PAVLODAR STATE UNIVERSITY NAMED AFTER S. TORAIGHYROV

MODULE HANDBOOK

of specialty **5B070200 «AUTOMATION AND CONTROL»**

Akkreditierungsagentur für Studiengängeder Ingenie
urwissenschaften, der Informatik, der Naturwissensch
aften und der Mathematik e.V.

Pavlodar, 2017

MODULE REFERENCE BOOK

1 Fundamentals of Mathematical and Natural science Disciplines
1.1 Mathematics, Science and Philosophy

Module designation	**Higher mathematics**
Courses included in the module	Mathematics I, Mathematics II
Semester(s) in which the module is taught	1,2
Person responsible for the module	ShomanovaR. E., BerguzinovaT. M.
Language	Russian, Kazakh
Relation to curriculum	EP - Automation and control Compulsory component
Type of teaching, contact hours	Full-time Lectures - 30 hours (up to 60 students) Practical classes – 52,5 hours (up to 30 students) Self-study – 187,5 hours
Workload	Total: 270 hours
Credit points	9 ECTS
Requirements according to the examination procedure	SO PSU8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Knowledge of all sections of the mathematics of the school course.
Module objectives/intended learning outcomes	Knowledge: - actions with different values and evaluation of their order; approximate methods of solving functions and definite integrals; - basic methods of solution applied problems related to the specialty; action with different values and evaluation of their order; approximate methods of solving functionsand definite integrals; - approximate methods of problem analysis and control of the correctness of solutions; - approximate methods of problem analysis and control of the correctness of solutions. Skills: -to independently understand the mathematical apparatus contained in the special literature; - to choose the research method and bring the solution of problems to a practically acceptable result; - touse computer technologies, tables and reference books. - 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 - on the basis of the mathematical analysis carried out, develop practical recommendations. Competencies: the ability to perform

	mathematical calculations; formulate a mathematical task.
Content	Determinants. Matrices. Systems of linear algebraic equations. Vectors. Scalar, vector and mixed products of vectors. Linear geometric objects. Introduction to mathematical analysis. The notion of set. Elements and symbols of mathematical logic. Number sequences and their limits. Limit of a function at a point. Continuity of function. The derivative of a function of the first and higher orders. Investigation of function. Integral calculus. Functions of several variables. Partial derivatives and complete differentials of higher orders. Implicit functions. Double integrals and their calculation. 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. Elements of probability theory and mathematical statistics. Complex numbers and actions over them. Functions of a complex variable Integration and differentiation of functions of a complex variable. The Taylor and Laurent series. Operational calculus. Laplace transforms and their properties. Elements of the theory of probability. Random variables, their distribution laws and numerical characteristics. Elements of mathematical statistics. Consent criteria. Elements of correlation.
	Exam
Media employed	Electronic textbooks on mathematics, the use of a package of electronic programs.
Reading list	1. Кудрявцев Л.Д. Курс математического анализа. Т. 1,2.М.: Высшая школа, 1981. 2. Под редакцией Рябушко А.П.. Сборник индивидуальных заданий по математике ч.1,2.Минск.: Высшая школа, 2001. 3. Щипачев В.С. Высшая математикаМ.:Высшая школа, 1999.

	4. Никольский С.М. Курс мат. Анализа.М.: Наука,1990.

Module designation:	**Information Processing and Analysis**
Courses of academic disciplines within the module	Informatics
Semester(s) in which the module is taught	1
Person responsible for the module	Krivoruchko V. A., Tokkozhina M. A.
Language	Russian, Kazakh
Relation to curriculum	EP– Automation and Control Compulsory component
Type of teaching, contact hours	Full-time Lectures - 15 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Laboratory classes - 7,5 hours (up to 15 students) Self-study - 105 hours
Workload	total: 150 hours
Credits / credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Mathematics
Module objectives/intended learning outcomes	Knowledge: classification of high-level language operators, standard modules, dynamic data structures, software design techniques, methods for debugging and testing programs; Skills: to develop structural schemes of various algorithms, to organize data structures, to correctly choose methods of solving problems; develop programs using language tools, write programs in a good style. Competencies: in the field of information processing and management with the use of computer facilities.
Content	The concept of PC software. Methods of automation of programming. Algorithmic languages and requirements to them. The concepts of procedural-oriented languages and object-oriented programming. Dialogue means of communication of users with the 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. 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.
Forms of final control	Exam
Media employed	software package.
Reading list	1 Давыдов В.Г. Программирование и основы алгоритмизации. – М.: Высшая школа, 2003. 2 Керниган Б. Плоднер Ф. Элементы стиля программирования. – М.:Радио и связь, 1984. 3 Хьюз ДЖ., Мичтом Дж. Структурный подход к программированию. - М.: Издательство «Мир», 2002.

Module designation:	**Physics**
Courses included in the module	Physics 1 Physics 2
Semester(s) in which the module is taught	2,3
Person responsible for the module	Igonin S.I., Dosanov T.S.
Language	Russian, Kazakh
Relation to curriculum	EP-Automation and control Compulsory component
Type of teaching, contact hours	Full-time Lectures - 30 hours (up to 60 students) Practical classes - 30 hours (up to 30 students) Laboratory classes – 22,5 hours (up to 15 students) Self-study – 187,5 hours
Workload	total: 270 hours
Credit points	9 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Mathematics
Module objectives/intended learning outcomes	Knowledge: the essence of the basic laws of classical and modern physics; Skills: the ability to estimate the degree of reliability of the results obtained with the help of experimental and theoretical research methods; Competencies: the ability to solve typical problems of discipline from various fields of physics, conduct experimental research.
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 an 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	1. Савельев И.В. Курс общей физики. Учебное пособие для втузов. В 5 книгах. М. Астрель/ АСТ 2003 г. 2. Трофимова Т.И. Краткий курс физики: учебное пособие для вузов Изд. 2-е, испр.-352 с, М: Высшая Школа, 2002 г. 3. Грабовский Р.И. Курс физики: Учебники для вузов. Изд. 6-е – 608 с. (Учебники для вузов:Специальная литература), СПб: Лань, 2002 г. 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.

Module designation:	**Theory of Scientific Knowledge**
Courses of academic disciplines within the module	Philosophy
Semester(s) in which the module is taught	3
Person responsible for the module	Yerzhanov E.A., Kulenov B. A, Altybasarova M.A.
Language	Russian, Kazakh
Relation to curriculum	EP - Automation and control Compulsory component
Type of teaching, contact hours	Full-time Lectures - 15 hours (up to 60 students) Practical classes - 30 hours (up to 30 students) Self-study - 105 hours
Workload	total: 150 hours
Credit points	5 ECTS
Requirements according to the examinationination 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	Knowledge:subject, tasks, principles, basic methods, the most prominent representatives

	and achievements of both philosophy and science; Skills: to use the basic categorial apparatus of the philosophy of science, to be able to comprehend the course material as a necessary theoretical tool for understanding the world and its place in it. Competencies: to state your own position using science and philosophy categories.
Content	Philosophy and methodology of science as a branch of philosophical knowledge. 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. 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. Status and problems of the history of science. Evaluation of the development of the history of science as a discipline. Features of the relationship 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. To 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. 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. The concept 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).
Forms of examinations	Exam
Media employed	Electronic books, electronic materials
Reading list	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. 6 Микешина Л.А. Философия познания. М., 2002.

1.2 General Engineering Training

Module designation:	**Electrical Engineering and Eelectronics**
Courses of academic disciplines within the module	Electrical Engineering Theory
Semester(s) in which the module is taught	3
Person responsible for the module	Mustafina R.M., Baikenova N.B.
Language	Russian, Kazakh
Relation to curriculum	EP - Automation and control Compulsory component
Type of teaching, contact hours	Full-time Lectures - 30 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes – 7,5 hours (up to 15 students) Self-study – 127,5 hours
Workload	total: 180 hours
Credit points	6 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Physics, Mathematics
Module objectives/intended learning outcomes	The purpose: the assimilation of modern methods of analysis and calculation of electrical circuits, knowledge of which is necessary for understanding and creative solution of engineering problems of the

	specialty studied, in the development of ideas about methods of applying the theory and methodology of the course in special disciplines Skills: know the electrical laws and methods of analysis of electrical and magnetic circuits, electrical terminology and symbols, design, operation principle, properties, the scope of application of the main elements of electrical circuits Competencies: be able to perform typical electrical calculations, and determine the parameters and characteristics of individual elements of electrical circuits, make measurements of electrical quantities and process measurement results, turn on electrical devices, manage them and monitor their safe operation.
Content	Conditional graphical symbols in electrical circuits, Ohm's law, Kirchhoff's law, sources of electrical energy, investigation of linear electric circuits of direct current, contour current method, power balance, calculation of circuits by the method of transformation, method of superposition, reciprocity, input and mutual conductivity, compensation theorem, Measurement of alternating currents, voltage and frequency, calculation of sinusoidal current circuits and the use of complex numbers, investigation of active and reactive electrical circuits with successive Connection of active and reactive elements. The emergence of transient processes, the laws of commutation, the forced, free component of transient processes, the inclusion of a constant voltage in the capacitor and coil circuits, the classical method for calculating transient processes, Ohm's and Kirchhoff's laws in operator form, the operator method, elements and equivalent circuits of the simplest nonlinear circuits. Calculation of magnetic circuits, alternating electromagnetic field.
Forms of final control	exam
Media employed	Laboratory equipment: electronic laboratory
Reading list	1. Электротехника и электроника: Учебник для вузов. /Под ред. Б. И. Петленко. -М.: Академия, 2003. - 230 с. 2. Данилов И.А., Иванов П.И. Общая электротехника с основами электроники: Учеб.пособие - М.: ВШ, 2000. - 752 с. 3. Прянишников В. А. Электроника: Полный

	курс лек-ций Ч-е\:т... испр. и доп. - СПб.: Учитель и ученик: КОРОНА принт. 2003. - 416 с ил 4. Лачин В.И. Электроника. - М.:ВШ, 2000. 5. Электротехника и электроника: Учебник для вузов. В 3-х кн. Кн.3. Электрические измерения и основы электроники. /Под ред. проф. В- Г. Герасимова. - М: Энергоатомиздат, 1998. - 432 с. 6. Рекус Г. Г., Белоусов А. И. Сборник задач по электротехнике и основам электроники: Учеб.пособие для неэлектротехн. спец. вузов. - М.: Высш. шк., 1991.-416 с: ил.

Module designation:	**Metrology and Measurement**
Courses of academic disciplines within the module	Metrology and Instrumentation/ Information Measuring Equipment
Semester(s) in which the module is taught	4
Person responsible for the module	Gabdulov A.U., Sadvokasova G.M.
Language	Russian, Kazakh
Relation to curriculum	EP– Automation and control optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes - 7,5 hours (up to 15 students) Self-study - 105 hours
Workload	total: 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Higher mathematics, Physics, theoretical fundamentals of electrical engineering, the basics of designing information systems, mathematical problems and the basics of automation
Module objectives/intended learning outcomes	Knowledge: the basic concepts of information and measurement techniques and technologies and their connection with general philosophical and logical concepts, measurement and control methods, methods of measuring signal conversion, the structure of analog and digital measuring instruments, their characteristics, methods for processing measurement results . Skills: to estimate metrological and other characteristics of measuring instruments, accuracy and reliability of measurement and control results

	Competencies: in the methods of measuring methods and measuring devices.
Content	The subject and tasks of metrology. Basic concepts of metrology. Elements of the measurement process. Scales of measurements. Measurement and its basic operations. Classification of measurements. Basics of reproduction of units of physical quantities and transfer of their sizes. Principles of constructing systems of units of physical quantities. The concept of the unity of measurements. Standards of units of physical quantities. Measurement inaccuracies. Systematic and random errors. Classification of errors. Principles of estimation of errors. Measuring signals. Quantization and sampling of measuring signals. Classification of measuring signals. Means of measurement. Measurements of electrical quantities. Measurement of current, voltage and power in DC and AC circuits. Electronic analog and measuring digital devices. The principle of operation, design, application of measuring transducers. Measurements of non-electrical quantities. Temperature measurement. Measurement of pressure. Measurements of the quantity and consumption of liquids, gases and solid bulk materials. Measuring the quality of raw materials and products of technological processes. Measurements of the composition and properties of liquids, gases, solid bulk bodies. Microprocessor measuring means.
Forms of examinations	Exam
Media employed	Laboratory installations
Reading list	1 Фридман А.Э. Основы метрологии. Современный курс. – СПб.: НПО «Профессионал», 2008. 2 Болтон У. Карманный справочник инженера-метролога. - М.: Додека-XX1, 2002. 3 Тартаковский Д.Ф., Ястребов А.С. Метрология, стандартизация и технические измерения. - М.: Высшая школа, 2002. 4 Фарзане Н.Г., Ильясов Л.В., Азим-Заде Л.В. Технологические измерения и приборы. – М.: Высш.шк., 1989.

Module designation:	**Electronics**
Courses of academic disciplines within the module	Electronics / Industrial Electronics
Semester(s) in which the module is taught	4
Person responsible for the module	Mendybaev S.A.
Language	Russian, Kazakh
Relation to curriculum	EP– Automation and control optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes - 7.5 hours (up to 15 students) Self-study - 105 hours
Workload	total: 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Higher Mathematics, Physics, Theoretical Fundamentals of Electrical Engineering
Module objectives/intended learning outcomes	Knowledge: the principles of construction and structure of functional devices of electronics, their parameters, features and operating conditions; Design methods; Programming language assembler and methods for debugging programs. Skillls: to make a choice of the necessary type of microcircuits in the environment of electronics; find optimal circuit solutions in automatic control systems; create programs for the microcontroller and debug them; practical development of functional electronic tools; on the choice of the necessary typical elements for the solution of the task. Competencies: the ability to develop and operate electronic means, use microcontrollers and programs in the language of assemblers and debug them.
Content	Physical basis of semiconductors. Semiconductor materials. Semiconductor diodes, thyristors. Bipolar transistors: p-n-p and n-p-n. The principle of amplification and circuit switching on transistors. Field-effect transistors: with control p-n-junction, with built-in and with induced channel. Parameters and static characteristics of field-effect transistors.

	Comparative evaluation of field and bipolar transistors Construction of amplifying stages: single-stage amplifiers on bipolar and field-effect transistors. The concept of feedback. Principles of constructing multistage amplifiers. Amplifiers of direct current. Power Amplifiers. Rectifiers, smoothing filters .. Surge Protectors. Parametric stabilizers, compensating stabilizers. Electronic generators and pulse formers. Microelectronics. Integrated circuits (IC). Classification of integrated circuits: by functional complexity, by manufacturing technology, digital and analog. Microcontrollers. Use of microcontrollers in automation systems
Forms of final control	exam, course project
Media employed	Electronic books, laboratory stands
Reading list	1.Микропроцессоры. В 3-х книгах./Под общей редакцией Преснухина Л.Н.–М.: Высшая школа. – 1986. 2. Соучек Б. Микропроцессоры и микро-ЭВМ. –М.: Мир, 1980. 3. Соботка И., Стары Б. Микропроцессорные системы. –М.: Энергоатомиздат, 1984. 4. Микропроцессорные автоматические системы регулирования. Основы теории и элементы /под редакцией Солодовникова В.В. –М.: высшая школа, 1991. 5. Алексеенко А.Г., Галицын А.А., Иванников А.Д. Проектирование радиоэлектронной аппаратуры на микропроцессорах. –М.: радио и связь, 1984. 6. Современные микроконтроллеры. Архитектура, средства проектирования, примеры применения, ресурсы Интернет./ Под редакцией Коршуна И.В. – М.: АКИМ, 1998. 7. В.Б.Бродин, М.И.Шагурин Микроконтроллеры. Архитектура, программирование, интерфейс.- М.: ЭКОМ, 1999. 8. В.Ф.Козаченко Микроконтроллеры. Руководство по применению 16-разрядных микроконтроллеров IntelMCS-196/296 во встроенных системах управления. – М.: ЭКОМ, 1997.

	9. Микроконтроллеры. Выпуск 1. – М.: ДОДЭКА, 1998.М.А.Гладштейн Микроконтроллеры семейства Z86 фирмы ZILOG. – М.: ДОДЭКА, 1999.

Module designation:	**Economic and Legal Literacy**
Courses of academic disciplines within the module	Law basics
Semester(s) in which the module is taught	3
Person responsible for the module	Boyko G.F., Tusupaeva M. Zh., Kulenov B.A.
Language	Russian, Kazakh
Relation to curriculum	EP– Automation and control optional component compulsory component
Type of teaching, contact hours	Full-time Lectures - 15 hours Practical classes - 15 hours (up to 30 students)
Workload	Total: 90 hours Including: Lectures - 15 hours Practical classes -15 hours Self-study – 60 hours
Credit points	3 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	History of Kazakhstan, Philosophy
Module objectives/intended learning outcomes	Knowledge: the purposes and methods of state regulation of the economy; the role of the public sector in the economy; bases of economy and organization of information production; Peculiarities of pricing in the sectors of information production, trends in the social development of society; methodology and methodology of applied sociological research; the history of origin, the most important milestones in the evolution of political thought; basic political doctrines and concepts; schools and scientific directions of modern political science; legal norms of the Republic of Kazakhstan. Skills: to collect and interpret economic information for the formation of judgments, taking into account social, ethical and scientific considerations and to adapt to the dynamically changing phenomena and processes in the national and world economy; to develop production plans, to

	determine the economic efficiency from the introduction of new equipment, to develop systemic organizational arrangements at the enterprise, to make managerial decisions, to adequately navigate in various social situations; Work in a team, correctly defend their point of view; to be able to find compromises, to correlate one's opinion with the opinion of the collective; to analyze the features of the development of the political process and political life of peoples and states; to orient in political science schools and directions; to form their own approach in the cognition and assessment of facts, events and phenomena in political life; to apply in practice the legal norms of the Republic of Kazakhstan Competencies: the ability to orient in different conditions and situations related to professional economic activity, to solve problems faced by people in the process of interaction with each other (social conflicts, social norms, social deviation, socialization, incentive and punitive interaction); to assess the political events taking place in the world; in the field of legal culture and prevention and prevention of violations.
Content	Fundamentals of the theory of law - the concept of law, sources of law, legal relationship, offense, legal responsibility; The fundamentals of constitutional law - the constitution, human rights, the suffrage ;, the basis of civil law - civil legal relations, subjects and objects of civil law. Ownership, transactions, obligations; The basis of administrative law - administrative offense, administrative penalties and their types, the procedure for imposing administrative penalties. Fundamentals of labor law - labor contract, working time, rest time, guarantees and compensation payments. Fundamentals of criminal law - the concept of crime, punishment, types of punishment, certain types of crimes. Fundamentals of family law - the concept of family, marriage, legal regime of the property of spouses; Bases of financial law
Forms of examination	exam
Media employed	-
Reading list	1 Курс экономической теории / Под общ.ред. проф. М.Н. Чепурина и проф.

	Е.А. Киселевой. - Киров, 2000. 2 Экономическая теория (политэкономия) / Под ред. В.И. Видяпина, Г.П. Журавлевой. - М.:ИНФРА,1999. 3 Экономика: Учебник / Под ред. А.С. Булатова. – М., Юрист, 2001. 4 Экономика: Учебник / Под ред. А.И. Архипова, А.Н. Нестеренко, А.К. Большакова. – М.: «Проспект», 2008. 5 Экономическая теория: Учебник для вузов / Под ред. А.И. Добрынина, Л.С. Тарасевича. - СПб: изд. СПб ГУЭФ, изд. «Питер Паблишинг», 2007. 6 Борисов Е. Ф. Экономическая теория: Учебник. Курс лекций для вузов. - М., Юрист, 1997. 7 Кодекс РК «О налогах и других обязательных платежах в бюджет» с дополнениями и изменениями. 8. Зайцев Н.Л. Экономика, организация и управление предприятием: Учебное пособие.- М.: ИНФРА-М, 2005. 9. Сергеев И.В. Экономика предприятия: Учебное пособие. – М.: Финансы и статистика, 2007. – 256 с. 10 Генкин Б.М. Организация, нормирование и оплата труда на промышленных предприятиях: учебник для ВУЗов - М.: Издательство НОРМА - 2003.-400 с. 11 Агыбаев А.Н. Уголовное право РК А.,2005 г. 12 Алексеев С.С. Теория права. М., 1994 13 Басин Ю.Г. Юридические лица по гражданскому кодексу РК, - А.,1996 14 Гражданское право РК. Общая часть. А., 1999 15 Григорьев В.И. Административное право РК (общая часть). А., 2002 16 Комаров С.А.. Малько А.В. Теория государства и права. - М., 1999 17 Основы права. Под ред. Крылова З.Г. М., 2002

Module designation:	**Ecology and Life Safety**
Courses of academic disciplines within the module	Life Safety Basics, Ecology and sustainable development
Semester(s) in which the module is taught	1,2
Person responsible for the module	Prozorova T.A., Semenova M.K.
Language	Russian, Kazakh
Relation to curriculum	EP – Automation and control Compulsory component

Type of teaching, contact hours (Life Safety Basics)	Full-time Lectures - 15 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Self-study – 60 hours
Type of teaching, contact hours (Ecology and sustainable development)	Full-time Lectures - 15 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Self-study – 60 hours
Workload	total: 180 hours
Credit points	3 ECTS, 3 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge: theoretical methods and rules of life safety, the basic conditions of a favorable ecological situation; Skills: to carry out calculations on monitoring of ecology and safety precautions. Competencies: in applying techniques and practical skills in life safety, identifying hazards and creating safe working conditions.
Content	Course objectives. 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 final control	exam
Media employed	Electronic manual, electronic tests, electronic trainings.
Reading list	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.

Module designation:	**Economy of Branch**
Courses of academic disciplines within the module	Economics and industrial engineering/Industrial Engineering
Semester(s) in which the module is taught	6
Person responsible for the module	Boyko G.F., Tusupaeva M. Zh.
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 30 hours Practical classes - 15 hours (up to 30 students) Self-study– 105 hours
Workload	total: 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge: the purposes and methods of state regulation of the economy; The role of the public sector in the economy; Bases of economy and organization of information production; Features of pricing in the information production industries. Skills: to collect and interpret economic information for the formation of judgments, taking into account social, ethical and scientific considerations; and to adapt to the dynamically changing phenomena and processes in the national and world economy; to develop production plans, to determine the economic efficiency from the introduction of new technology, to develop systemic organizational arrangements at the enterprise, to make managerial decisions \ Competencies: in different conditions and situations related to professional economic activities.
Content	The subject of economic theory. Basic economic concepts. Methods of cognition of economic processes. Economic resources and factors of production. Public production, its structure and results. Reproduction. A systematic approach to the study of economic phenomena. Economic system, its elements. Classification of types of economic systems. The place of property relations in the

	economic system. Economic and legal maintenance of property. Variety of forms of ownership in a market economy. Rasto-statification and privatization in the Republic of Kazakhstan. A commodity economy: conditions of occurrence and historical models. Marxist and marginalist methods of investigating the categories of commodity economy. Evolution of commodity-money relations and the formation of the market. Market intelligence The basic elements of a market mechanism. Types of markets. The origin and essence of money. The law of demand, the demand curve. Change in demand under the influence of non-price factors. The law of supply, the supply curve. Change in supply under the influence of non-price factors. Interaction of supply and demand. Market equilibrium. The essence of entrepreneurship, its characteristics. Organizational forms of entrepreneurship: their advantages and disadvantages. Development of entrepreneurship in the Republic of Kazakhstan. The essence of competition: the concept, participants, types of competition .. Circuit and capital turnover. Basic and working capital. Essence and types of investments. The total, average and marginal revenue of the firm. Fundamentals of the theory of functional distribution and the formation of factor incomes. Wages as the price of labor. Percentage as a factor income of the owner of capital. Land rent is the factor income of the landowner. Profit as a factor income of the entrepreneur. National economy as a system. Gross national product and methods of its calculation. Cyclical development of market economy. The economic cycle and its varieties. Types and factors of economic growth. Models of economic growth. State regulation of the economy. Monetary and credit system. Monetary policy. The essence and structure of the financial system. Internal and external public debt. Concept of the enterprise. Types of enterprises. Production and general structure

	of production. Organizational structure of enterprise management. Fixed assets of the enterprise. Economic essence, composition and classification. Current assets of the enterprise, their economic essence, composition and classification. Staff of the enterprise. Productivity of labor. Remuneration of labor in the enterprise. Principles of the organization of payment. Costs of the enterprise and production costs. Pricing in an enterprise in a market environment. Financial performance of the enterprise. Sources of financial resources. Investment policy of the enterprise.Economic efficiency of investments.
Forms of final control	Exam
Media employed	-
Reading list	1 Курс экономической теории / Под общ.ред. проф. М.Н. Чепурина и проф. Е.А. Киселевой. - Киров, 2000. 2 Экономическая теория (политэкономия) / Под ред. В.И. Видяпина, Г.П. Журавлевой. - М.:ИНФРА,1999. 3 Экономика: Учебник / Под ред. А.С. Булатова. – М., Юрист, 2001. 4 Экономика: Учебник / Под ред. А.И. Архипова, А.Н. Нестеренко, А.К. Большакова. – М.: «Проспект», 2008. 5 Экономическая теория: Учебник для вузов / Под ред. А.И. Добрынина, Л.С. Тарасевича. - СПб: изд. СПб ГУЭФ, изд. «Питер Паблишинг», 2007. 6 Борисов Е. Ф. Экономическая теория: Учебник. Курс лекций для вузов. - М., Юрист, 1997. 7 Кодекс РК «О налогах и других обязательных платежах в бюджет» с дополнениями и изменениями. 8. Зайцев Н.Л. Экономика, организация и управление предприятием: Учебное пособие.- М.: ИНФРА-М, 2005. 9. Сергеев И.В. Экономика предприятия: Учебное пособие. – М.: Финансы и статистика, 2007. – 256 с. 10 Генкин Б.М. Организация, нормирование и оплата труда на промышленных предприятиях: учебник для ВУЗов - М.: Издательство НОРМА - 2003.-400 с.

2 Fundamentals of Special Disciplines
2.1 Theoretical Basis of Automation

Module designation:	**Theories of Automatic Control**
Courses of academic disciplines within the module	Linear automatic control systems Nonlinear automatic control systems
Semester(s) in which the module is taught	5, 6 semesters
Person responsible for the module	Borodenko V. A., Isupova N. A.
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Obligatory component
Type of teaching, contact hours (Linear automatic control systems)	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory sessions - 7.5 hours (up to 15 students) Self-study – 105 hours
Type of teaching, contact hours (Nonlinear automatic control systems)	Full-time Lectures - 15 hours (up to 60 students) Practical classes - 7.5 hours (up to 30 students) Laboratory classes - 7.5 hours (up to 15 students) Self-study – 60 hours
Workload	total: 240 hours
Credit points	5 ECTS, 3 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Mathematics, Physics, Theoretical Fundamentals of Electrical Engineering
Module objectives/intended learning outcomes	Knowledge: the technical and public importance of automation; the basic principles of creating automatic control systems; The main types of automatic control systems; methods of synthesis of linear and nonlinear systems; General theoretical basis of automatic regulation and management. Skills: to apply mathematical methods when performing calculations for the analysis and synthesis of linear and nonlinear control systems; Competencies: in the theory of control and regulation of linear and nonlinear automatic systems.
Content	Automatic systems and problems of control theory and regulation Control and regulation in engineering, objects and systems of automatic control (ACS). Principles of building ACS.

	Functional description of ACS and their elements. Classification of ACS by purpose and principles of operation. Systems of stabilization, program control and tracking systems. Static and dynamic models of automatic control systems and their links. Further classification of automatic control systems by their properties and mathematical description: ordinary systems and systems with distributed parameters, continuous and discrete, deterministic and stochastic, one-dimensional and multidimensional, linear and nonlinear, optimal and adaptive systems. Models, bases of analysis and general properties of stationary continuous linear systems Stationary linear systems, time domain models, linear differential equations with constant coefficients in the Cauchy normal form. Models of a complex area. Transfer functions. The matrix of transfer functions as a matrix of linear transformation "input-output" in images. The matrix of transfer functions of a system given in the normal form of Cauchy. The attached matrix and the characteristic polynomial of the system. Structural diagrams and graphs of stationary systems. One-dimensional and multidimensional links. Structural schemes. Single-circuit, multi-loop and multiply connected systems. Structural graphs. Rules for transforming structural schemes and graphs. Vector-matrix description of multidimensional and multiply connected systems . Analysis of processes in stationary linear systems. The task of investigating the process of its image. Stability of stationary systems. Dynamic characteristics of stationary ACS. Weight (pulse transient) and single transient functions. Reaction to harmonic effects. Frequency characteristics. Minimal phase links. Typical dynamic links. Criteria and areas of stability of ordinary continuous stationary systems Conditions for the stability of linear automatic control systems. Algebraic stability criteria. The principle of the

	argument and the frequency stability criteria. Criteria of Mikhailov and Nyquist. Stability reserves. Critical gain. The method of logarithmic amplitude-phase frequency characteristics. Areas of stability in the space of parameters. D-decomposition by one and two parameters. The main curve and special lines. Isolation of the stability region. Transient processes and quality of continuous stationary control systems Transient in a single-loop ACS. Direct assessments of the quality of ACS. Time of increase and regulation of processes, oscillation and overshoot. Indirect criteria. Frequency and algebraic methods of studying the transient process. Numerical methods for calculating the transient. Accuracy and accuracy indicators of single-loop control systems. Transient and steady errors. Static and astatic systems. Formulas for the decomposition of a steady-state error, error coefficients. Integral quality criteria. Linear and quadratic integral functionals as criteria for the quality of the transient process. Methods of their calculation. Frequency criteria for assessing the quality of the system. Bandwidth, vibration index and resonant frequency. Constructing the frequency characteristics of a closed system. Frequency characteristics and properties of the transient process. The property of the time and frequency domain scales. Assessment of the oscillation index. Approximate methods of constructing the curve of the transient process by the frequency characteristics of a closed automatic control system. Systems with delay and distributed parameters Systems with delay, models of time and complex area, methods of analysis. The characteristic quasipolynomial, the distribution of its zeros, and the asymptotic properties of the system. Methods of stability analysis. Critical lag. Methods of analysis of transient processes and the quality of delayed systems. Methods of compensation for the effect of lag. Systems with distributed parameters. Time domain models, partial differential

	equations, boundary and initial conditions. A long electric line as a link of the system. Other examinationples. Transfer functions of systems with distributed parameters. Features of the study of the stability and accuracy of systems with distributed parameters. Providing stability, improving the quality of regulation and the synthesis of linear ACS. Methods and means of improving the properties of linear ACS. Correction devices. Transformative elements. Increase of accuracy in steady-state regimes. Compensation for external influences. Ensuring invariance. Combined control. Ensuring stability and increasing the stability margin. Selection of parameters and synthesis of correcting devices by root locus. Synthesis of correcting devices based on logarithmic amplitude-frequency characteristics.
Forms of final control	exam
Media employed	package of applied programs
Reading list	1 Ерофеев А.А. Теория автоматического управления: Учебник для вузов. – 2-е изд., перераб. и доп. – СПб.: Политехника, 2005. – 302 с. 2 Мирошник И.В. Теория автоматического управления. Линейные системы. – СПб.: Питер, 2005. – 336 с. 3 Бороденко В.А. Практический курс теории линейных систем автоматического регулирования. – Павлодар : Изд-во ПГУ, 2007. – 260 с. 4 Бороденко В.А. Теория автоматического управления. Лабораторный практикум. – Павлодар: Изд-во ПГУ, 2004. – 15 с. 5 Сборник задач по теории автоматического регулирования и управления: Под ред. В.А. Бесекерского. – 5-е изд. – М.: Наука, 1978. – 512 с. 6 Электрические системы. Математические задачи электроэнергетики: Учебник для студентов вузов / Под ред. В.А. Веникова. – 2-е изд., перераб. и доп. – М.: Высш. школа, 1981. – 288 с.

Module designation:	**Programming technologies**
Courses of academic disciplines within the	Programming technology / Programming in

module	engineering
Semester(s) in which the module is taught	2
Person responsible for the module	Pudich N.N.
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 15 hours (up to 30 students) Practical classes - 15 hours (up to 30 students) Laboratory classes -7,5 hours (up to 15 students) Self-study – 82,5 hours
Workload	total: - 120 hours
Credit points	4 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Computer Science, Higher Mathematics
Module objectives/intended learning outcomes	Knowledge: the principles and principles of object-oriented design and programming. Skills: to apply knowledge and skills of traditional imperative style of programming. Competencies: in applying the knowledge and skills of the traditional imperative programming style.
Content	Algorithmic concepts and models. Algorithms and calculations. Basic concepts and methods related to the construction and analysis of algorithms. Approximate algorithms and algorithmic correctness. Models of programs represented by transition systems. Formal program specifications. Data models. Implementation of elementary data structures. Structural approach. Representation of the main governing structures: "sequence", "choice", "repetition". Building modular programs. Prototyping. Functional decomposition. The principle of localization. Fundamentals of program design. Criteria of program quality. Stages of the program design. Pseudocode as a tool for program development. Elements of the style of programming. Principles and practical questions of style. The structure of management and the structure of the program. Efficiency and equipment. Documenting. Rules of good programming style. Debugging and testing. Types of methodological testing: formal

	reviews and testing, based on the execution of the program. Testing by specification and testing by software code. Fundamentals of the object-oriented approach. Basic concepts of object-oriented programming. Concepts of functional and object decomposition of the system. Principles of object-oriented programming. Object-oriented program as an operating model of the problem being solved. Organization testing in object-oriented models. Overview of programming languages that support an object-oriented approach. Fundamentals of modeling and design of the structure of object systems (UML). Fundamentals of object-oriented programming languages (C ++, JAVA). Technology of design. The "essence-link" approach. Notation of recording design decisions. Problems of building the architecture of the system. Development of structural and functional schemes. Designing data structures. Design based on data decomposition. Development of program structure with object approach. Design patterns. Methodology and design tools. Automatic code generation. Component technology. The concept and application of platform-independent and platform-independent model (MDA). Aspect-oriented programming
Forms of final control	exam
Media employed	Computer class, software package
Reading list	1 Окулов С. М. Программирование в алгоритмах. М.: БИНОМ. Лаборатория знаний, 2004. - 341 с. 2 Юркин А. Г. Задачник по программированию. – СПб.: Питер, 2002. 3 Гуденко Д., Петроченко Д. Сборник задач по программированию. – СПб.: Питер, 2003. 4 Смайли Джон. Учимся программировать на C# вместе с Джоном Смайли: Пер. с англ. –СПб, 2003. -528 с.

Module designation:	**Basics of Designing Information Systems**
Courses of academic disciplines within the module	Informational Systems Designing Basics/Automation Systems Designing
Semester(s) in which the module is taught	4
Person responsible for the module	Khatsevsky Vladimir Filatovich

Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Self-study– 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Physics, Computer Science, Higher Mathematics II
Module objectives/intended learning outcomes	Knowledge of: types of project activities and ways to improve design efficiency; To have an idea of the properties required for a qualified bachelor, general ideas about the design process; Types of project activities and other opportunities associated with technical education. Skills: to make calculation of the basic parameters at designing of electronic devices; Solve the problems arising from the transition from manual design to automated design; Optimize design decisions. Competencies: in the field of the fundamentals of the design of the technological process and the requirements for the schemes for their implementation.
Content	Historical development of technical creativity. Basic concepts and definitions. The current state and the need for mass education of young people in the methods of technical creativity. Causes and consequences of the increasing complexity of technical products. Essence and types of design. Project activity of the person: essence, types, historical development. Development of types of project activity rights. The stage of handicraft production, the sources of activity. Brief characteristics of the main forms of design. Technological design, structural (morphological) design. Functional and artistic design. Interrelation of historical stages of development of project activity and modern design process. Basic invariant concepts of engineering. Principles of the choice and formation of

	basic concepts. Really existing technical facilities and technologies. Technology and hierarchy of the description of technical objects. Interaction of a technical object and the environment. Laws and regularities, stability of qualitative and quantitative cause-effect relationships. Types of functions and structure of technical objects. Parameters technical objects. Technical creativity in ancient times. Modern creative work. The role of technologists. Differences between science and technical creativity. General view on technical creativity. The importance of specialization in technical creativity. Practical and economic aspects of technical activities to meet the diverse needs of people. Technical point of view. Striving for self-improvement. Utilitarian and aesthetic categories in the evaluation of technical facilities. General ideas about the structure and design process. The essence of the triune task: representation, optimization, design. Representation is schematic, graphic, mathematical. Simulation - analog, digital, other types. Importance of using the modeling method. Simplifications, assumptions, idealization. Development of predictive models. Optimization is the optimum as the goal of the work, the input-output model. Designing - ways of formulating a problem, analyzing a problem (constraints, criteria, volumes), searching for possible solutions (maximizing value, requiring simplicity, making a decision). Brief review of science and technology in the process of the formation of civilization. World outlook aspects of human project activities. Psychological aspects of project activity: the personality type. Psychological obstacles in solving creative problems.Methods for analyzing project situations Types of models of design objects. Criteria for the development of technical objects: groups of criteria, conditions of existence and requirements for them. The laws of technology development: progressive evolution, stage development, the correspondence between function and structure.

	The main indicators of the quality of technical objects. The concept of integral indicators of the quality of technical objects Types of project tasks. Examinationples from project practice. System analysis of the project situation. The formulation of the problem, the tree of goals. Analogues. Selection criteria for evaluation, quality indicators. Analysis of examinationples. Conditions and restrictions. Identify the interaction of the elements of the design task. Questionnaire survey, interviewing consumers. Reformulation of the problem. Technical task. An examinationple of a technical assignment. Procedures and methods of technical design. The design process: the basic principles of the system approach. Types of technical systems: machines, devices, devices. Functional purpose of machines. Stages and stages of design. Structure and methods of design. Classification. Choosing a design method. Morphological analysis. Decision tree. Search and resolution of contradictions. An examinationple of an analysis of a particular device. Vector formulation of the problem. Normalization of quality indicators. Methods for increasing the effectiveness of technical creativity and the design process Methods for evaluating design solutions. Checklists. Ranking and weighing. Errors in the design. Classification of optimization methods. Elements of qualimetry. Scalar optimization. The worst decisions. Optimization in conflict situations. Composition of project documentation. Organization of creativity, tools of creative self-organization of man. Organization of intensive search in creative teams. Automatic design engineering. The emergence and development of CAD. Manual control. Direct driving of the vehicle. Sequences of operators. Quality control when tracking a trajectory. Discussion of goals. Information problems - storage and retrieval, processing, communication. Problems of education. Information science and technology (computer science). Large systems. Multifunctional instruments for research. Vehicles and their safety.
Forms of final control	exam

Media employed	Laboratory stands
Reading list	1. Половинкин А.И. Основы инженерного творчества: Учебное пособие для студентов вузов.- М.: Машиностроение, 1988. - 368 с. 2. Тищенко Н.М. Введение в проектирование систем управления. - М.: Энергоатомиздат, 1986. - 240 с. 3. Ивоботенко Б.А. и др. Планирование эксперимента в электромеханике. - М.: Энергия, 1975. - 184 с. 4. Аветисян Д.А. Основы автоматизированного проектирования электромеханических преобразователей. - М.: Высшая школа, 1988. - 271 с. 5. Норенков И.П. Принципы построения и структура САПР. - М.: Высшая школа, 1986. Выпуски 1...9. 6. Геминтерн В.И. и др. Основы автоматизированного проектирования электрических машин. - М.: Моск. энерг. ин-т, 1989. - 98 с. 7. Э.Крик. Введение в инженерное дело. Пер. с англ.- М.: Энергия, 1970.-176 с. 8. Половинкин А.И. Автоматизация поискового конструирования. - М.: Высшая школа. - 275 с. 9. Джонс Дж.К. Инженерное и художественное конструирование. Современные методы проектного анализа. - М.: Мир, 1976. - 374 с. 10. Моисеева Н.К. Выбор технических решений при создании новых изделий. - М.: Машиностроение, 1980. - 181 с. 11. Подиновский В.В., Ногин В.Д. Парето-оптимальные решения многокритериальных задач. - М.: Наука, 1982. - 320 с. 12. Потемкин И.С. Автоматизация синтеза функциональных схем. - М.: Энергоатомиздат, 1981. - 279 с.

Module designation:	**Designing Databases of Automated Management Systems**
Courses of academic disciplines within the module	Database Design of automated control systems/TP Datebase Design
Semester(s) in which the module is taught	3
Person responsible for the module	Girnis Svetlana Rimantasovna, Amangeldy Nurzada
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component

Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Self-study– 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Programming technologies, Higher Mathematics II
Module objectives/intended learning outcomes	Knowledge of: the basics of building databases (DB), the basic operations on data, the methods of organizing the search and data processing. Skills: to use methods of organization of search and data processing, as well as the principles of building data models, in modern database management systems (DBMS) Competencies: in the field of formation of an information flow of data for process automation.
Content	New information technologies. Systems using data banks. History of the development of data processing systems. Basics of building databases. Information and data. Subject area of the data bank. The role and place of data banks in automated systems. Users of data banks. Two approaches to the design of a data bank: an approach from the "real world" and an approach from the "user query". Basic requirements for the data bank. Advantages of centralized data management. The main components of the data bank. Database. Database management system (DBMS), languages for description and manipulation of data. DBMS including and basic languages. The scheme of interaction is applied to the program with the DBMS. Dictionary of data. Independence of data applications d. Infological design of the database. Database - as the target model of the domain. The essence of the information approach to the design of information systems. Data models. Abstract data types, data structure, basic data operations. Limitation of integrity, choice of data model. Hierarchical, network and relational data

	models, their types of structures, basic operations and constraints. Languages of relational algebra and relational calculus of relations. Representation of data structures in computer memory. List structures. Sequential and related memory allocation, types of pointers. Organization of data using the methods of tree and network structures in computer memory. Methods of organizing and processing files. The inverted file. Modern trends in building file systems. Methods of special processing. Providing data protection in the database. Ensuring data integrity. Optimization of queries. Organization of parallel data processing processes. Database management systems. Relational systems. Modern relational DBMS for PC of various types. Relational DBMS for medium and large computers. Postrelational DBMS. Multidimensional DBMS. Object-oriented systems. Object modeling of data types. Object-relational DBMS Deductively-object-oriented DBMS. Object-oriented tool environments for application development. Features of the network versions of the DBMS. Distributed databases. Client-server architecture. Database servers. SQL servers. Using the transaction mechanism. Protection of information, locks. Means of integration. ODBS standard. End-user tools for accessing data
Forms of final control	exam
Media employed	software package.
Reading list	1. Половинкин А.И. Основы инженерного творчества: Учебное пособие для студентов вузов.- М.: Машиностроение, 1988. - 368 с. 2. Саламатов Ю.П. Как стать изобретателем. - М.: Просвещение, 1990, - 240 с. 3. Джонс Д.К. Методы инженерного творчества. Пер. с англ. - М.: Мир, 1986. - 326 с. 4. Тищенко Н.М. Введение в проектирование систем управления. - М.: Энергоатомиздат, 1986. - 240 с. 5. Ивоботенко Б.А. и др. Планирование эксперимента в электромеханике. - М.: Энергия, 1975. - 184 с.

	6. Аветисян Д.А. Основы автоматизированного проектирования электромеханических преобразователей. - М.: Высшая школа, 1988. - 271 с. 7. Норенков И.П. Принципы построения и структура САПР. - М.: Высшая школа, 1986. Выпуски 1...9. 8. Геминтерн В.И. и др. Основы автоматизированного проектирования электрических машин. - М.: Моск. энерг. ин-т, 1989. - 98 с. 9. Э.Крик. Введение в инженерное дело. Пер. с англ.- М.: Энергия, 1970.-176 с. 10. Потемкин И.С. Методы поиска технических решений. - М.: Моск. энерг. ин-т, 1989. - 123 с. 11. Половинкин А.И. Автоматизация поискового конструирования. - М.: Высшая школа. - 275 с. 12. Половинкин А.И. Методы инженерного творчества. - Волгоград: Волгоград. полит.ин-т, 1984. - 365 с. 13. Джонс Дж.К. Инженерное и художественное конструирование. Современные методы проектного анализа. - М.: Мир, 1976. - 374 с. 14. Моисеева Н.К. Выбор технических решений при создании новых изделий. - М.: Машиностроение, 1980. - 181 с. 15. Моисеева Н.К. и др. Новая техника: повышение эффективности издания и освоения. - М.: Высшая школа, 1984. - 289 с. 16. Подиновский В.В., Ногин В.Д. Парето-оптимальные решения многокритериальных задач. - М.: Наука, 1982. - 320 с. 17. Пигоров Г.С., Таран Ю.Н., Бельгольский Б.П. Интенсификация инженерного творчества. - М.: Профиздат, 1989. - 197 с. 18.Потемкин И.С. Автоматизация синтеза функциональных схем. - М.: Энергоатомиздат, 1981. - 279 с.

Module designation:	**Mathematical Problems and Bases of Automation**
Courses of academic disciplines within the module	Mathematical Problems and Automation Basics/Algorithms and Automation Programs
Semester(s) in which the module is taught	5
Person responsible for the module	Isabekova Bibigul Beisembaevna
Language	Russian, Kazakh

Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Self-study– 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Computer science, Higher Mathematics II, PhysicsII
Module objectives/intended learning outcomes	Knowledge of: types of representation of mathematical models; Numerical methods for solving automation problems. Skills: to build mathematical models on the verbal formulation of automation tasks; to solve problems of optimization of automated systems; Competently apply numerical methods in solving problems arising when creating automated systems. Competencies: in the development of mathematical models of technological processes and objects.
Content	The concept of a model and its object. Modeling as a research method. The role of modeling in the processes of human cognitive and practical activity. The concept of a mathematical model. The value of mathematical models (MM) in solving automation problems. Recommended Reading list. Basic principles of modeling: the necessary degree of detail MM; A systematic approach to constructing a model. Types of models: static, dynamic, deterministic, stochastic; One-dimensional, multidimensional; Linear, nonlinear. Conformity MM to the studied object, an estimation of quality of model. Forms of representation of models. Structural models: features, opportunities, advantages, disadvantages. Software. Models of states. The concept of the state of a dynamic system; Forms of state models. Model of the state of the control object. Model of the state of a closed multidimensional system. Software. Identification of management objects. Statement of the identification problem. Methods of identification.

	Construction of mathematical models of the main elements of automation systems. Description of modeling objects. Simplification (idealization) of the object. Regularities in the field of application of the model. Methods of mathematical formulation of these patterns. Description of objectives, limitations, input effects, setting devices. Description of sensors, converters, regulators. Numerical methods of solution. Approximation of functions. Formulation of the problem. Spot Approximation. Uniform approximation. Use of series. Interpolation. Selection of empirical formulas. Numerical differentiation. Approximation of derivatives. Use of interpolation formulas. Method of undetermined coefficients. Numerical integration. The method of rectangles and trapezoids. The Simpson method. Using splines. Methods for solving linear systems: direct and iterative. The Cauchy problem: one-step and multi-step solutions. Estimation of the accuracy of the result and the choice of the step of integration. Boundary value problem: methods of solution. Application of mathematical models for solving optimization problems General formulation of the optimization problem. One and multicriteria optimization problems, approaches to their solution. One-dimensional and multidimensional optimization; Unconditional and conditional optimization. Numerical methods of unconditional optimization: the method of uniform search; Bitwise approximation method; Method of dichotomy; Golden section method. Linear programming problems. Multidimensional optimization of linear objective functions under linear constraints of the form of equalities and inequalities. Algebra of the simplex method, obtaining a support solution. The dual problem of linear programming. Standard programs and examinationples of their use for solving automation tasks. Problems of nonlinear programming. Multidimensional problems of nonlinear programming. Standard programs and their use for engineering calculations.

	Optimization of multi-stage processes. Methods for solving dynamic programming problems. Use of optimization methods for solving optimal control problems. Using nonlinear programming methods.
Forms of final control	Exam
Media employed	Software package
Reading list	1. Моисеев Н.Н. Математические задачи системного анализа. - М.: Наука, 1998. - 487 с. 2. Советов Б.Я., Яковлев С.А. Моделирование систем. - М.: Высшая школа, 2000. - 271 с. 3. Турчак Л.И. Основы численных методов. - М.: Наука, 2001. - 320 с. 4. Коршунов Ю.Н. Математические основы кибернетики. - М.: Энергоатомиздат, 1987. - 424 с. 5. Краскевич В.Е. Численные методы в инженерных исследованиях. - К.: Высшая школа, 1986. - 263 с. 6. Ротач В.Я. Расчет динамики промышленных автоматических систем регулирования. - М.: Энергия, 1973. - 440 с. 7. Егоров В.Н., Корженевский-Яковлев О.В. Цифровое моделирование систем электропривода. - Л.: Энергоатомизадт, 1986. - 168 с. 8. Теория автоматического управления. Теория линейных систем автоматического управления. - Под редакцией Воронова А.А.: Высшая школа, 1977. - 303 с. 9. Бахвалов Н.С., Жидков Н.П., Кобельков Г.М. Численные методы. - М.: Наука, Гл. ред. физ-мат. лит., 1987. - 600 с. 10. Демидович Б.П., Марон И.А. Основы вычислительной математики. – М.: Гос. изд. физ-мат. лит., 1960 - 659 с. 11. Фурунжиев Р. И. и др. Применение математических методов и ЭВМ: Практикум: Учебное пособие для вузов/ Р. И. Фурунжиев, Ф.М. Бабушкин, В.В. Варавко. – Минск: Вышэйшая школа, 1988 - 191 с. 12. Потемкин В.Г. Система инженерных и научных расчетов MATLAB: - В 2-х т. Том 2. – М.: ДИАЛОГ – МИФИ, 1999 - 304 с.

2.2 Processes and settings

Module designation:	**Digital Technology and Microprocessor Means**
Courses of academic disciplines within the module	Digital equipment and microprocessor means / Microprocessor means and software complexes
Semester(s) in which the module is taught	5
Person responsible for the module	Mendybaev S.A.
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 30 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Self-study– 105 hours
Workload	total: 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Higher Mathematics, Physics, Theoretical Fundamentals of Electrical Engineering
Module objectives/intended learning outcomes	Knowledge: the principles of construction and the structure of functional electronics devices, their parameters, features and operating conditions; design methods; programming language assembler and methods for debugging programs. Skills: to make a choice of the necessary type of microcircuits in the environment of electronics; to find optimal circuit solutions in automatic control systems; to create programs for the microcontroller and debug them. Competencies: in the development and operation of electronic means, in the use of microcontrollers and programs in the language of assemblers and their debugging.
Content	Physical basis of semiconductors. Semiconductor materials. Semiconductor diodes, thyristors. Bipolar transistors: p-n-p and n-p-n. The principle of amplification and circuit switching on transistors. Field-effect transistors: with control p-n-junction, with built-in and with induced channel. Parameters and static characteristics of field-effect transistors. Comparative evaluation of field and bipolar transistors Construction of amplifying stages: single-stage amplifiers on bipolar and field-effect transistors. The concept of feedback.

	Principles of constructing multistage amplifiers. Amplifiers of direct current. Power Amplifiers. Rectifiers, smoothing filters .. Surge Protectors. Parametric stabilizers, compensating stabilizers. Electronic generators and pulse formers. Microelectronics. Integrated circuits (IC). Classification of integrated circuits: by functional complexity, by manufacturing technology, digital and analog. Microcontrollers. Use of microcontrollers in automation systems.
Forms of final control	Exam, course project
Media employed	Laboratory stands
Reading list	1.Микропроцессоры. В 3-х книгах./Под общей редакцией Преснухина Л.Н.–М.: Высшая школа. – 1986. 2. Соучек Б. Микропроцессоры и микро-ЭВМ. –М.: Мир, 1980. 3. Соботка И., Стары Б. Микропроцессорные системы. –М.: Энергоатомиздат, 1984. 4. Микропроцессорные автоматические системы регулирования. Основы теории и элементы /под редакцией Солодовникова В.В. –М.: высшая школа, 1991. 5. Алексеенко А.Г., Галицын А.А., Иванников А.Д. Проектирование радиоэлектронной аппаратуры на микропроцессорах. –М.: радио и связь, 1984. 6. Современные микроконтроллеры. Архитектура, средства проектирования, примеры применения, ресурсы Интернет./ Под редакцией Коршуна И.В. – М.: АКИМ, 1998. 7. В.Б.Бродин, М.И.Шагурин Микроконтроллеры. Архитектура, программирование, интерфейс.- М.: ЭКОМ, 1999. 8. В.Ф.Козаченко Микроконтроллеры. Руководство по применению 16-разрядных микроконтроллеров IntelMCS-196/296 во встроенных системах управления. – М.: ЭКОМ, 1997. 9. Микроконтроллеры. Выпуск 1. – М.: ДОДЭКА, 1998.М.А.Гладштейн Микроконтроллеры семейства Z86 фирмы ZILOG. – М.: ДОДЭКА, 1999.

Module designation:	**Experiment Technique and its**

	Processing
Courses of academic disciplines within the module	Technique of experiment and its processing / Methods of data processing of automation systems
Semester(s) in which the module is taught	6
Person responsible for the module	Pudich Natalia Nikolaevna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Self-study – 105 hours
Workload	total: 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	basics of designing information systems, theoretical fundamentals of electrical engineering, higher mathematics II
Module objectives/intended learning outcomes	Knowledge: mathematical methods for solving engineering and scientific and technical problems; Methods of experiment planning. Skills: to apply in practice mathematical methods, modern computers and their mathematical support for solving engineering and scientific and technical problems; Apply the basic methods of processing experimental data. Competencies: on the conditions of the experiment
Content	The concept of a planned experiment. The purpose and objectives of the discipline, its relationship with other disciplines. The concept of the object of research. Planned experiment as a method of investigation. The role of the planned experiment in the processes of cognition and practical activity. Physical and computational Experiment Theoretical basis of the planned experiment. The concept of a planned experiment. Tasks of the planned experiment. Statement of the planned experiment. The planning matrix. Obtaining a relationship between the variable parameters and the indicators of the research object. Determination of the coefficients of a polynomial. Determination

	of variance of the coefficients of a polynomial. Study of the model with the help of a full factorial experiment of type 2n. The object of research, its factors. Determining the range of factors. Goal function. The planning matrix. Natural and relative units. The transition from natural to relative units. Student's criteria. Calculation of the coefficients of a polynomial. Checking the significance of the coefficients. Check the adequacy of a polynomial. Advantages of representation of dependencies in the form of a polynomial. Area of problems to be solved. Geometric interpretation of the planned experiment. A true factor space. The discrepancy. Characteristic problems using the full factorial experiment (PFE) of type 2n. Problems of approximation. Investigation of the model with the help of a fractional factorial experiment (FFE) of the 2n-k type. Justification of the examinationple of FFE. Fractionality of the plan. Generating relationship of the plan. The planning matrix. Staging the experiment. Calculation of the coefficients of a polynomial. Checking the significance of the coefficients. Check the adequacy of a polynomial. Recommendations on the use of FFE. The allocation of dominant factors by the method of accidental balance when testing electromechanical equipment for reliability. Formulation of the problem. Formation of the planning matrix. Allocation of dominant factors. Diagram of scattering. Correction of the column of values of the objective function. Recommendations for use. Analysis of the operation of the electromechanical system using orthogonal second-order planning (OSOP). Substantiation of the transition to second-order plans. Types of second-order plans. "Star points" and the size of the shoulder. Number of experiments. Staging the experiment. Construction of the planning matrix. Calculation of the coefficients of a polynomial. Checking the significance of the coefficients. Check the adequacy of a polynomial. Scope of the method. The analysis of the operation of the electromechanical system using second-

	order rototabel planning (SORP). Rationale for the application of the SORP planning method. The choice of the shoulder and the "star points". The planning matrix. Calculation of the coefficients of a polynomial. Checking the significance of the coefficients. Check the adequacy of a polynomial. Application area. Application of the method of factor experiment to solve optimization problems. Class of tasks to be solved. Research of dynamic characteristics of electric motors. Investigation of the electromechanical system. Recommendations for use.
Forms of final control	exam
Media employed	-
Reading list	1 Ивоботенко Б.А., Ильинский Н.Ф., Планирование эксперимента в электромеханике. - М.: Энергия, 1975. - 185 с. 2 Копылов И.П. Применение вычислительных машин в инженерно-экономических расчетах. - М.: Высш. шк., 1980. - 263 с. 3 В.А. Рогов. Методика и практика технических экпериментов. – М., 2005. 4 Бахвалов Н.С., Жидков Н.П., Кобельников Г.М. Численные методы. - М.: Наука, 2008. - 600с. 5 Гайдышев И. Анализ и обработка данных: спец. справ. - СПб: Питер, 2001.-752 с. 6 Петров А.П. Статистическая обработка результатов экспериментальных исследований: уч.пособ. -Курган: изд-во КГУ, 1998. - 85с. 7 Веников А.В., Веников Г.В. Теория подобия и моделирования (применительно к задачам электроэнергетики). - М.: Высш. шк., 1984. - 439с. 8 Налимов В.В. Теория эксперимента. - М.: Наука, 1971. – 208

Module designation:	**The Use of Computers in the Calculation of Information Systems**
Courses of academic disciplines within the module	Application of computers in calculations of information systems / Use of computers in automation systems
Semester(s) in which the module is taught	5
Person responsible for the module	Isabekova Bibigul Beisembaevna

Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes -7.5 hours (up to 15 students) Self-study – 105 hours
Workload	total: - 150 hours
Credit points	5 ECST
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	computer science, higher mathematics II, physics
Module objectives/intended learning outcomes	Knowledge of: mathematical methods for solving engineering and scientific and technical problems; basic methods of calculating information systems and processing experimental research data on computers. Skills: to apply in practice mathematical methods, modern computers and their mathematical support for solving engineering and scientific and technical problems; to optimize design and design decisions using a computer. Competencies: in the application of mathematical methods in data processing.
Content	Place of the course in the educational process. The purpose and objectives of the discipline, its relationship with other disciplines. The main issues studied in the course, the volume in hours, the form of verification assimilation. Application of computers in calculations and experiments. The use of computers for solving problems of analysis and synthesis of automatic systems. Computing machines. The main hardware nodes. Modern programming environments and algorithms for solving engineering problems. Prospects for the development of computer technology. The main stages of solving the problem on a computer. Formulation of the problem. Choosing a solution method. Compilation of the algorithm. Drawing up the program. Debug the program. Calculation and analysis of results.

	Features of research on computers of control systems and their elements. Basic principles of constructing models of systems and their elements. Methods of modeling. Structural modeling. Use of the mathematical apparatus necessary for the decision of problems on the computer. Gauss method of sequential elimination of. unknowns. Reflection method. Simple iteration method. Features of the implementation of the simple iteration method on a computer. Seidel's method. The method of steepest gradient descent. The conjugate gradient method. The error of the approximate solution of the system of equations and the conditionality of the matrices. Simple iteration method and related questions. Newton's method. Methods of descent. The methods of Euler and Runge-Kutta. Method of undetermined coefficients. Finite-difference methods and singularities of integration of systems of equations. Methods of numerical integration of second-order equations. Statement of the interpolation problem. Basic concepts of the theory of the method of grids. Linear and quadratic interpolation. Interpolational Lagrange polynomial. Newton's interpolation polynomial. Inverse and multiinterval interpolation. Approximation of curves. Least square method. Approximation by a polynomial. Solution of integral equations by the method of replacing the integral by a quadrature sum. Integration by the method of rectangles, trapezium, Simpson method.
Forms of final control	exam
Media employed	software package
Reading list	1. Алексеев В.Е., Ваулин А.С., Петрова Г.П.. Вычислительная техника и программирование: практикум по программированию: практ. пособие /под ред. Петрова А.В. -М.: Высш. шк.,2001. - 400 с. 2. Фурунжиев Р.И., Бабушкин Ф.Н., Варавко В.В. Применение математических методов ЭВМ: практикум: уч. пособие для вузов. – Мн: Высш. шк., 2003.- 191с. 3. Бахвалов Н.С., Жидков Н.П., Кобельков Г.М. Численные методы: Уч.

	пособие. - М.: Наука, 1987. - 600с. 4. Веников А.В., Веников Г.В. Теория подобия и моделирования (применительно к задачам электроэнергетики). - М.: Высш.шк., 1984. - 439 с. 5. Планирование эксперимента // Методические указания по курсу «Основы научных исследований» / Р.К. Джапарова, С.А.Бугубаев, Т.А. Асамбаева. - Алма-Ата: АЭИ. - 1988. -26 с. 6. Додж М., Кината К., Стинсон К. Эффективная работа с MicrosoftExcel-97. -СПб.:Питер, 1998. -1072 с. 7. Шарон Подлин. Освой самостоятельно программирование для MicrosoftExcel 2000 за 24 часа. -М.: Изд-й дом "Вильяме", 2000. -304 с. 8. Волченков Н.Г. Программирование на VisualBasic 6: в 3-х ч. -М.: ИНФРА-М, 2002. 9. Носач В.В. Решение задач аппроксимации с помощью персональных компьютеров. - М.:МИКАП, 1994. -382 с. 10. Петров А.П. Статистическая обработка результатов экспериментальных исследований: уч.пособ. -Курган: изд-во КГУ, 1998. - 85с. 11. Тюрин Ю.Н., Макаров А.А. Статистический анализ данных на компьютере. -М.:ИНФРА-М, 1999. -85 с. 12. Гайдышев И. Анализ и обработка данных: спец. справ. - СПб: Питер, 2001.- 752 с.

Module designation:	**Technological Processes and Production**
Courses of academic disciplines within the module	Technological processes and production / Technological objects of automation
Semester(s) in which the module is taught	6
Person responsible for the module	Zhalmagambetova Ulvuar Kairbulatovna, Glokk Kristina Sergeevna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Self-study – 105 hours

Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	computer science, higher mathematics II, physics II
Module objectives/intended learning outcomes	Knowledge of the basics of building automatic lines and production modules; structure of construction of control systems for production sites. Skills: the ability to calculate and select the main process equipment; design flexible production modules. Competencies: in the construction of circuits of automatic lines and modules.
Content	The main technological processes of industrial production. Technical means of production systems. Fundamentals of the choice of technological equipment. System-technical synthesis. The method of virtual routes. Calculation of the number and optimal placement of technical means. Structure of the automated section management. Structural composition of the automated site. Control links in the components of the automated site. Basics of modeling production systems. Principles of the system approach to modeling. The production system as an object of management. Control systems for production modules, lines, sections, workshops. The object of management of the production system and the structure of the management system. The upper level of management. The aggregate-modular principle of constructing flexible automatic lines. Types and classification of structural and layout schemes. Selection on the computer of rational layouts. Optimization of structural and layout schemes of flexible automatic lines. Analysis of variants of the layout of machine tools from a given set of modules. Choice of structural and layout schemes of equipment. Construction of flexible production modules. Multioperational machine tools. Explosion-proof equipment. Optimization of technological processes.

Forms of final control	exam
Media employed	-
Reading list	1) Технологические основы гибких производственных систем / Под ред. Ю.М. Соломенцева. – М.: Высшая школа, 2000. – 255 с. 2) Дащенко А.И., Белоусов А.П. Проектирование автоматических линий. – М.: Высшая школа, 1983. – 327 с. 3) Проектирование технологии автоматизированного машиностроения. Под ред. Ю. М. Соломенцева. - М.: Высшая школа, 1999. - 416 с.

Module designation:	**Applied Information Theory**
Courses of academic disciplines within the module	Applied Information Theory / Theory of Algorithms
Semester(s) in which the module is taught	5
Person responsible for the module	Pudich Natalia Nikolaevna
Language	Russian
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes -7.5 hours (up to 15 students) Self-study– 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	special sections of mathematics.
Module objectives/intended learning outcomes	Knowledge of setting the problem of discretization; quantitative assessments of information; information characteristics of the source of messages; ways of encoding information. Skills: to calculate quantitative estimates of information; information characteristics of the source of messages; to apply the basic models and means of information transfer for optimization of modern computer systems. Competencies: in questions of information presentation, ways of its processing.
Content	Fundamentals of information theory. Basic concepts and definitions. Mathematical models of signals. A random

	process as a model of signals. The theory of message transmission. Modulation and detection of signals in the transmission of information. Digital signals. Coding of information messages. Communication channels for transmission. Multichannel methods of information transfer. Quantitative assessment of information. Entropy as a measure of the uncertainty of choice. General scheme of information processing. Hardware. Static analysis result.
Forms of final control	exam
Media employed	Software package
Reading list	1. Зельдин Е.А. Цифровые интегральные микросхемы в информационно-измерительной аппаратуре – Л.: Энергоатомиздат, 1986.-280с. 2. Опадчий А. Аналоговая и цифровая электроника – М.: «Горячая линия. Телеком», 1999.-768с. 3. Пухальский Г.И. Цифровые устройства - Санкт-Петербург.: «Политехника», 1996.-886с. 4. Пухальский Г.И. Проектирование дискретных устройств на интегральных микросхемах – М.: «Радио и связь», 1990.-304с.

Module designation:	**Microprocessor Systems in Control Systems**
Courses of academic disciplines within the module	Microprocessor complexes in control systems / Microprocessor control systems
Semester(s) in which the module is taught	5
Person responsible for the module	Isabekova Bibigul Beisembaevna, Glokk Kristina Sergeevna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes -7.5 hours (up to 15 students) Self-study – 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the	Physics, higher mathematics, computer

module	science, electronics, programming technologies, applied information theory
Module objectives/intended learning outcomes	Knowledge of modern single-chip and modular sets of microprocessor means used to build microprocessor systems; principles of operation and comparative characteristics of LSI and VLSI microprocessor kits, approaches to building microprocessor systems, the functional purpose of the modules of the kit and their programming; The main stages of the design of microprocessor systems, factors affecting the selection of microprocessor kits; Features of development and debugging of hardware and software systems on cross-media and in resident mode. Skills: to practically use the systems of characteristics of modules of microprocessor kits when designing hardware and software of microprocessor systems; Make independent decisions when choosing the structure of the system and the algorithms for implementing the functions in accordance with the selected design criteria; Design a microprocessor module, a memory system, an interface in microprocessor systems based on the requirements specification; Set tasks of analysis and optimization of system structures, use standards when preparing documentation for hardware and software Competencies: in the principles of operation of microprocessor devices and their application
Content	Microprocessors, basic concepts of definition, classification, stages and history of development. Structure of the basic microprocessor system. Microprocessor architecture Processing of data in a microprocessor. Memory structure and addressing methods. The basic concepts of assembler and the composition of commands. Methods of information exchange and memory organization of microprocessor systems. Peripheral devices and the organization of input / output of information in microprocessor systems. Tools for debugging microprocessor devices and systems. Microprocessor controllers; varieties,

	technical characteristics, principles of construction. Organization of connections of various devices to microprocessor controllers. PC-compatible controllers. Connection of PC compatible controllers to the computer. Networking on the basis of controllers. The current state of software and hardware systems of microprocessor systems. The main classes of microprocessor means: microprocessors, microcontrollers, integrated processors, signal processing processors. System modes of operation of processors. The concept of a register-based software model of a microprocessor, illustrating them using the examinationple of modern single-chip microprocessors. Classification of commands of microprocessors: data transfer, logical and arithmetic processing, input-output, control transfer, microprocessor control. The basic tendencies of development of architecture of microprocessors. Communication microcontrollers. Microcontrollers for control. The tasks and role of microprocessor controllers in automated control systems. Composition of the software. Languages of the description of algorithms. Implementation of typical functions in microprocessor controllers and systems. Methods for improving the performance of microprocessor systems Use of mathematical coprocessors. Multimicroprocessor systems. Cross-means of designing software for microprocessor systems. Software and hardware systems of control systems Software and hardware systems of automated process control system. Principles of construction and structure of modern microprocessor control systems. Typical automated control systems. Software packages SCADA system. The main characteristics of new microprocessors and microcontrollers, interface modules, semiconductor memory modules. Prospects for the development of microprocessor technology. Modern microprocessor control systems

Forms of final control	Exam, course work
Media employed	Stand for programming microprocessor controllers.
Reading list	1. Гук м. Аппаратные средства IBMPC– Спб.: «ПитерКом» 2006 2. Техническое описание контроллера FastwelCPU-185 3. Смит Дж Сопряжение компьютера с внешними устройствами. Уроки реализации. – М.: 2000. 4. Олссон Г, Пиани Д Цифровые системы автоматизации и управления -Спб.: Невский диалект 2001. 5. Микропроцессоры и микропроцессорные комплекты интегральных микросхем Справочник. – М.: Радио и связь 1988.

Module designation:	**Modeling and identification of control objects**
Courses of academic disciplines within the module	Modeling and control objects / Modeling and software of control systems
Semester(s) in which the module is taught	6
Person responsible for the module	Isabekova Bibigul Beisembaevna, Glokk Kristina Sergeevna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 22.5 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes -7.5 hours (up to 15 students) Self-study– 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	higher mathematics; Informatics, programming technology; physics.
Module objectives/intended learning outcomes	Knowledge of modern single-chip and modular sets of microprocessor means used to build microprocessor systems; Principles of operation and comparative characteristics of LSI and VLSI microprocessor kits, approaches to building microprocessor systems, the functional purpose of the modules of the kit and their programming; The main stages of the design of microprocessor systems, factors affecting

	the selection of microprocessor kits; Features of development and debugging of hardware and software systems on cross-media and in resident mode. Skills: to use practically systems of characteristics of modules of microprocessor kits at designing hardware and software of microprocessor systems; make independent decisions when choosing the structure of the system and the algorithms for implementing the functions in accordance with the selected design criteria; design a microprocessor module, a memory system, an interface in microprocessor systems based on the requirements specification; set tasks of analysis and optimization of system structures, use standards when preparing documentation for hardware and software. Competencies: in the choice of conditions for the use of microprocessor devices in the control system
Content	Brief information about the development and formation of identification methods. Identification in management processes. Reflection of the properties of the object, essential for the purpose of modeling. Adequacy and criteria for adequacy of the model. General information about mathematical models and their classification. A family of transfer function models. General scheme of the identification process. A priori and a posteriori information. The problem of identifiability. Statistical criteria of tightness of communication. Criteria and methods for targeting the cause-effect relations of the model coordinates. Identification based on assessment methods. Correlation methods of identification. Features of identification of objects in closed systems. Identification methods with configurable adaptive models. Types of criteria for approximation of models to the object. Simplification of synthesized algorithms for tuning adaptive models. Methods for identifying nonlinear dynamic characteristics. Application of harmonic linearization in the identification of nonlinear objects. Use of the method of statistical linearization for the

	identification of nonlinear objects.
Forms of final control	exam
Media employed	-
Reading list	1 Вавилов А.А. и др. Имитационное моделирование производственных систем- М.: Техника, 1983 г. 2 Волков Е.А. Численные методы- М.: Наука, 1987. 3 Моисеев Н.Н. Математические задачи системного анализа- М.: Наука, 1981 г. 4 Самарский А. А., Михайлов А. П. Математическое моделирование: Идеи. Методы. Примеры.- 2-е изд., испр.- М.: ФИЗМАТЛИТ, 2002.- 320 с. 5 Советов Б.Я., Яковлев С.А. «Моделирование систем». Учебник для ВУЗов -М.: Высшая школа, 1985 г.

Module designation:	**Reliability of Control Systems**
Courses of academic disciplines within the module	Reliability of control systems / Theory of reliability in automatic control systems
Semester(s) in which the module is taught	7
Person responsible for the module	Isabekova Bibigul Beisembaevna, Glokk Kristina Sergeevna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 30 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Self-study – 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	
Module objectives/intended learning outcomes	Knowledge of mathematical methods for calculating the reliability of control systems in the design, manufacture and operation of technical systems for various purposes; methods of monitoring and diagnosing, forecasting, obtaining estimates of reliability indicators; General principles of building quality management of technical systems. Skills: to promote the introduction and wide dissemination of modern principles of product quality management in automatic control systems for technical objects and

	technological processes; to apply methods of calculation and design of highly reliable systems using modern computer facilities. Competencies: in determining the parameters characterizing the reliability of the control system
Content	Basic concepts, definitions and criteria of product quality. Indicators of product quality and their types. Identification and analysis of factors affecting the quality of products. Methods for determining the values of quality indicators. Selection of parameters characterizing the quality of products. Basic concepts, definitions and reliability criteria. Causes and factors of the appearance of failures and failures in automatic control systems. General characteristics of the problem of increasing the efficiency of management of technological processes and technical objects. The basic stages of calculating the reliability of elements and systems. Coefficient of operational readiness. Methods for calculating the reliability of redundant systems Methods for calculating the reliability of technical systems with redundancy Tests of reliability tests. Operational reliability of technical systems. Processing of experimental data. Quality management of complex technical systems The importance of reliability theory and product quality management in the solution of automation tasks in control systems.
Forms of final control	exam
Media employed	-
Reading list	1. Дружинин Г.В. Надежность автоматизированных систем. – М.: Энергия, 2000. 2. Китушкин В.Г. Надежность энергетических систем. Учебное пособие. Ч.1. Из-во НГГУ, Новосибирск, 2002 г. 3. Гук Ю.Б. Теория надежности в электроэнергетике. - Л. Энергоатомиздат, 1990 г. 4. Рябинин И.А. Расчёт надёжности систем со структурной избыточностью/Надёжность и эффективность в технике: Справочник. В

	10 т. М.: Машиностроение, 1988. – т.5: Проектный анализ надёжности / Под ред. В.И. Патрушева и А.И. Рембезы.

3 Deepening of special knowledge

Module designation:	**CAD of Automation Systems**
Courses of academic disciplines within the module	CAD of devices and automation systems / Design in P-CAD systems
Semester(s) in which the module is taught	7
Person responsible for the module	Isupova Natalia Alexandrovna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 30 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Self-study– 105 hours
Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	the use of computers in the calculation of information systems, the theoretical basis of electrical engineering, physics II.
Module objectives/intended learning outcomes	Knowledge of the principles of CAD organization; Creation and operation of CAD; The main directions of development of automated systems of technological training and their designation; Methods of designing highly efficient technological processes; Software and hardware CAD. Skills: to use computer facilities in the development of technological processes; develop algorithms and work with databases; to analyze the influence of the initial data on the quality of the projected technological processes; Use software and hardware CAD as a tool for the designer of automation systems. Competencies: the use of design systems of automatic control systems
Content	System approach to design. Structure of the design process. Classification of models and parameters. History of the development of CAD. Theoretical bases of development of CAD. Hierarchical structure of CAD. Principles of system construction. Components of mathematical support: mathematical models, numerical methods,

	algorithms; Requirements for them in CAD. Mathematical support for analysis and synthesis of design solutions. Basic requirements for hardware CAD. Basic concepts, types of information and their definitions. Structure of information support of CAD. Classification of languages. The software system as the main form of building applied CAD software. Methodical models. Organization of the design process. Technical design assignment. Composition of project documentation. Basic electrical diagrams, wiring diagrams and drawings.
Forms of final control	Exam
Media employed	Graphic editor "AutoCAD"
Reading list	1. Норенков И.П., Маничев В.Б. Основы теории и проектирования САПР. М:Вычш.шк. -1990. -335 с, 2. Капустин Н.М. САПР технологических процессов/ Уч. пособие -VI., 1992,-164с. 3. Сазыкин В.Г. Интеллектуализация САПР объектов энергетики: Структура информации и концепция ее обработки / Энергетика. -1993. - № 5-6. - с.51-56. 4. Норенков И.П. Введение в автоматизированное проектирование технических устройств и систем. -М.: Высшая школа, 1986. - 304 с. 5. Разработка САПР. В 10 кн./ под ред. А.В. Петрова, в 10 кн. -М., 1990- 1991. 6. Кн.1.: Петров А.В., Черненький В.М. Проблемы и принципы создания САПР.-1990.-144с. 7. Кн.2.: Даичул А.П., Полуян Л.Я. Системотехнические задачи создания САПР. -1990.-144с. 8. Кн.3.: Федоров В.С., Гуляев Н.Б. Проектирование ПО САПР,.-1990.- 159с. 9. Кн.4.: Вейнеров О.М.. Самохвалов Э.Н. Проектирование БД САПР .- 3990.-144с. 10. Кн.5.: Артемьев В.И., Строганов В.Ю. Организация диалога в САПР.- 1990.-158с.

Module designation:	**Technological Measurements and Instruments**
Courses of academic disciplines within the module	Technological measurements and devices / process control systems for industrial processes
Semester(s) in which the module is taught	7
Person responsible for the module	Kibartas Victor Vytautasovich, Glokk Kristina Sergeevna
Language	Russian, Kazakh

Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 37.5 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Self-study– 150 hours
Workload	total: 210 hours
Credit points	7 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	higher mathematics, theoretical fundamentals of electrical engineering, mathematical problems and the basics of automation
Module objectives/intended learning outcomes	Knowledge of methods for calculating the reliability of electrical engineering installations and the quality of electricity in the design, manufacture and operation of technical systems for various purposes; methods of monitoring and diagnosing, forecasting, obtaining estimates of reliability indicators; general principles of building quality management of technical systems. Skills: to use modern principles of product quality management in automatic control systems for technical objects and technological processes; to apply methods of calculation and design of highly reliable systems using modern computer facilities. Competencies: in the use of measuring systems in control systems.
Content	Basic metrological concepts. Metrological characteristics of measuring instruments; General information about measuring instruments (SI); Errors of SI, their characteristics. Methods for increasing the accuracy of measurements in SI, methods for reducing the random and systematic components of SI errors. Measurement inaccuracies. Spring gauges and vacuum gauges. Instruments for measuring temperature. Induction flowmeters. Electrical thermal conductometric gas analyzers. Examinationples of measuring the density of a liquid Devices for level measurement.

	Measurement and control of moisture of materials. Technical analysis in the metallurgy of non-ferrous and rare metals. Scientific - methodical classification of methods of technical analysis.
Forms of final control	exam
Media employed	-
Reading list	1 Кулаков М.В. Технологические измерения и приборы для химических производств.- М. Машиностроение, – 2003. 2 Коршунов Ю.М. Математические основы кибернетики: Учебное пособие для вузов. – М.: Энергия, 2000. – 424 с.: ил. 3 Беляев И.И. Контроль и автоматизация производства глинозема и алюминия. М.: Энергоатомиздат, 1999. – 256 с.

Module designation:	**Automation of Standard Technological Processes and Productions**
Courses of academic disciplines within the module	Automation of standard technological processes and productions / Automation of technical complexes
Semester(s) in which the module is taught	7
Person responsible for the module	Kibartas Victor Vytautasovich, Zhalmagambetova Ulvuar Kairbulutovna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 30 hours (up to 60 students) Practical classes - 15 hours (up to 30 students) Laboratory classes -7,5 hours (up to 15 students) Self-study – 127,5 hours
Workload	total: - 180 hours
Credit points	6 ECST
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	the basics of automation; Design of control and automation systems.
Module objectives/intended learning outcomes	Knowledge of the principles of operation, design, electrical and pneumatic circuits: electric machine devices; primary measuring transducers (sensors); transducers of sensor signals and control signals into unified signals; secondary instruments; ballasts; executive mechanisms and regulatory

	bodies; regulators and microprocessor controllers. Skills: to make calculation of the basic parameters at designing of ACS; solve the problems arising from the transition from manual design to automated design; optimize design decisions. Competencies: in the sequence of the elements of the automatic control scheme for typical technological processes.
Content	Processing of technological information. Obtaining information about the technological object of management. Technical means of standard technological processes and complexes. Means of displaying and storing information. General characteristics and classification of the main computer nodes. Automation of continuous and discrete technological processes. Typical schemes of automatic regulation of technological variables. Automated control systems for technological processes. Typical solutions for SCADA systems in various industries. The concept of control systems, their varieties. Technical means of automation The main types of typical mathematical models. Mathematical description of physicochemical and thermal processes in industrial technologies. Computer and microprocessor control and management systems. Basic ideas about the system of visual modeling (Vissim). A meaningful and mathematical formulation of the problem of optimal control of a typical technological process. The structure of modern automated control systems of technological processes, its functions and basic varieties.
Forms of final control	exam, course project
Media employed	-
Reading list	1 Бушуев С.Д., Михайлов В.С. Автоматика и автоматизация производственных процессов. М.: Высш. шк., 1992 2 Автоматизация технологических процессов Бородин И. Ф., Судник Ю. А. М.: изд.: КОЛОСС, 2007г. 3 Мазуров В.М. Теоритические основы построения АСУ ТП. М. : Изд-во ЭРА,

	2003 г – 436с. 4 Передовые технологии автоматизации. Каталог 9.0. М. : Изд-во ПРОСОФТ, 2007. –310с. 5 Компоненты для комплексной автоматизации. Каталог SIMATICST -70. Алматы : Изд-во SIEMENS. 2007.-1460с.

Module designation:	**Installation and Adjustment of Automation Systems**
Courses of academic disciplines within the module	Module of installation and adjustment of automation systems / Methods of production of installation works and principles of adjustment of process control system
Semester(s) in which the module is taught	7
Person responsible for the module	Isupova Natalia Alexandrovna, Glokk Kristina Sergeevna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures - 37.5 hours (up to 60 students) Practical classes - 22.5 hours (up to 30 students) Self-study – 150 hours
Workload	total: - 210 hours
Credit points	7 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	designing control and automation systems.
Module objectives/intended learning outcomes	Knowledge of technical requirements for the installation of instrumentation and A, shields, consoles and cable routes; the device of machine tools, tools and devices for performing assembly and adjustment works; Methods and methods for setting up measuring instruments and automatic control schemes for technological processes. Skills: the ability to read and compile the basic electrical control schemes for automatic control systems, installation and switching diagrams of panels and panels, schemes for cable and pipe postings; to use the individual tools of the automation tool installer; to perform installation and adjustment of measuring instruments, simple schemes of remote and automatic control. Competencies: in the knowledge of the sequence of performing the installation and

	commissioning work in the organization of an automatic control system
Content	Stages of development and implementation of automation systems. Project documentation for process automation systems Equipment, tools and accessories for installation work. Installation of automation means Setting up automation tools Adjustment of means and systems of measurement. Adjustment of schemes and devices for technological signaling, protection and interlocking. Removal of static and dynamic characteristics of the objects of regulation. Calculation and selection of control laws, regulator settings.
Forms of final control	exam
Media employed	-
Reading list	1. Наладка средств автоматизации и автоматизированных систем регулирования. Под ред. А.С. Клюева – М.: 1989. 2. Алексеев К.А. Монтаж приборов и средсв автоматизации. Справочник – М.: 1989. 3. Наладка средств измерений и систем технологического контроля. Под ред. А.С. Клюева– М.: 1990 4.Компоненты для комплексной автоматизации. Каталог SIMATTIC ST-70. Алматы.: SIEMES, 2001. 5. СНиП 3.05.07.-85 Правила производства и приемки работ. Системы автоматизации.

4 Out- and intersubjectContents

Module designation:	**Social History**
Courses of academic disciplines within the module	History of Kazakhstan
Semester(s) in which the module is taught	1
Person responsible for the module	Kulumbaeva M. Zh., Moldakimova A.S.
Language	Russian, Kazakh
Relation to curriculum	EP – Automation and control compulsory component
Type of teaching, contact hours	Full-time Lectures- 30 hours (60 students) Practical classes – 15 hours (30 students)) Self-study – 105 hours

Workload	total: - 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 «Control and assessment of academic achievements of students »
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge of the history of Kazakhstan since the most ancient times up to now in all concreteness and variety of historic facts; Skills: to analyze, generalize, interpret the facts of history and to use it when studying a concrete historical situation; Competencies: in uses of experience of historical development (antecedents of the person and society) in real practical activities
Content	Kazakhstan in the ancient time, Kazakhstan in the period of the early and developed Middle Ages, Kazakhstan in the XIII-XV centuries, Ethnogenesis of Kazakhs. Kazakh khanate, Accession of Kazakhstan to Russia, People's liberation fight of Kazakhs at the end of XVIII – the middle of the XIX centuries, Kazakhstan as a part of the Russian Empire (the second half of XIX – the beginning of the XX centuries), Social movement in Kazakhstan the beginnings of the XX century, Kazakhstan in 1917 - 1920. Social and economic transformations in the 20-30th of the XX century, Political and cultural life in the 20-30th, Kazakhstan in the period of the Great Patriotic War, Kazakhstan in post-war years, Kazakhstan in 1965 - 1991, Independent Kazakhstan
Forms of final control	State exam
Media employed	-
Reading list	1 Батпенова З.С., Фоминых В.В. История Казахстана. Методические рекомендации для самостоятельной работы студентов всех специальностей 1 курса. - Усть-Каменогорск, 2004 2 История Казахской ССР с древнейших времен до наших дней в 5 т. - Алма-Ата, 1977-1981 3 История Казахстана с древнейших времен до наших дней в 4(5) т. - Алматы, 1996-2000. Т. 1-3

Module designation:	**Multilingual Training**

Courses of academic disciplines within the module	Foreign language Kazakh
Semester(s) in which the module is taught	1,2
Person responsible for the module	Avazbakieva F.R., Aitkazina T.D., Kopaeva A.K.
Language	Russian, Kazakh
Relation to curriculum	EP – Automatization and management compulsory component
Type of teaching, contact hours (Foreign language Kazakh – Semester 1)	Full-time Practical classes – 37,5 hours (up to 30 students) Self-study- 82,5 hours
Type of teaching, contact hours (Foreign language Kazakh– Semester 2)	Full-time Practical classes - 45 hours (up to 30 students) Self-study- 105 hours
Workload	total: - 270 hours
Credit points	4 ECTS, 5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge of the methods and techniques of the structural-semantic and semantic-linguistic analysis of the scientific text; the logic of the development of information of the text, Skills: to use the scientific Reading list in the specialty in order to obtain information conducive to the formation of professional competence; build the logical and compositional basis of the text; Generalize and interpret the information received; to conduct a dialogue in situations of formal and informal communication in the domestic, educational and labor spheres, Competencies: in using the system of subject and language knowledge to solve problems of professional communication.
Content	Phonetic, spelling, lexical, grammatical norms of a foreign language. phonetics: pronouncing and rhythmic-intonational features of a 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 familiarization, search, learning and viewing 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, personal and formal letters. Translation of texts by specialty from a foreign language to a native language in accordance with the language norms. Auditing: listening to messages of everyday, informational and professional nature. The official language is a unifying factor of the people of Kazakhstan. My university and my profession. The engineer and the future of my country. Independent Kazakhstan. The nature of our region. Art and Culture of Kazakhstan. Famous people of Kazakhstan. Information Systems and the Faculty of Power Engineering. My future profession. Information systems. The role of the society of experts in this field. The twenty-first century is the century of information technologies. Information technology specialist. The history of the personal computer. The computer world. Information Technology industry. Society and science. Kazakhstan's machinery industry. Terminology minimum.
Forms of final control	exam
Media employed	Linguaphone cabinet, electronic textbooks
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. Liz and John Soars. New Headway Intermediate. Student's Book. Oxford University Press 2010 4. Liz and John Soars. New Headway Intermediate. Work Book Oxford University Press 2010 5 Бектұров Ш. Қазақ тілінің қолданбалы грамматикасы. –Астана, 2003. 7 Бектұров Ш., Бектұрова А. «Сұхбат» компьютерлік бағдарламасы. –«Парад» АҚ, 1998.

	7 Қазақ тілі терминдерінің салалық ғылыми түсіндірме сөздігі. –Алматы, 2003. 8 Қонарбаева А.Қ. Қазақ тілі: Электронды оқу құралы. –ШҚМТУ, 2005. Мұхамадиева Н. Кәсіби қазақ тілі. –Алматы, 2004.

Module designation:	**Social Sciences**
Courses of academic disciplines within the module	Sociology, Politology
Semester(s) in which the module is taught	2, 4
Person responsible for the module	Sultanova G. Sh., Altybasarova M.A.
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Compulsory component
Type of teaching, contact hours (Sociology)	Full-time Lectures – 15 hours Practical classes –15 hours (up to 30 students) Self-study – 60 hours
Type of teaching, contact hours (Politology)	Full-time Lectures – 15 hours Practical classes –15 hours (up to 30 students) Self-study – 60 hours
Workload	total: 180 hours
Credits / credit points	3 ECTS, 3 ECTS
Requirements according to the examination regulations	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge of trends in the social development of society; methodology of applied sociological research; the history of origin, the most important milestones in the evolution of political thought; Basic political doctrines and concepts; schools and scientific directions of modern political science; legal norms of the Republic of Kazakhstan. Skills*:*to adequately navigate in various social situations; work in a team, correctly defend their point of view; to be able to find compromises, to correlate one's opinion with the opinion of the collective; to analyze the features of the development of the political process and political life of peoples and states; to orient in political science schools and directions; to form their own approach in the cognition and assessment of facts,

	events and phenomena in political life; to apply in practice the legal norms of the Republic of Kazakhstan. to independently analyze complex phenomena and trends in the sphere of political life; to use minimal knowledge in politics to develop a conceptual apparatus. *Competencies:*the ability to solve problems encountered by people in the process of interaction with each other (social conflicts, social norms, social deviation, socialization, incentive and punitive interaction), to assess political events occurring in the world, in the field of legal culture and prevention and prevention of violations, in the values of general theoretical knowledge for subsequent professional activities.
Content	Sociology as a science. The main stages of the formation and development of sociology. History of sociology: classical and modern sociological theories.Society, social institutions and interactions. Social groups and communities. Personality in the system of social interaction. Social inequality and social mobility. Social structure and social stratification. Culture as a factor of social change. Global problems of social life and universal values. Theories of the middle level (the sociology of communications, the sociology of education, the sociology of youth, economic sociology, the sociology of religion, etc.). Social conflicts and the logic of their resolution. Methodology and methods of sociological research. Development of the program of sociological research. Methods of collecting sociological information. Analysis and technique of processing empirical sociological research. Politology as an interdisciplinary science. Tendencies and laws of functioning and development of political life. The process of including political actors in activities with the implementation of political power and political interests. Laws of relationships between social actors and political power.
Forms of final control	Exam
Media employed	-
Reading list	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 Волков Ю.Г. Социология: учебник. - М.: Кнорус, 2011. 6 Назаренко С.В. Социология. – М., 2009.

5 Additional types of training

Module designation:	**Physical training**
Courses of academic disciplines within the module	Physical training
Semester(s) in which the module is taught	1-4
Person responsible for the module	Teykhrib Vladimir Egorovich
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control
Type of teaching, contact hours	Full-time Practical classes – 30 hours (up to 30 students)
Workload	total: 157,5 hours
Credit points	12 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge of the provisions on healthy lifestyle. Skills: physically carry out a fairly active activity Competencies: in matters of maintaining a high physical state of the body
Content	Regular exercise. Participation in competitions
Forms of final control	Exam, course work
Media employed	-
Reading list	

6Professional and practical part

Module designation:	**Internship**
Courses of academic disciplines within the module	Field internship; Work experience internship; Pre-graduation internship
Semester(s) in which the module is taught	2, 4, 8
Person responsible for the module	Isabekova Bibigul Beisembaevna
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control compulsory component

Type of teaching, contact hours	Full-time
Workload	18,5 weeks
Credit points	18 ECTS
Requirements according to the examinationination procedure	
Terms of admission for training within the module	
Module objectives/intended learning outcomes	The student must: - fully implement the program of internship, keep an internship diary according to the form set by the higher educational institution; - obey the rules of internal regulations, acting on the relevant practice base; - study and strictly observe the rules of labor protection, safety and industrial sanitation; - present to the head of practice in the established form a written report, a diary, signed by the head of the practice base on the fulfillment of all assignments
Content	The aim of the field internship is to familiarize the student with the activities of the higher educational institution, educational programs implemented by a higher educational institution, trained in the specialty, types of functions and tasks of future professional activity. The places of the field internship are an educational institution, training workshops, laboratories, training grounds, experimental farms, clinics, other training and support units of the university, as well as organizations corresponding to future professional activities. The aim of the work experience internship is to consolidate key competencies, acquire practical skills and experience of professional activity in the field of study. The places of the work experience and technological internships are organizations corresponding to the profile of the trainee's specialty (or related organizations). To prepare and write a diploma work (project), an educational and professional program provides a pre-graduation internship The content of a pre-graduation internship is determined by the theme of the graduation project (work). 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 graduation project (work).The results of the internship are used to write a graduation project (work).and are drawn up accordingly.
Forms of final control	presentaton of a report
Media employed	Laboratories
Reading list	-

Module designation:	**Professional language training**
Courses of academic disciplines within the module	Professional Kazakh Language Profession-oriented foreign language
Semester(s) in which the module is taught	3,4
Person responsible for the module	Kibartas V. V., Isabekov Zh. B., Zhalmagambetova U. K.
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Compulsory component
Type of teaching, contact hours (Professional Kazakh Language)	Full-time Practical classes – 30 hours (up to 30 students) Self-study– 60 hours
Type of teaching, contact hours (Profession-oriented foreign language)	Full-time Practical classes – 30 hours (up to 30 students) Self-study– 60 hours
Workload	total: - 180 hours
Credit points	3 ECTS, 3 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge of the methods and techniques of the structural-semantic and semantic-linguistic analysis of the scientific text; the logic of the development of information of the text, Skills: to use scientific literature in the specialty in order to obtain information that fosters the formation of professional competence; to build the logical and compositional basis of the text; to generalize and interpret the information received; to conduct a dialogue in situations of formal and informal communication in the domestic, educational and labor spheres, Competencies: in using the system of subject and language knowledge to solve problems of professional communication.

Content	Phonetic, spelling, vocabulary, grammar rules of a foreign language. Phonetics: the pronunciation and intonation, rhythmic characteristics of a foreign language, reception and reproduction of the sound system of speech. Spelling: sound-and-spelling system of the language, basic spelling rules. Vocabulary: word-formation models; lexical minimum of 2,500 units of the foreign language and the terms corresponding to the profile of the specialty; differentiation of vocabulary in the spheres of application. Grammar: the main parts of speech - noun, adjective, adverb, verb, article, pronoun, preposition; the structure of simple and complex sentences; basic models of word formation. Reading: building skills of presentation, searching, exploring and viewing reading. Speaking: skills of dialogical and monological speech within the topics studied. Writing: developing skills consistent presentation of ideas, arguments, and the information while writing essays and letters of personal and business nature. Translation of texts on the specialty from foreign language into native language, in accordance with language rules. Listening: auditory perception of everyday life, informative and professional character. The official language is a unifying factor of the people of Kazakhstan. My university and my profession. The engineer and the future of my country. Independent Kazakhstan. The nature of our region. Art and Culture of Kazakhstan. Famous people of Kazakhstan. Specialty “Information Technology” and the Fculty of Power Engineering in the world. My future profession. Information systems. The role of the society of experts in this field. The twenty-first century is the century of information technologies. Information technology specialist. The history of the personal computer. The computer world. Information Technology industry. Society and science. Kazakhstan's machinery industry. Terminology minimum.
Forms of final control	exam
Media employed	Electronic books
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. Liz and John Soars. New Headway Intermediate. Student's Book. Oxford University Press 2010 4. Liz and John Soars. New Headway Intermediate. Work Book Oxford University Press 2010 5 Бектұров Ш. Қазақ тілінің қолданбалы грамматикасы. –Астана, 2003. 6 Бектұров Ш., Бектұрова А. «Сұхбат» компьютерлік бағдарламасы. –«Парад» АҚ, 1998. 7 Қазақ тілі терминдерінің салалық ғылыми түсіндірме сөздігі. –Алматы, 2003. 8 Қонарбаева А.Қ. Қазақ тілі: Электронды оқу құралы. –ШҚМТУ, 2005. Мұхамадиева Н. Кәсіби қазақ тілі. –Алматы, 2004.

Module designation:	**Fundamentals of Professional Activity**
Courses of academic disciplines within the module	Fundamentals of professional activity/ Introduction to the specialty: information technology
Semester(s) in which the module is taught	1
Person responsible for the module	Mendybayev Sergazy Amergaliyevich
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures – 45 hours (up to 60 students) Self-study – 105 hours
Workload	total: 150 hours
Credit points	5 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	informatics, physics II, theoretical fundamentals of electrical engineering, higher mathematics.
Module objectives/intended learning outcomes	Knowledge of the conditions of study at the university, its structure, and the structure of the faculty, the score-rating system; the field of bachelor's activity, the problems the bachelor faces in his daily and creative work; the main directions of automation development and its role in production and daily life. Skills: to produce independently bibliographic search of special literature; to solve the problems arising in the work process of training, concerning organizational

	issues; to differentiate the acquired basic knowledge in the learning process. Competencies: in the field of future professional activity.
Content	Short historical excursus to the managment development. Development of theory and means of automation in different periods of human activity. Theroleofdigitalcontrolautomationtechnology. Mathematical methods used in the development of control systems: functions, functionals and operators, Laplace transform and transfer functions, frequency characteristics, the concept of the state space, basic concepts of fuzzy sets theory, mathematical models of control objects. Methods of analysis and synthesis of control systems. Investigation of the stability and quality of management systems. Robust stability. Basic methods of synthesis and design of control systems. Methods of parametric synthesis. Determination of the regulator coefficients by empirical formulas. Methods of structural synthesis. Condition controllers. Observers of the state. Dynamic compensation method. Modern production management systems. Structure of modern management system. Process variable sensors and actuators. Digital industrial networks. Devices of communication with the object. Controllers.
Forms of final control	Exam
Media employed	-
Reading list	1Теория автоматического регулирования.- Часть первая. Под ред. А. А. Воронова. М. : Высшая школа, 1986. 2 Методы классической и современной теории автоматического управления: Учебник в 5-и томах / Под ред. К.А. Пупкова, Н.Д. Егупова. – М.: Издательство МГТУ им. Н.Э. Баумана. 2004. – 656 с. 3 Острем К., Виттенмарк Б. Системы управления с ЭВМ системами /Пер. с англ. – М.: Мир, 1987. – 480 с. 4 Дорф Р, Бишоп Р. Современные системы управления /Пер. с англ. – М.: Лаборатория Базовых Знаний, 2002. – 832 с.

Module designation:	**Elements and Devices of Automatics**
Courses of academic disciplines within the module	Elements and devices of automation / Elements and means of automation

Semester(s) in which the module is taught	4
Person responsible for the module	Novozhilov Alexander Nikolaevich
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures – 30 часов (up to 60 students) Practical classes – 15 hours (up to 30 students) Laboratory classes – 7,5 hours (up to 15 studentes) Self-study– 127,5 hours
Workload	total: 180 hours
Credit points	6 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Informatics, Physics II, Theoretical Foundations of Electrical Engineering
Module objectives/intended learning outcomes	Knowledge: the principle of work and the basic elements of various electromechanical converters; the range of application of various electromechanical converters; ways to adjust the basic coordinates of electromechanical converters; the main stages of choosing an electromechanical converter, factors affecting the choice of the actuator; place of executive mechanisms in the automation system and their connection with other elements, operating principles, design, electrical and pneumatic circuits of electric machine devices; primary measuring transducers - sensors; transducers of sensor signals into unified signals; control equipment and regulators; starting-regulating equipment; executive mechanisms and regulatory bodies. Skills: to make calculation of the basic parameters of electric drives of executive mechanisms of the automated data management system; solve problems arising in the automated design of actuators of actuating mechanisms of the automated control system; to optimize design solutions, select primary and secondary converters; calculate the parameters of elements and devices of automation; simulate the operation of elements and devices of automation. Competencies: in questions of the analysis of the influence of elements and devices of automation on the process of regulation; In

	the use of software and hardware CAD as a tool for scientific researchers.
Content	The purpose and tasks of developing and using elements and devices for automation and control. A short historical excursus to the development of automation and management tools. Areas of use of elements and devices of automation and control. Electromachine automatic devices.Electric machines of direct current. Thyristor converters of direct current. Drives with semiconductor converters. General information about electric machines of alternating current. Basic modes of operation of an asynchronous machine. Frequency control of an asynchronous motor. The device and principle of operation of a synchronous machine. Control of gate converters. Control of direct-current permanent magnet synchronous motors. Discrete drive with stepping motors. Piezoelectric, magnetostrictive motors for small displacements. Electric micromachines as converters of mechanical quantities. Direct current tachogenerators. Rotary transformers. Reductosins. Inductosins. Thermal regimes and the choice of electric motors.General information on engine selection. Electromagnetic devices of automation. Magnetic materials used in electromagnetic automation devices. Electromagnets. General characteristics of electromagnets and their application. Electromagnetic power elements. Electromagnetic couplings. Electromagnetic relay. Ferrida - the principle of action, design. The device and principle of the reed switches. Sensors. Basic principles of sensor construction.Transducers. Classification of sensors by the shape of the output signal. Element base of pneumatic and hydraulic automation devices.
Forms of final control	Exam, course work
Media employed	Laboratory stands
Reading list	1 Волков Н.И., Миловзоров В.П. Электромашинные устройства автоматики. М: Высш.шк., 2001 г.

	2 Основы теории электрических аппаратов. Под ред. И.С.Таева. М.: 1997г. 3 Буль Б.К., Буль О.Б., Азанов Б. А., Шоффа В.Н. Электромеханические аппараты автоматики. М: Высш. шк., 1998 г. 4 Исембергенов Н.Т., Сарсенбаев Н.С., Фогель А.А. Элементы и устройства автоматики. Методические указания к лабораторным работам. Алматы, КазНТУ. 2005 г. 5 Справочник по автоматизированному электроприводу. Под ред. Елисеева, В.А. Шинянского А.В. М.: 1998 г. 6 Герман-Галкин С.Г. Компьютерное моделирование полупроводниковых: систем в MATLAB 6.0.: учебное пособие.- СПБ.: Корона принт, 2001. 320 с, ил.

Module designation:	**Actuators of Automated Data Management System**
Courses of academic disciplines within the module	Actuators of atomated data management system/ Mechanisms and drives of automation
Semester(s) in which the module is taught	6
Person responsible for the module	Kybartas Victor Vytautasovich
Language	Russian, Kazakh
Relation to curriculum	EP Automation and control Optional component
Type of teaching, contact hours	Full-time Lectures – 30 hours (up to 60 students) Practical classes – 15 hours (up to 30 students) Laboratory classes – 15 hours (up to 15 students) Self-study– 150 hours
Workload	total: 210 hours
Credit points	7 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	Informatics, Physics II, Theoretical Foundations of Electrical Engineering
Module objectives/intended learning outcomes	Knowledge: principle of work and the basic elements of various electromechanical converters; the range of application of various electromechanical converters; ways to adjust the basic coordinates of electromechanical converters; the main stages of choosing an electromechanical

	converter, factors affecting the choice of the actuator; place of actuators in the automation system and their connection with other elements, operating principles, design, electrical and pneumatic circuits of electric machine devices; primary measuring transducers - sensors; transducers of sensor signals into unified signals; control equipment and regulators; starting-regulating equipment; actuators and regulatory bodies. *Skills:*To calculate the main parameters of electric actuators of the actuating mechanisms of the automated control system; solve problems arising in the automated design of actuators of actuating mechanisms of the automated control system;optimize design solutions, to select primary and secondary converters; calculate the parameters of elements and devices of automation; model the operation of elements and devices of automation and analyze their influence on the regulatory process; use software and hardware CAD as a tool for scientific researchers. Competencies: in the interaction of the control system and the drive mechanisms.
Content	The purpose and tasks of developing and using elements and devices for automation and control. Areas of use of elements and devices of automation and control. Electromachine automatic devices. Electric machines of direct current. Magnetic materials used in electric and electromagnetic automation devices. Electric machines of direct current. The device and the principle of operation. Methods of stimulation. Reaction anchors. Mechanical and operating characteristics of a DC motor of series, parallel, independent and mixed excitation. Thyristor converters of direct current. Drives with semiconductor converters. Mechanical characteristics of thyristor drive. Transformers. General information. Basic equations of single-phase transformer. General questions of the theory of electric machines of alternating current. General information about electric machines of alternating current. Mechanical characteristics of three-phase

	and two-phase asynchronous motors. The substitution scheme. Equation of the moment of an asynchronous machine. Mechanical characteristics. Basic modes of operation of an asynchronous machine. Mechanical characteristics of two-phase motors. General information about synchronous machines. The synchronous motor and its characteristics. Electromagnetic power and torque of the synchronous motor. Methods for starting a synchronous motor. Control of gate converters. Control of thyristors and thyristor converters. Direct digital control of thyristor converters. Choice of switching frequency. Pulse speed regulation. Structure and schemes of frequency control. Converters with direct connection. Converters with DC link. Inverters and their management. Discrete drive with stepper motors. Mode of operation and characteristics of the stepper motor. Control units are a switch, an amplifier-driver and a control system. Electric micromachines as converters of mechanical quantities. Direct current tachogenerators. Synchronous and asynchronous tachogenerators. Synchros. Transmission systems for the angle of rotation. Indicator and transformer modes of syncros. Rotary transformers. Linear and sine-cosine transformers. Reductosins. Inductosins.Thermal regimes and the choice of electric motors. Types of load moments. General information on the choice of engine. The choice of engine power under long-term load. Methods for comparing losses and equivalent current. Electromagnetic devices as converters of linear and angular displacements, and also as executive devices of automation and control. Traction and mechanical characteristics of a DC electromagnet. Electromagnet with alternating current and its traction characteristic. Electromagnetic power elements. Electromagnetic couplings. Angular and linear displacement sensors. Angular and linear velocity sensors. Acceleration sensors. Sensors of vibration

	parameters. Sensors of the moments of rotation. Force sensors. Pressure sensors. Sensors for liquid level and loose materials. Flow sensors for liquids and gases. Temperature sensors. Element base of pneumatic and hydraulic automation devices.
Forms of final control	Exam
Media employed	Laboratory stends
Reading list	1 Волков Н.И., Миловзоров В.П. Электромашинные устройства автоматики. М: Высш.шк., 2001 г. 2 Основы теории электрических аппаратов. Под ред. И.С.Таева. М.: 1997г. 3 Буль Б.К., Буль О.Б., Азанов Б. А., Шоффа В.Н. Электромеханические аппараты автоматики. М: Высш. шк., 1998 г. 4 Исембергенов Н.Т., Сарсенбаев Н.С., Фогель А.А. Элементы и устройства автоматики. Методические указания к лабораторным работам. Алматы, КазНТУ. 2005 г. 5 Справочник по автоматизированному электроприводу. Под ред. Елисеева, В.А. Шинянского А.В. М.: 1998 г. 6 Герман-Галкин С.Г. Компьютерное моделирование полупроводниковых: систем в MATLAB 6.0.: учебное пособие.- СПБ.: Корона принт, 2001. 320 с, ил.

Module designation:	Final State Attestation
Courses of academic disciplines within the module	Graduation qualification work
Semester(s) in which the module is taught	8
Person responsible for the module	KibartasV.V
Language	Russian, Kazakh
Relation to curriculum	EP– Automation and control
Type of teaching, contact hours	-
Workload	total: 6 week
Credit points	13 ECTS
Requirements according to the examinationination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	-
Module objectives/intended learning outcomes	Knowledge: the provisions for performing the final work in the direction. Skills: Competencies: in the general procedural

	stages of the organization and conduct of the final attestation.
Content	Implementation of the main sections of the thesis project.
Learning activity outcomes/Forms of final control	exam, the defense of the graduation paper
Media employed	-
Reading list	-

PAVLODAR STATE UNIVERSITY NAMED AFTER S. TORAIGHYROV

MODULE HANDBOOK

of specialty **6M070200 «AUTOMATION AND CONTROL»**

Akkreditierungsagentur für Studiengängeder Ingenie
urwissenschaften, der Informatik, der Naturwissensch
aften und der Mathematik e.V.

Pavlodar, 2017

MODULE REFERENCE BOOK

1 Organizational and communicative

Module designation	**History and Philosophy of Science**
Code, if applicable	TPNI
Courses included in the module	History and philosophy of science
Semester(s) in which the module is taught	1
Responsible for the module	Nevmerzhitsky S. V., Kozhamzharova M. Zh.
Language	Russian, Kazakh
Relation to curriculum	Basic disciplines (BD) Compulsory component
Type of teaching, contact hours	Full time Lectures – 22,5 hours Practical classes – 15 hours Independent study – 82,5 hours
Workload	Total: 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	«History»; «Philosophy» «History of Kazakhstan»; «Man and Society»; « Culturology».
Module objectives/intended learning outcomes	*Knowledge of* methodology of scientific knowledge; principles and structure of the organization of scientific activity. *Skills*: the use of acquired knowledge for the original development and application of ideas in the context of scientific research; a critical analysis of existing concepts, theories and approaches to the analysis of processes and phenomena; integration of knowledge obtained 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; fluency in a foreign language at a professional level, allowing scientific research and teaching of special subjects in universities. *Competencies*: in the field of research methodology.
Content	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.
Examination form	Exam
Media employed	-
Reading list	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) 2) Бердяев, Н. Самопознание.-М.:ЭКСМО. Самопознание.-2008.-639 с..-(Антология мысли) 3) Тарасов, Ю. Н.Философские проблемы социально-гуманитарных наук:учеб. пособие для аспирантов.-Воронеж:[б.и.]. Философские проблемы социально-гуманитарных наук.-2008.-208 с.

Module designation	**Module of pollylanguage traning**
Courses included in the module	Foreign language (professional), Business Kazakh
Semester(s) in which the module is taught	2, 3
Responsible for the module	Zhalmagambetova U.K., Rozhkova E.M., Zeynulina A.F.
Language	Russian, English
Relation to curriculum	Basic disciplines (BD) Compulsory component Optional component
Type of teaching, contact hours (Foreign language (professional))	Full time Practical classes – 37,5 hours Independent study – 82,5 hours
Type of teaching, contact hours (Business Kazakh)	Full time Practical classes – 37,5 hours Independent study – 82,5 hours
Workload	Total: 240 hours
Credit points	4 ECTS, 4 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Terms of admission for training within the module	English in high school, Kazakh, History of Kazakhstan
Module objectives/intended learning outcomes	Knowledge: the structure and basis of the construction of written and oral texts on professional subjects; rules of speech behavior in accordance with situations of professional communication, depending on the style and nature of communication in social and academic spheres. Language material on the specialty, cultural studies. Skills: the ability to conduct a business dialogue in professional fields; transmit the

	content of the read and heard text, to annotate and abstract authentic scientific articles, texts and monographs, compose business correspondence (resume, autobiography, business letters, essays); expand the glossary of professional terminology; make reports on the topic in the form of a review essay or a report containing a personal assessment and reasoning; participate in a discussion that requires prior collection and processing of facts; conduct presentations, business meetings, negotiations, discussions. write scientific articles of a professional nature. to apply the acquired knowledge in professional scientific and practical activities: speaking: to conduct a dialogue in situations of formal and informal communication in the domestic, educational and labor spheres, using arguments, telling, reasoning in connection with the studied topics of read / listening texts, describing events; Listening: to understand relatively complete expression in various situations; understand the main content of authentic audio or video texts of cognitive nature related to the chosen profession; Reading: authentic texts, using basic types of reading depending on the communicative task; Writing: describe phenomena, events, state facts. Competencies: the engagment in a constructive dialogue to achieve the greatest effectiveness of the goal; the preparation of project assignments in a foreign language; working with Internet sites in a foreign language; practical activities for successful interaction in various communication situations, including profile-oriented participation in competitions, olympiads and conferences.
Content	Phonetic, spelling, lexical, grammatical norms of the studied foreign language. Phonetics: pronouncing and rhythmic-intonational features of a 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**: Skills of dialogical and monologic speech within the studied topics. **Writing**: the sequential presentation of thoughts, reasoning, and information when writing essays, personal and formal letters. **Translation of texts** in the specialty from the foreign language into the native language in accordance with the language norms. **Listening**: comprehension of everyday, informational and professional messages. **The state language** is the factor that connects Kazakhstan. My university and my specialty. Technique and development of my country. Independent Kazakhstan. The nature of our land. Culture and art of Kazakhstan. Outstanding personalities of the people of Kazakhstan. Kazakh language in the field of specialty "Information technologies". Information technology and the faculty of energy. My specialty in the world. The future of my specialty. Workplace. History of the computer. History of the development of information systems. Specialists in this industry in my homeland. XXI century - the age of information technology. Development of this industry and computer equipment in Kazakhstan. Terminological minimum.
Forms of examination	Exam
Media employed	-
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. Liz and John Soars. New Headway Intermediate. Student's Book. Oxford University Press 2010 4. Liz and John Soars. New Headway Intermediate. Work Book Oxford University Press 2010 5 Бектұров Ш. Қазақ тілінің қолданбалы грамматикасы. –Астана, 2003. 6 Бектұров Ш., Бектұрова А. Қазақ тілі (ана тілі деңгейінде үйрету құралы).–Алматы, 1998. 7 Бектұров Ш., Бектұрова А. «Сұхбат» компьютерлік бағдарламасы. –«Парад» АҚ, 1998. 8 Қазақ тілі терминдерінің салалық ғылыми

	түсіндірме сөздігі. –Алматы, 2003. 9 Қазақша-орысша, орысша-қазақша терминологиялық сөздіктер. –Алматы, 2000. 9 Мұхамадиева Н. Кәсіби қазақ тілі. –Алматы, 2004.

2 The fundamentals of special disciplines

Module designation	**Modern of modern theories, methods and means of creation and projecting of automation and control systems**
Courses included in the module	Modern theories, methods and means of automation and control systems creation Structure of designed solutions for automation systems / Automated projecting of automation systems
Semester(s) in which the module is taught	1
Responsible for the module	Khatsevsky V.F.
Language	Russian
Relation to curriculum	Core disciplines (CD) Compulsory component Basic disciplines (BD) Optional component
Type of teaching, contact hours (Modern theories, methods and means of automation and control systems creation Structure of designed solutions for automation systems)	Full time Lectures – 22,5 hours Practical classes – 15 hours Independent study – 82,5 hours
Type of teaching, contact hours (Automated projecting of automation systems)	Full time Lectures – 22,5 hours Practical classes – 15 hours Independent study – 82,5 hours
Workload	Total: 240 hours
Credit points	4 ECTS, 4 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Higher mathematics; Computer science; Theory of automatic control; Mathematical foundations of the theory of systems; Optimization methods. Physics, theoretical fundamentals of electrical engineering, metrology and measurement, elements and devices of automation, programming technology.
Module objectives/intended learning outcomes	Knowledge: a holistic view of development and modern trends in management systems; ORCAD system capabilities; the scope of the ORCAD system; structure of the ORCAD program; means of working with the graphic editor of the ORCAD system.

	Skills: the ability to use theoretical bases, basic principles and mathematical methods of special systems; to adjust the system to a specific domain; perform graphic works in two-dimensional space; edit the created drawings; print drawings to the printer and plotter; find the best algorithms for working with the ORCAD system; to calculate the main parameters when designing electronic devices; optimize project solutions; Competencies: the application of automation methods in the construction of mathematical models, analysis and synthesis of systems using modern computer facilities; possession of related to work with ORCAD.
Content	Modern management theory and systems theory, mathematical methods of research; New objects and tasks of management in engineering, economics, social and biological systems; The universal nature of the basic principles of management and the interdisciplinary nature of management science. Methods of analysis and synthesis of control systems in conditions of incomplete certainty. Methods for describing control objects in the coordinates of the state space. Observability, controllability, adequacy. Stability of processes in the state space. Methods of the theory of absolute stability. Robust and invariant systems Classification of robust control systems. Uncertain control systems. Robust stability. Methods and algorithms for estimating dynamic processes. Methods and algorithms for identifying dynamic systems. Criteria for optimizing management. Some general methods of the theory of optimal control. Algorithms of optimal control. Optimization of dynamical systems with a random structure. Algorithms of adaptive systems of automatic control. The method of recurrent objective inequalities in adaptive control. Systems of extreme regulation. Methods and algorithms of estimation

	in correlation-extreme systems. Methods of the theory of sensitivity. Search methods of design automation. Automation of the design of automatic control systems. Software for simulation of dynamic systems. Causes and consequences of the increasing complexity of technical products.Preparation for work. The purpose of the ORCAD system, its capabilities. Object commands of the ORCAD system.ORCAD Editor Commands.Tools for editing drawings in the ORCAD system.3D modeling in the ORCAD system.Solid design and visualization of objects.
Forms of examination	Exam
Media employed	Software package
Reading list	1 Алефельд Г. Введение в интервальные вычисления. – М.: 1987. 2 Асаубаев К.Ш., Шуакаев М.К. Алгебры и группы Ли, ряды Вольтерра и теория управления. – А.: Казахская академия творчества, 1993. 3 Арнольд В.И. Теория катастроф. – М.: Наука, 1990. 4 Емельянов СВ. Бинарные системы автоматического управления. – М.: 1984. 5 Воронов А.А. Теория автоматического управления. – М.: «Наука», 1-Зт, 1986г. 6 Крутько П.Д., Максимов А.И., Скворцов Л.М. Алгоритмы и программы проектирования автоматических систем. – М.: «Радио и связь», 1988, 304с. 7 Справочник по теории автоматического управления / Под ред. А.А. Красовского. – М: Наука, 1987. 8 Алтунин А.Е., Семухин М.В. Модели и алгоритмы принятия решений в нечетких условиях: Монография. – Тюмень: Издательство Тюменского государственного университета, 2000. 9 Леоненков А.В. Нечеткое моделирование в среде MatLAB и TECH. – СПб.: БХВ-Петербург, 2003. 10 А.П. Федоренков, К.А. Басов, А.М.

	Кимаев. AutoCAD 2000: Практический курс: - М: «ДЕСС КОМ», 2000 – 527 с. 11 Половинкин А.И. Основы инженерного творчества: Учебное пособие для студентов вузов.- М.: Машиностроение, 1988. - 368 с. 12 Джонс Д.К. Методы инженерного творчества. Пер. с англ. - М.: Мир, 1986. - 326 с. 13 Справочная система ORCAD. – Internet//. 14 http://Info/AutoCAD2002/Menu.html 15 Половинкин А.И. Автоматизация поискового конструирования. - М.: Высшая школа. - 275 с.

Module designation	**Fundamentals of higher school**
Courses included in the module	Pedagogics, Psychology, Methods of teaching disciplines for automation of technological processes / Methods of teaching disciplines on automized systems of control
Semester(s) in which the module is taught	1, 2
Responsible for the module:	Burdina E. V., Kertaeva K. M., Khatsevsky V.F.
Language	Russian, Kazakh
Relation to curriculum	Basic disciplines (BD) Compulsory component Core disciplines (CD) Optional component
Type of teaching, contact hours (Pedagogics)	Full time Lectures – 22,5 часа Practical classes – 15 hours Independent study – 82,5 hours
Type of teaching, contact hours (Psychology)	Full time Lectures – 22,5 часа Practical classes – 15 hours Independent study – 82,5 hours
Type of teaching, contact hours (Methods of teaching disciplines for automation of technological processes / Methods of teaching disciplines on automized systems of control)	Full time Lectures – 30 часа Practical classes – 15 hours Independent study – 105 hours
Workload	Total: 390 hours
Credit points	4 ECTS, 4 ECTS, 5 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Philosophy; Psychology; Sociology. Politology
Module objectives/intended learning outcomes	Knowledge: the psychology of cognitive activity of students in the learning process;

	Psychological methods and means of increasing the effectiveness and quality of education; the optimal structure of organization of science, management and organization of scientific and scientific and technical activities; On the right of intellectual property to the result of scientific and scientific and technical activities, on the state system of scientific and technical information. Skills: the application of knowledge of pedagogy and psychology of the tertiary school in the pedagogical activity; application of interactive teaching methods; Planning of scientific research, and execution of all necessary documents for filing an application for the implementation of an innovative project or for an invention. Competencies: in the field of scientific and scientific-pedagogical activity in higher educational institutions; In the issues of modern educational technologies. in the field of planning and organization of scientific research
Content	Theoretical and methodological and historical foundations of pedagogy. Development of higher education in the modern world. 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. Psychology of the pedagogical collective. Psychological counseling of students and teachers. Objectives and criteria for the importance of fundamental research. Subjects of scientific and scientific and technical activities. The idea of planning an experiment. Processing and presentation of experimental results. The main criteria for the evaluation of innovative projects: the relevance, novelty and practical significance of the study, the

	prospects, the material and technical base, the planned results. The idea of compiling a cost estimate and a research calendar. Instrument and scientific software. The right of intellectual property to the result of scientific and research activities. Principles of the organization of a scientific experiment: the definition of the problem, setting goals and methods for achieving it. Preparation and design of a scientific experiment. Working with literary sources, patent search. The concept of impact factors of journals, recommendations on publications of scientific research. Automation of experiments and computer modeling. Theoretical analysis of the obtained results as a means of studying the applicability of the constructed model. The Patent Law of the Republic of Kazakhstan. Law on innovation. Goals and objectives of patent research. Methods of patent research. Rules of registration and filing of applications for the patenting of industrial property.
Forms of examination	Exam
Media employed	-
Reading list	1 Абдыманапов С.А., Нефедова Л.В., Ахметкаримова Г.С., Соколова М.Г. Тесты: теория и практика.- Астана, 2001.- 194 с. 2 Гузеев В.В. Педагогическая техника в контексте образовательной технологии. М. :Народное образование,2001.128с. 3 Джусубалиева Д., Мынбаев А. Закономерности образовательного пространства и информационное общество// Высшая школа Казахстана, 2000, №1, с.52-59. 4 Каймулдина А. Гуманитаризация технического образования// Высшая школа Казахстана,2000, №1, с. 78-74. 5 Ксензова Г.Ю. Оценочная деятельность учителя.- М., 2000.- 121 с. 6 Психология воспитания: Пособие для методистов дошкольного и начального школьного образования, преподавателей, психологов/ Под ред. В.А.Петровского.- М.: Аспект Пресс, 2005.- 152 с. 7 Пустовит В.В. и др. Новые формы организации вузовской лекции. М.,

	2008. 52 с. (НИИВШ). 8 Равен Дж. Педагогическое тестирование: Проблемы, заблуждения, перспективы.-М., 2009.-144 с. 9 Рецензирование Lectures: Сборник.-М, 2006. 10 Андреева Г.М. Социальная психология. Учебник.- М.: Аспект Пресс. 1998.- 376 с. 11 Квин В. Прикладная психология. Учебник. - СПб., 2000. - 558 с. 12 Кузьмин И. Психотехнологии и эффективный менеджмент.- М.: Технологическая школа бизнеса.- 1994.- 192 с. 13 Зажигаев Л.С., Кишьян А.А., Романиков Ю.И. Методы планирования и обработки результатов физического эксперимента. –Москва: Атомиздат, 1978. - 232 с. 14 Рузавин Г.И. Методология научного исследования. –Москва: ЮНИТИ:ДАНА, 1999. – 317 с. 15 Захаров А., Захарова Г. Как написать и защитить диссертацию. –Санкт-Петербург.: СПБ, 2003. – 157 с. 16 Основы патентного права и патентоведения в Республике Казахстан: Учебное пособие /Ответ. редактор Т.Е.Каудыров. –Алматы: Meti тарғы, 2003. – 392 с. 17 Правовые основы научной деятельности: Сборник нормативных правовых актов. –Алматы: ЮРИСТ, 2003. – 148 с. 18 Интеллектуальная собственность в Республике Казахстан: Сборник нормативных актов. –Алматы: ЮРИСТ, 2002. – 93 с. 19 Закон РК «О науке» 20 Закон РК «Об авторском праве и смежных правах». 21 Закон РК «Об инновационной деятельности» 22 Патентный закон РК

3 Deepening of special knowledge

Module designation	**Module of Automized control of production**
Courses included in the module	Automized control of production / Modern automation systems
Semester(s) in which the module is taught	2

Responsible for the module	Kletsel Mark Yakovlevich
Language	Russian
Relation to curriculum	Core disciplines (CD) Optional component
Type of teaching, contact hours	Lectures – 45 hours Practical classes – 15 hours Independent study – 150 hours
Workload	Total: 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	Technological processes and production equipment; Elements and devices of automation; Executive mechanisms of the automated control system; Theory of automatic control; Microprocessor complexes in control systems.
Module objectives/intended learning outcomes	Knowledge: the main types of technological processes; functions and composition of automated control systems of technological processes; control schemes for automated process control systems; types of sensors and measuring converters; types of technical means included in the automated process control systems. Skills*:* reading and drawing up of functional schemes of automation; reading of automation schemes; solving problems of primary and secondary data processing; Competencies: in the simulation of actuators; In the choice of regulatory laws and technical means of automation.
Content	General information about technological processes Control schemes in automated control systems of technological processes Preparation of initial information in automated control systems of technological processes. Modeling of executive devices. Laws of regulation. Complex of technical means for automated control systems of technological processes.
Forms of examination	Exam
Media employed	-
Reading list	1 Втюрин, В. А. Автоматизированные системы управления технологическими процессами. –

	Санкт-Петербург : учебное пособие, 2006. – 151 с. 2 Бородин, И. Ф., Судник Ю.А. Автоматизация технологических процессов. – М. : КолосС, 2004. – 344 с. 3 Асамбаев, А. Автоматизация технологических процессов для хлебопекарного, макаронного и кондитерского производства. – Астана : Фолиант, 2010. – 384 с.

Module designation	**Module of Electrical equipment and automation of electrotechnological sets**
Courses included in the module	Automation of electrotechnological sets / Electrical equipment of automation systems
Semester(s) in which the module is taught	3
Responsible for the module	Khatsevsky V.F.
Language	Russian
Relation to curriculum	Core disciplines (CD) Optional component
Type of teaching, contact hours	Full time Lectures – 30 hours Practical classes – 15 hours Independent study – 105 hours
Workload	Total: 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, physics, theoretical fundamentals of electrical engineering, theory of automatic control, elements and devices of automation, programming technology.
Module objectives/intended learning outcomes	Knowledge: the main types of technological processes; functions and composition of automated control systems of technological processes; control schemes for process control systems; types of sensors and measuring converters; types of technical means that make up the automated control systems of technological processes. Skills: to solve problems of primary and secondary data processing; simulation of executive devices. Competencies: the choice of regulatory laws and technical means of automation.
Content	Definition of ETU. Types of heating. Classification of ETU. Automatic control

	of electrical installation of resistance heating. The principle of the electrical resistance heating. Electric resistance ovens. Electrical equipment and regulation of EPS parameters. Methods for controlling the temperature in electric resistance furnaces. Constructions and schemes of automatic temperature controllers. Electrical diagram of a continuous temperature regulator of EPS. The basic electric scheme of EPS control. Automatic control of electrical induction heating. Fundamentals of induction heating. General information about induction ETU. Power supplies of the ETU. Induction settings as control objects. Electrical regulation systems for induction units. Control of induction plants using UVM. Basic electrical circuits for monitoring and control of induction units.Automatic control of electric installations of arc heating.The principle of operation of electric installations of arc heating. Electrical equipment of arc furnace installations. Control system for electric arc furnaces. Automatic control of the arc furnace mode. A schematic circuit diagram of the automatic arc controller.
Forms of examination	Exam
Media employed	-
Reading list	1 Шеховцов В. П. Электрическое и электромеханическое оборудование.- М: ФОРУМ: ИНФАРМ-М, 2009.-416 с. 2 Ерофеев А. А. Теория автоматического управления.- М: Политехника, 2005.-302 с. 3 Котюк А. Ф. Датчики в современных измерениях.- М: Телеком, 2006.- 96 с. 4 Кулаков М. В. Технологические измерения и приборы для химических производств. – М: Машиностроение, 2003.

Module designation	**Module of systems of automized control of production and electrical regimes**
Courses included in the module	Systems of automized control of production and electrical regimes / systems of regulation of automatics of

	heat regimes
Semester(s) in which the module is taught	3
Responsible for the module	Khatsevsky V.F.
Language	Russian
Relation to curriculum	Core disciplines (CD) Optional component
Type of teaching, contact hours	Full time Lectures – 30 hours Practical classes – 15 hours Independent study – 105 hours
Workload	Total: 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, physics, theoretical fundamentals of electrical engineering, metrology and measurement, theory of automatic control, elements and devices of automation.
Module objectives/intended learning outcomes	Knowledge: the fundamental mathematical foundations of modeling objects and systems, methods of researching automation systems, tasks and production control algorithms. Skills: creative application of mathematical methods for the analysis of automation systems; Competencies: building automation systems based on specified quality management requirements.
Content	Automatic control system and its elements. Control objects and automatic controller. Transient processes in regulatory systems. Methods of mathematical description of links and systems.Thermal control objects and their characteristics.Laws of regulation and ways of their formation in automatic regulators.Automatic regulators of thermal processes.Industrial regulators and their main elements. Actuators of regulators. Purpose of thermal automation.
Forms of examination	Exam
Media employed	
Reading list	1 Основы автоматического управления, Шишмарев В. Ю.- М: Academia, 2008. 2 Автоматизация производственных процессов, 2-е изд., Волчкевич Л. И.- М: Машиностроение, 2007. 3 Анализ и синтез систем автоматического управления с

	распределенными параметрами. Рапопорт Э. Я.- М: Высш. школа, 2005

Module designation	**Module of means and devices of automation of systems of regulation**
Courses included in the module	Means and systems of automation of objects of electrotechnology / Fundamentals of constructing of logic automized systems. Means of discrete automation / Automation of electrical consumption of melting sets. Microprocessor-based means and systems of automation / Neuron systems of regulation.
Semester(s) in which the module is taught	3
Responsible for the module	Khatsevsky V.F., Zhalmagambetova U.K.
Language	Russian
Relation to curriculum	Basic disciplines(BD) optional component core disciplines (CD) Optional component
Type of teaching, contact hours (Means and systems of automation of objects of electrotechnology / Fundamentals of constructing of logic automized systems.)	Full time Lectures – 22,5 hours Practical classes – 15 hours Independent study – 82,5 hours
Type of teaching, contact hours (Means of discrete automation / Automation of electrical consumption of melting sets.)	Full time Lectures – 22,5 hours Practical classes – 15 hours Independent study – 82,5 hours
Type of teaching, contact hours (Microprocessor-based means and systems of automation / Neuron systems of regulation.)	Full time Lectures – 30 hours Practical classes – 15 hours Independent study – 105 hours
Workload	Total: 390 hours
Credit points	4 ECTS, 4 ECTS, 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, physics, metrology and measurement, programming technology, theoretical fundamentals of electrical engineering, theory of automatic control, elements and devices of automation, microprocessor complexes in control systems, digital technology and microprocessor means.
Module objectives/intended learning outcomes	Knowledge: the principles of work, design, electrical and pneumatic schemes; electric machine devices; - primary measuring transducers (sensors); - converters of signals from sensors and

	control signals into unified signals; secondary instruments; ballasts; executive mechanisms and regulatory bodies; regulators and microprocessor controllers. The role and place of discrete automatic systems in the tasks of automation of electric power systems; basic principles of relay circuits, modern trends and its development and improvement; basic principles and schemes of automatic control, the main types of automation systems, their mathematical description and the main research tasks. Modern modular sets of programmable logic controllers, approaches to the construction of microprocessor systems. Skills: the ability to make calculation of the basic parameters at designing CAP; creatively apply mathematical methods to analyze the general properties of discrete automation devices, on this basis, to own methods of analysis and synthesis of logical automation systems; Perform calculations on the analysis of the stability and quality of systems, the synthesis of parameters and corrective links according to specified requirements for the quality of discrete automation. Use the systems of characteristics of the modules of microprocessor kits, design a microprocessor module. Competencies: solving problems arising from the transition from manual control to automated control. In manual and automated design using modern design systems for automation equipment. In the practical skills of programming industrial controllers.
Content	The purpose and tasks of developing and using elements and devices for automation and control. A brief history of the development of automation and management tools. Areas of use of elements and devices of automation and control. Electromachine automatic devices. General information about electric machines of alternating current. Control of gate converters. Discrete drive with stepping motors. The concept of a software and hardware

	complex (PTC) and its place in automation systems. Principles of organization of distributed control systems on the basis of PTC. Programming languages of industrial controllers. SCADA systems.
Forms of examination	exam
Media employed	-
Reading list	1 Волков Н.И., Миловзоров В.П. Электромашинные устройства автоматики. - М: Высш. шк., 2001 г. 2 Основы теории электрических аппаратов. Под ред. И.С.Таева. М.: 1997 г. 3 Буль Б.К., Буль О.Б., Азанов Б. А., Шоффа В.Н. Электро-механические аппараты автоматики. - М: Высш. шк., 1998 г. 4 Исембергенов Н.Т., Сарсенбаев Н.С., Фогель А.А. Элементы и устройства автоматики. Методические указания к лабораторным работам. - Алматы, КазНТУ, 2005 г. 5 Справочник по автоматизированному электроприводу. Под ред. Елисеева, В.А. Шинянского А.В. - М.: Высш. шк., 1998 г. 6 Герман-Галкин С.Г. Компьютерное моделирование полупроводниковых: систем в MATLAB 6.0.: учебное пособие.- СПБ.: Корона принт, 2001. - 320 с, ил. 7 Исембергенов Н.Т. Электромашинные преобразователи на базе асинхронизированных машин для нетрадиционных источников энергии. - Алматы, 2000. - 202 с.,ил. 8 Башарин А.В., Постников Ю.В. Примеры расчета автоматизированного электропривода на ЭВМ. Учебное пособие для вузов. - Л.: Энергоатомиздат, 1998. - 512 с, ил. 9 Техническая коллекция Schneider Electric: выпуск 16. Системы автоматического управления на основе программируемых логических контроллеров// Schneider Electric (RU). - Издательство: Schneider Electric Publisher, 2008. – 81 с. 10 Деменков Н. П. Языки

	программирования промышленных контроллеров: Учебное пособие/ Под ред. К.А. Пупкова. – М.: Изд-во МГТУ им. Н.Э. Баумана, 2004. – 172 с. 11 Деменков Н. П. SCADA-системы как инструмент проектирования АСУ ТП: Учебное пособие. – М.: Изд-во МГТУ им. Н.Э. Баумана, 2004. – 328 с. 12 Елизаров И.А. Технические средства автоматизации. Программно-технические комплексы и контроллеры: Учебное пособие/ Елизаров И.А., Мартемьянов Ю.Ф., Схиртладзе А.Г., Фролов С.В. – М.: Машиностроение, 2004. – 180 с. 13 Петров И.В. Программируемые контроллеры. Стандартные языки и приемы прикладного проектирования. – М.: Солон-Пресс, 2004. – 256 с. 14 Парр Э. Программируемые контроллеры: руководство для инженера. – М.: БИНОМ. Лаборатория знаний, 2007. – 516с.

Module designation	**Practice**
Courses included in the module	Pedagogical, Research
Semester(s) in which the module is taught	2,3,4
Responsible for the module	Isabekova B.B.
Language	Russian
Relation to curriculum	EP – Automation and control Compulsory component
Type of teaching, contact hours	Full time
Workload	113 weeks
Credit points	3 ECTS, 12 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students"
Recommended prerequisites	Pedagogy and Psychology
Module objectives/intended learning outcomes	fully implement the program of internship, keep an internship diary in accordance with the form established by the higher educational institution; follow the rules of internal regulations, acting on the relevant practice base; study and strictly observe the rules of labor protection, safety and industrial sanitation; submit a written report on the performance of all tasks, a diary signed by the supervisor due to the prescribed form
Content	The aim of the pedagogical internship is the formation of practical skills and methods of teaching in higher education

	The aim of the research internship – the familiarization 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. The place of the pedagogical internship is the relevant departments of universities, the place of the research internship are the scientific laboratories of research organizations of the appropriate profile.
Forms of examination	report
Media employed	-
Reading list	-

4 Professional-practical part

Module designation	Scientific and research work of the master
Courses included in the module	Scientific and research work of the master including implementation of the master's thesis
Semester(s) in which the module is taught	1, 3, 4
Responsible for the module	Isabekova B.B.
Language	Russian
Relation to curriculum	EP – Automation and control Compulsory component
Type of teaching, contact hours	Full time
Workload	
Credit points	29 ECTS
Requirements according to the examination procedure	SO PSU 8.01.2-09 "Monitoring and evaluation of educational achievements of students
Recommended prerequisites	Pedagogy and Psychology
Module objectives/intended learning outcomes	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.
Content	The aim of the research internship – the familiarization with the latest theoretical, methodological and technological achievements of domestic and foreign science The place of the pedagogical internship is the relevant departments of universities, the place of the research internship are the scientific laboratories of research organizations of the appropriate profile.
Forms of examination	report
Media employed	-
Reading list	-

Module designation	**Final State Attestation**
Courses included in the module	Complex examination taking, compiling and defense of the master's thesis
Semester(s) in which the module is taught	4
Responsible for the module	Isabekova B.B.
Language	Russian
Relation to curriculum	EP – Automation and control Compulsory component
Type of teaching, contact hours	Full time
Workload	
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	-
Module objectives/intended learning outcomes	full compliance with the requirements of the training program; presentation of the final master's thesis to the supervisor due to the prescribed form.
Content	Master's thesis and a comprehensive exam of the undergraduate is conducted with the purpose of verifying the mastering of the content of the educational program.
Forms of examination	Comprehensive examination, defense of master's thesis
Media employed	-
Reading list	-