Institute of Automation and Information Technology

Department of Electronics, Telecommunications and Space technologies"

EDUCATIONAL PROGRAM

CURRICULUM PROGRAM

6B07112, 6B07104
"ELECTRONIC and ELECTRICAL ENGINEERING"

Bachelor of Engineering and Technology
in the field of electronics and electrical engineering in the direction
6B071 - Engineering and Engineering Science

Group of educational programs B062 "Electrical engineering and power engineering" and B063 "Electrical engineering and automation"

Almaty 2024

СӘТБАЕВ УНИВЕРСИТЕТІ SATBAYEV UNIVERSITY

Образовательная программа 6В07112, 6В07104«ELECTRONIC AND ELECTRICAL ENGINEERING
Утверждена на заседание Учёного совета КазНИТУ им.К.И.Сатпаева
Протокол №5 от "25 " ноября 2022 г.

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Образовательная программа 6В07112, 6В07104 «ELECTRONIC AND ELECTRICAL ENGINEERING разработан академическим комитетом по направлению 6В071 – Инженерия и инженерное дело

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Content

1 Brief description of the program

The professional activities of the program's graduates are aimed at the field of industrial and civil electrical engineering and electronics, basic elements of the Internet of Things and smart technologies.

The training of specialists in electronics and electrical engineering will be carried out according to the new educational program (EP) "Electronic and Electrical Engineering" - "Electronics and Electrical Engineering", which has two specializations: "Electronic Systems" and "Electrotechnical Devices".

The content of the disciplines of the educational program was developed taking into account the relevant educational programs of the world's leading universities and the international classifier of professional activities in the field of electronics and electrical engineering.

The types of professional activity are: production and technological; service and operational; organizational and managerial; installation and adjustment; calculation and design; experimental and research.

The objects of professional activity are systems that include:development and design of the element base of electronics and electrical engineering, including intelligent systems for digital economy sectors using programmable logic integrated circuits, sensors and converters.

Targeteducational program (EP) – training of highly qualified specialists in the field of digital electronics and electrical engineering, possessing deep knowledge, skills and practical abilities that ensure high-quality performance of functional duties in the chosen specialty, mobility in the professional labor market, knowledge of the latest global achievements and prospects for the development of the electronics industry.

The objective of the new educational program is:

- training a new competitive generation of technical specialists in the field of electronics and electrical devices for the labor market, proactive, able to work in a team, possessing high personal and professional competencies;
- integration of educational and scientific activities;
- establishing partnerships with leading universities in the near and far abroad with the aim of improving the quality of education and supporting technical and cultural ties;
- expanding relations with customers of educational services, employers in order to determine requirements for the quality of training of specialists, conducting courses, seminars, master classes, internships,

industrial practices.

Contents of the educational program (EP)"Electronic and Electrical Engineering"will be implemented in accordance with the credit technology of education and will be carried out in the state, Russian and English languages.

The EP allows for the successful implementation of the Bologna Process principles. Based on the students' choice and independent planning of the sequence of studying disciplines, they independently form their individual curriculum (IEP) for each semester with the help of an advisor based on the educational program and the catalog of elective disciplines.

The educational program has increased the volume of mathematical, natural science, basic and language disciplines.

The following disciplines are studied: “Introduction to Electronic Science and Engineering Technologies”, “Physical Foundations of Electronics”,«Theories of signal transmission,
"Circuitry of electronic devices" "Microprocessor Andmicrocontroller devices and systems”, “Theoretical foundations of electrical engineering”, "Electrotechnical materials","Basics powerelectronics", "Ultra-high frequency electronics", "Linear systemsautomatic regulation","Electronic sensors Andconverters", "Optoelectronics" "Programmable logical integrated circuits", "Intellectual networks", "Designelectronic means" etc.

In addition, attention is paid to modern trends in the development of electronics and electrical engineering in the field of artificial intelligence, reliability of electrical and electronic devices.

Students will undergo internships in companies such as JSC Saiman, Transtelecom JSC, ALTEL JSC, KazTransCom JSC, TOO "Kar-Tel", ASKB "Alatau", branches of LG, Cisco, Rochde&Schwarz, IKTT LLP, Kazakhstan ASELSAN Engineering LLP, etc., as well as at the base service centers of large international companies in the electronics industry.

Under the academic mobility program, the best students will study at leading foreign universities in the relevant program.

Graduates in the Electronic and Electrical Engineering program will work as electronics specialists, operators, managers for organizing business processes of intelligent systems, and developers of smart things systems for various sectors of the economy.

1 Admission requirements

Admission of persons entering the educational program "Electronic and Electrical Engineering" is carried out upon applications from an applicant who has fully completed secondary or secondary specialized education on a competitive basis in accordance with the points of the certificate issued based on the results of a unified national test with a minimum score of at least 65 points.

Special requirements for admission to the program apply to graduates of 12 summer schools, colleges, applied bachelor's programs, NIS, etc. Such applicants must pass diagnostic testing in English, mathematics, physics and special disciplines.

Rules for credit transfer for accelerated (shortened) education based on 12-year secondary, secondary technical and higher education

Code	Type of competence	Description of competence	Competence result	Responsibleny
GENERAL (This implies full training with possible additional training depending on the level of knowledge)				
G1	Communicativeness	- Fluent monolingual oral and written And communication skills - ability not fluent communication with a second language - ability to use in various situationscommunicative communication - there are Basicsacademic writing in native language - diagnostic language level test	Full 4-year education with the acquisition of a minimum 240 academic credits (including 120 contact classroom credits) academic credits) with possible credit transfer in a second language where the student has an advanced level. Level langu agedetermined by passing a diagnostic test	Department of Kazakh and Russian Language, Department of English Language
G2	Mathematical literacy	- Basic mathematical thinking oncommunication level - ability solve situational problems based on mathematicalapparatus of algebra and principles of mathematical analysis - diagnostic test for mathematical Algebra literacy	A full 4-year course of study with a minimum of 240 academic credits (including 120 contact classroom academic credits). At positive surre nder diagnostic test level Mathematics 1, at negative - level Algebra and beginning of analysis	Department mathematicians
G3	Basic literacyin natural-	- Basic understanding of the scientific picture of the world with an understanding	Complete 4-x summer education With developmentminimum 240	Departments by direction

	scientific disciplines	the essence of the basic laws of science - understanding of basic hypotheses, laws, methods, drawing conclusions and assessing errors	academic credits (including 120 contact classroom credits) academic credits). If the diagnostic test is passed positively, the Physics 1, General Chemistry level is awarded; if the diagnostic test is passed negatively, the - level of Beginning of Physicsand Basic Chemistry	natural sciences
SPECIFIC (implies a shortened course of study due to the transfer of credits depending on the level knowledge on competencies for graduates of 12-year schools, colleges, universities, including humanitarian and economic areas)				
S1	Communicative ness	- Fluent bilingual oral, written and communication skills - ability not fluent communication with a third language - skills writing texts of various styles and genres - skills deep understanding and interpretation of one's own works certain leveldifficulties (essay) - basic aesthetic and theoretical literacy as a condition for full-fledged perception, interpretation of the original text	Full re-creditcredits in languages (Kazakh and Russian)	Department of Kazakh and Russian Language
S2	Mathematical Kaya literacy	- Special mathematical thinking using induction and deduction, generalizations And specifications, analysis Andsynthesis, classification and systematization, abstraction and analogy - the ability to formulate, substantiate and prove positions - application commonmathematical concepts,formulas And extendedspatial perception Formath problems - complete understanding the basics of mathematical analysis	Credit transfer for the discipline Mathematics (Calculus) I	Department of Mathematics

S3	Special literacy in natural sciences (Physics, Chemistry, Biology and Geography)	- Wide scientificperception peace, presupposing an understanding of natural phenomena - critical perception for understanding phenom enasurrounding world - cognitive ability to formulate scientific understanding formsthe existence of matter, its interactions in nature	Credit transfer for Physics I, General Chemistry, General Biology, Introduction to Geology, Introduction to Geodesy; Educatio nalpractice, etc.	Departments in the areas of natural sciences
S4	English language	- Readiness for further self-study on English in various fields - willingness to gain experience in project and research work with using English	Re-credit creditsEn glish language from academic to professional level (up to 15 credits)	Department of English
S5	Computer skills	- Basic programming skillsin one modern language - usage software applications for teaching various disciplines	Re-credit credits p discipline Introduction information and communication technologists Information and communication technologies	Department of Software Engineering
S6	Social and humanitarian competencies and behavior	- Understanding and awareness of the responsibility of each citizen for the development of the country and the world - ability discussethical and moral aspects V society,culture and science	Re-credit credits ByModern storiesKazakhs tan (forwith the exception of the state exam)	Department of Social Sciences
		- critical understanding and ability to debate B ymodern scientific hypotheses and theories	Transfer of credits in philosophy and other humanities disciplines	
PROFESSIONAL (implies shortened training by transferring credits depending on the level of knowledge in competencies for graduates of colleges, AB schools, and universities)				
P1	Professional -those competencies	- Critical perception and deep understandingprofessional competencies at level 5 or 6 - ability discuss and debate Byprofessional	Re-credit credits Bybasic professional disciplines, including Introduction to the Specialty, Engineering Ethics, Technology robotic production, Technological objects	Releasingth department

		questions V within the frameworkmastered program	automation, Theoretical Basicse lectrical engineering, Technological measurements And devices, Mathematical Basics theories management, Electronic automation devices.	
P2	General engineering competencies	- Basic general engineering skills and knowledge, ability to solve general engineering tasks and problems - be able to use application software packages to process experimental data, solutions systemsalgebraic And differential equations	Transfer of credits in general engineering disciplines (Engineering graphics, Descriptivegeom etry, Basicselectrical engineering, Fundamentals of microelectronics.)	I'm releasingde partment
P3	Engineering and computer competencies	- basic skillsuse computer programs and software systems for solving general engineering problems	Credit transfer for the discipline Computer graphics, Computer modeling And programming in MatLab environment.	I'm releasingde partment
P4	Socio-economic competencies	- critical understanding and cognitive ability to reason in modern social And economic issues - basic understanding of economics ratings objects of study and profitability of projects.	Re-credit credits in social, humanitarian and technical and economic disciplines V creditelective cycle	I'm releasingde partment

The University may refuse to transfer credits if a low diagnostic level is confirmed or if the final grades for completed courses were below A and B.

2 Requirements for Completion of Studies and Obtaining a Diploma

General mandatory standard requirements for graduating from a university and receiving a bachelor's degree: completion of at least 240 academic credits of theoretical training, completion of a final diploma thesis, or passing a state exam in the specialty.

Special requirements for graduation from this program.

The graduate should know:

-English language (technical);
- principles of construction of electronic circuits and their functioning,
-principles constructions and exploitation systems electronics Andelectrical devices,
- features of network and information and communication technologies,
-norms and standards (V volume number international) projectdocumentation used in the electronics industry,
- modern world development trends in the field of electronic technologies.

The graduate must be able to:

- develop, deploy, test and exploitinformation and electronic systems for various purposes;
- design electrical engineering devices and their elements Vvarious areas of the digital economy;
- apply modern FPGA technologies to process and transmit large volumes of information, analyze it to make smart decisions;
- have skills works V team developers and usersengineering electronic systems

4. Passport of the educational program

"ELECTRONIC AND ELECTRICAL ENGINEERING"

Field name	Note
Code and classification of educational	6B07**1** Engineering, manufacturing and construction industries
Code and classification of training	6B**0**71 Engineering and Engineering
Group of educational programs	Electrical Engineering n energy, Electrical Engineering n automation
Name of the educational program	Electronic and electrical engineering
Purpose OP Goal	of the educational program The purpose of the educational program (OP) is to train highly qualified specialists in the field of digitalof digitalspecialists in electronics and electrical engineering who have deep knowledge, skills and practical skills that ensure high-quality performance of functional duties in their chosen specialty, mobility in the рынке professional labor market, and who know the latest world achievements and prospects for the development of the electronic industry.
Objectives of educational programs	objectives The new educational program aims to: - training of a new competitive generation of technical specialists in the field of electronics and electrical devices for the labor market, proactive, able to work in a team, with high personal профессноand professional competenciesand professional competencies компетенциями; - integration of educational and scientific activities; - establishment of partnerships with leading universities in the near and far abroad to improve the quality of education, to support technical specialists in the field of and cultural relations: - expanding relations with customers of educational services, employers in order to determine the quality requirements for training specialists, conducting courses, seminars, master-classes, internships, industrial practices
The results of training	a graduate should know: -English (technical); - principles of construction of electronic circuits and their functioning ; - principles of construction and operation of electronic systems and electrical devices ; - features of network and non-standard and unique technologies.

	- norms and standards [including international ones] of project documentation applied in the electronic industry, - current global trends in development in the field электроf electronicof technologies. The graduate must be able to: - develop, implement, test and operate information and electronic systems for various purposes: -design electrical devices and their elements in various areas экоof the digitaleconomy; - apply modern FPGA technologies for processing and transmittinglarge amounts of information, analyze it to make smart decisions: - have the skillsand experience of working in a team of developers and users of electronic engineering systems.
Requirements for completion of studies and obtaining a diploma	Mastering at least 240 academic credits of theoretical training, completing the final thesis or passing the state exam in the specialty.
Qualificationcharacteristics	
Academic degree of the graduate	Bachelor of Engineering and Technology in the direction of 6**B0**71 Engineering and Engineering
Object of professional activity	Graduates in the direction of "Electronic and electrical engineering" will work в as по electronics specialists, operators, managers of the organization of bnznes- processes of intelligent systems and developers of smart things systems for various sectors of the economy.
ISCED level	6 level-Bachelor's degree its equivalent
NRC level	6 level-higher education practical experience
ORC level	6 level - A wide range of specialized (theoretical and practical) knowledge (including innovative). Independent search, analysis and evaluation of professional information
Form of study	Full-time, distance
Language training	Kazakh / Russian

4.1 Working curriculum of the educational program

SATBAYEV UNIVERSITY

Қ.И.СӘТБАЕВ атындағы ҚАЗАҚ ҰЛТТЫҚ ТЕХНИКАЛЫҚ ЗЕРТТЕУ УНИВЕРСИТЕТІ ҰАҚ

БЕКІТЕМІН
Басқарма Төрағасы-
Қ.И.Сәтбаев атындағы ҚазҰТЗУ Ректоры
М.М.Бегентаев
[illegible] ж.

2024-2025 оқу жылына қабылданғандар үшін білім беру бағдарламасының
ОҚУ ЖОСПАРЫ

6В07104 «Электрондық және электротехника» білім беру бағдарламасы
В063 "Электротехника және автоматтандыру" білім беру бағдарламаларының тобы

Оқу түрі: күндізгі | Оқу мерзімі: 4 жыл | Академиялық дәреже: техника және технологиялар бакалавры

Пәннің коды	Пәннің атауы	Цикл	Жалпы көлемі, кредиттер	Барлық сағаттар	Аудиторлық көлемі дәріс/лаб/пр	СӨЖ (оның ішінде СОӨЖ) сағаттар	Бақылау түрі	Аудиториялық сабақтарды курстар мен семестрлер бойынша бөлу: I курс, 1 семестр	I курс, 2 семестр	II курс, 3 семестр	II курс, 4 семестр	III курс, 5 семестр	III курс, 6 семестр	IV курс, 7 семестр	IV курс, 8 семестр
ЖАЛПЫ БІЛІМ БЕРЕТІН ПӘНДЕР ЦИКЛІ (ЖБП)															
М-1. Тілдік дайындық модулі															
LNG 108	Ағылшын тілі	ЖБП, МК	5	150	0/0/3	105	E	5							
LNG 108	Ағылшын тілі	ЖБП, МК	5	150	0/0/3	105	E		5						
LNG 104	Қазақ (орыс) тілі	ЖБП, МК	5	150	0/0/3	105	E	5							
LNG 104	Қазақ (орыс) тілі	ЖБП, МК	10	300	0/0/3	210	E		5						
М-2. Дене шынықтыру пәні бойынша дайындық модулі															
KFK 101-104	Дене шынықтыру	ЖБП, МК	8	240	0/0/8	120	Дифсынақ	2	2	2	2				
М-3. Ақпараттық технологиялар модулі															
CSE 677	Ақпараттық-коммуникациялық технологиялар (ағылшын тілінде)	ЖБП, МК	5	150	2/1/0	105	E			5					
М-4. Әлеуметтік-мәдени даму модулі															
HUM 137	Қазақстан тарихы	ЖБП, МК	5	150	1/0/2	105	МЕ	5							
HUM 132	Философия	ЖБП, МК	5	150	1/0/2	105	E			5					
HUM 120	Әлеуметтік-саяси білім модулі (әлеуметтану, саясаттану)	ЖБП, МК	3	90	1/0/1	60	E			3					
HUM 134	Әлеуметтік-саяси білім модулі (мәдениеттану, психология)	ЖБП, МК	5	150	2/0/1	150	E				5				
М-5. Сыбайлас жемқорлыққа қарсы мәдениет, экология және өмір қауіпсіздігі негіздерінің модулі															
HUM 136	Сыбайлас жемқорлыққа қарсы мәдениет және құқық негіздері	ЖБП, ТК	5	150	2/0/1	105	E				5				
MNG 489	Экономика және кәсіпкерлік негіздері														
ELC 577	Ғылыми зерттеу әдістерінің негіздері														
CHE 656	Экология және өмір қауіпсіздігі														
MNG 564	Қаржылық сауаттылық негіздері														
НЕГІЗГІ ПӘНДЕР ЦИКЛІ (НП)															
М-6. Физикалық-математикалық дайындық модулі															
MAT 101	Математика I	НП, ЖООК	5	150	1/0/2	105	E	5							
MAT 102	Математика II	НП, ЖООК	5	150	1/0/2	105	E		5						
MAT 103	Математика III	НП, ЖООК	5	150	1/0/2	105	E			5					
PHY 111	Физика I	НП, ЖООК	5	150	1/1/1	105	E	5							
PHY 112	Физика II	НП, ЖООК	5	150	1/1/1	105	E		5						
М-7. Негізгі жалпы техникалық оқыту модулі															
GEN 429	Инженерлік және компьютерлік графика	НП, ЖООК	5	150	1/0/2	105	E		5						
ELC 589	Электротехниканың теориялық негіздері I	НП, ЖООК	6	180	1/1/1	130	КЖ қорғау			6					
ELC 590	Электротехниканың теориялық негіздері II	НП, ЖООК	5	150	1/1/1	105	КЖ қорғау				5				
ELC 587	Модельдеу ортасын программалау орта	НП, ТК	5	150	1/1/1	105	КЖ қорғау			5					
ELC 588	MatLab және басқа да бағдарламалық ортада электрондық құрылғыларды модельдеу														
ROB 504	Жоғары деңгейлі бағдарламалау	НП, ТК	5	150	2/0/0	105	E				5				
ROB 503	Алгоритм әдістері және бағдарламалау				1/1/1										
CSE 811	Жасанды интеллект негіздері				1/0/2										
AAP 173	Оқу практикасы	НП, ЖООК	2						2						
БЕЙІНДЕУШІ ПӘНДЕР ЦИКЛІ (БП)															
М-8. Электроника және электротехника модулі															
ELC 478	Электрондық тізбек пен инженерлік технологиялар кіріспе	БП, ЖООК	4	120	2/0/0	75	E	4							
ELC 575	Электроника және өлшеу техникасының негіздері	БП, ЖООК	5	150	1/1/1	105	E				5				
ELC 591	Электроника және схемалар	БП, ЖООК	5	150	1/1/1	105	КЖ қорғау					5			
ELC 100	Оптоэлектроника негіздері	БП, ТК	5	150	1/0/2	105	Э					5			
MNG561	Кәсіпкерлік [illegible]				2/0/1										
ELC 836	MNG562+A73	БП, ЖООК	5	150	2/0/1	105	E						5		
ELC 544	Электрониканың физикалық негіздері	БП, ЖООК	5	150	1/1/1	105	E					5			
ELC 280	Интеллект жүйелер технологиясы	БП, ЖООК	5	150	2/1/0	105	E						5		
ROB 411	Сандық және басқару бағдарламалау	БП, ТК	5	150	1/1/1	105	E						5		
ROB 398	Микроконтроллерлерді қолдану бағдарламалау				2/1/0										
MNG562	Энергетикалық жүйелерді басқару				2/0/1										
ELC 594	Электр құрылғыларын жобалау	БП, ТК	5	150	1/1/1	105	КЖ қорғау							5	
ELC 593	Электрондық құрылғыларды жобалау														
ELC 524	[illegible]	БП, ТК	5	150	2/0/1	105	E							5	
ELC 385	Сандық схема				2/1/0										
ELC 598	[illegible]	БП, ТК	5	150	1/1/1	105	E							5	

ELC 595	Автоматты есептеулер														
ELC 596	Күш жабдығы жүйелері	БП, ТК	6	180	2/0/1	120	Е								6
ELC 597	Кәсіпорындық жүйелерін жобалау														
AAP 102	Өндірістік практика I	БП, ЖООК	2								2				
AAP 103	Өндірістік практика II	БП, ЖООК	3										3		
	М-9. Электр жетектері мен өлшеу аспаптары модулі														
ELC 580	Электр жетегінің негіздері	БП, ЖООК	4	120	3/0/0	75	КЖ қорғау						4		
ELC 631	Динамика және электр жетектерін басқару	БП, ТК	4	120	2/1/0	75	Е						4		
ELC 632	Электр құрылғыларын жобалау және басқару														
ELC 578	Сандық электр жетегін басқару	БП, ТК	4	120	2/0/1	75	Е							4	
ELC 579	Электр энергиясы жүйелерін басқару														
ELC 634	Микропроцессорлық жүйелер	БП, ТК	5	150	2/1/0	105	Е							5	
ELC 584	Автоматтандыру электр өлшеу аспаптары				2/0/1										
	М-10. Өндірістік автоматтандыру модулі														
AUT 424	Автоматтандыру негіздері	КП, ЖООК	5	150	2/0/0	105	Е					5			
ELC 635	Гидравликалық басқару жүйелері	КП, ЖООК	5	150	2/1/0	105	Е						5		
ELC 636	Нақты уақыттағы басқару жүйелері	КП, ЖООК	5	150	2/1/0	105	Е							5	
ELC 582	Автоматтандыру және басқарудың техникалық құралдары	КП, ТК	6	180	2/0/1	120	Е								6
ELC 633	Автоматтандыру жүйелері				1/0/2										
ELC 581	Автоматтандырудағы күштік электроника	КП, ЖООК	4	120	2/0/1	75	Е					4			
AUT 411	Сызықтық автоматты реттеу жүйелері	КП, ЖООК	5	150	1/1/1	105	Е					5			
	М-11. Модуль жобаларын басқару және уәкілді өндіріс концепциялары														
IND 127	Өндіру негіздері	КП, ТК	5	150	2/1/0	105	Е								5
IND 128	Lean жүйесі														
	М-12. Шығармашылықты дамыту модулі														
ELC 482	Өнеркәсіптік технологиялардағы электр жетектері	КП, ЖООК	6	180	2/0/2	120	Е								6
	М-13. Қорытынды аттестаттау модулі														
ECA 103	Дипломдық жұмысты (жобаны) жазу және қорғау	ҚА	8												8
	М-14. Оқыту түрлерінің қосымша модулі														
AAP 500	Әскери дайындық	ҚКЗ	0												
	Университет бойынша барлығы:							31	29	31	29	29	31	29	31
								60,00		60		60		60	

Циклдар	Пәндер циклдері	Міндетті компонент (МК)	ЖОО компоненті (ЖООК)	Таңдау компоненті (ТК)	Барлығы
	Білім беру бағдарламасының кредиттер саны				
ЖБП	Жалпы білім беретін пәндер циклі	51		5	56
БП	Негізгі пәндер циклі (БП)		87	24	176
КП	Бейіндік пәндер циклі		34	41	
	Теориялық оқыту бойынша барлығы:	51	111	70	232
ҚА	Қорытынды аттестаттау	8			8
	ЖИЫНЫ:	59	111	70	240

Қ.И.Сәтбаев атындағы ҚазҰТЗУ Ғылыми кеңесінің шешімі Хаттама № 12 "21" 04. 2024 ж.

Қ.И.Сәтбаев атындағы ҚазҰТЗУ Оқу-әдістемелік кеңесінің шешімі Хаттама № 6 "19" 04. 2024 ж.

АжАТ Институт Ғылыми кеңесінің шешімі Хаттама № ___ "___" __________ 2024 ж.

Басқарма мүшесі – Академиялық мәселелер жөніндегі проректор		Р.К.Ускенбаева
АжАТ Институт директорының м.а		Ж.Б. Кальпеева
ЭТжАТ кафедрасының меңгерушісі		Е. Тоигожинов
Жұмыс берушілердің мамандық кеңесінің мүшесі		Д.Ш. Ахметова

СӘТБАЕВ УНИВЕРСИТЕТІ | SATBAYEV UNIVERSITY

SATBAYEV UNIVERSITY

Қ.И.СӘТБАЕВ атындағы ҚАЗАҚ ҰЛТТЫҚ ТЕХНИКАЛЫҚ ЗЕРТТЕУ УНИВЕРСИТЕТІ КЕАҚ

БЕКІТЕМІН
Басқарма төрағасы-
Қ.И.Сәтбаев атындағы ҚазҰТЗУ ректоры
_____ М.М.Бегентаев
«___» _______ 2024ж.

2024-2025 оқу жылында қабылданғандар үшін білім беру бағдарламасының
ОҚУ ЖОСПАРЫ

6В07112 «Электрондық және электротехника» білім беру бағдарламасы
В062 "Электротехника және энергетика" білім беру бағдарламаларының тобы

Оқу түрі: күндізгі | Оқу мерзімі: 4 жыл | Академиялық дәреже: техника және технологиялар бакалавры

Пәннің коды	Пәннің атауы	Цикл	Жалпы көлемі, кредиттер	Барлық сағаттар	Аудиторлық жүктеменің көлемі дәріс/зер б/лр	СӨЖ (оның ішінде СОӨЖ) сағатпен	Бақылау түрі	Аудиторлық сабақтарды курстар мен семестрлер бойынша бөлу: I курс, 1 семестр	I курс, 2 семестр	II курс, 3 семестр	II курс, 4 семестр	III курс, 5 семестр	III курс, 6 семестр	IV курс, 7 семестр	IV курс, 8 семестр
ЖАЛПЫ БІЛІМ БЕРЕТІН ПӘНДЕР ЦИКЛІ (ЖБП)															
М-1. Тілдік дайындық модулі															
LNG 108	Ағылшын тілі	ЖБП, МК	5	150	0/0/3	105	Е	5							
LNG 108	Ағылшын тілі	ЖБП, МК	5	150	0/0/3	105	Е		5						
LNG 104	Қазақ (орыс) тілі	ЖБП, МК	5	150	0/0/3	105	Е	5							
LNG 104	Қазақ (орыс) тілі	ЖБП, МК	5	150	0/0/3	105	Е		5						
М-2. Дене шынықтыру модулі															
KFK 101-104	Дене шынықтыру	ЖБП, МК	8	240	0/0/8	120	Дифсынақ	2	2	2	2				
М-3. Ақпараттық технологиялар модулі															
CSE 677	Ақпараттық-коммуникациялық технологиялар (ағылшын тілінде)	ЖБП, МК	5	150	2/1/0	105	Е			5					
М-4. Әлеуметтік-мәдени даму модулі															
HUM 137	Қазақстан тарихы	ЖБП, МК	5	150	1/0/2	105	МЕ	5							
HUM 132	Философия	ЖБП, МК	5	150	1/0/2	105	Е			5					
HUM 120	Әлеуметтік-саяси білім модулі (әлеуметтану, саясаттану)	ЖБП, МК	3	90	1/0/1	60	Е			3					
HUM 134	Әлеуметтік-саяси білім модулі (мәдениеттану, психология)	ЖБП, МК	5	150	2/0/1	105	Е				5				
М-5. Сыбайлас жемқорлыққа қарсы мәдениет, экология және өмір қауіпсіздігі негіздерінің модулі															
HUM 136	Сыбайлас жемқорлыққа қарсы мәдениет және құқық негіздері	ЖБП, ТК	5	150	2/0/1	105	Е				5				
MNG 489	Экономика және кәсіпкерлік негіздері														
ELC 577	Ғылыми зерттеу әдістерінің негіздері														
MNG 564	Қаржылық сауаттылық негіздері														
CHE 656	Экология және өмір қауіпсіздігі														
НЕГІЗГІ ПӘНДЕР ЦИКЛІ (БП)															
М-6. Физикалық-математикалық дайындық модулі															
MAT 101	Математика I	НП, ЖООК	5	150	1/0/2	105	Е	5							
MAT 102	Математика II	НП, ЖООК	5	150	1/0/2	105	Е		5						
MAT 103	Математика III	НП, ЖООК	5	150	1/0/2	105	Е			5					
PHY 111	Физика I	НП, ЖООК	5	150	1/1/1	105	Е	5							
PHY 112	Физика II	НП, ЖООК	5	150	1/1/1	105	Е		5						
М-7. Негізгі жалпы техникалық оқыту модулі															
GEN 429	Инженерлік және компьютерлік графика	НП, ЖООК	5	150	1/0/2	105	Е		5						
ELC 589	Электротехниканың теориялық негіздері I	НП, ЖООК	6	180	2/1/1	120	ЕЖ қорғау			6					
ELC 590	Электротехниканың теориялық негіздері II	НП, ЖООК	5	150	2/1/0	105	ЕЖ қорғау				5				
ELC 566	Модельдеуге арналған программалық орта	НП, ТК	5	150	2/1/0	105	Е			5					
ELC 556	MatLab және басқа да бағдарламалық ортадарда электрондық құрылғыларды модельдеу				1/2/0										
MNG563	Қазақстандағы Тұрақты даму негіздері және ESG қағидалары				2/0/1										
AAP 171	Оқу практикасы	НП, ЖООК							2						
БЕЙІНДЕУШІ ПӘНДЕР ЦИКЛІ (БП)															
М-8. Электроника және электротехника модулі															
ELC 479	Электрондық ғылым мен инженерлік технологияларға кіріспе	НП, ЖООК	4	120	2/0/1	75	Е	4							
ELC 637	Электроника және өлшеу техникасының негіздері	НП, ЖООК	4	120	1/1/1	75	Е				4				

ELC 591	Электроника және сигналдар	ҚП, ЭЮОК	5	150	1/1/1	105	ҚЖ корғау					5				
ELC 500	Микроэлектроника	ҚП, ЭЮОК	5	150	2/1/0	105	Е					5				
ELC 100	Оптоэлектроника негіздері	ҚП, ЭЮОК	5	150	1/0/2	105	Е					5				
ROB 411	Бақыланған жүйелерді бағдарламалау	ҚП, ТК	5	150	1/1/1	105	Е									
ROB 195	Микроконтроллерлерге арналған бағдарламалау				2/1/0											
CSE 831	Жасанды интеллект негіздері				1/0/2											
ELC 638	Электр құрылғыларын жобалау	БП, ТК	6	180	2/1/1	120	ҚЖ корғау							6		
ELC 639	Электрондық құрылғыларды жобалау															
ELC 524	Бағдарламаланатын логикалық интегралды сымдар	БП, ТК	5	150	2/0/1	105	Е							5		
ELC 634	Микропроцессорлық жүйелер				2/1/0											
ELC 548	Электрониканың физикалық негіздері	ҚП, ЭЮОК	5	150	1/1/1	105	Е					5				
AAP 102	Өндірістік тәжірибе I	БП, ЭЮОК	2								2					
AAP 183	Өндірістік практика II	БП, ЭЮОК	3										3			
	М-9. Қазіргі энергетика модулі															
ERG 176	Энерготехникалық материалтану	ҚП, ЭЮОК	5	150	2/0/1	105	Э									5
ELC 640	Энерготехникалық құрылғылар	БП, ЭЮОК	5	150	2/0/1	105	ҚЖ корғау									
ELC 641	Энергия тиімділігі және жүйелерді оңтайландыру	ҚП, ТК	5	150	2/1/0	105	Э					5				
ERG 119	Жаңа және жаңартылатын энергия көздері	БП, ТК	5	150	2/0/1	105	Э							5		
ERG 180	Қосөткізгіштердағы энергия ауысуы және энергия үнемдеу															
ELC 578	Сандық электр жетегін басқару	ҚП, ТК	4	120	2/0/1	75	Э							4		
ELC 579	Жарықдиодты байланыс жүйелері															
	М-10. Электр жетектері мен механизмдерінің модулі															
ELC 483	Өнеркәсіптік желіледі басқару	ҚП, ЭЮОК	4	120	2/0/1	75	Э									
ELC 642	Қорғау және энергия	БП, ЭЮОК	6	180	2/0/2	120	ҚЖ корғау							6		
ELC 651	Динамика және электр жетектерін басқару	БП, ЭЮОК	4	120	2/1/0	75	Э						4			
ELC 580	Электр жетектің негізі	БП, ЭЮОК	4	120	1/1/1	75	ҚЖ корғау						4			
ELC 643	Машиналар мен механизмдердің динамикасы	ҚП, ТК	5	150	1/1/1	105	Э									5
ELC682	Энергетикадағы интеллектуалды басқару жүйелері															
MNG 562	Энергиялық менеджті құқықтық реттеу				2/0/1											
ELC 644	Электр машиналарының негіздері	ҚП, ТК	5	150	2/0/1	105	Э						5			
ELC685	Электромагниттік құрылғылар мен аппараттар															
ELC 645	Электроника және микропроцессорлық технологиялар	БП, ТК	6	180	2/0/2	120	Э							6		
ELC 646	Электр жүйелерінің динамикасы															
	М- 11. Өндірісті автоматтандыру модулі															
AUT 424	Автоматтандыру негіздері	ҚП, ЭЮОК	5	150	2/1/0	105	Э					5				
	М- 12. Жобаларды басқару модулі және үнемді өндіріс тұжырымдамалары															
NSE 185	Жобаларды басқару теориясы мен практикасы	БП, ТК	5	150	2/0/1	105	Е									5
ELC 565	Электрондық технологиялар															
IND 129	Өндіру өндірісі	БП, ТК	5	150	2/1/0	105	Е									5
IND 128	Lean жүйесі															
	М-13. Шығармашылықты дамыту модулі															
ELC 492	ӨҒТШТ инженерлік есептерді шешуде	ҚП, ТК	6	180	2/0/2	120	Е				6					
	М-14. Қорытынды бағалау модулі															
ECA 109	Дипломдық жұмысты (жобаны) қорғау және қорғау	ҚА	8													8
	М-15. Оқытудың қосымша түрлерінің модулі															
AAP 300	Өзіндік дайындық	ОӨСТ	0													
	UNIVERSITY бойынша барлығы:							31	29	31	29	30	30	32	38	
								60,00		60		60		60		

Цикл коды	Пәндер циклдері	Кредиттер			
ЖОП	Жалпы білім беретін пәндер циклі	51		5	56
ҚП	Негізгі оқыту циклі (ҚП)		91	24	178
ТП	Бейінді пәндер циклі		29	33	
	Теориялық оқыту бойынша барлығы:	*51*	*120*	*61*	*232*
ҚА	Қорытынды аттестаттау	8			8
	ЖИЫНЫ:	59	120	61	240

Қ.И.Сәтбаев атындағы ҚазҰТЗУ Ғылыми кеңесінің шешімі Хаттама № 12 "22 " 04. 2024 ж

Қ.И.Сәтбаев атындағы ҚазҰТЗУ Оқу-әдістемелік кеңесінің шешімі Хаттама № 6 "19" 04. 2024 ж

АлаАТ институтының Ғылыми кеңесінің шешімі. Хаттама . № "___" _____ 2024 ж

Басқарма мүшесі академиялық мәселелер жөніндегі Проректор — Р.К. Утепбаева

АлаАТ институты директорының м. а. — Ж.Б. Кальпеева

ЭТжЕТ кафедрасының меңгерушісі — Е.Ташпай

Жұмыс берушілердің мамандық кеңесінің өкілі — Д.Ш. Алмасов

4.2 Descriptors of the level and volume of knowledge, skills, abilities and competencies

A – knowledge and understanding:

A1 - scientific principles underlying the study of general professional and specialized disciplines, containing both basic and advanced courses for fundamental training in the field of electronics and electrical engineering;

A2 - principles of operation and technical characteristics of the electronic and electrical equipment used, methods of conducting measurements in the field of electrical engineering and electronics;

A3-methodologies of joint analysis; design and decision-making in complex social and professional situations; methods of communication and coordination of points of view; design and presentation of analytical and design documentation.

B – application of knowledge and understanding:

B1 -independent development and proposal of various options for solving professional problems using theoretical and practical knowledge;

B2 - for designing electronic systems and smart grids taking into account real-world constraints (impact on the environment and society, manufacturability and sustainable development);

B3 - for organizing work on collecting, storing and processing, receiving and transmitting information used in the digital economy.

C – formation of judgments:

C1 - about modern systems of electronic devices, new technologies in electronics and electrical engineering;

C2 - about modern approaches in electronic technologies for creating the Internet of things, virtual services, while being able to compare, formulate conclusions, build your own arguments, express and justify your position;

C3 - about modern technical support of electronic systems, allowing to create optimal variants of smart devices and corresponding electronic equipment.

D – personal abilities:

D1 - awareness of the social significance of the profession, adherence to the principles of professional ethics, improvement of the professional and personal qualities of a specialist in the field of electronics and electrical engineering;

D2 - the desire to develop intellectual, moral, communicative, organizational and managerial skills;

D3 - the ability to listen, persuade and argue, the ability to find a compromise, to correlate one's opinion with the opinion of the team.

4.3 Competencies upon completion of training

B - Basic knowledge, skills and abilities

B1 - be able to analyze current issues in the modern history of Kazakhstan;

B2 - know and apply in practice the basics of engineering professional ethics;

B3 - know modern and promising directions of development of electronic systems and electrical devices, computer technologies, modern software.

P – Professional competencies, including those in accordance with the requirements of industry professional standards:

P1 - a wide range of theoretical and practical knowledge in the professional field;

P2 – the ability to develop, design and install electronic systems; work with various intelligent logic circuits of electronics, mechatronics and optoelectronics; configure electrical devices;

P3 – provide technical support to users of electronic devices.

O – General human, social and ethical competencies:

O1 - abilityto continuous learning, to concentration; to be self-confident in conditions of uncertainty; to have a high level of spatial and logical thinking;

O2 - be able to work in a team, have organizational skills, set priorities, quickly acquire new knowledge and skills, and apply them in practice;

O3 - be focused on achieving results, effectively plan and organize your development;

O4 - is able to freely use English as a means of business communication, a source of new knowledge in the field

C – Special and managerial competencies

C1 - independent management and control of work and educational processes within the framework of the strategy, policy and goals of the organization, discussion of the problem, argumentation of conclusions and competent handling of information;

C2 - the ability to motivate to solve specific problems, the ability to bear responsibility for the results of work at the department or enterprise level

C3 - the ability to demonstrate a set of skills in managing the work process, the ability to select methods, techniques and evaluation criteria to obtain results, distribute and delegate authority, form teams, and make decisions during the production process.

5 Diploma Supplement according to ECTS standard

ECTS – EuropeanCredit Transfer and Accumulation System (ECTS) is a pan-European system for recording students' academic work when mastering an educational program or course. In practice, the ECTS system is used when students transfer from one educational institution to another throughout the European Union and other European countries that have adopted this system, including the Republic of Kazakhstan. One academic year corresponds to 60 ECTS credits (36 RK credits), which is about 1500-1800 academic hours.

To obtain a bachelor's degree, you need to earn 215 ECTS credits (129 RK credits), and for a master's degree, you need to make up the remaining 290 (that is, another 75 ECTS credits or 50 RK credits).

The application consists of 8 mandatory items in English/Kazakh/Russian languages. Represents by yourselfstandardized text that confirms the conformity of the developed supplement to European standards. The form of the European Diploma Supplement is given in Appendix A.

Section 1 Information about the holder of the qualification: surname, first name (as written in the passport), date and place of birth, identification number or student code.

Section 2 Information about the qualification obtained: name of the qualification, main specialty Major, additional specialty Minor (if any), name and status of the higher education institution that awarded the qualification in the native language, name and status of the higher education institution that awarded the qualification in English, language of instruction and knowledge assessment.

Section 3 Information on the qualification level: the qualification level is indicated – bachelor's (master's, doctoral), duration of study, admission requirements.

Section 4 Information on the content of training and the results obtained: the form of training is indicated - full, distance, shortened full, program requirements (the necessary volume for mastering the program), the content of the educational program (compulsory and elective disciplines, coursework completed by the student, completed internships, a defended diploma thesis indicating the complexity of disciplines, internships, coursework and diploma theses, status (compulsory, optional, additional), final grades) in RK credits and ECTS, the national grading scale approved by the order of the Ministry of Education and Science of the Republic of Kazakhstan and its description, the mechanism for converting grades to the European system, the general classification of qualifications.

Section 5 Professional characteristics of the qualification: does the obtained qualification allow one to move on to the next level of education and what requirements must be met for this, professional status (what professional rights do students acquire upon receiving the qualification).

Section 6 Additional Information: additional information about the university, additional sources of information.

Section 7 Certification of the application: indicates the date of award of the qualification, the date of issue, the last name, first name of the official,

certifying the diploma supplement, signing the diploma itself; all this information is certified with a seal.

Section 8 Information on the national higher education system.

This supplement is issued only upon graduation from the university upon the graduate's application on a fee basis in accordance with the standards established by the university.

To get the application you need submit written(electronic) application to the university office with a copy of the payment receipt attached.

The application is issued by the Office Registrar within 15 working days fromthe moment of application submission and is registered in the journal of issuance and registration of diplomas and supplements. The supplement forms are kept in the Registrar's Office. An electronic record of the issuance of this supplement to the diploma is generated in the graduate's personal portfolio on the university portal.

Description of disciplines

Introduction to Electronic Science and Engineering Technologies
CODE – ELC 197
CREDIT – 3 (2/0/1/3) PRE-REQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

Teaching students the methods and fundamentals of electronic science and electronic engineering. In addition, students must be familiar with the basic concepts, models and principles of building the electronic industry of developed countries, the republic's current tasks for developing the digital economy, and their development trends. Requirements of international standards in building smart technologies for electronic components.

BRIEF DESCRIPTION OF THE COURSE

An idea of the trends in the development of electronic industry technologies, the patterns of their development that determine the relationship between the quality indicators of the element base, performance parameters, and energy consumption indicators of electronic systems. General principles for constructing the element base of electronic engineering, the foundations for the development of science in the electronic and electrical engineering industries.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the discipline, the student must:

- have an idea of the trends in the development of electronic industry technologies, the patterns of their development that determine the relationship between the quality indicators of the element base, energy parameters, and economic indicators of the development of digital systems;
- know the general principles of constructing electronic engineering, radio engineering; requirements of international standards for the development and design of the element base;
- be able to analyze the structure of the construction and characteristics (indicators) of electronic devices and systems of analog and digital information processing; apply methods of analysis and synthesis, technical solutions used in electronic devices and electrical systems.

Algebra and Introduction to Mathematical Analysis
CODE – MAT100
CREDIT – 3 (1/0/2/3)
PREREQUISIT - diagnostic test

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of the course is to introduce students to the basic ideas and concepts of algebra and mathematical analysis and to develop the basic knowledge necessary for studying the course "Mathematics 1".

The objectives of the course are to develop skills for studying mathematical disciplines and the effective use of mathematical methods to solve research and practical problems in the professional field.

BRIEF DESCRIPTION OF THE COURSE

The course "Algebra and Introduction to Analysis" provides the basic concepts of algebra, mathematical analysis, differential and integral calculus.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE
The student
should know:
- basic concepts of algebra;
- basic concepts of mathematical analysis;
- basic elementary functions; must be
able to:
- find solutions equations And inequalities, systems equations Andinequalities;
- transform algebraic and trigonometric expressions;
- solve word problems;
- find the derivative of elementary functions;
- explore functions using derivatives;
- find the indefinite integral of elementary functions;
- find a definite integral;
- find the area of a curvilinear trapezoid.

Mathematics I
CODE – MAT101
CREDIT – 3 (1/0/2/3)
PREREQUISITE – Algebra and Introduction to Mathematical Analysis COURSE OBJECTIVES AND TASK

The main goal of the course is to provide the future specialist with a certain amount of knowledge in the sections of the course "Mathematics-I", necessary for studying related engineering disciplines. To acquaint students with the ideas and concepts of mathematical analysis. The main focus is on the formation of basic

knowledge and skills with a high degree of understanding of differential and integral calculus.

Course objectives:

acquisition of knowledge necessary for the effective use of rapidly developing mathematical methods; acquisition of skills in constructing and researching mathematical models; mastery of fundamental sections of mathematics necessary for solving research and practical problems in the professional field.

BRIEF DESCRIPTION OF THE COURSE

The course "Mathematics-I" provides an outline of the sections: introduction to analysis, differential and integral calculus

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

Studying this discipline will allow the student to apply the course "Mathematics-I" to solve simple practical problems, find tools sufficient for their research, and obtain numerical results in some standard situations.

Mathematics II

CODE – MAT102

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Mathematics 1

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Mathematics II" is to develop in bachelors an understanding of modern mathematics as a whole as a logically coherent system of theoretical knowledge.

The objectives of the course are to instill in students solid skills in solving mathematical problems with bringing the solution to a practically acceptable result. To develop primary skills in mathematical research of applied issues and the ability to independently understand the mathematical apparatus contained in the literature related to the student's specialty.

BRIEF DESCRIPTION OF THE COURSE

The course "Mathematics II" provides an accessible presentation of the sections: elements of linear algebra and analytical geometry, differential calculus of functions of several variables, multiple integrals. "Mathematics II" is a logical continuation of the course "Mathematics I".

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

Studying this discipline will allow you to apply in practice the acquired theoretical knowledge and skills with a high degree of understanding in the sections of the course, use them at the appropriate level; translate into mathematical language the simplest problems posed in terms of other

subject areas; acquire new mathematical knowledge using educational and information technologies; solve applied problems in the field of professional activity

Mathematics
IIICODE – MAT103
CREDIT – 3 (1/0/2/3)
PREREQUISITES – Mathematics 1, Mathematics II

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Mathematics-III" is to form basic knowledge and skills with a high degree of understanding in the sections of the course, helping to analyze and solve theoretical and practical problems.

Course objectives: to instill in students the ability to independently study educational literature, conduct theoretical probability and statistical analysis of applied problems; develop logical thinking and improve the general level of mathematical culture.

BRIEF DESCRIPTION OF THE COURSE

The course "Mathematics-III" includes the following sections: theory of series, elements of probability theory and mathematical statistics and is a logical continuation of the discipline "Mathematics II".

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

The student
should know:
- theory of number series;
- theory of functional series;
- Fourier series;
-elements of probability theory and mathematical statistics; must be
able to:
- solve problems in all sections of the theory of series;
- find the probabilities of events;
- find numerical characteristics of random variables;
- use statistical methods to process experimental data;

Physics I, II
CODE – PHY111-112
CREDIT – 6 (2/2/2/6)
PREREQUISITE – diagnostic test/PHY111

PURPOSE AND OBJECTIVES OF THE COURSE

The main objective of teaching the course Physics I and Physics II is

in the formation of ideas about the modern physical picture of the world and scientific worldview.

BRIEF DESCRIPTION OF THE COURSE

The disciplines Physics I and Physics II are the basis for theoretical training and engineering and technical activities of graduates of higher technical schools Andrepresent by yourself core physical knowledge, necessary for an engineer operating in the world of physical laws. Course "Physics 1" includes sections: physical foundations of mechanics, structure substances And thermodynamics, electrostatics And electrodynamics.Discipline "Physics II»is logical continuation studiesdiscipline "Physics 1", and forms a holistic understanding of the course of general physics as one of the basic components of the general theoretical training of bachelors engineering and technical profile. Discipline "Physics II»includes sections:magnetism, optics, nanostructures, Basics quantum physics, atomic and nuclear physics.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

– the ability to use knowledge of fundamental laws, theories of classical and modern physics, as well as the use of physical research methods as the basis of a system of professional activity.

Modern history of Kazakhstan

CODE – HUM100

CREDIT – 3 (1/0/2/3)

PRE-REQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to familiarize students of technical specialties with the main theoretical and practical achievements of domestic historical science on the problems of the history of modern Kazakhstan, a comprehensive and systematic study of the main stages of the formation and development of Kazakhstani society.

- to analyze the features and contradictions of the history of Kazakhstan during the Soviet period;
- to reveal the historical content of the fundamental laws of political, socio-economic, and cultural processes at the stages of the formation of an independent state;
- to promote the formation of students' civic position;
- to educate students in the spirit of patriotism and tolerance, and a sense of belonging to their people and Fatherland.

BRIEF DESCRIPTION OF THE COURSE

The course Modern History of Kazakhstan is an independent discipline and covers the period from the beginning of the 20th century to the present day. Modern History of Kazakhstan studies the national liberation movement of the Kazakh intelligentsia at the beginning of the 20th century, the period of the creation of the Kazakh ASSR, as well as the process of formation of a multinational society.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

- knowledge of events, facts and phenomena of the modern history of Kazakhstan;
- knowledge of the history of the ethnic groups inhabiting Kazakhstan;
- knowledge of the main stages of the formation of Kazakh statehood;
- the ability to analyze complex historical events and predict their further development;
- ability to work with all types of historical sources;
- writing skillessays and scientific articles on issues of the history of the Fatherland;
- ability to operate with historical concepts;
- ability to conduct a discussion;
- skills of independent analysis of historical facts, events and phenomena; public speaking skills.

Kazakh/Russian language

CODE – LNG101

CREDIT – 5 (0/0/5/5)

PREREQUISIT - diagnostic test

PURPOSE AND OBJECTIVES OF THE COURSE

- to teach students to perceive by ear statements on well-known topics related to home, study, and free time;
- understand texts on personal and professional topics containing the most frequent words and expressions;
- be able to conduct a conversation on everyday topics; describe your experiences; express your opinion; retell and evaluate the content of a book you read, a film you saw;
- be able to create simple texts on familiar topics, including those related to professional activities.

BRIEF DESCRIPTION OF THE COURSE

The language material of the course is selected in such a way that the student, while mastering the lexical and grammatical minimum, has the opportunity to become familiar with typical communicative situations and find himself in such situations, be able to correctly evaluate them and choose the appropriate model (strategy) of speech behavior.

The main focus of training is shifted from the process of transferring knowledge to teaching the ability to use the language being studied in the course of various types of speech activity, such as reading (subject to understanding what is read), listening (subject to the same condition)

and the production of texts of a certain complexity with a certain degree of grammatical and lexical correctness.

The material for the classes is selected so that students, studying the Kazakh/Russian language, acquire the skills of reading, writing and understanding spoken language based on the simultaneous mastery of the basics of grammar (phonetics, morphology and syntax) and word usage in the course of constant multiple repetition with a gradual increase in the complexity of tasks.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

Provided that the student actively organizes work in class and conscientiously completes homework, by the end of the first semester he or she acquires skills and abilities corresponding to the common European level A2 (Threshold according to the ALTE classification), that is, he or she is on the threshold of independent language proficiency.

English

CODE – LNG1051-1057

CREDIT – 12 (0/0/12/12)

PREREQUISITE – diagnostic test/LNG1051-1056

LNG1051

PURPOSE AND OBJECTIVES OF THE COURSE

The English language course “Beginner English” is intended primarily for learning from scratch. This course is also suitable for those who have only basic knowledge of the language. After completing this level, the student will be able to confidently communicate on basic topics in English, learn the basics of grammar and lay a certain foundation that will allow them to improve their skills at the next stage of learning English.

Course requirements: Elementary English.

LNG1052

PURPOSE AND OBJECTIVES OF THE COURSE

The discipline “Elementary English” is the foundation of the study of the English language, which is aimed at developing students' receptive skills (reading and listening) and productive skills (writing and speaking), analyzing basic knowledge, using and memorizing the main grammar rules and mastering the features of pronunciation and elementary vocabulary, as well as encouraging independent learning and critical thinking.

Course prerequisites: Beginner.

Course postrequisites: General 1.

LNG1053

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course “General English 1” is to provide students with the opportunity to gain sufficient knowledge to become more fluent in everyday life

social and academic settings. Students work on improving their pronunciation, vocabulary, and grammar. At this level, the main goal will be to consolidate the skills acquired earlier, learn to compose and correctly use complex syntactic constructions in English, and also achieve really good pronunciation.

Course prerequisites: Elementary English.

Course postrequisites: General 2.

LNG1054

PURPOSE AND OBJECTIVES OF THE COURSE

The course “GeneralEnglish 2” is intendedfor students who continue to study “GeneralEnglish 1”. The course is focused on the ability to actively use in practice most aspects of English tenses, conditional sentences, phrases in the passive voice, etc. At this stage, the student will be able to maintain a conversation with several interlocutors or express his point of view. The student significantly expands his vocabulary, which will allow him to freely express his thoughts in any situation. At the same time, speech will be supplemented with various synonyms and antonyms of already familiar words, phrasal verbs and set expressions.

Course prerequisites: General 1. Course postrequisites: Academic English.

LNG1055

PURPOSE AND OBJECTIVES OF THE COURSE

The main goal of the English language course “Academic English” is to develop academic language skills. The discipline is a language style that is used in writing academic papers (paragraph, abstract, essay, summary, etc.) This course is designed to help students become more successful and effective in their studies, developing critical thinking and independent learning skills.

Course prerequisites: General 2. Course postrequisites: Professional English.

LNG1056

PURPOSE AND OBJECTIVES OF THE COURSE

“Business English” is English for businesscommunication,business and career. Knowledge of business English will be useful for conducting negotiations and business correspondence, preparing presentations and informal communication with business partners.

The peculiarities of the preparation are that it is necessary not only to master the vocabulary, but also to acquire new skills: presentation, communication, language, professional.

Course prerequisites: IELTS score 5.0 and/or Academic English

Course postrequisites: Professional English, IELTS score 5.5-6.0

LNG1057

PURPOSE AND OBJECTIVES OF THE COURSE

"Professional English" course is designed for students at level B2+, the purpose of which is to improve students' language competence in relevant professional fields. The main objective of the course is to teach students to work with texts, both audio and written, in their specialty. The curriculum is built on the necessary vocabulary (words and terms) often used in English for specific purposes. Students will acquire professional English language skills through integrated content- and language-based learning, master the vocabulary to read and understand original sources with a high degree of independence, and practice various communication models and vocabulary in specific professional situations.

Course prerequisites: BusinessEnglish. Course postrequisites: any elective course.

Information and Communication Technologies (in English)

CODE – CSE174

CREDIT – 3 (2/1/0/3)

PRE-REQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

Training in the skills of using modern information technologies in the sphere of professional activity. The objectives of the course include:

– To reveal the basic concepts of computer systems architecture;

– To reveal the basic concepts of information and communication technologies and subject terminology;

– To teach how to work with software interfaces of operating systems;

– Learn to work with data in various waysrepresentation, both in tabular structured and unstructured form;

– To teach how to apply basic principles of information security;

– To reveal the concepts of data formats and multimedia content. To teach how to work with typical applications for processing multimedia data. To use modern approaches to presenting material;

– To reveal the concepts of modern social, cloud and mail platforms and ways of working with them;

– To teach how to use algorithmic and programming methods to solve problems of business process automation

BRIEF DESCRIPTION OF THE COURSE

The course contains a training program aimed at leveling the students' basic knowledge in the field of information and communication technologies. Contains a full range of topics, according to the Standard Curriculum

The State Educational Standards (GOSO) program, with a predominance of developing practical skills in working with data, algorithms and programming. The course is designed in such a way as to teach students not only the basic concepts of architecture and modern infrastructure of information and communication technologies, but also to teach them how to use these tools to solve applied problems. To teach how to optimize processes, apply adequate models and methods for solving practical problems using modern methods and tools of information technology, automate routine processes, be productive and effective.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

Students will know:

– Computer device;
– Architecture of computing systems;
– Information and communication technology infrastructure;
– Interfaces of modern operating systems;
– Modern tools for working with data of various nature and purposes;
– Types of information security threats, principles, tools and methods of data protection;
– Python programming language.

Students will be able to:

– Work with interfaces of modern operating systems;
– Work with modern application software for working with data of various nature and purposes;
– Use modern social, cloud, and mail platforms to organize business processes;
– Program in an algorithmic programming language;
– Analyze, model, design, implement, test and evaluate information and communication technology systems

Philosophy
CODE – HUM124
CREDIT – 3 (1/0/2/3)
PRE-REQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to develop cognitive, operational, communicative, and self-educational competencies.

to solve problems:

– to promote the development of adequate ideological guidelines in the modern world;

– to develop creative and critical thinking in students;

– distinguish between the relationship between spiritual and material values, their role in life a person, societies and civilizations;

– to help define one's attitude to life and the search for harmony with the surrounding world.

BRIEF DESCRIPTION OF THE COURSE

"Philosophy" is formation holistic worldview that developed in the context of the socio-historical and cultural development of mankind. Introduction to the main paradigms of the methodology of teaching philosophy and education in the classical and post-classical traditions of philosophy. Philosophy is designed to develop stable life guidelines, finding the meaning of one's existence as a special form of spiritual production. It contributes to the formation of the moral character of the individual with the ability of critical and creative thinking. The theoretical sources of this course are the concepts of Western, Russian, and Kazakhstani scientists in the history and theory of philosophy.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

– knowledge of basic terms, main concepts and problems of philosophy;

– knowledge of the basic philosophical methods for resolving ideological issues in the context of culture;

– the ability to analyze the history of the development of philosophical thought;

– ability to determine alternative methods formulation and resolution of ideological questions in stories development of humanity;

– the ability to identify the main theoretical approaches in the relationshipa person with society;

– ability to master the methodology of execution independent works;

– skills for searching and systematizing material;

– skills to debate freely and make rational decisions;

Ordinary differential equations. MatLab

CODE – MAT126

CREDIT – 3 (1/0/2/3)

PREREQUISITES – Mathematics I-III

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Ordinary Differential Equations. Matlab" is to form basic knowledge in the sections of the course, helping to analyze, model and solve theoretical and practical problems using both analytical and numerical methods using Matlab; to instill in students the ability to independently study educational literature.

The objectives of the course are to teach how to recognize the types and forms of integrable equations and systems, integrate them, and apply differential equations to mathematically solve applied problems.

BRIEF DESCRIPTION OF THE COURSE

Ordinary differential equations of the first order. Ordinary differential equations of higher orders. Systems of differential equations. Linear equations with variable coefficients. Numerical integration of differential equations and systems. Using Matlab for numerical solution of differential equations.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

- master the methods of solving ordinary differential equations;
- set mathematical problems;
- be able to build mathematical models;
- be able to solve problems modeled by differential equations using both analytical and numerical methods using Matlab

Partial Differential Equations. MatLab

CODE – MAT127

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Mathematics I-III, Ordinary Differential Equations. MatLab

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Partial Differential Equations. Matlab." is to form basic knowledge in the sections of the course, helping to analyze, model and solve theoretical and practical problems.

Course objectives: apply the theory of partial differential equations to solve and study applied problems from various fields of natural science, economics, medicine, biology and ecology; develop an understanding of the implementation of numerical methods for solving boundary value problems using Matlab

BRIEF DESCRIPTION OF THE COURSE

Fundamental equations of mathematical physics. Classical boundary value problems for partial differential equations. Analytical and numerical methods for solving classical boundary value problems. Using Matlab for numerical solution of boundary value problems.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

- master this mathematical apparatus, which allows one to analyze, model and solve classical boundary value problems;
- master the methods of solving classical boundary value problems;
- be able to formulate a problem, choose solution methods, both in analytical form and using computer technologies;
- to usemodern software - Matlab package;
- master the methodology and skills of numerical implementation of a mathematical model, analysis of the obtained results, and their interpretation to refine the model;
- independently expand your mathematical knowledge.

Engineering and computer graphics

CODE – GEN101

CREDIT – 3 (1/0/2/3)

PRE-REQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

- development of spatial representation and imagination, constructive-geometric thinking, the ability to analyze and synthesize spatial forms and relationships based on graphic models of space;
- training students to work with graphic information of various types and contents, the basics of graphic representation of information, methods of graphic modeling of geometric objects, rules for developing and executing design documentation, graphic models of phenomena and processes;
- students master the methods and means of computer graphics, acquire knowledge and skills in working with the AutoCAD computer-aided design system.

BRIEF DESCRIPTION OF THE COURSE

Studying ways receipt certain graphic models spatial forms, methods projection and the ability to solve problems

these models, tasks related to spatial forms and relationships. Mastering the basic principles and methods of geometric modeling and the methodology for developing graphic applications. Mastering the knowledge of drawing construction, the ability to read and compose graphic and text design documentation in accordance with the requirements of regulatory documents, state standards. Familiarizing students with the concept of computer graphics, geometric modeling, graphic objects, with modern interactive graphic systems for solving problems of automating drawing and graphic work using AutoCAD as an example.

Developing skills in using universal graphic systems for developing and editing drawings using three-dimensional computer modeling, design automation as applied to the development and execution of design documentation.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

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

- theoretical foundations for obtaining complex and axonometric drawings;
- methods for constructing images – views, sections, cross-sections – of both existing and newly created products;
- rules execution And design drawings, compilationdesign and text documents established by GOSTs;
- types of connections of component parts of products, their conventional images and designations;
- methods for constructing surface developments. be able to:
- construct complex and axonometric drawings of geometric images;
- produce text and graphic design documentation;
- read assembly drawings and make working drawings and sketches in accordance with GOST;
- freely navigate in projections with numerical marks;
- work in the universal AutoCAD environment with both 2D views and 3D objects.

have skills:

- execution and reading of assembly drawings;
- construction of flat projection models of three-dimensional space;
- solutions to positional and metric problems;
- Proficiency in modern computer design tools. Have the following competencies:

- the ability to apply methods of graphic representation of objects of professional activity, for example, mechanical engineering objects, diagrams and systems;
- readiness to use information technologies, including modern computer graphics tools, in their subject area;
- willingness to participate in the development of design and working engineering documentation in accordance with standards, specifications and other regulatory documents.

Socio-political knowledge
CODE – HUM126
CREDIT – 4 (4/0/0/4)
PRE-REQUISITE – no

This course involves the study of four scientific disciplines – psychology, political science, sociology and cultural studies, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of the research approaches of these disciplines; commonality of the methodology of training focused on the result; a unified systemic representation of the typology of learning outcomes as formed abilities.

The theoretical sources of this course are the concepts of Western, Russian, and Kazakh scientists in the fields of sociology, political science, and cultural studies.

Theories of inventive problem solving
CODE – ELC198
CREDIT – 3 (2/0/1/3)
PRE-REQUISITE – no

PURPOSE AND OBJECTIVES OF THE COURSE

Teaching students the basics of finding engineering solutions to technical contradictions during development, design and operation and their modernization. In addition, students must develop a culture of creative thinking, develop ideas about the essence of natural, technical phenomena and their interrelationships, the ability to produce scientifically reasoned reasoning, and gain experience in analyzing inventive problems

BRIEF DESCRIPTION OF THE COURSE

An understanding of the trends in the development of methods for solving inventive problems, a creative approach to problem solving, the nature and types of contradictions,

on methods of resolving contradictions in technical systems, in particular electronic engineering. Methods of solving inventive problems, Su-Field analysis of problems, drawing up a model of a technical system, drawing up algorithms for solving problems, technical contradictions, methods for finding the ideal end result. Classification of physical contradictions, methods for using the information fund, methods for mobilizing and using resources, morphological analysis. Algorithms for solving inventive problems. Methods for testing solutions to inventive problems.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the discipline, the student must:

- have an idea of the basic methods and techniques of TRIZ: brainstorming techniques and its varieties, contradiction resolution techniques, a systematic approach to creativity, personal analogy, morphological analysis;
- know the basic concepts of TRIZ: Ve-PoL, technical contradiction, ideal final result, physical contradiction, information fund, algorithm for solving inventive problems
- be able to apply basic categories and concepts in practical activities to analyze a specific problem; create models of a technical system; apply information resources to solve problems; conduct a morphological analysis of a specific inventive problem

Physical principles of electronics

CODE – ELC196

CREDIT – 3 (1/1/1/3)

PREREQUISITE – Physics I, Theory of Electric Circuits

PURPOSE AND OBJECTIVES OF THE COURSE

The objective of the course is to develop students' knowledge of the operating principles, parameters and characteristics of the main classes of modern semiconductor devices and integrated circuits and their operating modes; to develop students' knowledge of the fundamentals of analog electronic device (AED) circuitry and methods for their analysis, as well as skills in selecting and constructing AED units; to study measurement technologies that combine a set of methods, approaches, software and logic support for organizing measurements; the state and trends in the development of measuring instruments and basic methods for measuring the characteristics of electronic circuits and signals, and to assess their accuracy.

BRIEF DESCRIPTION OF THE COURSE

Physics of semiconductors. Semiconductor diodes. Transistors. Optoelectronic semiconductor devices. Microelectronics, integrated circuits (IC). Logical and linear integrated circuits. Indicators and characteristics of analog electronic devices. Principles,

Purpose and types of feedback (OS). Power amplifiers. Differential cascade. Operational amplifiers. Analog signal processing devices. Inverting and non-inverting amplifiers on op amps. Active RC filters. Signal converters. Comparators and generators of electrical oscillations. Metrology. Measurements and measuring technologies. Digital measuring instruments. Standardization and certification. Basic concepts, terms and definitions. Legislative basis for certification.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the discipline, the student must:

- know: features, main parameters and manufacturing technology of electronic devices and microcircuits, classification of electronic devices and microcircuits; classification and principles of operation of basic analog devices and their basic elements, features and main parameters of differential and operational amplifiers, linear and nonlinear circuits based on operational amplifiers with feedback, legal and organizational-methodological foundations of standardization, metrology and certification of products, services and quality systems;
- be able to: build the simplest electronic schemes on electronic devicesand microcircuits, select the element base for a specific area of application of devices, build multi-stage amplifiers, decision amplifiers, active filters, generators of sinusoidal and relaxation oscillations, converters, comparators and carry out calculations of AEU, determine the main characteristics and parameters of electrical circuits and signals;
- have experience in: taking the main characteristics of electronic devices and microcircuits, the main characteristics of amplifiers (amplitude-frequency, phase-frequency, amplitude) and determining the parameters of various analog circuits, selecting the element base, applying the properties of measurements in various practical areas;
- have an idea of: the trends and prospects for the development of the element base of micro-, opto- and nanoelectronics, the operating principles of modern analog integrated circuits, the features of the circuit design of analog devices, taking into account their implementation using integrated technology and ensuring the stability of their operation, the classification of electrical measuring instruments, their operating principles, features and basic metrological parameters; the processing of measurement results, assess the accuracy of measurement tools and results.

Signal Transmission Theory
CODE – ELC401
CREDIT – 3 (1/1/1/3)
PRE-REQUISITE – Information and Communication Technologies

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course "Theory of Signal Transmission" is to develop knowledge of the fundamentals of signal theory and their application to the optimization of modern electronics and electrical engineering systems. The objective of the course is to familiarize students with the basic processes that occur when converting messages into signals and transmitting them through communication channels and lines.

BRIEF DESCRIPTION OF THE COURSE

General informationon the formation, transmission and reception of signals in transmission systems (classification of signals, description of signals, processing and transmission of analog and digital signals). Transmission and processing of signals; patterns determining the properties of signals and transmission of their functioning. Elements of transmission systems and types of signals; communication channels and their characteristics; purpose and main types of modulations and demodulations; methods and devices for noise-resistant coding.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of mastering the discipline, the student

should: Know:

– the physical essence of the processes, happening in communication channels, cascades and signal conversion and processing nodes;

- types And description signals, processing And transmission analog Anddigital signals.

Be able to:

- determine And calculate main characteristics And determineparameters of various signals;
- conduct signal analysis and synthesis.
- be able to analyze communication channel construction models, characteristics (indicators) of devices and systems for analog and digital signal processing;

Be competent:

- possess skills in methodological analysis of signals and communication channels.
- acquire practical skills in calculating electrical parameters of signals, constructing time and spectral diagrams of signals, and studying the main processes in communication systems.

Basics of automation

CODE – AUT146

CREDIT – 3 (2/1/0/3)

PREREQUISITE – Physics I, Physical Foundations of Electronics, Signal Transmission Theory

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course "Theory of Automatic Control" is to present the basics of the modern theory of automatic control of linear and nonlinear systems. The objective of the course is also to form

students practical skills in constructing mathematical models based on the formalism of automatic control theory

BRIEF DESCRIPTION OF THE COURSE

General information on automatic control systems. Linearization of differential equations of automatic control systems. Transfer function of the dynamic link. Time and frequency characteristics of the dynamic link. Logarithmic frequency characteristics of the dynamic link. Typical links of automatic control systems and their characteristics. The concept of stability of linear systems. Construction of stability regions. Indicators of the quality of regulation of linear systems.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of mastering the discipline, the student must:

- know: methods for describing automatic control systems in the form of transfer functions; construction of time and frequency characteristics of automatic control systems; methods for studying the stability of linear automatic control and management systems; methods for assessing the quality of the control process.
- be able to: draw up structural diagrams of automatic control systems; conduct a study of the stability of linear automatic control systems.
- to own: to conduct analysis and calculation of the main indicators: sustainability, quality, reliability and technical and economic efficiency of automatic control systems using computer technology;
- be competent: in matters of selecting elements of an automation system, analyze and calculate the main indicators of stability, quality, reliability and technical and economic efficiency of automatic control systems

Optics in Telecommunications

CODE – ELC420

CREDIT – 3 (2/0/1/3)

PRE-REQUISITE– Signal transmission theory

PURPOSE AND OBJECTIVES OF THE COURSE – presentation of the principles and methods of transmitting signals via fiber optic cables, scientific foundations and the current state of the fiber optic communication system.

BRIEF DESCRIPTION OF THE COURSE

The types and main types of optical linear communication structures, their design, operational characteristics, electrical parameters; bandwidth requirements; fiber-optic model are considered.

optical transmission systems; optical connectors, splices and passive optical devices; wavelength division multiplexing; technological processes during operation, repair and construction of optical linear structures; safety regulations when working on lines.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

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

- operating principle, functional diagrams, design devices of the main units of the OSB equipment;
- basics of theory, calculation and operationfiber optic cables and fiber optic communication line systems for enterprises and telecommunication facilities;
-main technical characteristics, functional schemes,design of modern OSB equipment;

be able to:

- carry out measurements of the main parameters of the channels and paths of the OSP;
- analyze measurement results and establish their compliance with current standards;
-read structural diagrams and functional diagrams of the main units of the centralized control system equipment;
- clearly understand the main directions and prospects for the development of communication systems and technologies, know the organization of telecommunications enterprises, the main parameters and requirements of fiber-optic communication lines.

Theoretical Foundations of Electrical Engineering - TOE, Part I

CODE – ELC 165

CREDIT – 3 (2/1/0/3)

PREREQUISITE – Physics I, Introduction to Electronic Science and Engineering

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PURPOSE AND OBJECTIVE OF THE COURSE

The aim of the discipline "Theoretical Foundations of Electrical Engineering I" is to master modern methods of modeling electromagnetic processes, methods of analysis and synthesis of electrical circuits; students' mastery of the basic concepts and laws of the Theory of Electrical Circuits and their connection with general

philosophical, mathematical and logical concepts, knowledge of which is necessary for understanding and successfully solving engineering problems of the future specialty.

The study of TES should contribute to the development of scientific intelligence of a modern telecommunications and radio engineer, since the discipline of TES studies such issues as the generation, transmission and conversion of electrical energy and electrical signals, transmission and

transformation of information and implementation of communication at a distance using electromagnetic waves.

BRIEF DESCRIPTION OF THE COURSE

The discipline "Theoretical Foundations of Electrical Engineering - Part 1" in accordance with the curriculum of the bachelor's degree program "Electronics and Electrical Engineering" is one of the basic disciplines in the system of training specialists in the field of electronics and electrical engineering. When studying this discipline, the foundations of knowledge are laid that allow skillfully using the modern element base of electrical engineering, understanding the trends and prospects for its development and practical use, skills are acquired in calculating the modes of active devices in electrical circuits, experimentally studying their characteristics and parameters, constructing basic cells of electrical circuits containing such devices.

This course has practical significance and their practical application for the creation, transmission and distribution of electric power as a universal intermediary between energy sources and consumers, for solving problems of transmission and distribution of information, electronics, automation, telemetry, information-measuring and computing technology.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the discipline, students must:

- know: basic concepts and definitions used in electrical circuits, basic laws, methods of analyzing electrical circuits in steady-state and transient modes, conditions for the passage of a signal through certain sections or elements of a circuit, distribution of an electromagnetic wave in steady-state and non-steady-state modes;
- be able to: draw up equations of state for a circuit that characterize the operation of the circuit, calculate currents in branches and voltages in sections for given parameters, calculate transient processes in circuits with one or more energy storage devices, analyze nonlinear circuits, analytically describe signals and evaluate their main time and energy parameters, design a circuit of a given configuration;
- acquire skills to calculate and measure currents in branches and voltages in sections with given parameters, study transient processes in circuits with one or more energy storage devices, conduct analysis of linear and nonlinear circuits, study electrical engineering processes, use technical and reference literature, and assess the quality of electrical engineering devices;
- master the methods of using electrical equipment for measuring and solving problems;
- justify the acquired skills theoretical fundamentals of electrical engineering in practice, formulate a problem and perform experiments on electrical engineering devices and instruments.

Theoretical foundations of electrical engineering, part II
CODE – ELC 166
CREDIT – 3 (2/1/0/3)
PREREQUISITE – TOE I

PURPOSE AND OBJECTIVE OF THE COURSE

The purpose of teaching the discipline "Theoretical Fundamentals of Electrical Engineering - II" is the acquisition of modern methods of modeling electromagneticprocesses, methods of analysis and synthesis of electrical circuits; students' mastery of the basic concepts and laws of the Theory of Electrical Circuits and their connection with general philosophical, mathematical and logical concepts, knowledge of which is necessary for understanding and successfully solving engineering problems of the future specialty.

The study of TOE-II should contribute to the development of scientific intelligence of a modern telecommunications and radio engineer, since the discipline of TEC studies such issues as the generation, transmission and conversion of electricity and electrical signals, the transmission and conversion of information, and the implementation of communication at a distance using electromagnetic waves.

BRIEF DESCRIPTION OF THE COURSE

The discipline "Theoretical Foundations of Electrical Engineering-II" in accordance with the curriculum of the bachelor's degree program "Electronics and Electrical Engineering" is one of the basic disciplines in the system of training specialists in the field of electronics and electrical engineering.

This course has practical significance and their practical application for the creation, transmission and distribution of electric power as a universal intermediary between energy sources and consumers, for solving problems of transmission and distribution of information, transient processes in magnetic circuits, transformer supply systems.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the discipline, students must:

know: basic concepts and definitions used in electrical circuits, basic laws, methods of analyzing electrical circuits in steady-state and transient modes, conditions for the passage of a signal through certain sections or elements of a circuit, distribution of an electromagnetic wave in steady-state and non-steady-state modes;

- be able to: draw up equations of state of a circuit that characterize the operation of the circuit, calculate currents in branches and voltages in sections for given parameters, calculate transient processes in circuits with one or more energy storage devices, analyze nonlinear circuits, analytically describe signals and evaluate their main time and energy parameters, design a circuit of a given configuration;

This course has practical significance and their practical application for the creation, transmission and distribution of electric power as a universal intermediary between energy sources and consumers, for solving problems of transmission and distribution of information, electronics, automation, telemetry, information-measuring and computing technology.

Circuitry of electronic devices
CODE – ELC 402
CREDIT – 3 (2/1/0/3)
PREREQUISITE – Physical principles of electronics

THE PURPOSE AND OBJECTIVES OF THE COURSE are to study the operating principles of amplifiers, generators and various converters, their parameters and volt-ampere characteristics, as well as the principles of constructing amplifying, switching, generating and digital circuits on discrete semiconductor devices such as diodes and transistors, as well as in integrated design.

BRIEF DESCRIPTION OF THE COURSE

The basic principles of constructing electronic circuits, the principles of operation of amplifying and converting cascades, signal generators, electrical filters, the principles of operation of integrated circuits, and various aspects of using the element base of electronics in practical activities are considered. For this purpose, the principles of operation of various transistor amplifiers, as well as integrated versions of amplifiers such as differential cascades and operational amplifiers, and their schematic design are considered in detail.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the course, the student must master the basic principles of constructing electronic circuits, the principles of operation of amplifying and converting cascades, signal generators, electrical filters, the principles of operation of integrated circuits, and various aspects of the application of the elemental base of electronics in practical activities.

As a result of studying the discipline, the student must:

- know: the classification and principles of operation of the main devices and their basic elements, the features and main parameters of differential and operational amplifiers, linear and nonlinear circuits based on operational amplifiers with feedback;
- be able to: build multi-stage amplifiers, decision amplifiers, active filters, sinusoidal oscillator generators, converters, comparators and perform calculations of electronic devices;
- have experience in: measuring the main characteristics of amplifiers (amplitude-frequency, phase-frequency, amplitude) and determining the parameters of various analog circuits, selecting the element base;
- have an idea: about the operating principle of modern integrated circuits

microcircuits, about the features of the circuit design of analog devices, taking into account their implementation using integrated technology and ensuring the stability of their operation.

Electrical materials
CODE – ELC406
CREDIT – 3 (2/0/1/3)
PREREQUISITE – Theoretical Foundations of Electrical Engineering I, II

PURPOSE AND OBJECTIVES OF THE COURSE

study the main groups of electrical engineering materials: conductors, dielectrics, semiconductors and magnetic materials, as well as materials with special properties of thermal expansion and special elastic properties. Study the physical nature of the phenomena occurring in materials when interacting with an electromagnetic field, the main electrophysical characteristics of materials and the influence of various factors on them, the features of the technology for obtaining materials and their use in electrical and electronic devices, automation elements and instruments.

BRIEF DESCRIPTION OF THE COURSE

Electrotechnical materials study the basic physical phenomena occurring in materials when exposed to electromagnetic fields, the properties of materials, and production technology. The development of new materials occurs simultaneously with the general development of electrical engineering, when the correct choice of materials, allowing for successful solution of emerging problems, is becoming increasingly important. The problem of the modern level is the creation of high-quality electrical materials that fully meet the latest requirements.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

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

- operating principle of electrical materials;
- fundamentals of theory, calculation and operation of electrical materials, insulating materials;
- main technical characteristics, functional schemes,classification of electrical materials;

be able to:

- produce measurements main parameters electrical engineeringmaterials;
- analyze measurement results and establish their compliance with current standards;
- read structural diagrams and functional diagrams of electrical engineeringmaterials;
- clearly present the main directions and prospects for development

electrical materials,	know main parameters And requirementselectrical materials.

OptoelectronicsCOD
E – ELC407 CREDIT
– 3 (1/0/2/3)
PREREQUISITE – Electronic circuit design

PURPOSE AND OBJECTIVES OF THE COURSE

Study of the physical foundations and principles of operation of active devices of optical systems for transmitting and processing information (lasers, photodetectors, modulators, deflectors, etc.)

BRIEF DESCRIPTION OF THE COURSE

Optical electronics is a scientific and technical field associated with the study of the interaction of optical radiation with

Electrons in matter, mainly in solids, to create optoelectronic devices that convert electrical signals into optical signals (semiconductor lasers, light-emitting diodes) and optical signals into electrical signals (photodetectors of various types).

Devices of quantum and optical electronics are widely used in modern optical systems for transmitting, receiving, processing, storing and displaying information.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

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

- principle actions, functional schemes, constructivedevices of the main units of optical electronics;
- Basics theories, calculation and operation devices opticalelectronics;
- signal conversion procedure, principles of operation of optoelectronic devices;
- principle actions, functional diagrams, designdevices of the main units of optical electronics;
- Basics theories, calculation and operation devices opticalelectronics;
- signal conversion procedure, principles of operation of optoelectronic devices;
- main technical characteristics, functional diagrams, design of modern optoelectronic equipment;

be able to:

- produce measurements main parameters optoelectronic devices;
- analyze measurement results and establish their compliance with current standards;

- read structural diagrams and functional diagrams of optoelectronic devices;
- clearly understand the main directions and prospects for the development of optoelectronic systems, know the basic parameters and requirements of optoelectronic devices.

Fundamentals of Power Electronics

CODE – ELC188

CREDIT – 3 (1/1/1/3)

PREREQUISITE – Electronic circuit design

PURPOSE AND OBJECTIVES OF THE COURSE

The goal studying course "Basics power electronics» is the development physical basics of power electronics And principles operation of elements of power electronic devices.

BRIEF DESCRIPTION OF THE COURSE

Basic elements of power electronics. Transient processes.Linear transformer power supplies. Rectifiers. Smoothing power filters. Voltage stabilizers. Voltage converters. Voltage multipliers. Dimmers. Batteries and chargers. Frequency regulators and stabilizers. Power factor correctors. Electronic stabilizers. Inverter stabilizers. Baristors. Snubbers. Methods for solving technical issues in power electronics. Solving creative problems of the first level of complexity. Methods for solving creative problems of the second level of complexity. Features of using passive elements in power electronics

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the course "Fundamentals of Power Electronics", the student should:

know:

- operating principle, functional diagrams, design devices of the main elements of power electronics;
- basics of theory, calculation And exploitation devices powerelectronics;
- principles of operation of electronic devices;
- main technical characteristics, functional schemes,design of modern power electronics equipment;

be able to:

- to measure the main parameters of power electronic devices;
- analyze measurement results and establish their compliance with current standards;
- read structural schemes And functional schemes power

electronic devices;

Microprocessor and microcontroller devices and systems
CODE – ELC403
CREDIT – 3 (1/1/1/3)
PREREQUISITE – Electronic circuit design

PURPOSE AND OBJECTIVES OF THE COURSE

Study of the structure of organizations and principles of operation of digital devices. Purpose and structure of operating units, functional units of digital devices and microprocessor technology.

BRIEF DESCRIPTION OF THE COURSE

The discipline "Microprocessor and microcontroller devices and systems" studies the structure of organizations and the operating principles of digital devices, microprocessor and microcontroller systems; the purpose and structure of operating units, functional units of digital devices and microprocessor technology.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

The student must know: the arithmetic and logical foundations of digital devices, the operating principles of the main units of the control unit, the operating principles of microprocessors and microcontrollers and their command systems, the basics of designing microprocessor systems and developing microprocessor technology.

The student must be able to: use reference and information materials on microprocessors and their elements; perform: arithmetic operations in number systems, operations with direct, inverse and additional codes; construct: Karnaugh maps, circuits of combinational digital devices, timing diagrams of combinational digital devices, sequential digital devices

The student should have skills in: research of combinational logiccircuits, operation of triggers, operation of counters, encoders and decoders, multiplexers and demultiplexers, analog-to-digital converter and digital-to-analog converter.

Linear automatic control systems
CODE – AUT 111
CREDIT – 3 (1/1/1/3)
PREREQUISITE – Basics of automation

PURPOSE AND OBJECTIVES OF THE COURSE The purpose of the course is to train a specialist who is deeplywho knows the basics of automatic control theory and is able to perform calculations to create automatic systems with a wide range of

using modern computer technology. The objectives of the course are to study the problems of analysis and synthesis of linear automatic control systems (LACS), development and study of models of objects in the time, complex and frequency domains, methods for analyzing the stability of linear systems, obtaining quality assessments of control processes.

BRIEF DESCRIPTION OF THE COURSE The LSAR training course includes sections of control theory related to the tasks of analysis and synthesis of linear control systems. Including: - principles and schemes of automatic control; mathematical description of control systems in the time, complex and frequency domains; construction of time and frequency characteristics of automatic control systems; methods for studying the stability of linear automatic control and management systems; methods for assessing the quality of the control process.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE Knowledge, obtained during the course: - basic principles and schemes of automatic control, basic types of automatic control systems, their mathematical description and basic research objectives;

- methods of linear systems theory, methods of analysis in the time, complex and frequency domains; - construction of time and frequency characteristics of automatic control systems; - methods for studying the stability of linear automatic control and management systems; - methods for assessing the quality of the control process. Skills and abilities (professional, managerial, communicative) acquired while completing the course BRIEF COURSE DESCRIPTION The LSAR course of study includes sections of control theory related to the tasks of analysis and synthesis of linear control systems. Including: - principles and schemes of automatic control; mathematical description of control systems in the time, complex and frequency domains; construction of time and frequency characteristics of automatic control systems; methods for studying the stability of linear automatic control and management systems; methods for assessing the quality of the control process.

- apply mathematical methods to analyze the general properties of linear control systems;

- the ability to perform calculations for the analysis of systems, and on this basis to manage the method of analysis and synthesis of the stability and quality of systems.

Electronic sensors and transducers

CODE – ELC409

CREDIT – 3 (2/1/0/3)

PRE-REQUISITE - Physical Basics electronics, Circuitryelectronic means, Optoelectronics

PURPOSE AND OBJECTIVES OF THE COURSE

Mastering basic knowledge of the theoretical foundations of electronic sensors And converters, their device, regions applications,characteristics and parameters, principles of their operation, operating conditions.The objectives of the course are to study the physical foundations and main provisions of the theory of electronic sensors; to acquire practical skills in calculation, selection and operation of electronic sensors and converters.

BRIEF DESCRIPTION OF THE COURSE

To familiarize students with electronic sensors and converters used in the use of electrical energy, from its production, transmission, distribution to consumption; their purpose, main characteristics, as well as areas of application, operating principles, and design.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the discipline, students should: know:

- on modern and promising directions of development of electronic sensors and converters;
- about the classification of electronic sensors;
- about the areas of application of various types of electronic sensors and converters;
- on the role of various electronic sensors and converters in improving the quality and energy efficiency of electricity distribution, increasing productivity, reducing operating costs and improving the continuity of power supply;

be able to:

-analyze physical phenomena, flowing V electronicsensors and transducers;

-build constructions various electronic sensors Andconverters, know the principle of their operation;

-to determine main characteristics And parameters electronicsensors and transducers;

gain skills:

- descriptions of the analysis of physical processes occurring in electronicsensors and transducers;

- evaluate the efficiency and select the type of electronic sensors and converters for specific conditions;

-on one's own conduct elementary tests electronicsensors and transducers;

- perform preliminary calculation of parameters and selection of electronic sensors and converters.

Programmable logic integrated circuits

CODE – ELC 410

CREDIT – 3 (2/0/1/3)

PRE-REQUISITE - Microprocessor And microcontrollerdevices and systems

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COURSE GOAL AND OBJECTIVES Obtaining basic knowledge about technologies and systems for automating the design of electronic devices based on FPGAs. Mastering the skills of designing digital electronic devices (DED) based on FPGAs.

COURSE SUMMARY. Systems approach to designing electronic devices. Key features of the system. Key provisions of the systems approach as applied to designing digital power supply units. Classification and main properties of programmable logic microcircuits. Recommendations for selecting the FPGA family and type for the device being developed. Designing digital devices based on Xilinx FPGAs using the WEBPACK ISE package. Project structure and methods for creating a new project in the WebPACK ISE CAD system. Creating a schematic description of the device being designed. Entering time and topological constraints for the project. Project synthesis using the WebPACK ISE package. Using the VHDL language to describe the device being designed. The structure of the device description in VHDL. Defining the functions and procedures used in the object architecture. Using different styles for defining the object architecture. Parallel and sequentially executed VHDL operators. Functional modeling of the designed FPGA-based device. Structure and methods for preparing the test module of the project. Creation of a test module of the project in text format and in the form of timing diagrams. Stages of modeling digital devices based on FPGA.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of mastering the discipline, the student must:

know: Current level of development of FPGAs and their functional capabilities; Capabilities of automated design systems for digital power supply units based on FPGAs; Languages for describing digital devices; Digital power supply unit design technology; Technologies for automated design of digital power supply units

be able to: Select the FPGA architecture when developing new electronic devices; Use automated design systems for FPGA-based devices. Implement stages of designing electronic devices. Apply a systematic approach to designing new electronic devices. Work with scientific, technical and educational literature in this area.

skills: Technology of debugging and testing software modules intended for recording in FPGA; Technology of debugging and testing hardware modules on FPGA; Methods of testing developed radio and digital electronic devices

Design of electronic means

CODE – ELC 412

CREDIT – 3 (2/1/0/3)

PREREQUISITE – Electronic circuit design, Microprocessor and microcontroller devices and systems, Linear automatic control systems

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PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to acquire knowledge and practical skills in the field of development and design of modern electronic technical products, their individual elements, the basics of constructing technological processes for their production; protection of products from external destabilizing factors.

The content of the discipline is subject to the requirements imposed in the training of engineers specializing in the development of metrological support tools, standardization, certification, and information and measuring equipment.

The objectives of the course are to study the basic principles of product construction, typical designs and their elements, modern principles of layout, manufacturing technology, assembly and control, requirements of standards for the development of design documentation, which will allow students to acquire the necessary skills in the development and design of electronic products, as well as understand technical documentation.

BRIEF DESCRIPTION OF THE COURSE

When studying this discipline, the foundations of knowledge are laid that allow one to skillfully use the modern element base of electronics, understand the trends and prospects for its development and practical use, acquire skills in calculating the modes of active devices in electronic circuits, experimentally studying their characteristics and parameters, and constructing basic cells of electronic circuits containing such devices.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

As a result of studying the discipline, students must:

- know the basic design principles, theoretical foundations and modern information technologies for the design and development of electronics; development and manufacturing technologies of electronic technical products, requirements for the preparation of design and technological documentation in accordance with the requirements of standards (ESKD, etc.), criteria for assessing the quality of a newly developed electronic product;
- be able to design and develop various types of electronic devices based on an object-oriented approach; use the acquired knowledge for design with specified design and taking into account the requirements for ensuring manufacturability, develop and prepare design and technological documentation; evaluate the quality of the developed product, its manufacturability and safety for the user during production and operation; read and develop drawings of technical devices and process flow diagrams, as well as design electronic products with specified design and operational properties;
- acquire skills in the design and development of electronic devices, development of technological processes, preparation of technical documentation, use of technical and reference literature, as well as assessment of the quality of electronic systems.
- master the methods of using software tools to solve project problems
- justify the design decisions made, carry out and perform experiments to verify their correctness and effectiveness

Intelligent Grids

CODE – KTT146

CREDIT – 3 (2/0/1/3)

PREREQUISITE – Design of electronic means

PURPOSE AND OBJECTIVES OF THE COURSE

To familiarize students with the concepts of the Intelligent Communications Network (ICS), which allows for the provision of additional telecommunications services, including those managed by the client.

BRIEF DESCRIPTION OF THE COURSE

Concept of the Intelligent Network. Interrelation of new technologies. ISS architecture: network elements; services and attributes, global functional plane, distributed functional plane, physical plane. Call service model. Interfaces and protocols. Issues of practical implementation of ISS. Prospects for the development of ISS.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

To know: the concept and architecture of the intelligent network (IN); the software component for implementing the IN services; the connection of components that ensure the provision of IN services; interfaces and protocols; the diagram of the relationship of the intelligent add-on with the telecommunications network; the model of the call service process; the classification and characteristics of intelligent services.

Be able to: apply IN concepts to service specification; organize subscriber access to IN platform equipment.

Have skills in designing intelligent information systems.

Project Management in the Electrical Industry

CODE – ELC 415

CREDIT – 3 (2/0/1/3)

PRE-REQUISITE –

no

PURPOSE AND OBJECTIVES OF THE COURSE The purpose of mastering the discipline "Project Management in the Electrical and Electronic Industry" is to provide students with technologies project management and production processes for electronics industry projects.

The main objectives of the discipline are: studying the basic principles of project management; familiarization with the basic technologies of project management and their capabilities; familiarization with computer technologies for implementing project management.

BRIEF DESCRIPTION OF THE COURSE.

Modern concepts of project management. Basic concepts and definitions. International project management standards. Initialization processes. Planning processes. Execution processes. Monitoring and control processes. Completion processes. Project content and organization management. Project duration management. Change management. Project resource management. Project cost management. Project quality management. Computer technologies for project management. Computer modeling of project execution on the SimulTrain business simulator.

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

Upon completion of the course, the student should,

- know: theoretical foundations and conceptual apparatus of project management; main types and elements of projects; the most important principles, functions and methods of project management; specifics of project implementation.
- be able to: use the acquired knowledge for the development and management of projects; develop the main project documents; analyze and manage project risks and changes; organize and control the implementation of the project.

Defense of the diploma thesis/diploma project

CODE –
ECA103
CREDIT – 6

PRE-
REQUISITE

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of completing a diploma thesis/diploma project (DR/DP) is: systematization, consolidation and expansion of theoretical knowledge acquired during the course of study; in-depth study by a bachelor of specific tasks and issues in accordance with the topic of the DR/DP; development of independent work skills in bachelors when completing the topic of the DR/DP; participation in the production process of the unit where the DR/DP is being completed; acquisition of experience in presenting and publicly defending the results of one's activities.

The goal is achieved by:

– compliance of the DR/DP subject matter with the current level of development of science and technology;

– the reality of the topic and the relevance of the issues being developed;

– extensive use by the bachelor of modern information technologies and software products on the chosen subject;

– ensuring a high scientific, theoretical and practical level of DR/DP;

BRIEF DESCRIPTION OF THE COURSE

Preparatory stage of completing the diploma thesis: choosing the topic of the DR/DP. Drawing up an assignment for completing the diploma thesis/diploma project. Coordinating the assignment with the graduating department and approving the topic. Procedure for completing the diploma thesis: after coordinating the assignment for the DR/DP, the supervisor and the bachelor student draw up a calendar plan for working on the assignment. When drawing up a calendar plan, the student should be guided by the fact that the design and execution of the DR/DP should be completed by the beginning of the preliminary defense of the diploma.

The content of the thesis must meet the requirements of the qualification characteristics for the bachelor's degree program in Telecommunications.

The thesis must contain: an abstract in three languages; the contents of the explanatory note; an introduction; a pre-project work – an analytical study of problems on the topic of DR/DP and the development of basic solutions for their technical implementation; a practical part; a conclusion; a list of references; appendices (if necessary).

KNOWLEDGE, SKILLS, ABILITIES UPON COMPLETION OF THE COURSE

Diploma thesis/diploma project is a student's final qualifying work, intended for objective control of the degree of development of knowledge, skills and abilities in the field of radio engineering, electronics and telecommunications.

When completing the DR/DP, the student must demonstrate the following skills and knowledge:

- on one's own put research task, evaluate herrelevance and social significance;
- collect and process information on the topic of DR/DP;
- study and critically analyze existing materials on the problem of the work;
- to deeply and comprehensively investigate the identified problem;
- develop, describe and professionally argue your options for solving the problem under consideration;
- formulate substantiated conclusions, proposals, and recommendations for the implementation of the obtained results in practical activities.

10 List of modules and competencies acquired by bachelors while mastering the educational program

OP 6B07112, 6B07104 "Electronic and Electrical Engineering" Academic degree: Bachelor of Engineering and Technology in the field 6B071 - Engineering and Engineering Science

Module name	Competencies		Disciplines that form the module
Multilingual training module	OK 1	Proficiency in Kazakh, Russian and foreign languages. Ability to work with scientific and technical literature in Kazakh, Russian and foreign languages; ability and willingness to work in an international environment, acceptance of differences and multiculturalism.	Kazakh language English language

Social Sciences Module	OK 2	Ability to navigate the surrounding world, analyze modern processes, recognizing them in the context of historical time, respectfully and carefully treat historical heritage and cultural traditions. Know the modern history of Kazakhstan, stages of development states and prospects.	Modernhistory of kazakhstan
	OK3	Understanding the concepts of modern philosophy, laws and methods of scientific thinking, principles of a systems approach to the study of processes and phenomena; applying knowledge of philosophical and methodological principles of cognition in professional activities	Philosophy
	OK5	Possession of a broad socio-political and professional outlook	Social-political knowledge
	OK6	Ability to understand the social significance of physical education And sports, their role V everyday life activities, in personal development and preparation for professional activity	Physicalculture
Physics module mathematical what preparation	OPK1	Ability to use basic knowledge of mathematics and fundamental sciences in cognitive and professional activities; ability to construct mathematical oral and written speech in a logical, reasoned and clear manner. Ability to apply analytical and computational methods to solve applied problems in the field of technology; ability to develop and apply a mathematical model corresponding to the process in the course of professional activity	Algebra A nd introduction VMathematical analysis, Mathematics I, Mathematics II, Mathematics III, Ordinary Differential Equations MatLab, Equations Vpartial derivatives. MatLab
	OPK2	The ability to systematize and deepen the understanding of the fundamental laws of physics; the ability to scientifically analyze problems, processes and phenomena in the field of physics, the ability to use basic knowledge in practice and methods of physical research.	Introduction Vphysics, Physics I Physics II
General technical	OPK5	The ability to identify and use laws, patterns and trends in the development of technical systems. The ability to self-develop and search for creative solutions. tasks in various fields.	Theories of inventive problem solving their tasks
	OPK4	Ability to master elements of descriptive geometry and computer graphics, apply modern software for creating and editing images and drawings, ability to work with design technological documentation	Engineering and computer graphics

training module	OPK6	Ability to master methods of solving problems of analysis and calculation characteristics electrical chains,electrical devices	Theoretical foundations of electrical engineering and I Theoretical foundations electricianand II

	OPK7	Understanding the basics of automation of production processes, studying the main methods of mathematical modeling, analysis and synthesis of automatic control systems, familiarization with the main functions of the automated process control system and technical means used in construction of automatic and automated control systems, including computers and microprocessor technology.	Basics automation
	PC3	Ability understand nature And physicochemical characteristics, indicators and parameters of electrical materials.	Electrical engineering materials
	PC2	Ability to analyze and synthesize linear automatic control systems, develop their mathematical description and modeling. Perform calculations for the analysis and synthesis of control systems.	Linear automatic control systems regulation
	PC4	Ability to understand the basic principles of project management; familiarization with the basic technologies of project management and their capabilities; familiarization with computer technologies for implementing project management.	Project Management Velectrical engineering industrial sti
	OPK10	Ability to understand the trends in the development of electronic industry technologies, the patterns of their development that determine the relationship between the quality indicators of the element base, performance parameters, and energy consumption indicators of electronic systems. Understanding the general principles of constructing the element base of electronic engineering, the foundations of science development in electronic and electrical engineering industries.	Introduction VElectronic Science Technologies And engineering
Electronics module	OPK11	Ability to determine the operating principles, parameters and characteristics of the main classes of modern semiconductor devices and integrated circuits; knowledge Fundamentals of circuit design and methods of their analysis; study of measurement technologies	Physical principles of electronics
	OPK13	Ability to understand the principles and phenomena used in the construction of microwave electronics elements and devices, methods for determining the characteristics of microwave electronics elements and devices, and to carry out general analysis functioning of elements and devices of microwave electronics	Basics micr owaveelectronics
	PC1	Ability to understand the principles of constructing electronic circuits, the principles of operation of amplifying and converting stages, signal generators, electrical filters, the principles of operation of integrated circuits, and various aspects of using the element base electronics in practical activities.	Circuitryelectronic means
	PC8	The ability to understand the principle actions,functionalschemes, structural devices of the main units of optical electronics; fundamentals theories, calculation And operation of optical electronic devices	Optoelectronhiccup
	PC10	Ability to understand the application areas of various types of electronic sensors and transducers; perform calculations, selection and operation of electronic sensors and converters	Electronic sensors Andtransform

			li
	PC11	Ability to understand technologies and systems for automated design of electronic devices based on FPGAs.	Programming we are logical

			integral schemes
	PC13	Ability to analyze, develop and apply modern reliable electronic components, tools and technologies for various industries economics	Electronic Engineering Seminar
	OPK12	Ability to understand the operating principle, functional diagrams, and design of the main elements of power electronic devices	Fundamentals of Power Electronics Secondary Power Sources I
	PC7	Ability to conduct analysisand synthesis of logical devices; synthesize digital devices using modern microelectronic element base, providing the specified functioning	Microprocessor And microcontroller devices AndMicroprocessor systems And microprocessor systems
	PC14	Ability to design modern electronic technical products and their individual elements; modern principles of layout, manufacturing technology, assembly and control. Ability to understand the requirements of standards for the development of design documentation	Design of electronic means Development radioelectron devices
Information transfer module	OK4	Ability to work with interfaces of modern operating systems and application software; use modern social, cloud, mail platforms to organize business processes; program on algorithmic languageprogramming; analyze, model, design, implement, test and evaluate information and communication technology systems	Informational-Communication technologies (eng)
	OPK9	Have an understanding of the fundamentals of signal theory and their application to the optimization of modern electronics and electrical engineering systems, familiarization with the main processes that occur when converting messages into signals and their transmission via communication channels and lines.	Signal Transmission Theory
	OPK8	Ability to understand the principles and methods of transmission of signals through fiber optic cables, the scientific basis and the current state of the fiber optic system connections;	Optics Vtelecommunications
	PC5	Ability to understand the concept and architecture of the intelligent network (IN); the software component of the IN service implementation; the relationship of the components that provide provision of intellectual services.	Intellectualnetworks

	PC6	Ability to understand the design features of satellite communication systems used to transmit information, as well as equipment for satellite repeaters and ground stations; ability to understand the physical processes occurring during operation satellite navigation systems, their basic principles	Methods of remote sensing Satellite systems

		constructions And use produced by them information in integrated navigation and control systems for mobile objects	navigation Andprobing
Practice-oriented module	PC15	The ability to consolidate and deepen theoretical knowledge, acquire practical experience and skills in the specialty being studied.	Educational practice Industrial practice I Industrial practice II
Final assessment module	PC16	Ability to apply all general cultural and professional competencies acquired during studies; development, design, modeling and implementation of projects for radio engineering, electronics and telecommunications systems With taking into account energy, technological, design, operational, ergonomic and economic indicators	Preparation Andwriting a thesis (project) Defense of the thesis (project)

Appendix A
STANDARD FORM OF A DIPLOMA SUPPLEMENT
European Credit Transfer and Accumulation System (ECTS)

Kazakh National Research Technical University named after K.I. Satpayev
К.И.Сәтбаев атындағы Қазақ Ұлттық техникалық университеті

DIPLOMA SUPPLEMENT
_____

This Diploma Supplement follows the model developed by the European Commission, the Council of Europe and UNESCO/CEPES. The purpose of this supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.) It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free of any value - judgments, equivalence statements or suggestions about recognition. Information should be provided in all eight sections. Where information is not provided, a reason should be given.

1	INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION	
1.1	Family Name	
1.2	Given Name	
1.3	Date of Birth (Day/Month/Year)	Republic Region, city (place of birth)
1.4	Student Identification Number	
2.	INFORMATION IDENTIFYING QUALIFICATION	
2.1	Title of Qualification and the Title Conferred	Bachelor in Technics
2.2	Major	
2.3	Minor	
2.4	Name and Status of Awarding University in original language	К.И.Сәтбаев атындағы Қазақ Ұлттық техникалық зерттеу университеті
2.5	Name and Status of Awarding University in English	Kazakh National Research Technical University named after K.I. Satpayev
2.6	Language of Instruction	
3	INFORMATION ON THE LEVEL OF THE QUALIFICATION	
3.1	Level of Qualification	Bachelor's level/ first-cycle degree of higher education
3.2	Official Length of Program	4 or 3 years

Kazakh National Research Technical University named after K.I. Satpayev
К.И.Сәтбаев атындағы Қазақ Ұлттық техникалық университеті

DIPLOMA SUPPLEMENT
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2.6	Language of Instruction	
3	INFORMATION ON THE LEVEL OF THE QUALIFICATION	
3.1	Level of Qualification	Bachelor's level/ first-cycle degree of higher education
3.2	Official Length of Program	4 or 3 years

<table>
<tr><td>3.3</td><td>Access Requirements</td><td></td></tr>
<tr><td>4</td><td colspan="2">INFORMATION ON THE CONTENTS AND RESULTS GAINED</td></tr>
<tr><td>4.1</td><td>Mode of Study</td><td>Full-Time</td></tr>
<tr><td>4.2</td><td>Program Requirements</td><td>129 credits of the Republic of Kazakhstan (240 ECTS credits), including General Studies – 30 (56 ECTS) credits, Basic Engineering Studies – 59 (110 ECTS) credits, Professional Studies – 40 (74 ECTS) credits, Elective Courses – 60 (112 ECTS) credits. Additionally, Practical Training – 6 (11 ECTS) credits, a Final Diploma Thesis – 3 (6 ECTS) credits</td></tr>
<tr><td>4.3</td><td>Program Details</td><td>Attached in transcript of records</td></tr>
<tr><td>4.4</td><td>Grading Scheme</td><td>
<table>
<tr><th>Evaluation</th><th>GPA</th><th>Point %</th><th>Appreciation</th></tr>
<tr><td>A</td><td>4</td><td>95-100</td><td>"Excellence"</td></tr>
<tr><td>A-</td><td>3,67</td><td>90-94</td><td>"Excellence"</td></tr>
<tr><td>B+</td><td>3,33</td><td>85-89</td><td>"Good"</td></tr>
<tr><td>B</td><td>3</td><td>80-84</td><td>"Good"</td></tr>
<tr><td>B-</td><td>2,67</td><td>75-79</td><td>"Good"</td></tr>
<tr><td>C+</td><td>2,33</td><td>70-74</td><td>"Pass"</td></tr>
<tr><td>C</td><td>2</td><td>65-69</td><td>"Pass"</td></tr>
<tr><td>C-</td><td>1,67</td><td>60-64</td><td>"Pass"</td></tr>
<tr><td>D+</td><td>1,33</td><td>55-59</td><td>"Pass"</td></tr>
<tr><td>D</td><td>1</td><td>50-54</td><td>"Pass"</td></tr>
</table>
</td></tr>
<tr><td>4.5</td><td>Grading scale of the overall assessment (in original language)</td><td>Grade Point Average (GPA) 3.6 out of 4.0</td></tr>
<tr><td>5</td><td colspan="2">INFORMATION ON THE FUNCTION OF THE QUALIFICATION</td></tr>
<tr><td>5.1</td><td>Access to Further Study</td><td>Eligible for second-cycle higher education, graduate programs in master</td></tr>
<tr><td>5.2</td><td>Professional Status</td><td>Under legislation of the Republic of Kazakhstan, a person who was taken Bachelor in Technics is qualified for posts or positions in the industrial, public and scientific sectors for which the qualification requirement is a first higher education degree in the major study. In some cases, the qualification requirement also includes the completion of studies in certain specified fields of minor study.
The degree is also satisfied and corresponded to the Article 11 of the Directive of the European Parliament on the recognition of professional qualifications under level D of The European Union.</td></tr>
<tr><td>6</td><td colspan="2">ADDITIONAL INFORMATION</td></tr>
<tr><td>6.1</td><td>University Address</td><td>22 Satpayev Street, Almaty, 050013, Kazakhstan allnt@ntu.kz
www.kaznitu.kz</td></tr>
<tr><td>6.2</td><td>Further information source</td><td>http://edu.gov.kz/ru</td></tr>
<tr><td>7</td><td colspan="2">CERTIFICATION OF THE SUPPLEMENT</td></tr>
<tr><td>7.1</td><td>Place and Date</td><td>" " 201__ Almaty, Kazakhstan</td></tr>
<tr><td>7.2</td><td>Rector</td><td>Beisembetov I./ Бейсембетов И.К.</td></tr>
</table>

7.3	Official Stamp	
8	INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM	
The education system of the Republic of Kazakhstan consists of basic secondary education, general upper secondary education, vocational upper secondary education, higher education and graduate education. The basic education consists of the 9-year compulsory school for all children from 6 to 15 years age. Post-compulsory education is given by the general upper secondary schools for 2 or 3 years and vocational upper-secondary institutions. The general upper secondary school provides 2- or 3-years, at the end of which pupils take the Unite National Test (UNT) examination for 2-year study and the Matriculation examination for the 3-year study. Vocational institutions provide 3-year programs, which lead to the upper secondary vocational qualifications with the further Complex Test Attestation (CTA). General eligibility for higher education is given by the UNT for the 4-year study, the Matriculation examination or the upper secondary vocational qualification with gained CTA results for 3-year higher education. Higher education studies are measured in credits. Study courses are qualified according to the workload required. One year of studies is equivalent to 1600 hours of student work on the average and is defined as 36 National credits or 60 ECTS credits. The credit system after recalculation complies fully with the European Credit Transfer and Accumulation System (ECTS).		
8.1	University Degree	The Government Decree on University Degrees (GOSO/2016) defines the compulsory objectives, extent and overall structure of degrees. The universities decide on the detailed contents, curricula, forms of instruction and structure of the degrees awarded.
8.1.1	First-Cycle (Bachelor)	The first-cycle university degree (Bachelor) consists of 99 (184 ECTS) credits for 3 years of full-time study or 129 (240 ECTS) credits for 4 years. The degree is called the Bachelor of Technology in all fields of study except Medicine and Architecture. The determined English translation for all the degrees corresponds to the Bachelor of Science in the European countries and the USA. Studies forwarding to the degree provide the student with: (1) functional knowledge of the fundamentals of the major and minor subjects or corresponding study entities or studies included in the degree program as well as the prerequisites for the following studies in the field; (2) functional knowledge and experimental skills needed for scientific thinking and the use of scientific methods for research needs; (3) functional knowledge and learning skills, needed for studies, leading to graduate university degrees and continuous learning; (4) professional skills and capacity for applying the acquired learning in the professional field work and beyond; (5) three-lingual language capacity (Kazakh / English / Russian) and communication skills. Studies forwarding to the degree include at least General Studies – 30 (56 ECTS) credits, Basic Engineering Studies – 59 (110 ECTS) credits, Professional Studies – 40 (74 ECTS) credits, Elective Courses – 60 (112 ECTS) credits. Additionally, Practical Training – 6 (11 ECTS) credits, a Final Diploma Thesis – 3 (6 ECTS) credits.

8.2.1	Second-Cycle (Master)	The second-cycle university degree (Master) consists at least 24 (45 ECTS) credits for 1-year full-time study, 36 (67 ECTS) credits for 1.5-years full-time study or 50 (93 ECTS) credits for 2-years full-time study. The degree is usually called Master of Technology or Master of Business Administration for 1 and 1.5-year full-time study; Master in Science for 2-years full-time study. The admission requirements for the second-cycle university degree (graduate) are a first-cycle university degree (undergraduate). General eligibility for the second-cycle education is given by a combination grade of the National Test of English Language unless an applicant has the certified IELTS test results with the overall scores - 6.0 and Proficiency Examination, which is corresponding to the GRE Subject Examination. Studies forwarding to the second-cycle university degree (Master) provide graduate with: (1) profound knowledge of the major subject or a corresponding entity and conversance with the fundamentals of the advanced studies in the field; (2) advanced knowledge and research skills needed to apply the scientific knowledge and research approaches required for the independent and demanding experimental work (dissertation); (3) good overall knowledge and professional skills in the major field needed for operating as an expert and developer in the field; (4) scientific knowledge and interests needed for the scientific (Doctoral) or postgraduate education devoted to cutting-edge science; (5) fluent professional English, communication and oral skills. Studies forwarding to the degree include at least Intermediate Studies – 8 (15 ECTS) credits and Advanced Studies – 16 (30 ECTS) credits. Additionally, Internship improving expertise – 6 (11 ECTS) credits, a Final Dissertation Work – 6 (11 ECTS) credits.
8.2	Doctoral Degree (PhD in Science)	Applicants can apply for the doctoral (Ph.D.) studies after the completion of a relevant second-cycle degree. General eligibility for Ph.D. education is given by a combination grade of the National Test of English Language unless an applicant has the certified IELTS test results with the overall scores - 6.0 and the Proficiency Examination, which is corresponding to the GRE Subject Examination, as well as at least the 3 year research experience in the relevant field. The aim of doctoral studies is to provide a student with in-depth and profound knowledge in their field of science through their scientific research and capabilities to produce novel scientific knowledge or solutions independently. The Doctor's degree takes minimum 3 years to complete. An applicant, who has been admitted to complete the Ph.D., Doctor's degree must take 12 (20 ECTS) credits of interdisciplinary study, show the independent and critical thinking in the field of research and write the Ph.D. dissertation to defend in public.