

Ministry of agriculture of the Republic of Kazakhstan
S. Seifullin Kazakh agrotechnical University

DISCUSSED
at session of
Academic Council of the University

Protocol № 15
from "30" "05" 2019 .

Approved by
President
JSC "S. Seifullin Kazakh
agrotechnical University "
A. K. Kurishbayev
" " " 2019 .



EDUCATIONAL PROGRAM
8D07107 "Management of technical systems»
(program name)

Education area code and classification	Doctor of Philosophy/Phd
Code and classification of training areas	3 years
International standard classification of education code	Intramural
Degree awarded	State/Russian
Period of study	Doctor of philosophy/ PhD
Form of training	3 years
Language of instruction	intramural
	state / Russian

Nur Sultan 2019

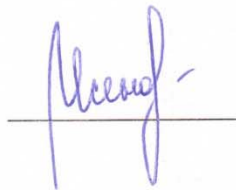
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The educational program "management of technical systems" was considered at the meeting of the Department of electrical equipment operation (Protocol No. 10 of 08.04.2019) and approved by the academic Council of the faculty of Energy (Protocol No. 12 from 24.04.2019).

Dean of the faculty of energy



Isenov S. S.

Head of operation

of electrical equipment department



Sarsikeev E. Zh.

Content of the educational program

№	Component name	Page
1.	Passport of the educational program	4
2.	General characteristics of the educational program	5
3.	Competence model (portrait) of the graduate	7
4.	Professional practice base	10
5.	Structure of the educational program	11
6.	Annex 1. Academic calendar	13
7.	Annex 2. Working curriculum	15
8.	Annex 3. Description of university disciplines of an obligatory component disciplines	21
9.	Annex 4. Description of elective component disciplines	24

1. Passport of the educational program

1.1 purpose of the educational program:

Creation of conditions of effective educational process for formation and development of personal, social, cultural, professional competences in the sphere of management of technical systems and automation of production and technological processes and productions.

1.2 learning Outcomes

- 1. To carry out teaching activities on educational programs of higher education in the professional sphere at a high modern level.
- 2. To apply the methodology of theoretical and experimental research in the field of control of technical systems and automation of technological processes.
- 3. To use technologies of digitization of technical systems and complexes, including the use of the latest information and communication technologies.
- 4. To organize the work of the research team on the problems of control and automation, technologies of digitization of technical systems.
- 5. To develop and implement modern methods and technologies to improve the reliability, quality and efficiency of operation for the created and modernized control and automation systems.
- 6. To carry out control and diagnostics of technical condition of the equipment of control and automation systems, to make its preventive tests and repair.
- 7. To apply methods of estimation of technical and economic characteristics, ways of increase of reliability, quality and efficiency of systems.

2. General characteristics of the educational program (relevance, features, competitive advantages, uniqueness, etc)

2.1 Relevance

- Modern production and technical systems consist of a number of complex interacting subsystems-robotic technological and automated power plants, combined into a single technical system, as well as systems for their management, automation, Informatization, digitalization. The high level of manufacturability of modern technical systems from the point of view of a single process or the entire production requires management of various parameters: technology, safety, reliability, quality, etc.
- Development of control systems for complex technical objects concerns not only new production facilities, but also the introduction of control elements in existing processes

and production without compromising the quality, reliability and efficiency of operation. For the implementation of all stages from design to operation, it is important to prepare scientific personnel capable of large-scale thinking, having a broad Outlook on the problems of technology and technology, having the skills to apply fundamental knowledge to solve scientific and practical problems.

2.2 Competitive advantages

- * Rich scientific and educational experience in the field of management of energy systems, technological processes and production.
- * Experienced scientists and academic staff train future specialists, preserving and developing rich traditions in the Department and faculty.
- * Developed material and technical base (Siemens, Schneider Electric, Danfoss, Festo, Edibon, Arduino, Educational equipment, etc.), there is a research and training ground, a specialized laboratory.
- * Full multimedia equipment for all classrooms with audio and video recording to control the quality of the educational process and ensure the safety of students.
- * Full provision of educational and methodical materials in the state and Russian languages for classroom and independent work.
- * Stable base of research and production practices, close relationship with representatives of industry, agriculture and their participation in the development of curricula, programs of special disciplines.

2.4 the Potential of the profession (office)

Deputy first head of automation.

- Chief power.
- technical Director.
- Head of department.
- Director of department.

3. Competence model (portrait) of the graduate

3.1 Areas of professional activity

- * Modeling, quality and reliability of technical systems.
- * Management of energy systems.
- * Management of agricultural production.
- * Control of technological processes.
- * Automated control systems for pumping, compressor and ventilation systems.
- * Automated control systems of lifting and transport mechanisms, production lines.
- * Automated control systems for numerical control machines, industrial robots and manipulators.
- * Algorithms and programming,
- * Data transmission and storage systems.
- * Microprocessors and microcontrollers.
- * Control and measurement systems.

3.2 Professional activities

A graduate of the educational program "management of technical systems" can carry out the following types of professional activities:

- * design-preparation and development of design documentation, calculation and design of automation and control systems, quality control and evaluation;
- * production and technological-analysis of processes and control objects, improvement of quality, reliability and safety of technical systems through the use of intelligent control systems, selection of equipment and tooling, development and control of technology standards;
- * research-carrying out theoretical, experimental and development work in power supply systems and automation of agricultural production;
- * organizational and management - organization of the team, management decisions; organization of staff training; adaptation of modern versions of quality management systems to specific production conditions on the basis of international standards, implementation of technical control and quality management;
- * educational and pedagogical-teaching of specialized disciplines in higher educational institutions.

3.3 General education competences

- * To know the legal and regulatory framework of teaching activities in higher education;
- * To know the requirements for qualification works of bachelors, specialists, masters;
- * To know modern ways of using information and communication technologies in the chosen field of activity;
- * To know the basic principles of the organization of work in the team and ways to resolve conflict situations
- * To be able to carry out selection of students in bachelor's degree, specialization and master's degree for performance of research and qualification works;
- * To be able to collect, select and use the necessary experimental data and effectively apply quantitative methods of their analysis;
- * To be able to choose and use the best teaching methods;
- * To be able to supervise the implementation of qualification works of bachelors, specialists, masters;
- * To possess the technology of designing the educational process at the level of higher education;
- * To possess methods and technologies of interpersonal communication, skills of public speech in the state, Russian and English languages;
- * To possess organizational skills, planning and distribution of work among the members of the research team;
- * To possess skills of collective discussion of work plans, obtained scientific results, coordination of interests of the parties and settlement of conflict situations in the team.

3.4 Core competencies

- * to know theoretical and methodological bases of research of problems of management and automation of technological processes; possibilities of use of new modern methods at carrying out researches;

- * to know the history of formation and development of the main scientific schools, polemics and interaction between them; actual problems and trends in the development of research in the field of control and automation of technological processes and technical systems;
- * To be able to choose and apply experimental research methods in professional activities;
- * To be able to choose and apply in professional activity calculation and theoretical methods of research;
- * To be able to choose the most effective and new methods of solving the main types of problems encountered in the study area;
- * To be able to plan scientific work, form the composition of the working group and optimize the distribution of responsibilities among the members of the research team;
- * To possess the methodology of research activities in the field of management of technical systems and automation of technological processes;
- * To successful and systematic application of skills of possession of modern methods of scientific research in the field of management of technical systems and automation of technological processes;
- * To possess the skills of search using information systems and databases and critical analysis of information on the subject of research;
- * To possess the skills of research planning, analysis of the results and formulation of conclusions;
- * To find the most effective and new solutions for the development of new methods in the study area.

3.5 Professional competence

- * To know the theoretical basis of design and modeling of control systems
- * To know the design and operation of the elements and the system as a whole.
- * To know the principle of operation and typical processes.
- * To know the principle of operation and design of typical measurement and control devices.
- * To know the basics of hydraulic, pneumatic and electric drives.
- * To be able to determine the parameters of structural elements of control systems

- * To be able to use calculation programs in static and dynamic modes of control systems.
- * To be able to calculate and select the devices and equipment of control systems for different characteristics.
- *To be able to make functional and schematic diagrams of hydraulics, electrics, Pneumatics and electronics.
- *To be able to define sensor parameters and select them according to different process requirements.
- * To be able to determine the parameters of different drive devices and select them according to different requirements.
- * To possess skills of development of design documentation.
- * To possess the skills of installation, installation and repair of hardware parts;
- * To have the skills to diagnose the technical condition of the equipment.

4 Base of passing of professional practice

Akmola electric grid distribution company, Astana - regional electric grid company, Kyzylorda electric grid distribution company, Astana electrotechnical plant, Mangystau branch of the main network, "Rodina" Agrofirma, Baiserke-agro, Kaznii of mechanization and electrification of agriculture, AST – Technologiya, Astana gorzharyk, New systems - teplolyux, IP-Stroyenergomagistral, EnergyserviceRTD, energyconsultinggroup, laimgroupastana, General plan of KZ, Astana engineering Corporation.

5 structure of the educational program Scientific and pedagogical direction

№	Name of cycles and disciplines	Total labor intensity	
		in academic hours	in academic credits
1	Complex of basic disciplines (DB)	1110	37
1)	High school component	690	23
	Methods and means of optimization of operating modes	210	7
	Programming in high-level languages	180	6
	Pedagogical practice	300	10
2)	Optional component	420	14
	Quality and reliability of power supply systems	210	7
	Intelligent control system	210	7
2	Complex of profile disciplines (PD)	1140	38
1)	High school component	240	8
	Methodology of teaching technical disciplines	90	3
	Research practice	150	5
2)	Optional component	900	30
	Modes of operation of power supply systems	210	7
	Mechatronic systems and modules	210	7
	Software and hardware complexes in power supply systems	240	8
	Software and hardware complexes in automation	240	8

№	Name of cycles and disciplines	Total labor intensity	
		in academic hours	in academic credits
	systems		
3	Research work of a Phd student, including internships and Phd dissertation	3450	115
4	End of course certification	360	12
1)	Preparation and defense of doctoral dissertation	360	12
	Subtotal	6060	202

Profile direction

№	Name of cycles and disciplines	Total labor intensity	
		in academic hours	in academic hours
1	Complex of basic disciplines (DB)	1110	37
1)	High school component	690	23
	Methods and means of optimization of operating modes	210	7
	Programming in high-level languages	180	6
	Manufacturing practice	300	10
2)	Optional component	420	14
	Quality and reliability of power supply systems	210	7
	Intelligent control system	210	7
2	Complex of profile disciplines (PD)	1140	38
1)	High school component	240	8
	Methodology of teaching technical disciplines	90	3
	Manufacturing practice	150	5
2)	Optional component	900	30
	Modes of operation of power supply systems	210	7
	Mechatronic systems and modules	210	7
	Software and hardware complexes in power supply systems	240	8
	Software and hardware complexes in automation systems	240	8
3	Research work of a Phd student, including internships	3450	115

№	Name of cycles and disciplines	Total labor intensity	
		in academic hours	in academic hours
	and Phd dissertation		
4	End of course certification	360	12
1)	Preparation and defense of doctoral dissertation	360	12
	Subtotal	6060	202

Annex 1. Academic calendar

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

Рассмотрено на заседании
Ученого совета университета
Протокол № _____ от _____
" _____ " _____ 2019 г.

УТВЕРЖДАЮ
Директор департамента по академическим вопросам
АО "КАТУ им.С.Сейфуллина"
" _____ " _____ 2019 г. Н.А.Серекпиев

Академический календарь на 2019-2021 учебные годы
Образовательные программы научно-педагогическое направление: Энергообеспечение и автоматизация сельского хозяйства, Управление техническими системами
Срок обучения: 3 года

Период	Сентябрь				Октябрь				Ноябрь				Декабрь				Январь				Февраль				Март				Апрель				Май				Июнь				Июль				Август										
	Нед.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
1 курс 2019-2020 учеб. г.	Нач.	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24		
	Кон.	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28		
		п/зд	с	с	зд/сз	зд/сз	к	к	к	ш	ш	пп	пп	пп	с	к/сз	ип	ип	ип	ип	ип	п/н	п/н	п/н	п/н	п/н	с	зд/сз	к/л	к/л	к/л	к/л	к/л	к/л	к	к	к	к
2 курс 2020-2021 учеб. г.	Нед.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
	Нач.	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	1	8	15	22	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23		
	Кон.	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27		
		ш	н	н	н	н	н	н	н	н	н	н	с	с	сз	сз	к	к	к	н	н	н	н	н	н	н	н	н	н	с	к/сз	к/сз	н	н	н	н	н	н	н	н	н	н	с	с	к/л	к/л	к/л	к/л	к/л	к/л	к	к	к	к	
3 курс 2021-2022 учеб. г.	Нед.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
	Нач.	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22		
	Кон.	3	10	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	4	11	18	25	4	11	18	25	1	8	15	22	29	6	13	20	27	03	10	17	24	1	8	15	22	29	5	12	19	26		
	2021-	п	н	н	н	н	н	н	н	н	н	с	с	сз	сз	к	к	к	н	н	н	н	н	н	н	н	н	н	н	с	к/сз	н	н	н	н	н	н	н	к/сз	на	на	на	на	на	на										

*НИРД в период теоретического обучения

Презентации	Теоретич. обуч.	Экзамен. сессия	Каникулы	Исслед. практика	Педаг. практика	Летний сем.	Запись на дисп.	Сдача FX	Итоговая аттестация	НИРД
п	.	с	к	ип	пп	л	зд	сз	на	н

Праздничные дни

День знаний	1 сентября	Международный женский день	8 марта
День независимости РК	16 - 17 декабря	Праздник "Наурыз"	21-23 марта
Новый год	1-2 января	День единства народов Казахстана	1 мая
День Конституции РК	30 августа	День защитника Отечества	7 мая
		День Победы	9 мая

Annex 2. Working curriculum

Дайындық бағыты (мамандығы)/Направление подготовки (специальность)/Direction of training (specialty): Инженерия және инженерлік іс/Инженерия и инженерное дело/
 Білім беру бағдарламасы (мамандандыру)/Образовательная программа (специализация)/Educational program (specialization): Техникалық жүйелерді басқару /Управление техническими системами /Control of technical systems
 Оқу кезеңі/Период обучения/Period of study: 2019 - 2020
 Дайындық деңгейі/уровень образования/Level of training: /Магистр по направлениям/
 Білім негізінде/На базе/On the base: Жоғарғы білім/Высшее образование/

№	Модуль атауы Наименование модуля Module name	Пәнаралық цикл Цикл дисциплин Cycle of disciplines	Компонент Компонент Component	Пәнаралық код Код дисциплины Code of discipline	Пәнаралық атауы Наименование дисциплины Discipline name	КР кредит саны Число кредитов КР Number of KZ credits	Білім алушылардың барлық жұмыс уақыты (сағ) Бюджет рабочего времени обучающихся (в часах) Student budget-time (in hours)										Кредиттері курс және семестр (триместр, квартал) бойынша бөлу Распределение кредитов по курсам и семестрам (триместрам, кварталам) Distribution of credits by courses and semesters (trimesters, quarters)			Бақылау түрі Формы контроля Forms of control			
							Барлық сағат саны Всего в часах Total (in hours)	Бюджет аудиторлық сағат саны Всего аудиторских часов Total class hours	Дәрісханалық сабақтар Аудиторные занятия Class work				СӨЖ СРОП ТЖСТ	БАӨЖ СФО ІТСТ	CFO	ІТСТ	CFO	ІТСТ	1 курс (оғаз)			Енгізу Экзам	Курсқа арнама жұмыс Курсовая работа Term paper
									Дәріс Лекции	Практикалық/семинарлық сабақтар Практические /семинарские Практика classes/seminars	Эксперименттік сабақтар Лабораторные занятия Лаборatory work	Студенттік сабақтар Студенческие занятия Students work							1	2	3		
																			Триместрлердегі апталар саны Неделя в триместре Weeks per trimester				
10	10	10																					
1.Жалпы модульдер/1.Общие модули/1.Common modules																							
1	Гуманитарлық-әлеуметтік Гуманитарно-социальный Humanitarian-social	БП БД BS	ЖК БК UC	ПУ5201	Басқару психологиясы Психология управления Psychology of management	2,00	60,00	20,00	10,00	10,00			8,00	32,00	2,00			Первый триместр					
		БП БД BS	ЖК БК UC	ПУаP5203	Шет тіл (кәсіби) Иностранный язык (профессиональный) Foreign language (professional)	2,00	60,00	20,00	10,00	10,00			8,00	32,00		2,00		Второй триместр					
Модуль бойынша барлығы/Итого по модулю/Total in module:							4,00	120,00	40,00	20,00	20,00			16,00	64,00	2,00	2,00		2				
2.Мамандық модульдері /2.Модули специальности/2.Specialty modules																							
1	Кәсіптік бағытталған Профессионально-ориентированный professionally-oriented	3Ж ІР RW		EIRM\VV\М D501	Магистрлік диссертацияны дайындау және эксперименталдық зерттеу жұмысы Экспериментально-исследовательская работа магистранта, включая выполнение магистерской диссертации/проекта Experimental research, including the master's thesis	13,00	390,00								4,00	6,00	3,00	Третий триместр, Второй триместр, Первый триместр					
		КП ПД PS	ЖК БК UC	PP5301	Өндірістік тәжірибе Производственная практика Production practice	4,00	120,00									4,00		Второй триместр					
2	Кәсіптік Профессиональный Professional	БП БД BS	ТК КВ SC	UKE5202	Энергияны сапалық реттеу Управление качеством энергии Energy Quality Management	4,00	120,00	40,00	10,00	20,00	10,00		16,00	64,00	4,00			Первый триместр					
		КП ПД PS	ТК КВ SC	SU5302	Басқару жүйелері Системы управления Control systems	8,00	240,00	80,00	20,00	20,00	40,00		32,00	128,00		8,00		Второй триместр					
		КП ПД PS	ЖК БК UC	OM5303	Мехатроника негіздері Основы мехатроники Fundamentals of Mechatronics	8,00	240,00	80,00	20,00	20,00	40,00		32,00	128,00	8,00			Первый триместр					
		БП БД BS	ТК КВ SC	E5204	Энергияны үнемдеу Энергосбережение Energy Saving	4,00	120,00	40,00	10,00	20,00	10,00		16,00	64,00	4,00			Первый триместр					
		КП ПД PS	ТК КВ SC	MTS5304	Техникалық жүйелерді моделдеу Моделирование технических систем Modeling of technical systems	8,00	240,00	80,00	20,00	20,00	40,00		32,00	128,00		8,00		Второй триместр					
		КП ПД PS	ЖК БК UC	PNR5305	Жобалық және ғылыми жұмыс Проектная и научная работа Project and scientific work	5,00	150,00	50,00	20,00	20,00	10,00		20,00	80,00		5,00		Третий триместр					
3	Экономикалық-басқарушылық Экономико-управленческий Economic and managerial	БП БД BS	ЖК БК UC	M5205	Менеджмент Менеджмент Management	2,00	60,00	20,00	10,00	10,00			8,00	32,00	2,00			Первый триместр					
Модуль бойынша барлығы/Итого по модулю/Total in module:							56,00	1 680,00	390,00	110,00	130,00	150,00		156,00	624,00	22,00	26,00	8,00	11				
3.Таңдау бойынша модульдер/3.Модули по выбору/3.Optional modules																							
1	Кәсіпбилім алдын Надпрофессиональный Professionally only	КА НА FE		IGA501	Құрылымды менеджменттің аттестаттау Итоговая государственная аттестация Final state certification	12,00	360,00									12,00		Третий триместр					

Модуль бойынша барлығы/Итого по модулю/Total in module:	12,00	360,00										12,00	1	
Кредиттер бойынша барлығы/Итого кредитов/Total credits:	72,00	2 160,00	430,00	130,00	150,00	150,00		172,00	688,00	24,00	28,00	20,00	14	
Зерттеу жұмыстары/Исследовательская работа/Research work:	13,00	390,00								4,00	6,00	3,00	3	
КА кредиттерінің саны/Количество кредитов КА/Number of credits in FE:	12,00	360,00										12,00	1	
Орташа апталық жүктеменің сағат саны/Средняя недельная нагрузка в часах/Weekly average workload at hours:										72,00	64,00	60,00		
БП кредиттерінің саны/Количество кредитов БД/Number of credits in BS:	14,00	420,00	140,00	50,00	70,00	20,00		56,00	224,00	12,00	2,00			
БП-інің ТК кредиттерінің саны/Количество кредитов БД КВ/Number of credits in BS SC:	8,00	240,00	80,00	20,00	40,00	20,00		32,00	128,00	8,00			2	
БП-інің ЖООК кредиттерінің саны/Количество кредитов БД ВК/Number of credits in BS UC:	6,00	180,00	60,00	30,00	30,00			24,00	96,00	4,00	2,00		3	
КП кредиттерінің саны/Количество кредитов ПД/Number of credits in majors:	33,00	870,00	290,00	80,00	80,00	130,00		116,00	464,00	8,00	20,00	5,00		
КП-інің ТК кредиттерінің саны/Количество кредитов ПД КВ/Number of credits in majors SC:	16,00	480,00	160,00	40,00	40,00	80,00		64,00	256,00		16,00		2	
КП-інің ЖООК кредиттерінің саны/Количество кредитов ПД ВК/Number of credits in majors UC:	17,00	390,00	130,00	40,00	40,00	50,00		52,00	208,00	8,00	4,00	5,00	3	

№	Модуль атауы Наименование модуля Module name	Пән/ер пәні Цикл дисциплин Cycle of disciplines	Компонент Component	Пән/ер коды Код дисциплины Code of discipline	Пән/ер атауы Наименование дисциплины Discipline name	ҚР кредит саны Число кредитов РК Number of ECTS credits	Білім алушылардың барлық жұмыс уақыты (сағ) Бюджет рабочего времени обучающихся (в часах) Student budget-time (in hours)										Кредиттері курс және семестр (триместр, квартал) бойынша бөлу Распределение кредитов по курсам и семестрам (триместрам, кварталам) Distribution of credits by courses and semesters (trimesters, quarters)			Кредиттері курс және семестр (триместр, квартал) бойынша бөлу Распределение кредитов по курсам и семестрам (триместрам, кварталам) Distribution of credits by courses and semesters (trimesters, quarters)			Бақылау түрі Формы контроля Forms of control	
							Дерісханалық сабақтар Аудиторные занятия Class work										1 курс (year)			2 курс (year)			Бақылау Элементі/Exam	Курсқа жұмыс/Работа Term paper
							Барлық сағат саны Всего в час Total (in hours)	Бюджеттік лекциялық сағат саны Всего аудиторных часов Total class hours	Лекция Lectures	Практикалық сабақтар Практические семинары Practical classes/seminars	Әртүрлі сабақтар Лаборатория және Laboratory work	Студиялық сабақтар Студийные занятия Studio work	БАӨБЖ СРОТ IVSST	БАӨБЖ СРО TWS	1	2	3	1	2	3				
1.Жалпы модульдер/1.Общие модули/1.Common modules																								
1	Гуманитарлық-әлеуметтік Гуманитарно-социальный Humanitarian-social	БП БД BS	ЖК БК UC	PUS202	Басқару психологиясы Психология управления Psychology of management	2,00	60,00	20,00	10,00	10,00		8,00	32,00	2,00							Первый триместр			
		БП БД BS	ЖК БК UC	ГуАР5204	Шет тіл (жасөспі) Иностранный язык (профессиональный) Foreign language (professional)	2,00	60,00	20,00	10,00	10,00		8,00	32,00		2,00						Второй триместр			
Модуль бойынша барлығы/Итого по модулю/Total in module:							4,00	120,00	40,00	20,00	20,00		16,00	64,00	2,00	2,00					2			
2.Мамандық модульдері /2.Модули специальности/2.Specialty modules																								
1	Кәсіптік бағыттаған Профессионально-ориентированный professionally-oriented	ҰЖ НР RW		HRMVVM D601	Магистрлік диссертацияны дайындау және эксперименталдық зерттеу жұмысы Экспериментально-исследовательская работа магистранта, включая выполнение магистерской диссертации/проекта Experimental research, including the master's thesis	18,00	540,00							5,00	4,00	1,00	8,00				Третий триместр, Второй триместр, Первый триместр, Четвертый триместр			
		КП ПД PS	ЖК БК UC	PP5301	Өндірістік тәжірибе Производственная практика Production practice	6,00	180,00									6,00					Третий триместр			
2	Экономикалық-басқарушылық Экономико-управленческий Economic and managerial	БП БД BS	ТК КВ SC	EOPP5201	Өндірістік өнөөсіптерді ұйымдастыру және экономикасы Экономика и организация производственных предприятий Economics and organization of industrial enterprises	4,00	120,00	40,00	20,00	20,00		16,00	64,00	4,00								Первый триместр		
		БП БД BS	ТК КВ SC	EOEP5203	Энергетикалық кәсіпорындардың экономикасы және ұйымдастыру Экономика и организация энергетических предприятий Economics and organization of electrical power plants	4,00	120,00	40,00	20,00	20,00		16,00	64,00	4,00								Первый триместр		
		БП БД BS	ЖК БК UC	MS205	Менеджмент Management	2,00	60,00	20,00	10,00	10,00		8,00	32,00	2,00								Первый триместр		
		БП БД BS	ТК КВ SC	UKS206	Сапаны реттеу Управление качеством Quality Management	5,00	150,00	50,00	20,00	30,00		20,00	80,00		5,00							Третий триместр		
		БП БД BS	ТК КВ SC	UP5207	Жобаларды басқару Управление проектами Project management	5,00	150,00	50,00	20,00	30,00		20,00	80,00		5,00							Третий триместр		
3	Кәсіптік Профессиональный Professional	КП ПД PS	ТК КВ SC	UKE5302	Энергияның сапасын реттеу Управление качеством энергии Energy Quality Management	7,00	210,00	70,00	20,00	30,00	20,00	28,00	112,00	7,00								Первый триместр		
		КП ПД PS	ЖК БК UC	SUS303	Басқару жүйелер Системы управления Control systems	8,00	240,00	80,00	20,00	20,00	40,00	32,00	128,00		8,00							Второй триместр		
		КП	ТК		Энергияны үнемдеу																			

		ПД PS	КВ SC	E5304	Энергосбережение Energy Saving	7,00	210,00	70,00	20,00	30,00	20,00		28,00	112,00	7,00					Первый триместр	
		КП ПД PS	ЖК БК UC	OM5305	Мехатроника негидролі Основы мехатроники Fundamentals of Mechatronics	8,00	240,00	80,00	20,00	20,00	40,00		32,00	128,00			8,00			Третий триместр	
		КП ПД PS	ТК КВ SC	MTS5306	Технические системы модели Моделирование технических систем Modeling of technical systems	6,00	180,00	60,00	20,00	20,00	20,00		24,00	96,00		6,00				Второй триместр	
		КП ПД PS	ЖК БК UC	PNR6307	Жобалар және ғылыми жұмыс Проектная и научная работа Project and scientific work	10,00	300,00	90,00	40,00	40,00	10,00		40,00	170,00				10,00		Четвертый триместр	
		КП ПД PS	ТК КВ SC	RIZ5308	Инженерлік есептерді шешу Решение инженерных задач Solving engineering problems	6,00	180,00	60,00	20,00	20,00	20,00		24,00	96,00		6,00				Второй триместр	
Модуль бойынша барлығы/Итого по модулю: Total in module:						96,00	2 880,00	710,00	250,00	290,00	170,00		288,00	1 162,00	29,00	24,00	25,00	18,00		17	
3. Таблица бойынша модульдер/3. Модули по выбору/3. Optional modules																					
1	Кәсіби ден адалық Надпрофессиональный Professionalism only	ҚА ИА FE		IGA601	Қорытынғы мемлекеттік аттестаттау Итоговая государственная аттестация Final state certification	12,00	360,00												12,00	Пятый триместр	
Модуль бойынша барлығы/Итого по модулю: Total in module:						12,00	360,00												12,00	1	
Кредиттер бойынша барлығы/Итого кредитов: Total credits:						112,00	3 360,00	750,00	270,00	310,00	170,00		304,00	1 226,00	31,00	26,00	25,00	18,00	12,00	20	
Зерттеу жұмыстары/Исследовательская работа/Research work:						18,00	540,00							5,00	4,00	1,00	8,00		4		
ҚА кредиттерінің саны/Количество кредитов ИА/Number of credits in FE:						12,00	360,00											12,00	1		
Орташа апталық жүктеменің сағат саны/Средняя недельная нагрузка в часах/Weekly average workload at hours:														93,00	78,00	75,00	54,00	36,00			
БП кредиттерінің саны/Количество кредитов БД/Number of credits in BS:						24,00	720,00	240,00	110,00	130,00		96,00	384,00	12,00	2,00	10,00					
БП-інің ТК кредиттерінің саны/Количество кредитов БД КВ/Number of credits in BS SC:						18,00	540,00	180,00	80,00	100,00		72,00	288,00	8,00		10,00				4	
БП-інің ЖООК кредиттерінің саны/Количество кредитов БД БК/Number of credits in BS UC:						6,00	180,00	60,00	30,00	30,00		24,00	96,00	4,00	2,00					3	
КП кредиттерінің саны/Количество кредитов ПД/Number of credits in majors:						58,00	1 560,00	510,00	160,00	180,00	170,00		208,00	842,00	14,00	20,00	14,00	10,00			
КП-інің ТК кредиттерінің саны/Количество кредитов ПД КВ/Number of credits in majors SC:						26,00	780,00	260,00	80,00	100,00	80,00		104,00	416,00	14,00	12,00					4
КП-інің ЖООК кредиттерінің саны/Количество кредитов ПД БК/Number of credits in majors UC:						32,00	780,00	250,00	80,00	80,00	90,00		104,00	426,00		8,00	14,00	10,00			4

Дайындық бағыты (мамандығы)/Направление подготовки (специальность)/Direction of training (specialty): Инженерия және инженерлік іс/Инженерия и инженерное дело/
 Білім беру бағдарламасы (мамандандыру)/Образовательная программа (специализация)/Educational program (specialization): Техникалық жүйелерді басқару/Управление техническими системами /Control of technical systems
 Оқу кезеңі/Период обучения/Period of study: 2019 - 2021
 Дайындық деңгейі/Уровень образования/Level of training: Магистр по научно-педагогическому направлению/
 Білім негізінде/На базе/On the base: Жоғарғы білім/Высшее образование/

№	Модуль атауы Наименование модуля Module name	Пәнаралық цикл Цикл дисциплин Cycle of disciplines	Компонент Компонент Component	Пәнаралық код Код дисциплины Code of discipline	Пәнаралық атауы Наименование дисциплины Discipline name	Білім алушылардың барлық жұмыс уақыты (сағ) Бюджет рабочего времени обучающихся (в часах) Student budget-time (in hours)										Кредиттері курс және семестр (триместр, квартал) бойынша бөлу Распределение кредитов по курсам и семестрам (триместрам, кварталам) Distribution of credits by course and semesters (trimesters, quarters)			Кредиттері курс және семестр (триместр, квартал) бойынша бөлу Распределение кредитов по курсам и семестрам (триместрам, кварталам) Distribution of credits by course and semesters (trimesters, quarters)			Бақылау түрі Формы контроля Forms of control	
						ҚР кредит саны Число кредитов РК Number of KZ credits	Барлығы сағат Всего в часах Total (in hours)	Барлығы ауқымдық сағат Всего ауқымдық часов Total class hours	Дәрісханалық сабақтар Аудиторные занятия Class work					БАӨБЖ СРОП ІВСТ БАӨЖ СРО ІВС	1 курс (year)			2 курс (year)			Елшілік Эта жана Елшілік	Курстық жарнама Курсовая работа Тема реферат	
									Дәріс Лекции Lectures	Практикалық семинарлық сабақтар Практикалық семинарлар Practical classes/seminars	Зертханалық сабақтар Лабораториялық жұмыстар Laboratory work	Стипуляциялық сабақтар Студийалық сабақтар Studio work	1			2							
													Непелер в триместре Weeks per trimester		10	10	10	Непелер в триместре Weeks per trimester	10	10			10
1.Жалпы модульдер/1.Общие модули/1.Common modules																							
1	Гуманитарлық-әлеуметтік Гуманитарно-социальный Humanitarian-social	БП БД BS	ЖК БК UC	IFNS201	Ғылым тарихы және философиясы История и философия науки History and philosophy of science	5,00	150,00	50,00	20,00	30,00		20,00	80,00	5,00					Первый триместр				
					Басқару психологиясы Психология управления Psychology of management	5,00	150,00	50,00	20,00	30,00		20,00	80,00	5,00						Первый триместр			
					Шет тіл (касіби) Иностранный язык (профессиональный) Foreign language (professional)	5,00	150,00	50,00	20,00	30,00		20,00	80,00	5,00							Первый триместр		
					Жоғарғы мектеп педагогикасы Педагогика высшей школы Pedagogics of higher school	3,00	90,00	30,00	10,00	20,00		12,00	48,00		3,00							Второй триместр	
Модуль бойынша барлығы/Итого по модулю/Total in module:						18,00	540,00	180,00	70,00	110,00		72,00	288,00	15,00	3,00			4					
2.Мамандық модульдері /2.Модули специальности/2.Specialty modules																							
1	Кәсіптік Профессиональный Professional	КП ПД PS	ТК КВ SC	UKE6301	Энергияның сапасын реттеу Управление качеством энергии Energy Quality Management	7,00	210,00	70,00	20,00	30,00	20,00		28,00	112,00				7,00		Четвертый триместр			
					Басқару жүйелері Системы управления Control system	8,00	240,00	80,00	20,00	20,00	40,00		32,00	128,00	8,00						Второй триместр		
					Энергияны үнемдеу Энергосбережение Energy Saving	7,00	210,00	70,00	20,00	30,00	20,00		28,00	112,00			7,00				Четвертый триместр		
					Мехатроника негіздері Основы мехатроники Fundamentals of Mechatronics	8,00	240,00	80,00	20,00	20,00	40,00		32,00	128,00		8,00						Третий триместр	
					Техникалық жүйелерді моделдеу Моделирование технических систем Modeling of technical systems	6,00	180,00	136,00	20,00	20,00	96,00		20,00	24,00			6,00					Четвертый триместр	
					Жобалық және ғылыми жұмыс Проектная и научная работа Project and scientific work	10,00	300,00	90,00	40,00	40,00	10,00		40,00	170,00				10,00					Пятый триместр
					Инженерлік есептерді шешу Решение инженерных задач Solving engineering problems	6,00	180,00	64,00	20,00	20,00	24,00		96,00	20,00				6,00					Четвертый триместр
2	Кәсіптік бағытталған Профессионально-ориентированный professionally-oriented	ЗЖ ІР RW	---	NIRMVVM D601	Магистранттың ғылыми-зерттеу жұмысы, магистрлік диссертацияны орындаумен қоса Научно-исследовательская работа магистранта, включая выполнение магистерской диссертации MS student's research work, incl. Master thesis	24,00	720,00							2,00			7,00	7,00	8,00	Второй триместр, Четвертый триместр, Шестой триместр, Пятый триместр			
					Зерттеу тәжірибесі Исследовательская практика	10,00	300,00										7,00		3,00		Третий триместр, Пятый		

		PS	UC		Research practice														----- триместр		
		БП БД BS	ЖК ВК UC	PP5210	Педагогикалық тәжірибе Педагогикалық практика Teaching practice	2,00	60,00												Второй триместр		
3	Экономикалық-басқарушылық Экономика-управленческий Economic and managerial	БП БД BS	ТК КВ SC	EOPP5202	Әлеуметтік өнеркәсіптің ұйымдастыру және экономикасы Экономика и организация производственных предприятий Economics and organization of industrial enterprises	5,00	150,00	50,00	20,00	30,00			20,00	80,00	5,00				Первый триместр		
		БП БД BS	ТК КВ SC	EOEP5203	Энергетикалық кәсіпорындардың экономикасы және ұйымдастыру Экономика и организация энергетических предприятий Economics and organization of electrical power plants	5,00	150,00	50,00	20,00	30,00			20,00	80,00	5,00				Первый триместр		
		БП БД BS	ТК КВ SC	MUBP5206	Бизнес-процестерінің модельдеу және басқару Моделирование и управление бизнес-процессами Business Process Modeling and Management	5,00	150,00	50,00	20,00	30,00			20,00	80,00		5,00			Второй триместр		
		БП БД BS	ТК КВ SC	POP5207	Жобалардың жоспарлау және бағалау Планирование и оценка проектов Project Planning and Assessment	5,00	150,00	50,00	20,00	30,00			20,00	80,00		5,00			Второй триместр		
		БП БД BS	ТК КВ SC	UKS209	Сапаны реттеу Управление качеством Quality Management	5,00	150,00	50,00	20,00	30,00			20,00	80,00			5,00		Третий триместр		
		БП БД BS	ТК КВ SC	UP5211	Жобалардың басқару Управление проектами Project management	5,00	150,00	50,00	20,00	30,00			20,00	80,00			5,00		Третий триместр		
Модуль бойынша барлығы/Итого по модулю/Total in module:						118,00	3 540,00	890,00	280,00	360,00	250,00		396,00	1 174,00	10,00	22,00	25,00	33,00	20,00	8,00	20

3. Таблица 6 бойынша модульдер/3. Модули по выбору/3. Optional modules

1	Кәсіби деңгейдегі Надпрофессиональный Professionally only	КА ИА FE		IGA601	Қорытынды мемлекеттік аттестаттау Итоговая государственная аттестация Final state certification	12,00	360,00												12,00	Шестой триместр	
Модуль бойынша барлығы/Итого по модулю/Total in module:						12,00	360,00												12,00	1	
Кредиттер бойынша барлығы/Итого кредитов/Total credits:						148,00	4 440,00	1 070,00	350,00	470,00	250,00		468,00	1 462,00	25,00	25,00	25,00	33,00	20,00	20,00	25
Зерттеу жұмыстары/Исследовательская работа/Research work:						24,00	720,00								2,00		7,00	7,00	8,00	4	
ҚА кредиттерінің саны/Количество кредитов ИА/Number of credits in FE:						12,00	360,00												12,00	1	
Орташа апталық жүктеменің сағат саны/Средняя недельная нагрузка в часах/Weekly average workload at hours:														75,00	75,00	75,00	93,00	60,00	60,00		
БП кредиттерінің саны/Количество кредитов БД/Number of credits in BS:						50,00	1 440,00	480,00	190,00	290,00		192,00	768,00	25,00	15,00	10,00					
БП-нің ТК кредиттерінің саны/Количество кредитов БД КВ/Number of credits in BS SC:						30,00	900,00	300,00	120,00	180,00		120,00	480,00	10,00	10,00	10,00					6
БП-нің ЖООК кредиттерінің саны/Количество кредитов БД ВК/Number of credits in BS UC:						20,00	540,00	180,00	70,00	110,00		72,00	288,00	15,00	5,00						5
КП кредиттерінің саны/Количество кредитов ПД/Number of credits in majors:						62,00	1 560,00	590,00	160,00	180,00	250,00		276,00	694,00		8,00	15,00	26,00	13,00		
КП-нің ТК кредиттерінің саны/Количество кредитов ПД КВ/Number of credits in majors SC:						26,00	780,00	340,00	80,00	100,00	160,00		172,00	268,00				26,00			4
КП-нің ЖООК кредиттерінің саны/Количество кредитов ПД ВК/Number of credits in majors UC:						36,00	780,00	250,00	80,00	80,00	90,00		104,00	426,00		8,00	15,00		13,00		5

Annex 3. Description of University disciplines of an obligatory component disciplines

1. Basic information about the discipline:	
Name of discipline	History and philosophy of science
2. Prerequisites:	-
3. Post-requisites:	-
4. The content of the discipline	The structure of scientific knowledge, methods of scientific research, functions of scientific theories and laws; expanding philosophical horizons; the development of ideas about the criteria of science and the requirements that must be met by scientific study and its results, as well as to develop scientific thinking style based on the study of history and philosophy of science.

1. Basic information about the discipline:	
Name of discipline	Management psychology
2. Prerequisites:	-
3. Post-requisites:	-
4. The content of the discipline	Conceptual apparatus. Head and team. Conflicts. Management communication. Decision-making technology. The concept of the subject and object of management. The Manager and the leader. Psychology of the order. Democratic leadership style and its features. Psychology of criticism. Psychotypes of subjects of communication. Psychological problems of training and retraining of management personnel. Selection and placement of personnel. Personnel rotation.

1. Basic information about the discipline:	
Name of discipline	Foreign language (professional)
2. Prerequisites:	-
3. Post-requisites:	-
4. The content of the discipline	The mastering of the future master the language for professional and academic purposes at an advanced level, which will operate freely with the scientific conceptual apparatus specialty, to expand the scientific information base, acquire the skills of interpreting scientific information, argument, persuasion, scientific debate, academic writing

1. Basic information about the discipline:	
Name of discipline	Pedagogy of higher education
2. Prerequisites:	-
3. Post-requisites:	-
4. The content of the discipline	Fundamentals of higher school pedagogy. Subject and tasks of pedagogy of higher school. Methodology and methods of pedagogical research in higher education. Higher school didactics. Pedagogical process in higher school. Laws, regularities and principles of training. Methods, forms and means of education in higher education. The current state of higher education in Kazakhstan.

1. Basic information about the discipline:	
Name of discipline	Management
2. Prerequisites:	-
3. Post-requisites:	-
4. The content of the discipline	The ability to make decisions, "predict, plan, organize, coordinate and control", motivate, lead different groups of people-training these skills that are necessary for managers, future leaders of companies for effective business and management.

1. Basic information about the discipline:	
Name of discipline	Pedagogical practice
2. Prerequisites:	-

3. Post-requisites:	-
4. The content of the discipline	Professional formation of the teacher of the higher school. The process of education in high school. The purpose of education as a pedagogical problem. Educational staff as a form of functioning of the holistic pedagogical process.

1. Basic information about the discipline:	
Name of discipline	Control system
2. Prerequisites:	-
3. Post-requisites:	Fundamentals of mechatronics
4. The content of the discipline	Consideration of software control systems. Construction of multilevel automatic control systems. Interconnected work of technical means. Study of production conditions of operation of control and management systems. Rational choice and use of control and management systems, design, and implementation in production, taking into account individual characteristics. Consideration of issues of reliable and efficient operation of control and management systems.

1. Basic information about the discipline:	
Name of discipline	Fundamentals of mechatronics
2. Prerequisites:	Control system
3. Post-requisites:	Project and scientific work
4. The content of the discipline	Fundamentals of automated mechatronic systems and devices construction. The role of computers as an element of the device management system. A systematic approach to the creation of complex technical objects. Devices for obtaining information about the state of the managed process. Actuators and devices of automated control systems. Features of Executive mechanisms of computer systems

1. Basic information about the discipline:	
Name of discipline	Research practice
2. Prerequisites:	-
3. Post-requisites:	Project and scientific work
4. The content of the discipline	Strategic processing of various sources of information about methods and object of research. Search for competent experts and consultation with them on the methods and object of research. Collection of information about the methods and object of research, covering the expanses of the world wide web. Collection of information on the solution of similar problems by other researchers. Preparation of materials for the experiment.

1. Basic information about the discipline:	
Name of discipline	Project and scientific work
2. Prerequisites:	Fundamentals of mechatronics
3. Post-requisites:	-
4. The content of the discipline	Study of design principles with the possibility of covering the maximum number of influencing factors. Practice of application of techniques of the modern equipment at electrification of objects taking into account system factors. Ability to comprehensively implementing design and research issues, taking into account technical requirements and economic justification. Ability to comprehensively systematizing information about the object and conditions of electrification.

1. Basic information about the discipline:	
Name of discipline	Manufacturing practice

2. Prerequisites:	-
3. Post-requisites:	Project and scientific work
4. The content of the discipline	A clear definition of the problem and the way of its mathematical formulation. Construction of the procedure for designing and planning the necessary actions for the experiment. Search for information to form the conditions and content of the experiment. Determination of the type of the final result when planning the conditions of the experiment for further correction in its implementation. Formation of a report on the results of the results obtained.

Annex 4. Description of elective component disciplines

1. Basic information about the discipline:	
Name of discipline	Economy and organization of production enterprises
2. Prerequisites:	-
3. Post-requisites:	Business process modeling and management, project Planning and evaluation
4. The content of the discipline	Quality, competitiveness, standardization and certification of products. The marketing approach to business activities. Production process and types of production. Calculation of the production cycle and plotting the types of movement. Scientific and technical preparation of production. Organization and management of material, technical and labor potential of the enterprise. Subject, methods and tasks of management study. Risk in business and the threat of bankruptcy.

1. Basic information about the discipline:	
Name of discipline	Economics and organization of energy enterprises
2. Prerequisites:	-
3. Post-requisites:	Business process modeling and management, project Planning and evaluation
4. The content of the discipline	Economic features of energy. Energy in the system of productive forces of the national economy. Costs and Prime cost of energy product. Pricing in the energy market. Profit and profitability in the energy sector. Production funds of energy, laws of their development, use and reproduction. Organization of sales of electric energy and energy saving. Methods of determination and ways to improve energy efficiency.

1. Basic information about the discipline:	
Name of discipline	Business process modeling and management
2. Prerequisites:	Economics and organization of energy enterprises, Economics and organization of production enterprises
3. Post-requisites:	-
4. The content of the discipline	Prerequisites for the formation of new approaches to the organization of the enterprise. The concept of business process. Process approach and process-oriented organization. Theoretical foundations of business process management. Main approaches and standards to business process modeling. Business process modeling methodologies. Business process modeling software. Methods of description of various subject areas of the organization. Methods of analysis of business processes. Controlling and monitoring processes.

1. Basic information about the discipline:	
Name of discipline	Project planning and evaluation
2. Prerequisites:	Economics and organization of energy enterprises, Economics and organization of production enterprises
3. Post-requisites:	-
4. The content of the discipline	Theoretical aspects of project management. The concept of the project, its main characteristics. The concept of project efficiency. The main provisions of modern methodology. Organization of collection and preparation of initial information for project analysis. Evaluation of the financial efficiency of the project. Assessment of economic efficiency of the project. Take into account

	factors of uncertainty and risk. Software for analysis of project effectiveness.
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1. Basic information about the discipline:	
Name of discipline	Quality management
2. Prerequisites:	-
3. Post-requisites:	-
4. The content of the discipline	Principles of quality assurance and product quality management. Evolution of product quality assurance methods. Quality management functions. The main methods of measurement of product quality. Procedure and methods of product quality assessment. Competitiveness of goods and services as a measure of enterprise profit. Statistical methods of quality control and management. Legal basis of certification in the Republic of Kazakhstan.

1. Basic information about the discipline:	
Name of discipline	Project management
2. Prerequisites:	-
3. Post-requisites:	-
4. The content of the discipline	The basics of project management. Project management as a special type of management. Time management of the project. Marketing of the project. Organizational structures of project management. Project team management. Financial management of the project. Project financing and risk management. Project quality management. The completion of the project and the dissolution of the team

1. Basic information about the discipline:	
Name of discipline	Energy quality management
2. Prerequisites:	-
3. Post-requisites:	Project and scientific work
4. The content of the discipline	Definition of indicators of quality of energy, the reasons causing their violation. Study of operating modes of electrical installations and consumers. Determination of degree of influence of deviation of indicators of quality of the electric power on technical and economic indicators. Study of organizational measures and technical means to normalize the quality of electricity. Influence of indicators of quality of the electric power on reliability and continuity of power supply.

1. Basic information about the discipline:	
Name of discipline	Energy saving
2. Prerequisites:	-
3. Post-requisites:	Project and scientific work
4. The content of the discipline	Consideration of energy saving issues in the design. Definition of the factors causing the greatest irrational losses of electric and thermal energy. Search for ways to reduce the loss of electricity and heat, the study of practical approaches to their implementation. Development of a plan for energy audit and compliance with energy management.

1. Basic information about the discipline:	
Name of discipline	Modeling of technical systems
2. Prerequisites:	-
3. Post-requisites:	Project and scientific work
4. The content of the discipline	Analytical modeling of technical systems. Simulation of technical systems and objects. Modeling and calculations of automatic control systems. Application of methods of optimization of design decisions by results of modeling.

1. Basic information about the discipline:	
Name of discipline	Problem solving in engineering
2. Prerequisites:	-
3. Post-requisites:	Project and scientific work
4. The content of the discipline	Mathematical interpretation of the problem should be solved. Identification of influencing factors and consideration of technical limitations. The choice of mathematical apparatus for solving the problem. Formation of stages of problem solving. Formation of an ideal final result. Formulation of physical contradictions. Analysis of the obtained solutions.