

PAVLODAR STATE UNIVERSITY NAMED AFTER S. TORAIGHYROV



MODULE HANDBOOK

of specialty **5B071800 «ELECTRICAL POWER ENGINEERING»**



Akkreditierungsagentur für Studiengänge der Ingenieurwissenschaften, der Informatik, der Naturwissenschaften und der Mathematik e.V.

Pavlodar, 2017

MODULE REFERENCE BOOK

1 General compulsory modules

Module designation	Social History
Courses included in the module	History of Kazakhstan
Semester(s) in which the module is taught	1
Responsible for the module	Malikov A.V., Kaskabasova A. A.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Lectures 30 Practical classes – 15 Self-study -105
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	"History"; "Philosophy" "History of Kazakhstan"; "Human and society"; "Culturology".
Module objectives/intended learning outcomes	<p>Knowledge: the history of the development of human society in Kazakhstan as an integral part of the world historical process, the dynamics of the development of national history (driving forces, mechanisms, trends, patterns of historical development), the general course of history (the structure of history, its dynamics), the traditions and culture of the peoples of Kazakhstan.</p> <p>Skills: to establish cause-effect relations in the history of Kazakhstan, to comprehend historical events and phenomena on the basis of comparative analysis, to creatively apply historical knowledge in practice.</p> <p>Competencies: the ability to develop forecasts of historical events. to be tolerant of the traditions, culture of other nations of the world.</p>
Content	<p>Kazakhstan in antiquity, Kazakhstan in the early and developed Middle Ages, Kazakhstan in the XIII - XV centuries,</p> <p>Ethnogenesis of Kazakhs. The Kazakh Khanate, Accession of Kazakhstan to Russia,</p> <p>People's liberation struggle of Kazakhs at the end of the XVIIIth - the middle of the XIXth centuries, Kazakhstan as a part of the Russian Empire (the second half of the XIXth - beginning of the XXth centuries), Public Movement in Kazakhstan at the beginning of the 20th century.</p> <p>Kazakhstan in the years 1917 - 1920. Socio-economic transformation in the 20-30-ies. The 20th century, the socio-political and cultural life in the 1920s and 1930s, Kazakhstan during the Great Patriotic War, Kazakhstan in the post-war years, Kazakhstan in 1965-1991,</p> <p>Independent Kazakhstan</p>
Forms of examination	Exam

Media employed	Electronic teaching aids: Slide-lectures, presentations, textbooks, dictionaries in electronic form. Technical training means: projector, electronic board, laptop
Reading list	<p>1 Батпеннова З.С., Фоминых В.В. История Казахстана. Методические рекомендации для самостоятельной работы студентов всех специальностей 1 курса. - Усть-Каменогорск, 2004</p> <p>2 История Казахской ССР с древнейших времен до наших дней в 5 т. - Алма-Ата, 1977-1981</p> <p>3 История Казахстана с древнейших времен до наших дней в 4(5) т. - Алматы, 1996-2000. Т. 1-3.</p> <p>4 Панковская Г.И., Фоминых В.В. История Казахстана в схемах, таблицах, диаграммах. - Усть-Каменогорск, 2008</p> <p>5 Панковская Г.И., Фоминых В.В. История Казахстана. Конспекты Lectures для студентов технических вузов. – Усть-Каменогорск, 2009</p> <p>6 Панковская Г.И., Фоминых В.В. История Казахстана. Хронологический путеводитель. – Усть-Каменогорск, 2011</p>

Module designation	Mathematics
Courses included in the module	Mathematics 1, Mathematics 2
Semester(s) in which the module is taught	1,2
Responsible for the module	Shomanova R.E.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures - 30 hours Practical classes - 45 hours Laboratory classes- 15 hours Self-study – 210 hours
Workload	300 hours
Credit points	10 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	All sections of the mathematics of the school course.
Module objectives/intended learning outcomes	<p>Knowledge:</p> <ul style="list-style-type: none"> - actions with different values and an estimation of their order; - approximate methods of solving functions and definite integrals; - the basic methods of solving applied problems related to the specialty; - actions with different values and an estimation of their order; - approximate methods of solving functions and definite integrals; - approximate methods of problem analysis and control of the correctness of solutions;

	<p>- - approximate methods of problem analysis and control of the correctness of solutions..</p> <p>Skills: the ability to</p> <ul style="list-style-type: none"> - independently understand the mathematical apparatus contained in the special literature; - choose the research method and bring the solution of problems to a practically acceptable result; - use computer technologies, tables and reference literature. - to build mathematical models using the apparatus of mathematical analysis - to set mathematical tasks for models of this process - to select suitable mathematical methods and algorithms for solving the problem - to develop practical recommendations based on the mathematical analysis. <p>Competencies: the ability to perform numerical calculations of various algebraic expressions; to perform numerical calculations of derivatives, integrals, and differential equations.</p>
Content	<p>Determinants. Matrices.</p> <p>Systems of linear algebraic equations.</p> <p>Vectors. Scalar, vector and mixed products of vectors.</p> <p>Linear geometric objects. Introduction to mathematical analysis. The notion of set. Elements and symbols of mathematical logic. Number sequences and their limits.</p> <p>Limit of a function at a point. Continuity of function. The derivative of a function of the first and higher orders. Investigation of function.</p> <p>Integral calculus.</p> <p>Functions of several variables. Partial derivatives and complete differentials of higher orders. Implicit functions. Double integrals and their calculation.</p> <p>Curvilinear integrals of I and II genera, and their applications. Numerical series. Signs of convergence of numerical series and the study of series on convergence. Functional and power series. Expansion of functions in power series. Fourier series. Integration of equations. Differential equations of higher orders.</p> <p>Elements of probability theory and mathematical statistics.</p> <p>Complex numbers and actions over them.</p> <p>Functions of a complex variable. Integration and differentiation of functions of a complex variable. The Taylor and Laurent series. Operational calculus.</p> <p>Laplace transforms and their properties.</p> <p>Elements of the theory of probability. . Random variables, their distribution laws and numerical characteristics. Elements of mathematical statistics.</p> <p>Consent criteria. Elements of correlation.</p>
Forms of examination	Exam

Media employed	Electronic textbooks on mathematics, Conducting classes using an electronic board
Reading list	<p>1) Кудрявцев Л.Д. Курс математического анализа. Т. 1,2. М.: Высшая школа, 1981.</p> <p>2) Под редакцией Рябушко А.П.. Сборник индивидуальных заданий по математике ч.1,2. Минск.: Вышшая школа, 2001.</p> <p>3) Щипачев В.С. Высшая математика М.: Высшая школа, 1999.</p> <p>4) Никольский С.М. Курс мат. Анализа. М.: Наука,1990.</p> <p>5) Хисамиев Н.Г., Бокенов А.О. Элементы линейной алгебры. Часть1, Усть-Каменогорск, 2004.</p> <p>6) Чи-Дун-Чи Ю. В., Сидоренко В.Н., Китапбаев М.К. Высшая математика в вопросах и задачах. Дифференциальное и интегральное исчисление. Усть-Каменогорск, 2002.</p>

Module designation	Information Processing and Analysis
Courses included in the module	Informatics
Semester(s) in which the module is taught	1
Responsible for the module	Krivoruchko E.B.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures - 15 hours Laboratory classes-7,5 hours Practical classes – 15 Self-study – 82,5 hours
Workload	120 hours
Credit points	4 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Mathematics
Module objectives/intended learning outcomes	<p>Knowledge: classification of high-level language operators, standard modules, dynamic data structures, software design methods, methods for debugging and testing programs;</p> <p>Skills: the ability to develop structural diagrams of various algorithms, organize data structures, correctly choose methods for solving problems;</p> <p>Competencies: in the field of information processing and management with the use of computer facilities; application of modern computer technology, use of information technologies in the sphere of professional activity</p>
Content	The concept of PC software. Methods of automation of programming. Algorithmic languages and requirements to them. The concepts of procedural-

	<p>oriented languages and object-oriented programming. Dialogue means of communication of users with a computer. Integrated programming systems. Definition of the algorithm. Methods of describing algorithms. Rules for the design of flowcharts of algorithms. Varieties of structures of algorithms. Organization of algorithms of cyclic structure. Classification of productions of technical problems. Typical components: analysis, synthesis, decision-making.</p> <p>Programming in the basic procedural-oriented algorithmic language. The alphabet of language. Rules for recording the main language objects. Classification of operators of algorithmic language. Structure of the program. User subroutines, their classification. Programming with external storage media and dynamic memory. Using the graphical capabilities of the language. Creating objects and using them. Perspectives of development of languages and technology of programming.</p>
Forms of examination	Exam
Media employed	Stand for laboratory work "Measuring equipment", software package "Electronics, Workbench".
Reading list	<p>1 Давыдов В.Г. Программирование и основы алгоритмизации. – М.: Высшая школа, 2003.</p> <p>2 Керниган Б. Плоднер Ф. Элементы стиля программирования. – М.: Радио и связь, 1984.</p> <p>3 Хьюз ДЖ., Мичтом Дж. Структурный подход к программированию. - М.: Издательство «Мир», 2002.</p>

Module designation	Physics
Courses included in the module	Physics
Semester(s) in which the module is taught	2
Responsible for the module	Igonin S.I.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures - 15 hours Practical classes – 22,5 hours Laboratory classes-15 hours Self-study – 127,5 hours
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Mathematics
Module objectives/intended learning outcomes	<p>Knowledge: the essence of the basic laws of classical and modern physics;</p> <p>Skills: the ability to evaluate the degree of reliability of</p>

	the results obtained with the help of experimental and theoretical research methods; Competencies: in the application of theoretical physical laws and methods in practice.
Content	Physics as a science about the forms of motion of matter and the general laws of nature. The most important stages in the development of physics. Wave equation for the electromagnetic field. The concept of ray optics. Properties of light waves. Electromagnetic waves in matter. Thermal radiation. Basic provisions of quantum theory. Elements of quantum electronics. Condensed state. Methods for studying crystal structures. Electrical conductivity of metals. Own and impurity conductivity. Quantum concepts of the properties of ferromagnets. The atomic nucleus. Exchange character of nuclear forces. Models of the kernel. Nuclear reactions. The problem of energy sources.
Forms of examination	Exam
Media employed	Laboratory stands
Reading list	<p>1) Савельев И.В. Курс общей физики. Учебное пособие для втузов. В 5 книгах. М. Астрель/ АСТ 2003 г.</p> <p>2) Трофимова Т.И. Краткий курс физики: учебное пособие для вузов Изд. 2-е, испр.-352 с, М: Высшая Школа, 2002 г.</p> <p>3) Грабовский Р.И. Курс физики: Учебники для вузов. Изд. 6-е – 608 с. (Учебники для вузов: Специальная литература), СПб: Лань, 2002 г.</p> <p>4) Трофимова Т.И. Сборник задач по курсу физики для втузов: Учебное пособие для инженерно-технических специальностей высших учебных заведений. Изд. 3-е – 384 с. М: Оникс 21 век/Мир и Образование, 2003 г.</p>

Module designation	Ecology and life safety
Courses included in the module	Ecology and sustainable development.
Semester(s) in which the module is taught	2
Responsible for the module	Seitzhanova D.B., Semenova M.K., Aimukhanov S.M.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures - 15 hours Practical classes – 15 hours Self-study - 60 hours
Workload	90 hours
Credit points	3 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"

Recommended prerequisites	Ecology
Module objectives/intended learning outcomes	<p>Knowledge: the basis for identifying factors and sources of negative environmental impact caused by human activities; modern, including information tools and methods for forecasting, assessing and managing the state of the environment.</p> <p>Skills: students are able to assess the impact of environmental factors on public health; develop programs for the development and optimization of the ecological status of the region; apply in practice a set of knowledge in the field of international cooperation on environmental protection from the impact of negative factors of the natural and man-made environment.</p> <p>Competencies: in anticipation of the main processes in the sphere of ecology, sustainable development and life safety.</p>
Content	Life safety: The objectives of the course. Legislative acts. Classification of emergencies. Estimation of the situation in the ES. Principles and methods of protecting the population in emergency situations. Shelter. Evacuation and dispersal. SNAVR. FROM: Legislative acts. Safety precautions. Industrial sanitation. PPE. Fire safety.
Forms of examination	Exam
Media employed	Electronic manual, electronic tests, electronic trainings.
Reading list	<ol style="list-style-type: none"> 1. Арустамов Э.А. Безопасность жизнедеятельности: Учебник для студентов среднего профессионального заведения-М.: Академия, 2004. 2. Атаманюк В.Г. Гражданская оборона /Учебник для ВУЗов, -М.:Высшая школа, 1986. 3. Баринов А.В. Чрезвычайные ситуации природного характера и защита от них: Учебное пособие.-М.: ВЛАДОС, 2003. 4. Белов А.С. Безопасность жизнедеятельности: Учебник для ВУЗов,- М.:ВШ, 1999. 5. Гусейнов В.Ф., Захматов А.А. Методические указания по оценке обстановки в ЧС, часть 1,2,3. Усть-Каменогорск, ВКГТУ, 2003.

Module designation	Social Sciences
Courses included in the module	Sociology Politolology
Semester(s) in which the module is taught	3,4
Responsible for the module	Artykbaeva G.T., Kappasova G.M.
Language	Russian, Kazakh

Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures - 30 hours Practical classes – 30 hours Self-study - 120 hours
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	History of Kazakhstan
Module objectives/intended learning outcomes	<p>Knowledge: the basic conceptual theories and laws of sociology, political science; the main stages and cause-and-effect relations of the development of political science; modern trends in the development of political science and social development of society; social and ethical values based on public opinion, traditions, customs, social norms and orient oneself to them in their professional activities.</p> <p>Skills: the ability to establish cause-effect relations in political science; adequately navigate in various social situations.</p> <p>Competencies: the ability to develop forecasts of trends in the development of the political environment, apply the basic laws of sociology in professional activity.</p>
Content	<p>The essence and basic concepts of sociology, political science as social sciences; about the basic ideological directions of development of political science. Basic conceptual theories and laws of sociology, political science; the main stages and cause-and-effect relations of the development of political science; modern trends in the development of political science and social development of society; social and ethical values based on public opinion, traditions, customs, social norms and to orient oneself to them in their professional activities.</p> <p>Analysis of historical events and modern political environment, application of sociological methods in their professional field.</p>
Forms of examination	Exam
Media employed	Laboratory stands
Reading list	<ol style="list-style-type: none"> 1) Современная западная социология. Словарь. - М., 1990. 2) Социологический словарь. - Минск, 1991. 3) Кравченко А.И. Социология: учебник для вузов. – М., 2011. 4) Добреньков В.И., Кравченко А.И. Социология. – М., 2010. 5) Современная западная социология. Словарь. - М., 1990.

	6) Социологический словарь. - Минск, 1991. 7) Кравченко А.И. Социология: учебник для вузов. – М., 2011. 8) Добреньков В.И., Кравченко А.И. Социология. – М., 2010. 9) Волков Ю.Г. Социология: учебник. - М.: Кнорус, 2011. 10) Назаренко С.В. Социология. – М., 2009.
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Module designation	Multilingual training
Courses included in the module	Foreign language Kazakh/ Russian
Semester(s) in which the module is taught	1, 2
Responsible for the module	Kulakhmetova N.S., Potselueva N.V., Shaharman Э.Р.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Practical classes – 172,5 hours Self-study – 397,5 hours
Workload	total: - 570 hours
Credit points	19 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Knowledge of the basics of languages
Module objectives/intended learning outcomes	<p>Knowledge: phonetics: the basic rules for reading and pronouncing letters of the alphabet and letter combinations in the speech stream; Spelling: writing letters and letters corresponding to certain sounds, orthographic correspondence to the most frequent lexico-grammatical features of the base language; Lexicon: word-formation models, contextual meanings of multivalued words, terms and lexical constructions of a sublanguage corresponding to the profile of the specialty being studied; Grammar: the most frequent specific grammatical phenomena of the basic and natural-humanitarian and technical sublanguages.</p> <p>Skills: the ability to understand the general content of complex texts on abstract and specific topics, including highly specialized texts; speak quickly and spontaneously enough to communicate with native speakers without much difficulty; make clear, detailed messages on various topics; outline their views on the main problem, show the advantages and disadvantages of different opinions.</p> <p>Competencies: the ability to form a scientific worldview by means of language, ethical principles and respect for language, the history of the country. Communicative competence, professional competence, linguistic competence, pragmatic competence, discursive competence, socio-cultural competence.</p>

Content	Phonetic, spelling, lexical, grammatical norms of the foreign language. Phonetics: pronouncing and rhythmic-intonational features of the foreign language, reception and reproduction of the sound system of speech. Orthography: sound system of the language, basic spelling rules. Vocabulary: word-building models; Lexical minimum of 2500 units of the base language, as well as terms corresponding to the specialty profile; differentiation of vocabulary by areas of application. Grammar: basic parts of speech - noun, adjective, adverb, verb, article, pronoun, preposition; The structure of a simple and complex sentence; Basic models of word formation. Reading: the formation of skimming and scanning skills. Speaking: the skills of dialogical and monologic speech within the studied topics. Writing: developing skills in the sequential presentation of thoughts, reasoning, and information when writing essays and letters of personal and business nature. Translation of texts by specialty from the foreign language into the native language in accordance with the language norms. Listening: everyday, informational and professional messages.
Forms of examination	Exam
Media employed	Multimedia class (computers with speakers and headphones), electronic dictionaries
Reading list	<ol style="list-style-type: none"> 1) Essential Grammar in Use. Murphy R. – Cambridge University Press:2002 2) Understanding and Using English Grammar, third edition. Betty Schrumpfer Azar – Longman:1999 2. 3) Семенова С.Д. Mastering English Grammar. Методические указания по английскому языку для студентов 1 и 2 курсов всех специальностей ВКГТУ – Усть-Каменогорск 4) Демидова А.К. Пособие по русскому языку. Научный стиль. Оформление научной работы: Учебное пособие/ А.К.Демидова. – М.: Русский язык, 1991. - 201 с. 5) Кадржанов К.К. Русский язык. Практический курс. Для казахских групп технических специальностей вузов/ К.К. Кадржанов. – Алматы: СаГа, 2005. - 324 с. 6) Пособие по научному стилю речи. Для вузов технического профиля/ Под ред. И.Г. Проскуряковой.- Москва, 2004. - 230с. 7) Русский язык: Учебное пособие для студентов казахских отделений университета/ Под ред. К.К. Ахмедьярова, Ш.К. Жаркынбековой. – Алматы: Қазақ университеті, 1999. – 156 с. 8) Шаяхметова Н.К. Обучение научному стилю: Учебное пособие/ Шаяхметова Н.К. – Алматы: Эверо, 2007. -189 с. 9) Адскова Т.П. Русский язык в техническом вузе.

	<p>Практикум по научному стилю речи: Учебник/ Т.П. Адскова. - Алматы: ТОО «Издат-во LEM», 2004. - 212 с.</p> <p>10) Аубакирова К.Т. Сборник упражнений по стилистике русского языка: Учебное пособие/ К.Т. Аубакирова. - Алматы: Print, 2005. - 136 с.</p> <p>3.</p>
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Module designation	Theory of Scientific Research
Courses included in the module	Philosophy
Semester(s) in which the module is taught	3
Responsible for the module	Erzhanov E.A.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures - 15 hours Practical classes – 30 hours Self-study– 105 hours
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	History of Kazakhstan
Module objectives/intended learning outcomes	<p>Knowledge of: the subject, tasks, principles, basic methods, the most prominent representatives and achievements of both philosophy and science; the basic categorial apparatus of the philosophy of science.</p> <p>Skills: the ability to comprehend course material as a necessary theoretical tool for understanding the world and its place in it, state their own position using the science and philosophy of categories.</p> <p>Competencies: the application of scientific methods of cognition in professional activity.</p>
Content	<p>Philosophy and methodology of science as a branch of philosophical knowledge.</p> <p>The subject of the philosophy of science. Its connection with science and philosophy. Variety of methodological concepts and problems. The main themes of the philosophy of science. Problems and results of the philosophy of science. Their importance for science and philosophy.</p> <p>Specificity and interrelation of the main aspects of the study of science: the logic of science, the philosophy of science, the history of science, the sociology of science, the psychology of science and other directions.</p> <p>Status and problems of the history of science. Evaluation of the development of the history of science as a discipline. Features of the relationship</p>

	<p>between the philosophy of science and the history of science. Methodological foundations of the philosophy of science. Science in culture and civilization. Science in the system of culture. The role and function of science in society. Science and Philosophy. The history of the relationship between philosophy and science. Philosophical understanding of the achievements of science. Influence of philosophical concepts on the development of science. Science and art. Science and religion. The influence of science on the religious perception of the world. Dialogue of religion and science. The social status of science and the dynamics of changing attitudes toward religion. Science and education.</p> <p>World outlook aspects of science. Science as a productive force. Humanistic horizons of science. Science and morality. Axiological status of science. Personality in science. Social aspects of the history of science. The nature of sociality in science as a problem. Philosophy in the history of scientific ideas. The role of philosophy in the work of scientists. Philosophical and methodological problems of science as an independent field of research. Concepts of science as neopositivism, the logic of scientific research, the ontology of science, the postpositivistic image of science. Strong ties of science with philosophy (A.Einstein, N.Bor, V.Vernadsky and others).</p>
Forms of examination	Exam
Media employed	Electronic teaching aids: slide-lectures, presentations, philosophical literature (textbooks, dictionaries) in electronic form. Media: projector, electronic board, laptop
Reading list	<ol style="list-style-type: none"> 1) Арлычев А.Н. Качественный аспект мира и его познание. М., 2001. 2) Бунге М. Философия физики. М., 2003. 3) Вернадский В.И. Размышление натуралиста. Научная мысль как планетное явление. Кн. 2. М., 1977. 4) Войтов А.Г. Самоучитель мышления.- М., 2001. 5) Войтов А.Г. Философское основание теоретической науки. М., 1999. 6) Ильин В.В.. Юлдашев Л.Г. Современная научная философия. М., 2003. 7) Микешина Л.А. Философия познания. М., 2002.

Module designation	Economic and Legal Literacy
Courses included in the module	Basics of economic theory Law basics
Semester(s) in which the module is taught	3
Responsible for the module	Baytayeva G.A., Glamazdina L.K.

Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures – 37,5 hours Practical classes – 30 hours Self-study – 142,5 hours
Workload	210 hours
Credit points	7 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Politolology, Sociology
Module objectives/intended learning outcomes	<p>Knowledge: the essence of economic phenomena, the patterns of socio-economic development of society in various economic systems; mechanisms of market self-regulation in conditions of limited resources; principles of state regulation of the economy; the foundations of the constitutional system of the Republic of Kazakhstan, the system of state power and their interaction with other socio-political institutions.</p> <p>Skills: the ability to observe and organize information, apply logic and dialectics as a conscious method of perception economic phenomena in their interrelationships; understand the state-legal structure of society, the subjects of state power and the mechanism for its implementation.</p> <p>Competencies: in the matters of the legal status of man and citizen, in search of solutions to socio-economic problems, taking into account the institutional features of Kazakhstani model of socially-oriented market economy.</p>
Content	The essence of economic phenomena, the patterns of socio-economic development of society in various economic systems; mechanisms for self-regulation of the market in conditions of limited resources; principles of state regulation of the economy; the foundations of the constitutional system of the Republic of Kazakhstan, the system of state power and their interaction with other
Forms of examination	Exam
Media employed	Electronic teaching aids: Slide-lectures, presentations, philosophical literature (textbooks, textbooks, dictionaries) in electronic form. Training equipment: projector, electronic board, laptop
Reading list	<p>1) Курс экономической теории / Под общ. ред. проф. М.Н. Чепурина и проф. Е.А. Киселевой. - Киров, 2000.</p> <p>2) Экономическая теория (политэкономия) / Под ред. В.И. Видяпина, Г.П. Журавлевой. - М.:ИНФРА,1999.</p> <p>3) Экономика: Учебник / Под ред. А.С. Булатова. – М., Юрист, 2001.</p>

	<p>4) Экономика: Учебник / Под ред. А.И. Архипова, А.Н. Нестеренко, А.К. Большакова. – М.: «Проспект», 2008.</p> <p>5) Экономическая теория: Учебник для вузов / Под ред. А.И. Добрынина, Л.С. Тарасевича. - СПб: изд. СПб ГУЭФ, изд. «Питер Пабблишинг», 2007.</p> <p>6) Борисов Е. Ф. Экономическая теория: Учебник. Курс Lectures для вузов. - М., Юрист, 1997.</p> <p>7) Кодекс РК «О налогах и других обязательных платежах в бюджет» с дополнениями и изменениями.</p> <p>8) Антология мировой политической мысли. В 5-ти томах. - М., 1997.</p> <p>9) Казахстанская политологическая энциклопедия / Под ред. Т.Т.Мустафина. - Алматы,1998. .</p> <p>10) Гаджиев К.С. Политология. Учебник. – М., 2005.</p> <p>11) Политология: Учебное пособие / Под ред. Байдельдинова Л.А., Бурханова К.Н., Соловьева А.В. Алматы, 2001.</p> <p>и практическая политология. М.,1998.</p> <p>12) Политология XX века. Хрестоматия в 2-х част. Саранск.1994.</p> <p>13) Гаджиев К.С. Политическая наука. М.,1994.</p> <p>14) Основы политологии. / Под. Ред. В.П. Пугачева. М., 1992г.</p> <p>15) Политология. Учебное пособие для высших учебных заведений. М., Акалис., 1996.</p> <p>16) Агыбаев А.Н. Уголовное право РК А.,2005 г.</p> <p>17) Алексеев С.С. Теория права. М., 1994</p> <p>18) Басин Ю.Г. Юридические лица по гражданскому кодексу РК, - А.,1996</p> <p>19) Гражданское право РК. Общая часть. А., 1999</p> <p>20) Григорьев В.И. Административное право РК (общая часть). А., 2002</p> <p>21) Комаров С.А.. Малько А.В. Теория государства и права. - М., 1999</p> <p>22) Основы права. Под ред. Крылова З.Г. М., 2002</p>
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2 Compulsory modules in the specialty

Module designation	Professional language training
Courses included in the module	Professional Kazakh / Russian language Professionally-oriented foreign language
Semester(s) in which the module is taught	3, 4
Responsible for the module	Seitkazin S.B. Kabdualiev N.M.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time

	Practical classes – 60 hours Self-study - 120 hours
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Basics of Russian, Kazakh and a foreign language
Module objectives/intended learning outcomes	Knowledge: terms and phrases in professional areas. Skills: to operatively conduct a conversation on general, educational and professional, scientific topics; communicate without preparation, avoiding grammatical errors, without visible restrictions on speech styles. Competencies: write scientific and professional works: abstracts, essays, business letters, etc.
Content	Terms and phrases in professional areas; professional stylistic and phraseological units.
Forms of examination	Exam
Media employed	Electronic means of teaching: Slide-lectures, presentations, dictionaries in electronic form. Technical training means: projector, electronic board, laptop
Reading list	1) Essential Grammar in Use. Murphy R. – Cambridge University Press:2002 2) Understanding and Using English Grammar, third edition. Betty Schrumpfer Azar – Longman:1999 3) Семенова С.Д. Mastering English Grammar. Методические указания по английскому языку для студентов 1 и 2 курсов всех специальностей ВКГТУ – Усть-Каменогорск

Module designation	Theoretical Foundations of Electrical Engineering and Electronics
Courses included in the module	Theoretical Foundations of Electrical Engineering 1 Theoretical Foundations of Electrical Engineering 2 Industrial Electronics
Semester(s) in which the module is taught	3,4
Responsible for the module	Mustafina R.M.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures – 52,5 hours Practical classes – 45 hours (up to 30 students) Laboratory classes– 15 (up to 15 students) Self-study – 60 hours (up to 60 students)
Workload	247,5 hours
Credit points	12 ECTS
Requirements according to the	SO PSU 8.01.2-09 "Monitoring and evaluation of

examination procedure	educational achievements of students"
Recommended prerequisites	Mathematics, Physics
Module objectives/intended learning outcomes	<p>Knowledge: the basic laws of electrical and magnetic circuits, electromagnetic field; basic methods of calculating electric and magnetic circuits, electromagnetic field; methods of analysis and synthesis of chains.</p> <p>Skills: the ability to calculate steady and transient regimes in linear and nonlinear circuits with constant and alternating currents; calculate the electrostatic field and the electric field of direct current; read the circuit; collect electrical circuits; measure electrical quantities; work with technical literature;</p> <p>Competencies: calculating various modes of steady and transient processes of electric and magnetic circuits of a constant, single-phase sinusoidal, 3-phase and non-sinusoidal currents.</p>
Content	<p>Electric circuits of direct current. Electrical circuits of single-phase sinusoidal current. Comprehensive method of calculation. Resonance and frequency response. Inductively-coupled chains. Three-phase circuits. Nonsinusoidal periodic electromotive forces, voltages, currents. Transients in linear circuits. Quadripoles with sinusoidal currents and voltages. Chain circuits and filters. Nonlinear electric and magnetic circuits with direct current. Nonlinear electric and magnetic circuits with periodic processes. Electrical circuits with distributed parameters. Electrostatic field. Electric field of direct current</p>
Forms of examination	Exam
Media employed	Electronic slides
Reading list	<ol style="list-style-type: none"> 1) Атабеков Г.И. Теоретические основы электротехники. Линейные электрические цепи. Ч.1. М.: Энергия. 1978. 592 с. 2) Бессонов Л.А. Теоретические основы электротехники. Электрические цепи. Ч.1. М.: Высшая школа. 1978. 528 с. 3) Бессонов Л.А. Теоретические основы электротехники. Учебник для вузов.- М.: Высшая школа, 1980.-528 с. 4) Задачник по теоретическим основам электротехники. /теория цепей./Под ред. К.М.Поливанова. М.: Энергия. 1973. 304 с. 5) Задачник по теоретическим основам электротехники/ Под ред. Поливанова К.М.- М.: Энергия, 1976.-304 с. 6) Зевеке Г.В., Ионкин П.А. Основы теории цепей: Учебник для вузов.- М.: Энергия, 1975.-572 с. 7) Колли Я.Н., Соболева Л.П., Фрадкин Б.М. Сборник задач по теории поля.- М.: Энергия, 1976.-168 с.

	<p>8) Матханов П.И. Основы анализа электрических цепей. Линейные цепи. М.: Высшая школа 1981. 333 с.</p> <p>9) Нейман Л.Р., Демирчян К.С. Теоретические основы электротехники: в 2-х т. Учебник для вузов.- Л.: Энергоиздат. Ленинград. отд-ние, 1981.- 1 т.-536 с., 2 т.-416 с.</p> <p>10) Основы теории цепей. / Г.В.Зевеке, П.А.Ионкин, А.В.Нетушил, С.В.Страхов / М.: Энергоатомиздат, 1989. 528 с.</p> <p>11) Толстов Ю.Г. Теория линейных электрических цепей. М.:Высшая школа. 1978.279с.</p> <p>12) Поливанов К.М. Теоретические основы электротехники. М.: Энергия. 1975. 352 с.</p> <p>13) Сборник задач и упражнений по теоретическим основам электротехники. /Под ред. П.А.Ионкина. М.: Энергоиздат. 1982. 768 с</p> <p>14) Теоретические основы электротехники / Под ред. Ионкина П.А. В 2-х т. Учебник для вузов.-М.: Высшая школа, 1976.- 1т.-544 с., 2 т.-378 с.</p> <p>15) Линейные цепи однофазного синусоидального тока. Методические указания и контрольные задания по ТОЭ, Контрольная работа № 2/ Мустафина Р.М., Инсебаев Т.А., Дробинский А.В., Мустафина Г.М., – Павлодар, НИЦ ПГУ, 2003–31 с.</p> <p>16) Линейные цепи постоянного тока. Методические указания и контрольные задания по ТОЭ. Контрольная работа № 1/ Мустафина Р.М., Инсебаев Т.А., Дробинский А.В., Мустафина Г.М., – Павлодар, НИЦ ПГУ, 2003–28 с</p> <p>17) Линейные электрические цепи постоянного и однофазного синусоидальных токов. Конспект Lectures по ТОЭ, часть 1/ Мустафина Р.М., Мустафина Г.М., Исенов С.С., Рахимбердинова Д.М., - Павлодар, НИЦ ПГУ, 2006 – 142 с.</p>
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Module designation	Engineering and Computer Graphics
Courses included in the module	Engineering and Computer Graphics
Semester(s) in which the module is taught	2
Responsible for the module	Shkreba E.V.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 22,5 hours Practical classes – 15 hours Laboratory classes– 7,5 hours Self-study – 105 hours
Workload	150 hours
Credit points	5 ECTS

Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Drawing
Module objectives/intended learning outcomes	<p>Knowledge: the basics of constructing images of geometric models of space, ways to solve technical problems graphically and the requirements of standards for the implementation of drawings and diagrams.</p> <p>Skills: the ability to determine the geometric shapes of simple parts and assembly units from their images;</p> <p>Competencies: in the implementation of drawings and diagrams, including the use of computer graphics.</p>
Content	Projection of geometric elements into two and three mutually perpendicular planes of projection. Methods for converting drawings. The intersection of surfaces by projecting planes. Axonometric projections of surfaces. Projecting polyhedra and surfaces of revolution. Execution of sketches and assembly drawings of technical details.
Forms of examination	Exam
Media employed	ICT room
Reading list	<ol style="list-style-type: none"> 1) Бубенников А.В. Начертательная геометрия. – М.: Высш.шк., 1985 – 288 с. 2) Фролов С.А. Начертательная геометрия. – М.: Высш.шк., 1983 – 215 с. 3) Лагерь А.И., Колесникова Э.А. Инженерная графика. – М.: Высш.шк., 1985 – 176 с. 4) Чекмарев А.А. Инженерная графика. – М.: Высш.шк., 1988 – 335 с. 5) Государственные стандарты ЕСКД. 6) Левицкий В.С. Машиностроительное черчение. – М.: Высш.шк., 1988 – 351 с 7) Фролов С.А. Сборник задач по начертательной геометрии. – М.: Машиностроение, 1986 – 176 с. 8) Будасов Б.В. Каминский В.П. Строительное черчение. – М.: Стройиздат, 1990. – 464 с. 9) Кириллов А.Ф. Чертежи строительные. – М.: Стройиздат, 1984 – 311 с.

Module designation	Economy of Branch
Courses included in the module	Economy of branch
Semester(s) in which the module is taught	7
Responsible for the module	Boyko G.F.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 15 hours Practical classes – 22,5 hours

	Laboratory classes– 7,5 hours Self-study – 105 hours
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Mathematics, Basics of Economic Theory
Module objectives/intended learning outcomes	<p>Knowledge: methods of calculating the costs of products produced by energy companies; methodology for calculating investment programs; methods for solving optimization problems; methods for calculating the tariff for energy services;</p> <p>Skills: the student is able to calculate performance indicators of technical solutions; choose the optimal solution for a specific technical problem, assess its accuracy and reliability, use application software packages to perform electricity calculations; choose the sources of funding for a technical solution; calculate indicators of labor and production efficiency; perform technical and economic calculations to determine the cost of energy production and costing of a unit of energy production; draw up a business plan for an energy-efficient project.</p> <p>Competencies: in the calculation of capital investments; determination of production costs and unit cost of production.</p>
Content	The subject and objectives of the course. The main and current assets of the enterprise. Labor resources of the enterprise. Cost of production, pricing and tariffs in the energy sector. Economics of the organization of operation and repair of power equipment. Basics of the economy of energy supply to enterprises. Economics of planning the work of the energy sector of industrial enterprises. Economics of managerial decisions of the energy economy of industrial enterprises. Tax system of the Republic of Kazakhstan and energy enterprises. Project analysis. Technical and economic calculations in the energy sector.
Forms of examination	Exam
Media employed	
Reading list	<ol style="list-style-type: none"> 1) Васильева Н.А., Матеуш Т.А., Миронов М.Г. Экономика предприятия: Конспект лекций. – М.: Высшее образование, 2008. 2) Волкова О.И., Девяткина О.В. Экономика предприятия (фирмы): учебник. – М.: Инфра-М., 2009. 3) Горфинкель В.Я., Швандер В.А. Экономика предприятия. – М.: ЮНИТИ, 2008. 4) Семенова В.М. Экономика предприятия. – М.: Питер, 2008. 5) Волков О.И., Складенко В.К. Экономика предприятия. Курс Lectures. – М.: Инфра-М, 2009

	6) Водяников В.Т. Экономическая оценка проектных решений в энергетике АПК. – М.: Колос, 2008.
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Module designation	Introduction to the Specialty and the Basics of Scientific Research
Courses included in the module	Profession Oriented Course and Scientific Research Basics
Semester(s) in which the module is taught	1
Responsible for the module	Padrul N.M.Dinmukhanbetova A.Zh.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 37.5 hours Self-study – 82.5 hours
Workload	120 hours
Credit points	4 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Physics, Mathematics
Module objectives/intended learning outcomes	Knowledge: specialty profile; the fundamentals of the functioning of the electric power system, its basic elements and principles of work; requirements for electricity supply systems; methods of scientific research; requirements and rules for registration of research work; Skills: the ability to assess the importance of this discipline; develop measures to save electricity; select and analyze the necessary information; formulate the goal and objectives, plan and conduct the experiment, formulate the conclusions of scientific research; Competencies: in carrying out various scientific research in the electric power industry.
Content	Sources of electrical energy. Receivers of electrical energy. Electric lines. Scientific research. Research methodology. Requirements and rules for registration of research work
Forms of examination	Exam
Media employed	
Reading list	1) Монтаж и ремонт электрооборудования электрических сетей. Под ред. Б. Б. Утегулов, А. П. Косогоров, Н. М. Падруль, ПГУ, 2005. 2) Надежность и качество электроэнергии в системах энергосбережения. Под ред. М. Е. Волгин, ПГУ, 2008. 3) Электрические системы и сети. Учебное пособие для студентов по направлению «Электроэнергетика». Под ред. А. В. Лыкин, Логос, 2008. 4) Правила устройства электроустановок. 6-е издание СПбДЕАЕ, 2005.

Module designation	Electrical Material Engineering and Measurements
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Courses included in the module	Electrical Material Engineering and Measurements
Semester(s) in which the module is taught	3
Responsible for the module	Ashimova A.K.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 45 hours Laboratory classes– 15 Self-study – 150 hours
Workload	210 hours
Credit points	7 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Physics, Mathematics, Theoretical Fundamentals of Electrical Engineering
Module objectives/intended learning outcomes	<p>Knowledge: the basic electrophysical phenomena arising in ETM under the influence of electromagnetic fields; classification, their chemical composition, methods for their production and designation, their physico-chemical and electrical properties; the order of the main characteristics and their change from the influence of production factors in the conditions of their work and the advantages and disadvantages of basic materials and their substitutes.</p> <p>Skills: the ability to make available tests, measurements and calculations of the main characteristics of the most common materials and electrical insulation.</p> <p>Competencies: in the basic physical phenomena occurring in materials when electromagnetic fields, the properties of materials, and the technology of production are exposed to them.</p>
Content	Basic concepts. Physical processes in dielectric materials. Electrical insulating materials. Conducting materials. Semiconductor materials. Magnetic materials.
Forms of examination	Exam
Media employed	
Reading list	<p>1) Алиев И.И. Электротехническое материаловедение и изделия. М.: РадиоСофт 2007.- 330 с.</p> <p>2) Ярочкина Г.В. Электроматериало-ведение. М.: Изд. Центр «Академия» 2008. -79 с.</p> <p>3) Кислов А.П., Кислова В.П., Кривко Л.И. Конспект Lectures по дисциплине «Электротехническое материаловедение» для студентов энергетических специальностей / Павлодар, 2007. – 90 с.</p> <p>4) Кислов А.П., Новожилов А.Н., Кислова В.П., Хацевский К.В. Учебно-методическое пособие по</p>

	курсу «Информационно-измерительная техника» для студентов энергетических специальностей / Павлодар, 2003. – 99 с.
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Module designation	Fundamentals of Control Theory and Digital Devices
Courses included in the module	Management Theory and Digital Devices Basics
Semester(s) in which the module is taught	4
Responsible for the module	Zhumadirova A.K., Ashimova A.K.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours Practical classes – 15 hours Laboratory classes – 7,5 hours Self-study – 127.5 hours
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Physics, Mathematics, Computer Science, Theoretical Foundations of Electrical Engineering
Module objectives/intended learning outcomes	<p>Knowledge: analysis and synthesis of ATS; correction methods; principles of the functioning of microprocessor systems; the possibility of improving control systems in the use of micro-computers and single-chip microcontrollers;</p> <p>Skills: the ability to make calculations of methods of stability of transient processes; perform calculations of transient quality methods; select the appropriate digital control system; form an idea of the functions of the digital control system;</p> <p>Competencies: in calculating permissible continuous currents for conductors and apparatus; in the calculations of the thermal stability of bus structures with a different arrangement of conductors; in the calculations of the electrodynamic stability of various bus structures and insulators; structural construction of microprocessor controllers; use and design of modern software products for process control and production.</p>
Content	Description of automatic control systems. Fundamentals of stability and quality of linear systems. Arithmetic bases of digital technology and microprocessor means. Logical fundamentals of digital technology and microprocessor means. Principles of building microprocessor means. Modern single-chip microcontrollers
Forms of examination	Exam
Media employed	
Reading list	1) Бороденко В. А. Практический курс теории

	<p>линейных систем автоматического регулирования. Павлодар 2007г.</p> <p>2) Бороденко В. А. Методические указания к выполнению лабораторного практикума по ТАУ для студентов электроэнергетических специальностей всех форм обучения. Павлодар 2004.</p> <p>3) Новожилов О.П. Основы цифровой техники. – М.: РадиоСофт, 2004.</p> <p>4) Безуглов Д.А., Калиенко И.В. Цифровая техника и микропроцессоры. – Ростов-на-Дону: Феникс, 2008.</p> <p>5) Угрюмов Е.П. Цифровая схемотехника. – СПб.: БВХ-Петербург, 2007.</p> <p>6) Нарышкин А.К. Цифровые устройства и микропроцессоры. – М.: Академия, 2008.</p> <p>7) Ахметов Б.С. Основы схемотехники. Актобе: АГУ им. К. Жубанова, 2005.</p> <p>8) Ашихмин А.С. Цифровая схемотехника. Шаг за шагом. – М.: Диалог МИФИ, 2008.</p> <p>9) Новиков Ю.В. Основы цифровой схемотехники: базовые элементы и схемы. Методы проектирования. – М.: Мир, 2001.</p> <p>10) Медведев Б.Л. Практическое пособие по цифровой схемотехнике. – М.: Мир, 2004.</p>
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Module designation	Mathematical Problems and Computer Modeling in the Electric Power Engineering
Courses included in the module	Mathematical Problems and Computer Modeling in the Electric Power Engineering
Semester(s) in which the module is taught	4
Responsible for the module	Volgin M.E., Mashrapov B.E.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures - 30 hours Practical classes – 22,5 hours Self-study- 127,5 hours
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical Foundations of Electrical Engineering; Mathematics; Physics; Computer Science
Module objectives/intended learning outcomes	<p>Knowledge: a certain mathematical apparatus necessary to solve the engineering problems of the electric power industry, as well as for scientific research;</p> <p>Skills: the ability to mathematically formulate the task and apply the appropriate mathematical apparatus for</p>

	its solution; Competencies: in choosing the optimal parameters of power supply systems, in determining the degree of reliability of electrical systems, in building and researching mathematical models of power facilities.
Content	Mathematical problems in the electric power industry. The application of methods of mathematical programming in the electric power industry. The theory of directed and nondirected graphs. Nonlinear Programming. Dynamic programming. Critical Programming. Application of probability theory and mathematical statistics in electric power problems.
Forms of examination	Exam
Media employed	ICT room
Reading list	<ol style="list-style-type: none"> 1) Волгин М.Е. Математические методы для решения задач электроснабжения. – Павлодар.: ПГУ им. С.Торайгырова, 2008,-130 с. 2) Волгин М.Е. Оптимизационные решения в электроснабжении. – Павлодар.: ПГУ им. С.Торайгырова, 2004, - 201 с. 3) Плис А.И., Сливина Н.А. МATHCAD математический практикум. – М.: Финансы и статистика, 2003, - 656 с. 4) Утегулов Б.Б., Волгин М.Е., Волгина О.С. Математические задачи электроснабжения. - Павлодар.: ПГУ им. С. Торайгырова, 2002, - 152с. 5) Методика и практика технических экспериментов. Учебное пособие для студ. вузов. М.: Академия, 2005.

Module designation	Nonconventional and Renewable Energy Sources
Courses included in the module	Noconventional and renewable energy sources
Semester(s) in which the module is taught	5
Responsible for the module	Padrul N.M., Dinmukhanbetova A.Zh.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 15 (up to 30 students) Self-study – 105 hours (up to 60 students)
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Physics, Introduction to the specialty and the basics of scientific research.
Module objectives/intended learning outcomes	Knowledge: technology of energy production (electric, thermal) based on renewable and nonconventional energy sources; Skills: the ability to be guided in constructive

	performance of the basic devices of transformation of energy; Competencies: in assessing the ecology of unconventional energy sources
Content	Modern methods of obtaining electrical energy. Traditional renewable energy sources. Nonconventional renewable energy sources. Nonconventional non-renewable energy sources. Accumulation of energy. Ecology of unconventional energy sources. Means of transmission of electrical energy
Forms of examination	Exam
Media employed	
Reading list	<p>1) Дукенбаев К.Д., Нуркен Е.И. Энергетика Казахстана. – Алматы. - 2001.</p> <p>2) Тепловые электрические станции: учебник для вузов. /В.Д. Буров, Е.В. Дорохов, Д.П. Елизаров и др.; под ред. В.М. Лавыгина, А.С. Седлова, СВ. Цанева. — 3-е изд., стереот. — М.: Издательский дом МЭИ. - 2009. - 466 с.</p> <p>3) Быстрицкий Г.Ф. Основы энергетики. – М.: Кнорус. - 2011.</p> <p>Дополнительная:</p> <p>4) Сафарбак А.М. Становление и развитие энергетики Павлодарской области.: - Павлодар. - ЭХО. - 2003.</p> <p>5) Кангожин Б., Жармагамбетова Н. Основы электропроизводств. – Астана: ФОЛИАНТ. - 2010.</p> <p>Дукенбаев К.Д. Энергетика Казахстана. - Алматы. - 2002.</p>

Module designation	Electrical Machines
Courses included in the module	Electrical Machines
Semester(s) in which the module is taught	5
Responsible for the module	Ashimova A.K.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures – 22,5 hours (up to 60 students) Practical classes – 15 (up to 30 students) Laboratory classes– 7,5 (up to 15 students) Self-study – 105 hours (up to 60 students)
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Physics, Informatics, Theoretical Foundations of Electrical Engineering

Module objectives/intended learning outcomes	<p>Knowledge: the fundamentals of the theory of electrical machines; general laws of physical processes in electrical machines; physical fundamentals of electromechanical and electrical energy conversion, the device and operation principle of DC electric machines, the electromechanical properties of electric DC and AC motors, the device and principles of construction of electromechanic systems;</p> <p>Skills: the ability to calculate (electromagnetic calculation) the main types of electric machines to acquire practical skills in the implementation and calculation of transformers, asynchronous and synchronous motors.</p> <p>Competencies: in the design and calculation of electrical machines of different types</p>
Content	Transformers. General questions of the theory of alternating current machines. Asynchronous machines. Synchronous machines. DC machines.
Forms of examination	Exam
Media employed	
Reading list	<ol style="list-style-type: none"> 1) Копылов И. П. Электрические машины. М., Высшая школа, 2004. 2) Проектирование электрических машин. Под общей редакцией И. П. Копылова М., Высшая школа, 2005. 3) Проектирование электрических машин. Гольдберг О.Д. М.: Высшая школа, 2001: 4) Копылов И.П., Математическое моделирование электрических машин. М. Высшая школа, 2001. 5) Кацман М.М., Сборник задач по электрическим машинам. М.: Академия, 2003. 6) Испытания, эксплуатация и ремонт электрических машин под ред. Котеленца Н.Ф. М.: Академия, 2003. 7) Кацман М.М., Сборник задач по электрическим машинам. М.: Академия, 2008. 8) Вольдек А.И., Попов В.В., Электрические машины. Введение в электромеханику. Машины постоянного тока и трансформаторы СПб.: Питер, 2008. 9) Куневич А.В., Сидоров И.И., Скорняков С.В. Трансформаторы для бытовой и офисной аппаратуры: справочник М.: Горячая линия – Телеком, 2004. 10) Наурзбаев Б. Х., Воронова З. М. Лабораторный практикум по электрическим машинам и электроприводу: – ПГУ, 2002.

Module designation	Electrical Drive
Courses included in the module	Electrical Drive
Semester(s) in which the module is	5

taught	
Responsible for the module	Markovsky V.P., Dinmukhanbetova A.Zh.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 22,5 hours (up to 60 students) Practical classes – 15 (up to 30 students) Laboratory classes – 7,5 (up to 15 students) Self-study – 105 hours (up to 60 students)
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Electrical Machines
Module objectives/intended learning outcomes	Knowledge: modern methods of analysis and synthesis of electromechanical and power electronic devices. Skills: the ability to operate systems of the automated electric drive and automation; use methods for calculating operating modes and selecting the elements of an automated electric drive. Competencies: in the calculation of the working and mechanical characteristics of the actuator
Content	Electromechanical properties and characteristics of electric motors and mechanisms of the electric drive. Regulation of the coordinates of the electric drive. Dynamics of electromechanical systems. Power and choice of power of electric motors.
Forms of examination	Exam
Media employed	Laboratory stands
Reading list	1) Ковчин С.А., Сабинин Ю.А. Теория электропривода. – СПб.: Энергоатомиздат. Санкт-Петербургское отд-ние, 2000. – 496с. 2) Москаленко В.В. Электрический привод. –М.: Академия, 2004. -416с. 3) Онищенко Г.Б. Электрический привод. М.: Академия- 2008. Драчев Д.И. Теория электропривода. Учебное пособие к курсовому проектированию. Челябинск: ЮУрГУ, 2002.

Module designation	Occupational Health and Safety in Electrical Installations
Courses included in the module	Labour Protection and Safety Measures in Electricity Generating Plants
Semester(s) in which the module is taught	4
Responsible for the module	Seitkazin S.B.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component

Type of teaching, contact hours	Full-time Lectures - 15 hours (up to 60 students) Practical classes – 22,5 hours (up to 30 students) Self-study – 82,5 hours (up to 60 students)
Workload	120 hours
Credit points	4 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical Fundamentals of Electrical Engineering 1,2
Module objectives/intended learning outcomes	Knowledge: the rules of operation techniques, safety rules, fire safety rules, industrial sanitation in electrical installations at the level of electrical personnel of the middle level; Skills: the ability to release the victim from electric current and provide primary medical care. Competencies: in filling out orders, orders for work; making an admission to work and carry out supervision during work in electrical installations up to 1000 V;
Content	Guarantee of workers' rights to safety and labor protection. Rights and duties of the employee and employer in the field of labor safety and protection. Organization of safety and labor protection. Safety regulations for the operation of technical installations. Rules for the technical operation of power plants and networks. Fire safety rules for energy companies. Basic requirements of industrial sanitation.
Forms of examination	Exam
Media employed	
Reading list	1) Закон Республики Казахстан «О безопасности и охране труда» от 28 февраля 2005 года, № 528 – II. 2) «Правила техники безопасности при эксплуатации электроустановок Республики Казахстан», РД 34 РК 03.202 – 04. 3) «Правила технической эксплуатации электрических станций и сетей Республики Казахстан», РД 34.РК.20.501 – 02. 4) «Правила пожарной безопасности для энергетических предприятий Республики Казахстан», РД 34.РКО – 03.301 – 4 (ППБС РК – 19 - 2004). 5) Шапкенов Б.К. Охрана труда и техника безопасности /для энергетиков/. – Павлодар: ЭКО.- 2009.

3 Elective modules for 5B071800 Power engineering

Module designation	Local Electrical Networks
Courses included in the module	Local electrical networks
Semester(s) in which the module is taught	5
Responsible for the module	Volgin M.E.

Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 15 (up to 30 students) Self-study – 105 hours (up to 60 students)
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical foundations of electrical engineering; Mathematical problems of power engineering and computer modeling
Module objectives/intended learning outcomes	Knowledge: replacement schemes for the main elements of the electrical network, the basic techniques and relationships used in determining the parameters of the electric network mode, the entire list of issues related to ensuring the effectiveness of power supply systems; Skills: the ability to perform calculations to determine the modes of the electrical network, evaluate various parameters of voltage quality in the electrical network, select means of voltage regulation in the electric network, calculate and select the optimal electrical network. Competencies: in designing optimal electrical networks
Content	Elements of the electric power system. Practical methods for calculating the operating modes of electrical networks. Regulation of voltage in electrical networks. Problems of designing electrical networks
Forms of examination	Exam
Media employed	
Reading list	<ol style="list-style-type: none"> 1) Лыкин А. В. Электрические системы и сети: учеб. пособие для студ. по направлению "Электроэнергетика". - М.: Логос, 2008. - 253 с. - (Новая университетская библиотека) 2) Правила устройства электроустановок, 6-е изд. - СПб.: ДЕАН, 2005. 3) Железко Ю. С. Расчет, анализ и нормирование потерь электроэнергии в электрических сетях: Руководство для практических расчетов. - М.: ЭНАС, 2008. 4) Электрические системы и сети в примерах и иллюстрациях: Учебное пособие для электроэнергетических специальностей. /Под ред. В. А. Строева. - М.: Высшая школа, 1999. 5) Правила технической эксплуатации электроустановок потребителей. - СПб.: ДЕАН, 2004. 6) Справочник по электрическим сетям 0,4-35 кВ и 110-1150 кВ.: в 6 т. Макаров, Е.Ф. :- М.: Энергия. Т. 2.- 2008.

Module designation	Electric Power Stations and Substations
Courses included in the module	Electric Power Stations and Substations
Semester(s) in which the module is taught	5
Responsible for the module	Padrul N.M., Dinmukhanbetova A.Zh.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 37,5 hours (up to 60 students) Practical classes – 15 (up to 30 students) Laboratory classes– 7,5 (up to 15 students) Self-study – 150 hours (up to 60 students)
Workload	210 hours
Credit points	7 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical fundamentals of electrical engineering
Module objectives/intended learning outcomes	<p>Knowledge: the construction of electrical conductors used in electric stations and substations; basic types of synchronous generators, transformers and autotransformers used at power plants and substations; design of current and voltage measuring transformers; electrical diagrams of stations and substations; schemes for own needs of power plants and substations; design of switchgears.</p> <p>Skills: the ability to apply the acquired knowledge for specific operating conditions of electrical networks for various purposes; select and test electrical conductors and apparatus; select and test the power transformers for overload capacity; develop the main schemes of electrical connections of substations; explain the design of conductors and apparatus; explain the design of switchgears according to the specified electrical diagrams;</p> <p>Competencies: in calculations related to the selection and verification of electrical conductors and apparatus; in the substantiation of variants of schemes of electric network substations; in the technical and economic comparison of substation schemes; in the explanation of the structures of switchgears according to the specified electrical diagrams</p>
Content	General information about the operation of electric power systems. Generators and compensators used in power plants and substations. Power transformers and autotransformers. Constructions, parameters and characteristics of electrical conductors and insulators. Thermal and dynamic resistance of conductors and apparatus. Electrical equipment of switchgears of power stations and substations. Electrical diagrams of power stations and substations. Constructions of switchgears of power stations and substations. Own needs systems of power plants and substations. Control

	of switching devices at power stations and substations
Forms of examination	Exam
Media employed	
Reading list	<p>1) Рожкова Л.Д., Карнеева Л.К., Чиркова Т.В. Электрооборудование электрических станций и подстанций М.: Изд. Центр «Академия» 2004</p> <p>2) Леньков Ю.А., Кургузов Н.Н., Кургузова Л.И. Электрические станции и подстанции: Сборник лабораторных работ.- Павлодар: Изд. ПГУ им. С. Торайгырова, 2003.- 152 с.</p> <p>3) Леньков Ю.А., Хожин Г.Х. Выбор коммутационных аппаратов и токоведущих частей распределительных устройств электрических станций и подстанций.- Павлодар. Изд-во ПГУ, 2003.-211 с.</p> <p>4) Леньков Ю.А. Электрические станции и подстанции. Метод. Указания к курсовому проекту. - Павлодар. Изд-во ПГУ, 2002.- 71 с.</p>

Module designation	Transient Processes in Power Supply Systems
Courses included in the module	Transient processes in power supply systems
Semester(s) in which the module is taught	5,6
Responsible for the module	Govorun V.F., Dinmukhanbetova A.Zh.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 15 (up to 30 students) Laboratory classes– 15 (up to 15 students) Self-study – 127,5 hours (up to 60 students)
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical fundamentals of electrical engineering
Module objectives/intended learning outcomes	<p>Knowledge: the fundamentals of the theory of electromagnetic transients for general design tasks for the selection of equipment in substations and workshops, protection and automation devices, the fundamentals of the theory of load stability in consumer power systems.</p> <p>Skills:the ability to apply methods of calculation of currents of symmetrical and asymmetric short circuits; perform calculations of short-circuit currents in power supply systems for an arbitrary time point, analyze the effect of network parameters on the short-circuit current; develop measures to reduce the levels of short-circuit currents; analyze the causes and the physical essence of the processes of violation of static and dynamic load stability, and also prevent their dangerous consequences in advance; perform load stability calculations.</p>

	Competencies: in performing calculations of the currents of symmetrical and asymmetrical short circuits in power supply systems for an arbitrary time point; the calculation of load stability.
Content	The concept of transient processes with reference to the simplest chains. Practical methods for calculating the short-circuit transient in power supply systems. The main points in the study of asymmetric transient processes, the parameters of elements and the scheme of individual sequences. Single transverse asymmetry. Closures in distribution networks and power supply systems, calculation of short-circuit currents in installations up to 1000 V. Classification of electromechanical transient processes. The main provisions used in the analysis. The notion of static and dynamic stability. Static stability. Characteristics of the power of the simplest system. Dynamic stability. A quantitative estimate of the relative motion of the generator rotor. The rule of the areas when the generator operates on tires of infinite power. Numerical methods for solving nonlinear differential equations of motion of rotors of system generators, the method of successive intervals
Forms of examination	Exam
Media employed	
Reading list	<ol style="list-style-type: none"> 1) Говорун В.Ф. Говорун О.В. Утегулов Б.Б. Переходные процессы в электроэнергетических системах. – Павлодар 2007. 2) Говорун В.Ф. Говорун О.В. Утегулов Б.Б. Электромагнитные переходные процессы в электроэнергетических системах. - Павлодар- 2008. 3) Говорун В.Ф. Говорун О.В. Утегулов Б.Б. Электромагнитные переходные процессы Учебное пособие по мультимедийному лабораторному практикуму.- Павлодар- 2007 4) Говорун В.Ф. Говорун О.В. Утегулов Б.Б. Электромеханические переходные процессы Учебное пособие по мультимедийному лабораторному практикуму. Павлодар- 2007 5) Говорун В.Ф. Переходные процессы в электроэнергетике. Учебное пособие по самостоятельной работе студента. - Павлодар: ЭКО, 2009.

Module designation	Power Supply
Courses included in the module	Power supply
Semester(s) in which the module is taught	6
Responsible for the module	Volgin M.E., Seitkazin S.B.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time

	Lectures – 37,5 hours (up to 60 students) Practical classes – 22,5 (up to 30 students) Laboratory classes– 7,5 (up to 15 students) Self-study – 127,5 hours (up to 60 students)
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical fundamentals of electrical engineering, electrical machines, local electrical networks
Module objectives/intended learning outcomes	<p>Knowledge: characteristics of electric receivers; methods and methods for determining electrical loads; schemes of internal and external power supply; ways to compensate reactive power to improve the quality of electricity; features of electricity supply to industrial, mining and agricultural enterprises; ways of sewerage of the electric power.</p> <p>Skills: the ability to perform calculations and optimize the operation mode of electric receivers, to choose the voltage, number and power of power transformers, build a cartogram and determine the center of electric loads, the cross section of electrical conductors and the electric power supply scheme.</p> <p>Competencies: in the calculation of power supply systems for various enterprises.</p>
Content	Receivers of electricity. Electrical loads. Selection of cross-sections of wires, busbars and cables. Shop electrical networks. Voltage selection. Selection of the number and power of power transformers. Schemes of power supply and distribution. Reactive power compensation. The quality of electricity. Special issues of electricity supply.
Forms of examination	Exam
Media employed	
Reading list	<ol style="list-style-type: none"> 1) Ю.Д. Сибикин, М.Ю. Сибикин, В.А. Яшков. Электроснабжение промышленных предприятий и установок. - М.: Академия, 2004 2) Б.И. Кудрин Электроснабжение промышленных предприятий. -М.: Интремет Инжинеринг, 2007 3) Ф.К. Бойко, Е.В. Птицына. Характеристика электропотребления.- Павлодар: ЭКО,2005 4) Ю. Д. Сибикин, М.Ю.Сибикин. Электробезопасность при эксплуатации электроустановок промышленных предприятий: учебник.- М.:Академия,2004 5) Расчет и проектирование схем электроснабжения. Методическое пособие для курсового проектирования:учебное пособие. В.П.Шеховцов.- М. : ФОРУМ- ИНФРА- М, 2008.- 213с.- (Профессиональное образование)

Module designation	Overvoltage and Insulation in Power Supply Systems
Courses included in the module	Overvoltage and insulation in power supply systems
Semester(s) in which the module is taught	6
Responsible for the module	Padrul N.M.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 15 (up to 30 students) Self-study – 105 hours (up to 60 students)
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical fundamentals of electrical engineering, Electrical material engineering and measurements
Module objectives/intended learning outcomes	<p>Knowledge: the main operational characteristics of the insulation of the power plant; physics of atmospheric and switching overvoltage processes; methods of protecting various electrical equipment against external and internal overvoltages; methods of preventive insulation tests.</p> <p>Skills: the ability to apply the methods of preventive tests for a concrete isolation and to assess its state according to their results; select protective devices against external and internal overvoltages.</p> <p>Competencies: in the selection and operation of protective devices against external and internal overvoltages.</p>
Content	General characteristics of the course. Basic concepts and definitions. The role of isolation in power plants. Basic properties and electrical characteristics of external insulation. Basic concepts of streamer theory in gases. Discharge in the air gap with lightning and switching pulses. General properties of internal insulation. Insulation control. External overvoltage. The mode of operation of neutral electrical networks. Internal overvoltage.
Forms of examination	Exam
Media employed	
Reading list	<ol style="list-style-type: none"> 1) Кадомская, К.П. Перенапряжения в электрических сетях различного назначения и защита от них/К.П. Кадомская, Ю.А.Лавров, А.А. Рейхердт.- Новосибирск: НГТУ, 2004. 2) Правила устройства электроустановок. СПб. Изд-во: ДЕАН, - 2001. 3) Попов А.И., Алиев И. Электротехнический справочник. Изд-во МЭИ: - 2004. 4) Сибикин Ю.Д. Электроснабжение промышленных предприятий и установок. – М.: Высшая школа, 2001.

Module designation	Electrotechnological Industrial Installations
Courses included in the module	Electrotechnological Full-scale Plants
Semester(s) in which the module is taught	7
Responsible for the module	Zakharov I.V., Seitkazin S.B.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 7,5 (up to 30 students) Laboratory classes– 7,5 hours Self-study – 105 hours (up to 60 students)
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Mathematics, theoretical fundamentals of electrical engineering, electrical machines
Module objectives/intended learning outcomes	Knowledge: the purpose of various electrical furnaces and installations, the scope of their application, design, operation principle, basic technical parameters. Skills: the ability to choose types of electrotechnological devices and to calculate their basic parameters at the analysis and introduction of design decisions; to diagnose the results of electrotechnological processes on the basic parameters of the products obtained. Competencies: in the implementation of automated control of the operating modes of the electrical furnaces and installations
Content	Electric resistance furnaces Induction furnaces and installations, installations of dielectric heating. Arc electric furnaces and installations. Installations of electric welding. Electrolysis plants. Processing of materials by a light beam. Electrical gas cleaning
Forms of examination	Exam
Media employed	Educational films
Reading list	1) Утегулов Б.Б., Захаров И.В., Ижилова А.Д. Специальные вопросы электротехнологии. – Павлодар: ТОО НПФ ЭКО, 2009 2) Электротехнологические промышленные установки.: Учебник для вузов /И.П.Евтюкова, Л.С.Кацевич, Н.Н. Некрасов, А.Д. Свенчанский: Ред. А.Д. Свенчанский. М.: Энергоиздат, 1982. 3) Болотов А.В., Шепель Г.А. Электротехнологические установки: Учеб. для вузов по спец. "Электроснабжение пром. предприятий". М.: Высшая школа, 1988. 4) Электротермическое оборудование: Справочник/ Под общ. ред. А.П.Альтгаузена. – М.: Энергия, 1980. 5) Электрооборудование и автоматика

	<p>электротермических установок: Справочник/ А.П.Альтгаузен, И.М.Бершицкий, М.Д.Бершицкий. – М.: Энергия, 1987.</p> <p>6) Установки индукционного нагрева: Учебное пособие для вузов/ А.Е. Слухоцкий, В.С. Немков, Н.А. Павлов, А.В. Бамунэр; Под ред. А.Е. Слухоцкого. – Л.: Энергоиздат, 1981. – 328 с.</p> <p>7) Автоматическое управление электротермическими установками: Учебник для вузов/ А.М. Кручинин, К.М. Махмудов, Ю.М. Миронов, и др.; Под ред. А.Д. Свенчанского. – М.: Энергоатом издат, 1990. – 416 с.</p>
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Module designation	Relay Protection and Automation in Power Supply Systems
Courses included in the module	Relay protection and automation in power supply systems
Semester(s) in which the module is taught	7
Responsible for the module	Mashrapov B.E.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 7,5 (up to 30 students) Laboratory classes– 7,5 (up to 15 students) Self-study – 105 hours (up to 60 students)
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Electric machines, transients in power supply systems
Module objectives/intended learning outcomes	<p>Knowledge: the principles of the implementation of relay protection and automation of power supply systems, their element base.</p> <p>Skills: the ability to calculate the settings of relay protection elements of the power supply system;</p> <p>Competencies: in carrying out laboratory tests of relay protection devices and automation of power supply systems.</p>
Content	<p>Selection of the principles of relay protection.</p> <p>Calculation of short-circuit currents and self-starting currents for RZA purposes</p> <p>Выбор принципов релейных защит. Расчет токов короткого замыкания и токов самозапуска для целей РЗА</p> <p>Calculation of relay protection settings against multiphase short circuits. Development of the layout and selectivity map of relay protection. Development of the circuit diagram of the relay protection of the power supply system element</p>

Forms of examination	Exam
Media employed	
Reading list	<p>1) Андреев В.А. Релейная защита и автоматика систем электроснабжения: Учебник для ВУЗов. – М.: Высшая школа, 2006.</p> <p>2) Андреев В.А. Релейная защита систем электроснабжения в примерах и задачах: Учебное пособие для ВУЗов. – М.: Высшая школа, 2008.</p> <p>3) Киреева Э.А. Релейная защита и автоматика электроэнергетических систем: Учебник для ССУЗов/ Э.А. Киреева, С.А. Цырук. – М.: Издательский центр «Академия», 2010.</p> <p>4) Правила устройства электроустановок Республики Казахстан. – Астана: Мин-во энергетики и минеральных ресурсов Республики Казахстан, 2003.</p> <p>5) Басс Э.И., Дорогунцев В.Г. Релейная защита электроэнергетических систем: Учебное пособие для ВУЗов/ Под ред. А.Ф.Дьякова. – М.: Изд-во МЭИ, 2002.</p> <p>6) Шабад М.А. Расчеты релейной защиты и автоматике распределительных сетей. – С-Пб.: Изд-во ПЭиПК, 2003.</p>

Module designation	Design of In-house Power Supply and Electric Lighting Base
Courses included in the module	Intrashop Electric Power Supply Design and the basics of Electric Light
Semester(s) in which the module is taught	6
Responsible for the module	Volgin M.E., Seitkazin S.B.
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 30 (up to 30 students) Self-study – 150 hours (up to 60 students)
Workload	210 hours
Credit points	7 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Physics, Theoretical fundamentals of electrical engineering, Electrical material engineering and measurements
Module objectives/intended learning outcomes	Knowledge: methods for calculating electrical loads in 0.4 kV networks; constructive execution of the in-plant networks; schemes of power supply and distribution of electricity with a voltage of 0.4 kV; energy characteristics of common industrial light sources; principles of rational construction of lighting and power supply systems for lighting installations of industrial premises;

	<p>Skills: the ability to: choose and calculate intra-shop schemes of electricity supply with a voltage of 0.4 kV; make a choice of low-voltage switchgear and control equipment, as well as network conductors; carry out the calculation of lighting methods of specific power, using the coefficient of use, point method.</p> <p>Competencies: in the calculations of electrical loads of low-voltage power networks of shops of an industrial enterprise and lighting network of industrial premises.</p>
Content	<p>Introduction. Industrial electrical networks: purpose, features, composition of electricity consumers. Calculations in the projects of guild networks. Methods for determining the design electric loads in the design of workshop networks. Schemes of in-plant networks. In-plant networks with voltage up to 1kV. Lighting engineering part of lighting installations. Rules and norms of artificial lighting. Light sources and lighting devices. Power supply of lighting installations. Registration of design developments.</p>
Forms of examination	Exam
Media employed	
Reading list	<p>1) Алиев И.И. Электротехнический справочник в 4-х томах. М.: Радиософт, 2004.</p> <p>2) Ю.Д. Сибикин, М.Ю. Сибикин, В.А. Яшков. Электроснабжение промышленных предприятий и установок. -М.:Академия, 2004. - 476 с.</p> <p>3) Б.И. Кудрин. Электроснабжение промышленных предприятий. - М.: Интремент Инжинеринг, 2007.-464 с.</p> <p>4) Правила устройства электроустановок. СПб: Издательство ДЕАН, 2001-2006. - 928с.</p>

Module designation	Fundamentals of the Theory of Electrical Apparatus
Courses included in the module	Fundamentals of the theory of electrical apparatus
Semester(s) in which the module is taught	6
Responsible for the module	Zakharov I.V., Seitkazin S.B
Language	Russian, Kazakh
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 22,5 (up to 30 students) Self-study – 127,5 hours
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical fundamentals of electrical engineering
Module objectives/intended learning outcomes	Knowledge: the appointment of various electrical apparatus, the scope of their application, design, operation

	<p>principle, basic technical parameters.</p> <p>Skills: the ability to recharge the replaceable fuse links of fuses; connect the motor to the mains; control it with the help of a contactor, a starter; make small repairs of electrical apparatus;</p> <p>Competencies: in changing fuse links of fuses; revision of contact systems of starters and contacts; maintenance and replacement of trip units of circuit breakers.</p>
Content	<p>Theory of commutation of electrical apparatus (EA). Heating of the EA. Thermal regimes of EA. The theory of electrical contacts. Theory of electromagnets. Isolation of EA. EA management. Starting regulating EA. Switching EA. Monitoring EA. Non-contact EA.</p>
Forms of examination	Exam
Media employed	Educational films
Reading list	<p>1) Чунихин А.А. Электрические аппараты. - М.: Альянс, 2008.</p> <p>2) Алиев И.И. Электрические аппараты. Справочник 4. – М.: Радиософт, 2005.</p> <p>3) Алиев И.И. Электрические аппараты. Справочник. – М.: Радиософт, 2007.</p>

Module designation	Installation, Adjustment and Operation of Power Plants
Courses included in the module	Installation, adjustment and operation of power plants
Semester(s) in which the module is taught	7
Responsible for the module	Volgin M.E.
Language	Russian, Kazakh
Relation to curriculum	EP – Power engineering Optional component
Type of teaching, contact hours	<p>Full-time</p> <p>Lectures –30 hours (up to 60 students)</p> <p>Practical classes – 30 (up to 30 students)</p> <p>Self-study – 150 hours</p>
Workload	210 hours
Credit points	7 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	electric machines; transitional processes; Local electrical networks; Power supply; Relay protection and automation in power supply systems.
Module objectives/intended learning outcomes	<p>Knowledge: technical and organizational issues of installation, adjustment and operation of electrical installations of industrial enterprises;</p> <p>Skills: to choose power electrical equipment and control schemes of electrical installations.</p> <p>Competencies: the choice, installation, adjustment and operation of electrical installations of industrial enterprises.</p>
Content	Characteristics of the discipline, its place in the learning process. General information about the

	electrical equipment of industrial enterprises. Electrical equipment of general industrial installations (pumps, compressors, flow-transport systems, lifting mechanisms) and their control schemes. Electrical equipment in explosive and fire hazardous areas. General questions of the organization of electrical installation works, installation of air and cable lines, installation of transformer substations. Organization of commissioning works, adjustment of electrical equipment of substations, Machines, switching equipment up to and above 1 kV. Organization of the operation of the electric power industry, maintenance of the electric power industry
Forms of examination	Exam
Media employed	
Reading list	<p>1) Правила устройства электроустановок. – СПб.: Издательство ДЕАН, 2001. – 928 с.</p> <p>2) Сибикин Ю.Д. Электроснабжение промышленных предприятий и установок. – М.: Высш. шк., 2001. – 336.</p> <p>3) Соколов Б.А., Соколова Н.Б. Монтаж электрических установок. – М.: Энергоатомиздат, 1991.</p> <p>4) Электротехнический справочник в 4-х томах. /Под общ. ред. профессоров МЭИ В.Г. Герасимова и др. (гл. ред. А.И. Попов). – 9-е изд., стер. – М.: Издательство МЭИ, 2004. – 696 с.</p>

Module designation	Design of Power Supply Systems by Industry
Courses included in the module	Sectional Electric Power Supply Systems Designing
Semester(s) in which the module is taught	7
Responsible for the module	Volgin M.E., Shapkenov B.K.
Language	Russian, Kazakh
Relation to curriculum	EP – Power engineering Optional component
Type of teaching, contact hours	Full-time Lectures –30 hours (up to 60 students) Practical classes – 37,5 (up to 30 students) Self-study– 172,5 hours (up to 60 students)
Workload	240 hours
Credit points	8 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Theoretical fundamentals of electrical engineering, mathematical problems and computer modeling in the electric power industry, transients in power supply systems
Module objectives/intended learning outcomes	Knowledge: modern methods of calculating electrical loads at all levels of the power supply system of industrial enterprises; constructive design of supply and distribution networks and substations; power supply and distribution

	<p>schemes; principles of building optimal power supply systems for industrial enterprises.</p> <p>Skills: to make a choice and check of an electric equipment and devices of distributive devices of electroinstallations of the industrial enterprises, and also conductors of a network; calculate short-circuit currents for the purpose of selecting and testing electrical equipment and relay protection devices; determine technical and economic indicators of power supply system options</p> <p>Competencies: the ability to perform calculations of electrical loads at all levels of the power supply system of an industrial enterprise; select and calculate power supply and distribution schemes</p>
Content	<p>Basic regulatory documents for the design of electrical installations. Electrical loads of enterprises, calculation methods. Design of an external power supply system based on technical and economic assessments of options. Designing a system of internal power supply based on technical and economic assessments of options. Design of reactive power compensation. Registration of design developments</p>
Forms of examination	Exam
Media employed	
Reading list	<p>1) Правила устройства электроустановок. - СПб.: Издательство ДЕАН, 2001.- 928 с.</p> <p>2) Сибикин Ю.Д. Электроснабжение промышленных предприятий и установок. - М.: Высш. шк., 2001. - 336 с.</p> <p>3) Электротехнический справочник в 4-х томах. Т2 /Под общ. ред. профессоров МЭИ В.Г. Герасимова и др. (гл. ред. А.И. Попов). - 9-е изд., стер. - М.: Издательство МЭИ, 2004. - 696 с.</p>

Additional education services

Module designation	Physical Training
Courses included in the module	Physical training
Semester(s) in which the module is taught	1, 2, 3, 4
Responsible for the module	
Language	Russian, Kazakh
Relation to curriculum	EP – Power engineering Compulsory component
Type of teaching, contact hours	Full-time Lectures -30 hours Practical classes – 75 hours Self-study - 255 hours
Workload	360 hours
Credit points	12 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	

Module objectives/intended learning outcomes	<p>Knowledge: the fundamentals of theory and techniques of physical culture and sports; features of the body's reactions to various modes of physical activity and performance; the most significant psychophysical and functional indicators affecting professional activity and basic forms, ways and methods of their regulation; hygienic basis of health management; the basis of a healthy lifestyle for a student; prevention of occupational diseases; system of natural-science, psychological-pedagogical, special knowledge of physical culture, as well as the formation of knowledge and skills for self-control.</p> <p>Skills: to use means and methods of physical culture and sports to maintain special, professional performance, health and prevention of occupational diseases; plan, monitor and manage physical and functional preparedness; make complexes of morning hygienic gymnastics; conduct testing of the level of development of basic physical qualities and evaluate physical fitness; organize and conduct competitions in the main sports and judge them; develop sets of exercises aimed at the development of a certain physical quality (on the instructions of the teacher); make an individual program of health improvement.</p> <p>Competencies: theories and methods of physical culture and sports; the peculiarities of the body's reactions to various modes of physical activity.</p>
Content	Fundamentals of theory and techniques of physical culture and sports; features of the body's reactions to various modes of physical activity and performance; the most significant psychophysical and functional indicators affecting professional activity and basic forms, ways and methods of their regulation; hygienic basis of health management; the basis of a healthy lifestyle for a student; prevention of occupational diseases; system of natural-science, psychological-pedagogical, special knowledge of physical culture, as well as the formation of knowledge and skills for self-control.
Forms of examination	Grading test
Media employed	Electronic teaching aids: Slide-lectures, presentations Technical training means: projector, electronic board, laptop
Reading list	

Module designation	Internship
Courses included in the module	Educational internship Work experience internship Pre-graduation intership
Semester(s) in which the module is taught	2, 4, 6, 8
Responsible for the module	Volgin M.E.

Language	Russian, Kazakh
Relation to curriculum	EP – Power engineering Compulsory component semesters- 2, 4, 6, 8
Type of teaching, contact hours	Full-time
Workload	18,5 weeks
Credit points	23 ECTS
Requirements according to the examination procedure	
Recommended prerequisites	
Module objectives/intended learning outcomes	<p>A student in the internship must:</p> <ul style="list-style-type: none"> - fully implement the program of internship, keep an internship diary in accordance with the form established by the higher educational institution; submit a written report on the performance of all tasks, a diary signed by the supervisor due to the prescribed form. - obey the rules of internal regulations, acting on the relevant practice base; - to study and strictly observe the rules of labor protection, safety engineering and industrial sanitation; - to submit a written report, a diary, signed by the supervisor of the internship base on the fulfillment of all tasks, to the supervisor of internship in accordance with the established form. <p>Competencies: in matters of safety regulations, rules of technical operation, rules for the installation of power plants, main and auxiliary equipment; in the issues of systems of technical operation of power equipment; in matters of technical operation of power equipment; new technologies used in the enterprise.</p>
Content	<p>The purpose of the educational internship is to acquaint students in the specialty 5B071800 - Electric Power Engineering with the laboratories of the Department "Power Engineering", as well as the types, functions and tasks of future professional activity.</p> <p>The study of the functional structure of the electric power plant (electrical installation), the technical characteristics of equipment, instrumentation and measurement methods for the main parameters of electrical equipment of normative and technical documentation for the design and operation of electrical equipment, technical solutions for the requirements of the uninterrupted functioning of electrical equipment, life safety issues in electrical installations.</p> <p>The places of the educational internship are the laboratories of the Department of Power Engineering.</p> <p>The purpose of the work experience internship is the consolidation of key competences, acquisition of practical skills and experience of professional activities in the field of study.</p>

	<p>The places of the work experience internship are the organizations corresponding to the profile of the trainee's specialty (or related organizations).</p> <p>To prepare and write a diploma paper (project), an educational and professional program provides a pre-graduation internship</p> <p>The content of the pre-graduation internship is determined by the topic of the diploma thesis (project).</p> <p>During the pre-graduation internship, the student collects the actual material on the professional activities of the relevant practice base, practical material on the topic of the diploma thesis (project). The results of the internship are used to write a diploma thesis (project) and are drawn up accordingly.</p>
Forms of examination	Presentation of a report
Media employed	
Reading list	

Module designation	Final State Certification
Courses included in the module	State examination in speciality Preparation and presentation of the diploma thesis (project)
Semester(s) in which the module is taught	8 semester
Responsible for the module	
Language	Russian, Kazakh
Relation to curriculum	8 semester
Type of teaching, contact hours	
Workload	
Credit points	12 ECST
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Mathematics, Physics, Theoretical Fundamentals of Electrical Engineering and Electronics, Economics of Industry, Engineering and Computer Graphics, Electrical Material Engineering and Measurements, Design of Power Supply Systems by Industry
Module objectives/intended learning outcomes	<p>Reflection of the modern scientific-theoretical and practical level of research of the problems under consideration, conducted by scientists, analysts, practitioners;</p> <p>Ensuring a focus on achieving concrete, practically meaningful results;</p> <p>Presence of independent approaches to the solution of tasks, own assessments and conclusions;</p> <p>Reflection of reliable data, realistic results of conducted studies and own reasoned recommendations, the use of which provides the solution of a specific problem;</p> <p>Providing a complete, logical, consistent, clear and concise presentation of the material;</p>

	Ensuring compliance with the norms of the literary language and the rules for processing written scientific works.
Content	Preparation and presentation of the diploma thesis (project)
Forms of examination	Diploma thesis (project)
Media employed	
Reading list	

PAVLODAR STATE UNIVERSITY NAMED AFTER S. TORAIGHYROV



MODULE HANDBOOK

of specialty **6M071800 «ELECTRICAL POWER ENGINEERING»**



Akkreditierungsagentur für Studiengänge der Ingenieurwissenschaften, der Informatik, der Naturwissenschaften und der Mathematik e.V.

Pavlodar, 2017

MODULE REFERENCE BOOK

1 General compulsory modules

Module designation	Theory and Practice of Scientific Research
Courses included in the module	History and Philosophy of Science Foreign language (professional)
Semester(s) in which the module is taught	1,2
Responsible for the module	Nevmerzhitsky S.V. Zhumazhanov S.K Zeynulina A.F.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Lectures 15 Practical classes – 45 Self-study – 150
Workload	210 hours
Credit points	7 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	English, Philosophy, History of Kazakhstan
Module objectives/intended learning outcomes	<p>Knowledge: the methodology of scientific knowledge; principles and structure of the organization of scientific activity.</p> <p>Skills: the ability to use the acquired knowledge for the original development and application of ideas in the context of scientific research; critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena; integrate the knowledge gained in different disciplines to solve research problems in new unfamiliar conditions; by integrating knowledge to make judgments and make decisions based on incomplete or limited information; be fluent in a foreign language at a professional level, allowing to conduct research and carry out teaching of special subjects in universities.</p> <p>Competencies: in the field of scientific research methodology.</p>
Content	<p>Philosophy and methodology of science as a branch of knowledge. Science in culture and civilization. The origin of science. The main stages of the historical dynamics of science. Structure of scientific knowledge. Scientific revolutions. Scientific rationality. Features of the modern stage of science. Science as a social institution. Natural sciences in the structure of modern scientific knowledge. Informatics as interdisciplinary science. Epistemological content of the computer revolution. History of the formation of the sciences of society, culture, history and man. Philosophical problems of pedagogy and philosophy of education. Philosophical problems of specific sciences.</p>

Forms of examination	Exam
Media employed	Multimedia class (computers with columns and headphones), electronic dictionaries, textbooks. Media: projector, laptop
Reading list	<p>1) Мессер, А. Введение в теорию познания.- Изд. 2-е, стер.-М.:КомКнига. Введение в теорию познания.-2007.-184 с..-(Из наследия мировой философской мысли: теория познания)</p> <p>2) Бердяев, Н. Самопознание.- М.:ЭКСМО. Самопознание.-2008.-639 с..-(Антология мысли)</p> <p>3) Тарасов, Ю. Н. Философские проблемы социально-гуманитарных наук:учеб. пособие для аспирантов.- Воронеж:[б.и.]. Философские проблемы социально-гуманитарных наук.- 2008.-208 с.</p> <p>4) Л. Дуйсенбекова Іс қағаздарын қазақша жүргізу. Алматы; Ана тілі, 2004.</p> <p>5) А.М. Акаев, В.П. Марковский, Л.И. Кургузова, М.М. Кабдуалиева, Н.Н. Кургузов, О.М. Талипов, Ю.А. Ленъков. Русско – казахский толковый словарь «Энергетика». Издательство “ЭКО”, 2010.</p> <p>6) Атабекян И.П. Английский для технических вузов. Изд.8. – Ростов на Дону: Феникс, 2007. – 350 с.</p> <p>7) Атабекян И.П. Английский для технических вузов. Изд.11. – Ростов на Дону: Феникс, 2008. – 250 с.</p> <p>8) Атабекян И.П. Английский для инженеров. – Ростов на Дону: Феникс, 2011. – 318 с.</p>

Module designation	Multilingual teaching
Courses included in the module	Business Kazakh
Semester(s) in which the module is taught	3
Responsible for the module	Zeynulina A.F.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Practical classes – 37,5 Self-study – 82,5
Workload	120 hours
Credit points	4 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Kazakh, Business Kazakh
Module objectives/intended learning outcomes	Knowledge of all kinds of sentences in the Kazakh language. Skills: the ability to convey their thoughts in the state language.

	Competencies: conducting business papers in the official language, signing a contract
Content	The course aims to deepen knowledge of the Kazakh language and further develop the professional orientation of speech of undergraduates, contribute to the development of skills of using the designs most typical for scientific and publicistic styles, the acquisition of skills of exchange of thoughts in the Kazakh language in the business sphere.
Forms of examination	Exam
Media employed	-
Reading list	<ol style="list-style-type: none"> 1) Н.Қ. Мухамадиева. Іскерлік қазақ тілі. Астана: «Фолиант», 2007. 2) Ақанова Д.Х., Алдашева А.М., т.б . Ресми-іскерлік қазақ тілі. Арман, 2002ж. 3) Скала В.И. (авторлық жинақ). Қазақстан Республикасында іс қағаздарын жүргізу. Алматы, 2005. 4) Г.М. Нұрғожина, Ф.М. Әбілқасов, Ш.А. Жетпісбай. Қазақ мәдениеті (Қазақ тіліне арналған мәтіндер жинағы). ҚарМТУ, 2003. 5) Бектұров Ш.К., Бектұрова А.Ш. Ана тілі деңгейінде үйрету құралы. Оқулықтық басылым Алматы: «Әділет» ЖҚМ. 2002. 6) Д.Х. Аханова, А.М. Алдашева, З.Қ. Ахметжанова, Қ.Қ. Қадашева, Э.Д. Сүлейменова. Ресми-іскери қазақ тілі. «Арман-ПВ», 2002. 1-2 кітап. 7) Дүйсенбекова Л. Іс қағаздарын қазақша жүргізу. Алматы: Ана тілі, ЖШС, 2000.

Module designation	The Foundations of Tertiary Education
Courses included in the module	Psychology Pedagogy Methods of Teaching Electrical Engineering Disciplines
Semester(s) in which the module is taught	1
Responsible for the module	Burdina E.I. Lenkov Yu.A.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Lectures 75 Practical classes –45 Self-study – 270
Workload	390 hours
Credit points	13 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"

Recommended prerequisites	Philosophy, Sociology, Culturology, Politology
Module objectives/intended learning outcomes	<p>Knowledge of the psychology of cognitive activity of students in the learning process; psychological methods and means of increasing the effectiveness and quality of education.</p> <p>Skills: the ability to apply knowledge of pedagogy and psychology of the higher school in the pedagogical activity; apply interactive teaching methods.</p> <p>Competencies: in the field of scientific and scientific-pedagogical activity in higher educational institutions; In the issues of modern educational technologies.</p>
Content	<p>Theoretical-methodological and historical bases of pedagogy. Development of higher education in the modern world</p> <p>Theory of education in higher education (didactics). Modern approaches to the content of higher education. Forms and methods of teaching in higher education. Educational work in higher education. Psychological counseling of students and teachers. Methods of psychological research. Psychology of student age. Social psychology of the student collective. Psychology of pedagogical communication. Psychology of pedagogical activity of a teacher of higher education</p> <p>Psychology of the pedagogical collective.</p> <p>Psychological counseling of students and teachers</p> <p>Theoretical</p>
Forms of examination	Exam
Media employed	-
Reading list	<ol style="list-style-type: none"> 1) Концепция непрерывного педагогического образования педагога новой формации Республики Казахстан. – Алматы, 2005 С. 5 2) Концепция высшего педагогического образования Республики Казахстан. – Алматы, 2005 С.2 3) Законодательство об образовании в Республике Казахстан. – Алматы: Юрист, 2006. – 209с. 4) Закон об образовании Республики Казахстан. 2007 5) Послание Президента Республики Казахстан народу Казахстана, от 22 февраля 2007 г. «Новый Казахстан в новом мире»

2. Deepening of special knowledge (specialization)

2.1 Compulsory modules in the specialty

Module designation	Innovative Technologies of Science and Technology
Courses included in the module	Innovative Technologies of Science and Technology
Semester(s) in which the module is taught	3

Responsible for the module	Zhumadirova A.K.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	Lectures 30 Practical classes –22,5 Self-study – 127,5
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	
Module objectives/intended learning outcomes	<p>Knowledge of the principles of the operation of network systems, the issues of increasing the reliability and efficiency of energy supply, reducing the negative environmental impact, introducing energy-saving products and technologies into production and life, the theoretical foundations for converting the energy of renewable energy resources, modern means and technologies for energy inspection and energy audit, the ideology of systemic and Interdisciplinary approach to problem solving.</p> <p>Skills: the ability to apply innovative technologies in various industrial branches and spheres of a science and technics</p> <p>Competencies: work with modern local and global computer networks.</p>
Content	Theoretical foundations of innovative research. Basic stages and characteristics of the innovation process. Features of the reproduction of innovations abroad. Innovative activity is a factor of energy saving at the enterprises.
Forms of examination	Exam
Media employed	-
Reading list	<ol style="list-style-type: none"> 1) Сулейменов Е.З. Инновационная деятельность в РК. Алматы: НЦ НТИ РК, -2006. 2) Барышева И.М. Инновационный менеджмент. М.: Дашков и К, - 2009. 3) Фатхутдинов Р.А. Инновационный менеджмент. Учебное пособие - СПб.: Питер, 2004. 4) Гамидов Г.С., Колосов В.Г., Османов Н.О. Основы инноватики и инновационной деятельности. – СПб.: Политехника, 2000 – 323 с. 5) Лобачева Е.Н. Научно-технический прогресс: Учебное пособие. – М.: Издательство: «Экзамен», 2004. – 192 с. 6) Кокурин И.Д. Инновационная деятельность, М.: Экзамене - 2001. 7) Ильдеменов С.В., Ильдеменов А.С.,

	Воробьев В.П. Инновационный менеджмент. – М.: ИНФРА-М, 2002.
Module designation	Methodology of Science and Methods of Scientific Research and Scientific and Technical Problems of Electric Power Engineering
Courses included in the module	Methodology of Science and Methods of Scientific Research and Scientific and Technical Problems of Electric Power Engineering
Semester(s) in which the module is taught	1,2
Responsible for the module	Zhumadirova A.K.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component Scientific and Technical Problems of Electric Power Engineering Methodology of science and methods of scientific research Optional component
Type of teaching, contact hours	Lectures 67,5 Practical –15 Self-study – 187,5
Workload	270 hours
Credit points	9 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	
Module objectives/intended learning outcomes	<p>Knowledge of the basic concepts of the course: method, methodology, objective, subjective, fundamental research, applied research, scientific principle, philosophical methods, general scientific methods, private scientific methods, disciplinary methods, interdisciplinary methods, abstraction, idealization, thought experiment, formalization, induction, deduction , analysis, synthesis, analogy, modeling; method of single similarity, method of single difference, method of accompanying changes, method of residues, observation, experiment, intuition, controversy;</p> <p>Skills: the ability to distinguish different types of methods of scientific research in the course of scientific analysis; use scientific methods in the process of working on any research; apply the knowledge of the theory of science about the methods of scientific research in the performance of any scientific work;</p> <p>Competencies: in finding and extracting the necessary information in the preparation of scientific research;the definition of the types of methods of scientific research, applied in one or another type of activity.</p>

Content	General problems of the world electric power industry at the present stage. Problems of increasing the efficiency of electrical systems and systems at the stage of electricity production. Problems increasing the efficiency of electrical systems and systems at the stage of transmission and consumption of electricity
Forms of examination	Exam
Media employed	-
Reading list	<ol style="list-style-type: none"> 1) Сиденко В. М., Грушко И. М. Основы научных исследований. – Харьков, 1979. 2) Василенко П.М., Погорельый Л.В. Основы научных исследований. – Киев: Выща шк., 1985. 3) Основы научных исследований: учеб. для техн. вузов / В.И. Крутов [и др.]; под ред. В.И. Крутова, В.В. Попова. - М., 1989. 4) Козлов А.В. и др. Основы научных исследований: учеб. пособие / А В. Козлов. – Челябинск, 1997. 5) Сабитов Р.А. Основы научных исследований: учеб. пособие / Р.А. Сабитов. – Челябинск, 2002. 6) Фрумкин Р.А, Михеев О.В. Основы научных исследований: учебное пособие для студентов / Р.А. Фрумкин. М: МГИ, 1990, - 144 с. 7) Рузавин Г.И. Методы научного исследования. М., 1974. 8) Степин В.С., Елсуков А.Н. Методы научного познания. Минск, 1979. 9) Деденко Л.Г., Керженцев В.В. Математическая обработка и оформление результатов эксперимента. – М.: Наука, 1977. 10) Зажигаяев Л.С., Кищвян А.А., Романиков Ю.И. Методы планирования и обработки результатов физического эксперимента. – М.: Атомиздат, 1978. 11) Адлер Ю.П., Меркова Е.В., Грановский Ю.В. Планирование эксперимента при поиске оптимальных условий. – М.: Наука, 1971.

2.2 Optional component

Module designation	DT and Microcontrollers of Management / Mathematical Models in Electric Power Industry
Courses included in the module	DT and Microcontrollers of Management / Mathematical Models in Electric Power Industry
Semester(s) in which the module is taught	3
Responsible for the module	Zhumadirova A.K.
Language	Russian

Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Lectures 30 Practical classes –15 Self-study – 105
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Informatics, Fundamentals of Control Theory and Digital Devices
Module objectives/intended learning outcomes	Knowledge of the principles of the functioning of microprocessor systems; the possibility of improving control systems in the use of micro-computers and single-chip microcontrollers; Skills: the ability to choose the suitable digital control system; form an idea of the functions of the digital control system; Competencies: when using and designing modern software products for process control and production.
Content	Arithmetic bases of digital technology and microprocessor means. Logical fundamentals of digital technology and microprocessor means. Principles of building microprocessor means. Modern single-chip microcontrollers
Forms of examination	Exam
Media employed	-
Reading list	<ol style="list-style-type: none"> 1) Новожилов О.П. Основы цифровой техники. – М.: РадиоСофт, 2004. 2) Безуглов Д.А., Калиенко И.В. Цифровая техника и микропроцессоры. – Ростов-на-Дону: Феникс, 2008. 3) Угрюмов Е.П. Цифровая схемотехника. – СПб.: БВХ-Петербург, 2007. 4) Нарышкин А.К. Цифровые устройства и микропроцессоры. – М.: Академия, 2008. 5) Ахметов Б.С. Основы схемотехники. Актобе: АГУ им. К. Жубанова, 2005. 6) Новиков Ю.В. Основы цифровой схемотехники: базовые элементы и схемы. Методы проектирования. – М.: Мир, 2001. 7) Ашихмин А.С. Цифровая схемотехника. Шаг за шагом. – М.: Диалог МИФИ, 2008.

Module designation	Special Issues of Electricity Supply / Electrical Safety in Electric Power Industry
Courses included in the module	Special Issues of Electricity Supply / Electrical Safety in Electric Power Industry
Semester(s) in which the module is taught	3
Responsible for the module	Markovsky V.P.

Language	Russian
Relation to curriculum	Core disciplines Optional component
Type of teaching, contact hours	Lectures 30 Practical classes –15 Self-study – 105
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Power Supply
Module objectives/intended learning outcomes	Knowledge of modern methods and methods for determining electrical loads; rational schemes of internal and external power supplies; features of electricity supply of various industrial enterprises, mining, agricultural enterprises and transport. Skills: the ability to perform calculations and optimize the operating modes of electric receivers using modern computer programs. Competencies: in carrying out studies of electrical loads in virtual electrotechnical laboratories.
Content	Energy-saving power electronics in power supply systems. Additional losses of active power and electricity in the elements of power supply systems, caused by non-sinusoidal currents. Modern methods and technical means of improving the quality of electricity. Improvement of the work of common industrial systems and equipment. Increase of efficiency of electric power saving of diversified technological processes and equipment. Electrocorrosion of underground structures of industrial enterprises by wandering currents. Special questions of the organization of power consumption.
Forms of examination	Exam
Media employed	-
Reading list	1) Б.И. Кудрин. Электроснабжение промышленных предприятий, М.: Интремет Инжиниринг, 2007. 2) Утегулов Б.Б., Волгин М.Е. Оптимизация параметров систем электроснабжения мощных угольных разрезов. Монография. Павлодар. 2005. – 145 с. 3) Ю.Д. Сибикин, М.Ю. Сибикин, В.А. Яшков. Электроснабжение промышленных предприятий и установок, М.: Высшая школа, 2001. 4) Утегулов Б.Б., Говорун В.Ф., Говорун О.В. Электромеханические переходные процессы. Изд. ЭКО. Учебное пособие по мультимедийному лабораторному практикуму.

	Павлодарский государственный университет имени С. Торайгырова. Павлодар. 2007.-167 с. 5) Утегулов Б.Б., Захаров И.В., Ижилова А.Д. Резонансные режимы индукторов с самокомпенсацией реактивной мощности. Монография. Павлодар. 2005. – 149 с.
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Module designation	Special Issues of Electrotechnology /Electric Drive of General Industrial Mechanisms
Courses included in the module	Special issues of electrotechnology /Electric drive of general industrial mechanisms
Semester(s) in which the module is taught	3
Responsible for the module	Zakharov I.V.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Lectures : 30 Practical classes –22,5 Self-study – 127,5
Workload	180 hours
Credit points	6 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	"Electrotechnological industrial installations", "Electric drive"
Module objectives/intended learning outcomes	<p>Knowledge of the purpose of various special electrotechnological installations, the scope of their application, design, operation principle, basic technical parameters.</p> <p>Skills: the ability to choose the types of special electrotechnological installations and calculate their basic parameters when analyzing and implementing design solutions.</p> <p>Competencies: in the calculation and selection of non-standard electrotechnological equipment (induction heating plants and melting furnaces, arc and ore-thermal furnaces, etc.).</p>
Content	<p>Application of electrical heating during transportation and storage of petroleum products. Inductors with self-compensating reactive power. Induction heating using voltage and current of complex shape. Arc furnaces (EAF). Optimal operating modes of chipboard. High-speed modes of induction heating and thermal stress in products. Induction heating devices for special technologies.</p>
Forms of examination	Exam
Media employed	-
Reading list	1) Утегулов Б.Б., Захаров И.В., Ижилова А.Д. Специальные вопросы электротехнологии. Издание второе переработанное и дополненное. Павлодар:

	<p>ТОО НПФ ЭКО, 2009. – 338 с.</p> <p>2) Захаров И.В. Теория индукторов с самокомпенсацией реактивной мощности. Павлодар: ТОО НПФ ЭКО, 2005. – 294 с.</p> <p>3) Скоростные режимы индукционного нагрева и термонапряжения в изделиях/ А.Б. Кувалдин, А.Р. Лепешкин; под ред В. С. Чередниченко. - Новосибирск: Изд-во НГТУ, 2006. - 284 с.</p>
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Module designation	Special Issues of the Electric Power Industry / Special Issues of the Automated Electric Drive
Courses included in the module	Special issues of the electric power industry / Special issues of the automated electric drive
Semester(s) in which the module is taught	2
Responsible for the module	Govorun V.F.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Lectures 30 Practical classes –15 Self-study – 105
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	"Theoretical Foundations of Electrical Engineering", "Electric Drive"
Module objectives/intended learning outcomes	<p>Knowledge of the terminology on power transmission; physical processes in the transmission of electricity; power transmission line replacement schemes; methods for calculating power and power losses; methods of electrical power transmission calculation; advanced domestic and foreign experience in the field of electric power transmission;</p> <p>Skills: the ability to calculate power transmission parameters; calculate and analyze the operating modes of power transmission;</p> <p>Competencies: when choosing measures to increase transmission capacity, taking into account voltage and reactive power limitations</p>
Content	Elements of the theory of electric power transmission by alternating current. DC power transmission. Elements of technical and economic analysis of electricity. Ways of improving power transmission. New ways and means of electricity transmission.
Forms of examination	Exam
Media employed	-
Reading list	1) Александров Г.Н. Режимы работы

	<p>воздушных линий электропередачи. Учебное пособие. Санкт-Петербург. 2006 -139 с.</p> <p>2) Коржов А.В. Дальние электропередачи сверхвысокого напряжения. Учебное пособие по самостоятельной работе. Челябинск. ЮУрГУ. 2006 -76 с.</p> <p>3) Костин В.Н. Электропитающие системы и электрические сети. Уч. пособие. – СПб.: Изд-во СЗТУ, 2007</p> <p>4) В.Ф. Говорун, О.В. Говорун. Методические указания к лабораторным работам на ЭВМ, Павлодар, 2002.</p> <p>5) В.Ф.Говорун. Методические указания и контрольные задания по курсу ПЭП и ПТ для студентов специальности 210240.</p> <p>6) Костин В.Н., Распопов Е.В., Родченко Е.А. Передача и распределение электроэнергии. Уч. пособие. СПб: СЗТУ, 2003.</p>
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Module designation	Modern Renewable Energy Sources / Modern Energy Conservation Technologies
Courses included in the module	Modern Renewable Energy Sources / Modern Energy Conservation Technologies
Semester(s) in which the module is taught	1
Responsible for the module	Shapkenov B.K.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Lectures 30 Practical classes –15 Self-study – 105
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Nonconventional Renewable Energy Sources
Module objectives/intended learning outcomes	<p>Knowledge of technology of energy production based on renewable energy sources; program of development of alternative energy of Kazakhstan</p> <p>Skills: the ability to work in the environment of systems of nonconventional sources of energy; use modern achievements of science and technology; orient in the constructive implementation of basic energy conversion devices.</p> <p>Competencies: in the issues of modern technologies for transforming nonconventional renewable energy sources.</p>
Content	Basic concepts and definitions. Problems of energy conservation technology. Technical and economic fundamentals of modern energy

	conservation technologies. Traditional renewable energy sources. Technical and economic indicators. Accumulation of energy. . Means of transmission of electrical energy.
Forms of examination	Exam
Media employed	-
Reading list	<p>1) Дукенбаев К.Д. и др. Энергетика Казахстана, Алматы, 2003.</p> <p>2) Сибикин Ю.Д., Сибикин М.Ю. Нетрадиционные возобновляемые источники электрической энергии. Учебное пособие М.: 2008</p> <p>3) Утегулов Б.Б., Захаров И.В., Ижикова А.Д. Специальные вопросы электротехнологии. Издание второе переработанное и дополненное. Павлодар: ТОО НПФ ЭКО, 2009 г.</p>

Module designation	Modern Energy-saving Technologies / Energy Saving and Energy efficiency in the Electric power industry
Courses included in the module	Modern energy-saving technologies / Energy saving and energy efficiency in the electric power industry
Semester(s) in which the module is taught	2
Responsible for the module	Shapkenov B.K.
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Optional component
Type of teaching, contact hours	Lectures 30 Practical classes –15 Self-study – 105
Workload	150 hours
Credit points	5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	
Module objectives/intended learning outcomes	<p>Knowledge of modern energy-saving equipment and energy consumption accounting system.</p> <p>Skills: the ability to make energy balances and calculate indicators of specific power consumption.</p> <p>Competencies: in perspective directions of development of modern energy-saving technologies.</p>
Content	Energy survey of power supply systems for enterprises, organizations and institutions. Energy Saving Technologies. Implementation of energy-saving technologies.
Forms of examination	Exam
Media employed	-

Reading list	<p>1) Варнавский Б. П. Энергоаудит промышленных и коммунальных предприятий. М.: АЭМ, 1999 – 217 с.</p> <p>2) Данилов Н. И., Щелоков Я. М. Основы энергосбережения. – Екатеринбург: ГОУ ВПО УГТУ – УПИ, 2006 – 564 с.</p> <p>3) Сибикин М. Ю., Сибикин Ю. Д. Технология энергосбережения. М.: ФОРУМ, 2010 – 352 с.</p> <p>4) Закон об энергосбережении и повышении энергоэффективности РК, 2012</p>
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Additional education services

Module designation	Internship
Courses included in the module	Teaching internship Research internship
Semester(s) in which the module is taught	1-3
Responsible for the module	
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	
Workload	
Credit points	12 ECTS
Requirements according to the examination procedure	
Recommended prerequisites	
Module objectives/intended learning outcomes	<p>To be able to: choose the necessary research methods (modify existing ones, develop new methods) based on the tasks of a particular study (on the topic of the master's thesis or when performing the tasks of the scientific supervisor in the framework of the master's program); To apply modern information technologies in the conduct of scientific research; Process the results obtained, analyze and present them in the form of completed research projects (report on research work, abstracts, scientific articles, master's thesis); make out the results of the work done in accordance with the requirements of established regulatory documents with the use of modern editing and printing tools;</p> <p>Knowledge of the specifics and character of the pedagogical and educational work of the teacher of higher education, the teaching, methodological, organizational and methodological and educational work of the departments, faculties, the application of knowledge and skills in the teaching of disciplines of specializations and psycho-pedagogical disciplines in practice, the formation of</p>

	professional personal qualities, culture of scientific and pedagogical thinking, professional-pedagogical skills and creative activity skills
Content	<p>The pedagogical internship is conducted with the purpose of forming practical skills and methods of teaching in higher education.</p> <p>The research internship of undergraduate students is conducted with the purpose of acquaintance with the latest theoretical, methodological and technological achievements of domestic and foreign science, with modern methods of scientific research, processing and interpretation of experimental data.</p> <p>The places of the pedagogical internship are the relevant departments of universities.</p> <p>The places of the research internship are the scientific laboratories of research organizations of the appropriate profile</p>
Forms of examination	Presentation of a report
Media employed	
Reading list	Scientific and technical journals: "Electricity"; "Electrical engineering"; "Energetik"; Electrics; "Electrometallurgy"; "Electric stations."

Module designation	Scientific research work of undergraduate student
Courses included in the module	Scientific research work of undergraduate student
Semester(s) in which the module is taught	1-4
Responsible for the module	
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	
Workload	
Credit points	24 ECTS
Requirements according to the examination procedure	
Recommended prerequisites	
Module objectives/intended learning outcomes	<p>Skills: on research of domestic and foreign analogs of the designed means and devices used in solving special tasks of the electric power industry, personal computers and modern control and measuring equipment.</p> <p>Knowledge: modern methods of scientific research, achievements of domestic and foreign science in solving special tasks of the electric power industry.</p> <p>Competencies: in the conduct of research and development in the field of electric power</p>
Content	Conducting information-analytical and

	information-bibliographic work involving modern information technologies; creative thinking and creative approach to solving new problems and situations
Forms of examination	Presentation of a report
Media employed	
Reading list	

Module designation	Final State Certification
Courses included in the module	Comprehensive exam Preparation and presentation of master's thesis
Semester(s) in which the module is taught	1-4
Responsible for the module	
Language	Russian
Relation to curriculum	EP Electrical Power Engineering Compulsory component
Type of teaching, contact hours	
Workload	
Credit points	13 ECTS
Requirements according to the examination procedure	
Recommended prerequisites	
Module objectives/intended learning outcomes	Skills: the ability to generalize the results of research and analytical work in the form of a thesis, a scientific article, a report, an analytical note, and others Competencies: in research and development, solving standard scientific problems;
Content	Preparation and presentation of master's thesis
Forms of examination	Master's thesis defense
Media employed	
Reading list	