy" in accordance with the points of the certificate issued based on the results of testing at the Republican Center for Testing in English, as well as passing the oral exam in special subjects. Special requirements for admission to the program apply to graduates of the profile master's program in Electrical Engineering and Energy, as well as master's degrees in related educational programs: automation and control, heat and power engineering.

3 Requirements for completing studies and obtaining a diploma

Persons who have mastered the educational program of doctoral studies and defended their doctoral dissertation, with a positive decision of the dissertation councils of the university with a special status or the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, based on the results of the examination, are awarded the

degree of Doctor of Philosophy (PhD) or Doctor of Science profile and issued a state diploma with an attachment (transcript).

Persons who have received a PhD degree, in order to deepen scientific knowledge, solve scientific and applied problems on a specialized topic, carry out a postdoctoral program or conduct research under the guidance of a leading scientist chosen by the university.

3.1 Requirements for key competencies of doctoral graduates:

1) have an idea:

- about the main stages of development and the change of paradigms in the evolution of science;
- on the subject, ideological and methodological specifics of the natural (social, humanitarian, economic) sciences;
- about scientific schools of the relevant branch of knowledge, their theoretical and practical developments;
- on the scientific concepts of world and Kazakh science in the relevant field;
- on the mechanism of implementation of scientific developments in practice;
- about the norms of interaction in the scientific community;
- about the pedagogical and scientific ethics of the scientist-researcher;

2) know and understand:

- modern trends, directions and patterns of development of domestic science in the context of globalization and internationalization;
- methodology of scientific knowledge;
- achievements of world and Kazakh science in the relevant field;
- (to understand and accept) the social responsibility of science and education;
- perfect foreign language for scientific communication and international cooperation;

3) be able to:

- organize, plan and implement the process of scientific research;
- analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions;
- analyze and process information from various sources;
- conduct independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;
- generate your own new scientific ideas, communicate your knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;
- to choose and effectively use modern research methodology;
- to plan and predict their further professional development;

4) have skills:

- critical analysis, assessment and comparison of various scientific theories and ideas;
- analytical and experimental scientific activities;

- planning and forecasting research results;
- oratory and public speaking at international scientific forums, conferences and seminars;
- scientific writing and scientific communication;
- planning, coordinating and implementing research processes;
- a systematic understanding of the field of study and demonstrate the quality and effectiveness of the selected scientific methods;
- participation in scientific events, fundamental scientific domestic and international projects;
- leadership management and team leadership;
- a responsible and creative attitude to scientific and scientific-pedagogical activities;
- conducting patent search and experience in transferring scientific information using modern information and innovative technologies;
- protection of intellectual property rights to scientific discoveries and developments;
- free communication in a foreign language;

5) be competent:

- in the field of scientific and scientific-pedagogical activity in conditions of rapid renewal and growth of information flows;
- in carrying out theoretical and experimental scientific research;
- in the formulation and solution of theoretical and applied problems in scientific research;
- in conducting a professional and comprehensive analysis of problems in the relevant area;
- in matters of interpersonal communication and human resource management;
- in matters of university training of specialists;
- in the examination of scientific projects and research;
- in ensuring constant professional growth.

3.2 Requirements for research and development of a student under the program of Doctor of Philosophy (PhD):

1) compliance with the main problems of the educational program of doctoral studies, on which the doctoral dissertation is being defended;

2) is relevant and contains scientific novelty and practical significance;

3) is based on modern theoretical, methodological and technological achievements of science and practice;

4) is based on modern methods of data processing and interpretation using computer technology;

5) carried out using modern scientific research methods;

6) contains scientific research (methodological, practical) sections on the main protected provisions.

3.3 Requirements for the organization of practices:

The practice is carried out with the aim of developing practical skills in scientific, scientific, pedagogical and professional activities.

The educational program of doctoral studies includes:

1) teaching and research practice - for students of the Ph.D. program;

2) industrial practice - for students under the program of specialized doctoral studies.

During the period of pedagogical practice, doctoral students, if necessary, are involved in conducting classes in undergraduate and graduate programs.

The research practice of a doctoral student is carried out with the aim of studying the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidating practical skills, applying modern research methods, processing and interpreting experimental data in the dissertation research.

The industrial practice of a doctoral student is carried out in order to consolidate the theoretical knowledge gained in the learning process and improve the professional level.

The content of research and industrial practice is determined by the topic of the doctoral dissertation.

Compulsory standard requirements for the completion of doctoral studies and the assignment of a PhD degree: mastering at least 110 academic credits of theoretical training and preparation for passing the state exam in the specialty and defending a thesis.

Requirements for key competencies of doctoral graduates:

the graduate should know:

- modern trends, directions and patterns of development of domestic science in the context of globalization and internationalization;
- methodology of scientific knowledge;
- Achievements of world and Kazakhstani science in the field of electric power, electrical networks and systems;
- to understand and accept the social responsibility of science and education;

perfect foreign language for scientific communication and international cooperation.

be able to:

- organize, plan and implement the process of scientific research;
- analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions;
- to carry out independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;

- to conduct research activities in the field of electrical networks and electrical power systems;

- draw up reports and proposals for improving the maintenance of electrical equipment of electrical networks and systems;

- to plan and predict their further professional development.

have skills:

- analytical and experimental scientific activities;

planning and forecasting research results;

- oratory and public speaking at international scientific forums, conferences and seminars.

4. Working curriculum of the educational program

4.1. Training period 3 years

WORKING CURRICULUM

Education Program 8D07112 - "Electrical power engineering"
Group of Educational Programs D099 - "Power engineering and electrical engineering"
enrolment for 2020 - 2021 academic year

Form of study: daytime | Term of study: 3 years | Academic Degree: Doctor of Philosophy (PhD)

year of study	Code	Name of course	Component	Academic credits	lecture/ lab/ prac/DSIW	Prerequisites	Code	Name of course	Component	Academic credits	lecture/ lab/ prac/DSIW	Prerequisites
	1 semester						**2 semester**					
1	MET321	Research methods	BD IC	6	2/0/1/3		AAP345	Doctoral student research work, including internships and doctoral dissertations	DSRW	24		
	LNG304	Academic writing	BD IC	6	2/0/1/3		AAP350	Pedagogical practice	BD	10		
	ERG301	Theory of electrical apparatus	BD OC	6	2/1/0/3							
	ERG302	Intellectual systems in power industry			2/0/1/3							
	ERG308	Alternative sources of energy	PS OC	6	2/0/1/3							
	ERG303	Design methods of electric power and electrical systems			2/0/1/3							
	ERG305	Energy and resource saving technology by means of electric drive	PS OC	6	2/1/0/3							
	ERG306	Microprocessor control systems of technological processes in power engineering			2/1/0/3							
		In total		**30**				**In total**		**34**		
	3 semester						**4 semester**					
2	AAP345	Doctoral student research work, including internships and doctoral dissertations	DSRW	24			AAP346	Doctoral student research work, including internships and doctoral dissertations	DSRW	25		
	AAP349	Research scientific training	PS	10								
		In total		**34**				**In total**		**25**		
	5 semester						**6 semester**					
3	AAP346	Doctoral student research work, including internships and doctoral dissertations	DSRW	25			AAP346	Doctoral student research work, including internships and doctoral dissertations	DSRW	25		
							ECA303	Writing and defending doctoral dissertation	FA	12		
		In total		**25**				**In total**		**37**		
								In all		**185**		

Decision of the Academic Board of Satbaev University. Protocol No. ___ of "_____" _____ 20___.

Decision of the Academic Board of the Institute IAD Protocol No. ___ of "___" _____ 20__.

Vice-rector for Research and Academic Affairs — **D.K. Nauryzbayeva**

Chair of the APC — **K.B. Tulegenova**

Director of the Institute of Industrial Automation and Digitalization — **B.O.Omarbekov**

Head of the Department "Power Engineering" — **Ye.A. Sarsenbayev**

Number of credits for the whole period of study	
Cycles of disciplines	**Credits**
The cycle of general education	0
A cycle of basic disciplines (BD IC, BD OC)	28
A cycle of principal subjects (PS IC, PS OC)	22
All on the theoretical classes:	**50**
DSRW	123
Registration and defense of the master's thesis (RaDMT)	12
In total	**185**

MODULAR CURRICULUM

Education program: **8D07112 – « Electrical power engineering»**

Full-time study Term of study: 3 years Academic degree: *Doctor of Philosophy (PhD)*

Component	Code	Name of course	Semester	Academic credits	lecture	laboratory	practice	DSIW	Control type	Department
Profile training module										
Basic disciplines (BD) (28 credits)										
University component										
BD 1.1.1	LNG304	Academic writing	1	6	2	0	1	3	Exam	EL
BD 1.2.1	MET321	Research methods	1	6	2	0	1	3	Exam	MPHE& TSM
Choice component										
Conceptual Research Module										
BD 1.3.1	ERG301	Theory of electrical apparatus	1	6	1	0	2	3	Exam	Power Engineering
BD 1.3.2	ERG302	Intellectual systems in power industry							Exam	Power Engineering
Practice-oriented module										
BD	AAP350	Pedagogical practice	2	10					Report	Power Engineering
Major disciplines (MD) (22 credits)										
Choice component										
Power Engineering Design Research Module										
MD 1.1.1	ERG308	Alternative sources of energy	1	6	1	0	2	3	Exam	Power Engineering
MD 1.1.2	ERG303	Design methods of electric power and electrical systems							Exam	Power Engineering
MD 1.2.1	ERG305	Energy and resource saving technology by means of electric drive	1	6	1	0	2	3	Exam	Power Engineering
MD 1.2.2	ERG306	Microprocessor control systems of technological processes in power engineering							Exam	Power Engineering
Practice-oriented module										
MD	AAP349	Research scientific training	3	10					Report	Power Engineering
Research module (123 credit)										
DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	2	24					Report	Power Engineering

DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	3	24					Report	Power Engineering
DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	4	25					Report	Power Engineering
DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	5	25					Report	Power Engineering
DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	6	25					Report	Power Engineering
Final certification module (12 credits)										
FA	ECA303	Writing and defending doctoral dissertation	6	12					Defense of dissertations	
Total credits				**185**						

5 Descriptors of the level and amount of knowledge, abilities, skills and competencies

The third level descriptors within the Comprehensive Qualifications Framework of the European Higher Education Area (EC-EHEA) reflect learning outcomes that characterize the student's abilities:

1) demonstrate a systematic understanding of the field of study, mastering the skills and research methods used in the field of electrical engineering and energy;

2) Demonstrate the ability to think, design, implement and adapt an essential research process with a scientific approach;

3) contribute with their own original research to expand the boundaries of the scientific field that deserves publication at the national or international level;

4) critically analyze, evaluate and synthesize new and complex ideas;

5) communicate their knowledge and achievements to colleagues, the scientific community and the general public;

6) to promote, in an academic and professional context, the technological, social or cultural development of a knowledge-based society.

6 ECTS Diploma Supplement

The application was developed according to the standards of the European Commission, Council of Europe and UNESCO / CEPES. This document is for academic recognition only and is not an official proof of education. Not valid without a university degree. The purpose of completing the European Supplement is to provide sufficient information about the holder of the diploma, the qualification obtained, the level of this qualification, the content of the study program, the results, the functional purpose of the qualification, as well as information about the national education system. The application model that will be used to translate grades uses the European Credit Transfer or Transfer System (ECTS).

The European Diploma Supplement provides an opportunity to continue education at foreign universities, as well as to confirm national higher education for foreign employers. When going abroad for professional recognition, additional legalization of the educational diploma is required. The European Diploma Supplement is completed in English upon individual request and is issued free of charge.

7 Description of disciplines

Scientific research methods
CODE – MET321
CREDIT – 6 (2/0/1/3)

PURPOSE AND TASKS OF THE COURSE
The purpose of the discipline is to develop doctoral students' skills and abilities in the field of methodology of scientific knowledge. The objectives of studying this discipline are: - Mastering the methodological foundations of scientific knowledge and creativity; - Gaining knowledge in the field of similarity and modeling of physical processes, computational experiment; - mastering the technique of setting up an optimal experiment and processing measurement results.

BRIEF DESCRIPTION OF THE COURSE The concept of methodology as a system of principles and methods of organization, construction of theoretical and practical activities. The concept of "activity". Structural components of activity. Scientific foundations of the methodology of science. Scientific knowledge and scientific research. Science as a social institution. General laws of the development of science. The structure of scientific knowledge. Scientific profiles and their relationship with extra-scientific professional (including teaching) activities. Opportunities for changing the scientific profile of a professional activities. Criteria for the scientific character of knowledge. Classification of scientific knowledge. Theoretical and empirical research, their relationship. Fundamental and applied research. Forms of organization of scientific knowledge.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE doctoral student should know: - features of the choice of the direction of scientific research and the stages of its implementation; - tasks and methods of theoretical research; - classification, types and objectives of experimental research; - information support of scientific research; A doctoral student must be able to: - to analyze the trends of modern science, to determine the promising directions of scientific research in the subject area of professional activity, the composition of research papers, which determine their factors; - to use experimental and theoretical research methods in professional activities; - to adapt modern achievements of science and science-intensive technologies to the educational and self-educational process;

- work with natural science literature of different levels (popular science publications, periodicals), including in foreign languages. must own: - modern methods of scientific research in the subject area; - ways of comprehending and critical analysis of scientific information; - skills to improve and develop their scientific potential.

Academic writing
CODE – LNG304
CREDIT – 6 (2/0/1/3)

PURPOSE AND TASKS OF THE COURSE

The aim of the course "Academic writing" is the formation of professional competence and the expansion of communicative competence associated with analytical textual activity; the formation of students' skills of linguistic and pragmatic thinking, the ability to analyze expressive units of the language and competently select the desired unit, depending on the goals and conditions of communication. The aim of the course is to improve the ability to write scientific articles for subsequent publication in international scientific journals. The objective of the course is to acquaint with the peculiarities of academic genres (annotations, abstract, analytical review, as well as messages about a scientific event (conference)); define the main goals of analytical word processing; teach to analyze texts on professional topics.

BRIEF DESCRIPTION OF THE COURSE

The Academic Writing course teaches effective academic writing using practical examples and exercises. Academic writing skills are required for academic staff and university students for publications in foreign scientific journals, participation in international scientific conferences, master's or doctoral studies at a foreign university within the framework of academic mobility programs.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE The doctoral student should know: - the goals and objectives of analytical processing of texts in the modern information space; - genre and stylistic characteristics of annotation, abstract, analytical review, scientific communication; - the principles of the communicative organization of annotation and abstract; - rules for writing reviews; be able to: - conduct a stylistic analysis of scientific, scientific and technical and popular science texts, - to determine the stylistic and genre affiliation of the text in the sphere of professional information; - highlight the style-forming elements of texts, - carry out a semantic analysis of the text and highlight its keywords; - determine the means of speech expression;

- transfer the content of texts in the form of annotations, abstracts, reviews; own: - methods of semantic analysis of the text; - the method of communicative analysis of the text; - genres of annotation and abstract.

Electrical Apparatus Theory

CODE - ERG301

CREDIT - 5

PRE-REQUISIT - no

PURPOSE AND OBJECTIVES OF THE COURSE

Training of a highly qualified specialist capable of performing the entire list of tasks related to providing consumers with electrical energy at standardized quality, reliability and efficiency.

Study of energy conversion methods, optimization analysis of power supply systems, mastering knowledge and practical skills in the choice of electrical equipment based on the studied methods.

SHORT DESCRIPTION OF THE COURSE

This discipline provides a basic understanding of the fundamentals of the theory of electrical devices as a single electromechanical complex, including current-carrying elements, contacts, insulating structures, arc-extinguishing devices, drive devices and electromagnetic mechanisms. Mathematical descriptions of physical processes accompanying the operation of electrical devices during operation are given.

The discipline orients the knowledge gained in the magistracy to the practical tasks of the electric power industry, shows their connection with related disciplines, and forms profiling knowledge in the field of the foundations of the theory of electrical devices for trained specialists.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

Doctoral students receive ideas on all issues of this discipline, study the main processes occurring in electrical devices. In the process of studying the discipline, doctoral students must understand the mathematical descriptions of the physical processes that accompany the operation of electrical devices during operation.

Intellectual systems in power industry
CODE – ERG302
Credit – 5
CREDIT - 5
PRE-REQUISIT - no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to develop clear knowledge of doctoral students on the theory and practice of intelligent power systems, which is an obligatory part of the training of a highly qualified specialist.

Objectives of the course - mastering the basic provisions of the theory and practice of philosophy of intelligent power systems.

As a result of studying the course "Intelligent systems in the electric power industry", the doctoral student must have an idea on all issues of this discipline, know the methodological foundations of scientific knowledge and creativity, the theory and practice of intelligent power systems.

SHORT DESCRIPTION OF THE COURSE

Study and construction of complex, large and poorly formalized technical, environmental, economic, political and social problems generated by the development of civilization and generated by it.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

The acquired knowledge contributes to the development of the dissertation work, as well as in the further professional activity of the doctoral student both on the production base and in the scientific and pedagogical one.

Methods for designing electric power and electrical engineering complexes

CODE – ERG303

CREDIT – 5

PRE-REQUISIT – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of studying the discipline is to form a theoretical base for doctoral students in the design of electric power and electrical engineering complexes, to study modern design methods in the design of new or development of existing power systems and complexes.

The objectives of studying the discipline are:

- study of the scientific foundations for the construction of modern electric power and electrical engineering complexes, principles and methods for the implementation of optimal technical solutions in their design;
- study of normative and technical documentation in this area;
- mastering the methods of choosing the main design solutions and the feasibility study of the decisions made.

This discipline is focused on the study of general problems of the creation and functioning of electric power systems and complexes, the development of methods and tools for their study at the local and regional level, the development of scientific methods and tools for predicting the structural development of the electric power industry, taking into account environmental requirements, system analysis and forecasting of scientific and technological progress in the electric power industry, as well as a comprehensive solution to the problems of production, transformation, transportation and use of electricity, energy conservation and protection of the environment from the impact of electric power facilities, the development of scientific foundations for the management of the electric power industry, the formation of a regulatory framework and an economic environment for its functioning and development, taking into account modern economic conditions.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

As a result of studying the discipline, a doctoral student should know:

- the current state of electric power and electrical systems and complexes and trends in their development, modern achievements of science and advanced technology in the field of electric power;
- normative and technical documentation governing the operation of electric power complexes and systems and used in their design;
- types and characteristics of electrical equipment used in the design;
- organization and procedure for designing EPS and their facilities;
- criteria and methods for choosing design solutions.

Technologies of energy and resource saving by means of electric drive
Code – ERG305
Credit – 5
PRE-REQUISIT – no

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of studying the discipline "Technologies of energy and resource saving by means of electric drive" is the acquisition of knowledge by doctoral students on the problem of energy saving at industrial enterprises. Knowledge of ways to save energy through the rational construction of electric drives for production machines and mechanisms for various purposes, as well as familiarization of doctoral students with technical solutions for electrical equipment that is part of electric drives that ensure high productivity and efficiency of the production process.

The main task of the discipline is to gain knowledge of doctoral students about the ways and means of saving electricity by means of electric drives at enterprises of the mining industry of the national economy.

SHORT DESCRIPTION OF THE COURSE

The discipline belongs to the variable part of the professional cycle of the curriculum for training specialists in the direction of "Power Engineering". In modern scientific and technological progress, the electric drive is among the leading directions of scientific and technological progress in terms of its dynamism and efficiency.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

As a result of studying this discipline, a doctoral student must know the devices, principles of operation and properties of the main elements of microprocessor devices, software of automation means by means of an electric drive.

Doctoral students will acquire knowledge and practical skills in the development and design of digital control systems for electric drives of industrial installations to achieve energy and resource conservation.

Microprocessor control systems for technological processes in the power industry

Code – ERG306

Credit – 5

PRE-REQUISIT – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to form knowledge of the physical fundamentals, circuitry, design solutions and control of the operation of technical devices based on microprocessors in electric power systems and power supply systems in future specialists.

The objectives of the course are to prepare doctoral students in the field of "Electrical Engineering and Power Engineering" for practical use in real time of microprocessor computer systems and automation systems.

SHORT DESCRIPTION OF THE COURSE

Diciplina "Microprocessor control systems for technological processes in the power industry" is based on the previous study of the disciplines of bachelor's and master's degrees.

The knowledge gained contributes to the development of the doctoral student's dissertation work, both on the production basis and in the scientific and pedagogical field.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

The process of studying the discipline is aimed at the formation of the following competencies:

- readiness to use information technologies in their subject area;
- the ability to calculate circuits and elements of main equipment, secondary circuits, protection devices and automation of electric power facilities;
- readiness to develop technological units of electric power equipment;
- the ability to use modern information technology, manage information using business applications;
- to use network computer technologies, databases and application packages in their subject area;
- the ability to analyze the technological process as an object of management of readiness to study scientific and technical information, domestic and foreign experience on the research topic;
- readiness to understand the essence of the tasks of analysis and synthesis of objects in a technical environment.

Alternative energy sources
Code – ERG308
Credit – 5
PRE-REQUISIT – no

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the discipline, the content of the discipline is aimed at studying modern ideas about alternative fuels, the current state of energy resources in the world and in Kazakhstan, promising resources, further development of the energy sector, in conditions of decreasing reserves of organic fuels are analyzed.

The task of studying the discipline:

- providing students with knowledge in the field of one of the sections of modern science - alternative energy.
- Mastering the students of the theoretical foundations and understanding of the physical phenomena underlying alternative energy.
- Preparing students for future professional activities related to the development and research in the field of alternative energy sources.
- Acquisition by students of the skills of independent solution of engineering physical problems in the field of alternative energy sources.
- Acquisition of competencies by students related to research and development activities in the field of alternative energy sources.

SHORT DESCRIPTION OF THE COURSE

The course examines the main environmental aspects of environmental pollution when using fossil fuels and alternative energy sources. To acquaint students with international indicators, programs and measures for the efficient use of energy resources.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

The course should formulate a clear understanding of the types of non-traditional energy sources, their advantages and disadvantages for the doctoral student.

The educational program of doctoral studies includes:
- research practice - for students under the PhD program;
- industrial practice - for students under the program of specialized doctoral studies.

The research practice of a doctoral student is carried out with the aim of studying the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidating practical skills, applying modern research methods, processing and interpreting experimental data in the dissertation research.

The industrial practice of a doctoral student is carried out in order to consolidate the theoretical knowledge gained in the learning process and improve the professional level.

The research work of a doctoral student must:
- correspond to the main problems of the specialty in which the doctoral dissertation is being defended;
- be relevant, contain scientific novelty and practical significance;
- be based on modern theoretical, methodological and technological achievements of science and practice;
- be based on modern methods of data processing and interpretation using computer technology;
- carried out using modern scientific research methods;
- contain research (methodological, practical) sections on the main protected provisions.

The experimental research work of a doctoral student should:
- correspond to the main problems of the specialty in which the doctoral dissertation is being defended;
- be relevant, contain scientific novelty and practical significance;
- to be based on modern achievements of science, technology and production and contain specific practical recommendations, independent solutions of management tasks of an integrated, inter-functional nature;
- be carried out using advanced information technologies;
- contain experimental and research (methodological, practical) sections on the main protected provisions.

Doctoral thesis defense

Code – ECA 303

Credit –12

The purpose of the doctoral dissertation is to assess the scientific-theoretical and research-analytical level of the doctoral student, the formed professional and managerial competencies, the readiness to independently perform professional tasks and the compliance of its preparation with the requirements of the professional standard and the educational program of doctoral studies.

SHORT DESCRIPTION

Doctoral dissertation is a scientific work of a doctoral student, which is an independent research, in which theoretical provisions are developed, the totality of which can be qualified as a new scientific achievement, or a scientific problem is solved, or scientifically grounded technical, economic or technological solutions are stated, the implementation of which makes a significant contribution to development the country's economy.

A doctoral dissertation is the result of the research / experimental research work of a doctoral student, carried out during the entire period of study of a doctoral student.

The defense of a doctoral dissertation is the final stage of the master's preparation. A doctoral dissertation must meet the following requirements:

- the topic of the thesis should be related to the priority areas of the development of science and / or government programs or programs of fundamental or applied research.

- the content of the dissertation, the goals and objectives, the scientific results obtained must strictly correspond to the topic of the dissertation.

- the dissertation is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value.

Content