ХАЛЫҚАРАЛЫҚ АҚПАРАТТЫҚ ТЕХНОЛОГИЯЛАР УНИВЕРСИТЕТІ
МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ
INTERNATIONAL UNIVERSITY

Faculty of Information Technology

Department of "Radio engineering, electronics and telecommunications"

APPROVED BY
Vice-rector for academic affairs,
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(Signature) (Full name)
"29" 08 2019 y.

6B01 – Pedagogical sciences
(Code of Academic Program)

6B015 - Teacher training in science subjects
6B01503 Computer Physics
(Name of Academic Program)

CATALOGUE OF ELECTIVE DISCIPLINES

2019

2019

IITU JSC 2

The catalogue of elective disciplines for the specialty/AP 6B01503 Computer Physics is developed on the basis of the working curriculum of the specialty/AP.

The catalogue of elective disciplines was discussed at a meeting of the department

RET

minutes No. 1 from "28" 08 2019.

Head of Department _____ Daineko Ye. A.
signature Full name, position, degree

CED compiler _____ Shapiyeva A. Ye.
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The catalogue of elective disciplines was approved at a meeting of the Academic Council of "International Information Technology University" JSC minutes No. 1 from "29" 08 2019.

Director of Academic Affairs _____ Mustafina A.T.
signature Full name, position, degree

F-71, Catalogue of Elective Disciplines

1 TERMS AND ABBREVIATIONS

1. 1 Academic program is a single set of basic characteristics of education, including goals, results and content of training, the organization of educational process, ways and methods for their implementation and criteria for assessing learning outcomes.
The content of academic program of higher education consists of three cycles of disciplines - general education disciplines (hereinafter - GED), basic disciplines (hereinafter - BD) and core disciplines (hereinafter - CD).
The cycle of GED includes disciplines of the compulsory component (hereinafter - CC), the university component (hereinafter - UC) and (or) the component of choice (hereinafter - COC). BD and CD include disciplines of UC and COC.
1. 2 Catalogue of elective disciplines (CED) is a systematic annotated list of all COC disciplines, for the entire training period, containing a brief description indicating the purpose of study, a summary of main sections and expected learning outcomes. CED reflects the prerequisites and postrequisites of each academic discipline. It should provide the students with the possibility of an alternative choice of elective disciplines for the formation of an individual educational trajectory.
On the basis of academic program and CED, the students develop individual curriculawith the help of advisers.
1. 3 Individual curriculum (IC) is a curriculum formed by the students independently with the help of an adviser for each academic year onthe basis of the academic program, the catalogue of elective disciplines or modules;
IC defines an individual educational trajectory of each student separately. It includes disciplines and types of educational activities (internship, experimental research, forms of final certification) of the compulsory component (CC), the university component (UC) and the component of choice (COC).
1. 4 Advisor is a teacher who performs the functions of an academic mentor of a student (according to the appropriate academic program), and assists in choosing a learning path (creating an individual curriculum) and mastering the academic program during the training period.
1. 5 Theuniversitycomponentis a list of compulsory educational disciplines determined by the university independently for the mastering of the academic program.
1. 6 Thecomponentofchoiceis a list of academic disciplines and the corresponding minimum amounts of academic credits offered by the university and independently chosen by students in any academic period, taking into account their prerequisites and postrequisites.
1. 7 Elective disciplines are educational disciplines that are a part of the university component and the component of choice in the framework of established academic credits, introduced by organizations of education reflecting the individual preparation of students and taking into account the specifics of socio-economic development, the needs of a particular region and established scientific schools.
1. 8 Postrequisitesarethe disciplines and (or) modules and other types of academic work, the study of which requires knowledge, skills and competencies acquired at the end of the study of this discipline and (or) modules;
1. 9 Prerequisitesarethe disciplines and (or) modules and other types of educational work containing knowledge, abilities, skills and competencies necessary for the mastering of the studied discipline and (or) modules;
1. 10 Competencies are the ability of the practical use of acquired knowledge and skills in professional activities.

2 ELECTIVE DISCIPLINES

Cycle of discipline	Code of discipline	Name of discipline	Sem	No of credits	Prerequisites
Elective discipline-1	NTP 2212	Scientific and Technical translation	3	4	POIYa 2202 Professionally-oriented foreign language
	KV 2213	Oscillations and Waves			EM 2207 Electricity and Magnetism
Elective discipline-2	ONM 2214	Basics of scientific computation	5	4	VVP 1205 Introduction to programming
	TKO 2215	Technology of criteria-based assessment			Ped 1224 Pedagogy
Elective discipline-3	MVP 4216	Educational management	8	5	Ped 1224 Pedagogy
	OBZ 4217	Health and safety			No
Elective discipline-4	MMChM 4218	Mathematical simulation and numerical methods	8	5	MMF 3301 Methods of mathematical physics
	OPPU 4219	Basics of semiconductor devices			EM 2207 Electricity and magnetism
Elective discipline-5	TFKP 2220	Theory of complex variable function	4	6	DU(III) 2209 Differential equations
	MIO 2221	Methods of investigation in education			No
Elective discipline-6	OVTA 2222	Basics of vector and tensor analysis	3	4	Mat(I) 1203 Mathematicalanalysis – 1
	FRS 2223	Physiology of school student development			No
Elective discipline-7	Ped 1224	Pedagogy	5	5	No
	OASD 2225	Basics of algorithms and data structure			IKT1105 Information and communication technology (in English)
Elective discipline-8	TSP 3228	Thermodynamics and statistical physics	7	5	Mol 1206 Molecular physics
	EMFI 4230	Electronic methods in physical investigations			AYaF 3210 Atomic and Nuclear physics
Elective discipline-9	IMOF 4230	Innovative methods of physics teaching	7	5	MPF 3111 Physics Teaching Methodology
	FKS 4232	Condensed state physics			KM 3314 Quantum mechanics
Elective discipline-10	KMO 4232	Computer simulation in education	8	5	ONM 2214 Basics of scientific computation
	TSE 4234	Technique of school experiment			EMFI 4230 Electronic methods in physics research
Elective discipline-11	TM 2232	Theoretical Mechanics	4	5	Mech 1201 Mechanics
	IO 2240	Inclusive education			-

Elective discipline-12	OET 3306	Fundamentals of electronic engineering	5	5	EM 2207 Electricity and magnetism
	AP 3307	Algoritmization and programming			VVP 1205 Introduction to programming
Elective discipline-13	TES 3308	Theory of Electrical Communication	6	5	TEP 3302 Theory of Electromagnetic Waves Transmission
	PBD 3309	Database design. Introduction to SQL			AP 3307 Algoritmization and programming
Elective discipline-14	TPEM 3310	Theory of Electromagnetic Waves Transmission	6	5	TEP 3302 Theory of Electromagnetic Field
	WT 4311	Web-technologies			AP 3307 Algoritmization and programming
Elective discipline-15	ORZSV 3312	Basics of radio circuits and signals	7	5	TES 3308 Theory of Electrical Communication
	PAD 3313	Python for data analysis			PBD 3309 Database design. Introduction to SQL
Elective discipline-16	SBTT 4316	Modern wireless telecommunication technologies	7	5	TPEM 3310 Theory of Electromagnetic Waves Transmission
	KS 4317	Computer Networks (Cisco 1)			WT 4311 Web-technologies
Elective discipline-17	ZOS 4318	Digital signal processing	7	5	ORZSV 3312 Basics of radio circuits and signals
	AD 4319	Software Design and Architecture (SDP5)			PBD 3309 Database design. Introduction to SQL

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Description of discipline	
Code of discipline	NTP 2212
Nameofdiscipline	**Scientific and Technical translation**
Number of credits(ECTS)	4 ECTS (0+3+0)
Course, semester	2, 3
Department	Languages department Radio engineering, electronics and telecommunications
Courseauthor (s)	Manapbayeva Zh.
Prerequisites	POIYa 2202 Professionally-oriented foreign language
Postrequisites	no
The aim of study of a discipline	The main goal of the course is to master students' communicative competencies, which will make it possible to use a foreign language in various fields of professional activity, scientific and practical work, in communication with foreign scientists, for self-educational and other purposes. Along with a practical goal, a professionally oriented foreign language course implements educational and educational goals, helping to broaden the horizons of students, increase their general culture and education, as well as a culture of thinking, everyday and professional communication, foster tolerance and respect for the spiritual values of other countries and peoples .
Brief course description (main sections)	The objects of study of this discipline are professionally-oriented vocabulary, professional terminology, scientific styles of forming annotations, reports at conferences, scientific articles, statement and formulation of problem problems of physics. Methods of studying this discipline: analytical; dialectic, research. The role and place of science of this discipline among other sciences: this discipline, as a science, studies vocabulary, grammatical structures, the main types of communicative activity of a person in a foreign language, taking into account the specifics of professional activity. The knowledge acquired within the framework of this discipline will allow a specialist to apply a foreign language in various fields of professional activity, in scientific and practical work, in communication with foreign scientists, for self-educational and other purposes.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- read and understand authentic texts in the specialty; - understand authentic oral texts of a monologue and dialogical nature in the form of a message, lecture, interview, conversation, discussion; - annotate written and verbal authentic popular science and scientific texts by profession in English; - make presentations, reports, presentations, reviews on various professional topics; - make written texts of an informative nature (message, report, review); - conduct business correspondence; - perform translation of texts in the specialty from a foreign language into a native language and from a native language into English; - perform interpretation of texts in the specialty from a foreign language into their native language.

Description of discipline	
Code of discipline	KV 2213
Nameofdiscipline	Oscillations and Waves
Number of credits(ECTS)	4
Course, semester	2 course, 3 semester
Department	Radio engineering, electronics and telecommunications
Courseauthor (s)	Shapiyeva A.Ye.
Prerequisites	Electricity and Magnetism
Postrequisites	Basics of semiconductor devices
The aim of study of a discipline	The purpose of the discipline is to provide students with skills and knowledge in the field of natural science and mathematical knowledge related to one of the most important areas of modern physics - the theory of oscillations and waves, in developing practical competencies for solving general physical problems and their practical applications in the field of nonlinear physics, electromagnetic waves and waves, in obtaining a higher professionally profiled education that allows the student to successfully work both in pedagogical and in research activities, possess subject-specific and universal competencies that contribute to successful professional activities.
Brief course description (main sections)	Studying the course is closely connected with such basic disciplines of the professional cycle as Mechanics, Electricity and Magnetism, Optics, mathematical analysis, differential equations, analytical geometry, and the theory of functions of a complex variable. The discipline "Oscillations and waves" allows you to create professional knowledge and general principles of the physical worldview in the field of modern ideas about the commonality of the basic mechanisms and laws of vibrational and wave processes in animate and inanimate nature.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of mastering the discipline, the student: • 1. must know: The objects of professional (research) activity of bachelors in profile - teacher education (program: education in the field of physics) are all types of physical phenomena and objects observed in nature that have an oscillatory or wave nature, as well as methods and algorithms for studying them. The student must know the current state in the chosen field of research, phenomena and research methods and be able to apply the knowledge gained in their professional activities. • 2. must be able to: use the theoretical principles and methods of mathematical description in the field of the theory of oscillations and waves to conduct a meaningful analysis of the dynamics of vibrational and wave systems; - apply methods and algorithms for studying physical phenomena and objects with an oscillatory or wave nature in scientific research, pedagogical and innovative activities; - use the methods for describing vibrational and wave processes in the development, modeling and formulation of laboratory studies in pedagogical activity. • 3. must own: The student teacher education (program: education in the field of physics) must possess computational methods in the field of

	oscillatory and wave processes to analyze the complex dynamics of model systems of a general physical nature (mechanics, acoustics, optics, radiophysics, etc.). 4. Must demonstrate ability and readiness: Master of profile - teacher education (program: education in the field of physics) is prepared for activities requiring in-depth professional and fundamental training, including in the research work of a calculated, theoretical and experimental nature. The bachelor of physics should be able to solve the following problems: - master new research methods and models; - work with scientific and periodical literature; - use new information technologies; - conduct research in the study of problems in the field of oscillatory and wave processes; - formulate new tasks arising in the course of scientific research; - choose the necessary research methods;

Description of discipline	
Code of discipline	ONM 2214
Nameofdiscipline	**Basics of scientific computation**
Number of credits(ECTS)	4 ECTS (1 + 0 + 2)
Course, semester	3, 5
Department	RET
Courseauthor (s)	Seitnur A.
Prerequisites	VVP 1205 Introduction to programming
Postrequisites	KMO 4232 Computer simulation in education
The aim of study of a discipline	The purpose of the course is to give students the knowledge and skills necessary for writing computer programs using imperative programming and algorithms. Course Objectives: • provide the student with basic knowledge in the field of imperative programming and algorithms; • provide the student with sufficient knowledge in these areas so that he can be prepared to take advanced courses in these areas; • provide the student with knowledge in these areas necessary to continue his / her main course of study in the field of science or technology; • develop a student's analytical approach to solving problems both in science and in "everyday life"; • develop in the student an understanding of the role of science in our modern society, as well as in the past and in the future.
Brief course description (main sections)	History of C ++. Variables and types. Flowchart. Building blocks. Variable declaration. The operators. Iterative operators (loops). Arrays Multidimensional arrays. Character sequences. Functions Recursion. Recursive function. Data structures. Pointers. Files. Pointers and arrays. Sorting. Sorting. Classes.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• formulate basic concepts and principles for solving problems related to computer science; • determine the types of variables for solving practical problems; • compare and contrast the various ways to solve the problem after testing the program; • explain the compiled program documentation; • List data structures, operators, and basic algorithmic constructs in C ++.

Description of discipline	
Code of discipline	TKO 2216
Name of discipline	**Technology of criteria-based assessment**
Number of credits(ECTS)	4
Course, semester	2 course, 4 semester
Department	Radio engineering, electronics and telecommunications
Course author (s)	Manatuly A.
Prerequisites	Pedagogy
Postrequisites	no
The aim of study of a discipline	The purpose of this course is to master the basic technologies of criteria-based assessment
Brief course description (main sections)	Formation and development of students: knowledge of modern methods and means of diagnosing the achievements of students; skills and skills of the practical application of modern means of assessment of results of training of students; positive motivation and interest in mastering the basics of objective assessment of students, striving for creative activity.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• ability to determine the level of training of a student at each stage of the educational process; • ability to determine and track individual progress and adjust the individual trajectory of student development; • choose the optimal technology for evaluating the planned results; • apply assessment tools that meet the objectives and content of education; • plan the results of training, develop and use rubrics for objective assessment of students; • evaluate the results of training using the criteria tables; • formative and summative assessment of the knowledge of students.

Description of discipline	
Code of discipline	MVP 4216
Name of discipline	**Educational management**
Number of credits(ECTS)	5 ECTS (1+2+0)
Course, semester	4, 8
Department	EandB
Course author (s)	Shapiyeva A.Ye.
Prerequisites	Ped 1224 Pedagogy
Postrequisites	no
The aim of study of a discipline	The formation of knowledge about the scientific basics of management in education, and the basics of managing the development of educational systems. Objectives of the discipline: - to reveal the essence and characteristics of the main system-forming elements of educational management; - reveal the main problems of management in education; - to characterize the main functions of intra-school management, as well as the main directions of development of the school as an element of educational policy; - to study the components of the managerial culture of the leader and their self-development.
Brief course description (main sections)	Developing integrated science that studies the problems of management in education. Management is an independent scientific discipline that studies the laws, principles, methods, forms, methods and techniques of managing collective work in various organizations. Education is a special kind of activity that is engaged in another science, pedagogy, studying the theory of education, didactics and other theories.

Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of the study, the student must: know - The history of the development of the concept of management in education; - goals and objectives of management in education; - basic theoretical, methodological and ethical principles, - organizational forms, technological methods and techniques for managing the educational process; - the place, role and significance of pedagogical management in the system of scientific knowledge; - the essence and characteristics of the main system-forming elements of pedagogical management; - the basics of organizing the activities of the teaching staff as a function of pedagogical management; - factors determining the effectiveness of management in education; - The basis of the psychological and pedagogical ethics of business communication. *be able to* - to formulate the goals and objectives of pedagogical management in education in accordance with modern problems; - take into account factors determining the effectiveness of pedagogical management; - comply with professional ethical standards adopted in the international practice of pedagogical management; - quickly navigate in difficult cases and effectively use the types and forms of modern business communications; - select methodological tools in the educational process that is adequate to the tasks; - conduct methodological procedures in accordance with ethical and methodological rules; - describe the results of planning and organizing activities. *own* - conceptual apparatus of management in education; - the skills of professional thinking necessary for the timely determination of the goals and objectives of their professional activities in the field of pedagogical management; - functional and role-playing repertoire of the manager; - management technologies; - self-management methods.

Description of discipline	
Code of discipline	OBZ 4217
Nameofdiscipline	**Health and safety**
Number of credits(ECTS)	5
Course, semester	4 course, 8 semester
Department	Radio engineering, electronics and telecommunications
Courseauthor (s)	Shapiyeva A.Ye.
Prerequisites	No
Postrequisites	No
The aim of study of a discipline	The purpose of the discipline is to provide students with skills and knowledge in the field of natural science and mathematical knowledge related to one of the most important areas of modern physics - the theory of oscillations and waves, in developing practical competencies for solving general physical problems and their practical applications in the field of nonlinear physics, electromagnetic waves and waves, in obtaining a higher professionally profiled education that allows the student to successfully work both in pedagogical and in research activities, possess subject-specific and universal competencies that contribute to successful professional activities.
Brief course description (main sections)	"Health and safety " is the education of safe thinking, a person of a safe type and the acquisition of knowledge about dangerous and emergency situations of natural, man-made and social origin; organization of the protection of the population and territories in peacetime and wartime; legal regulatory, technical and organizational foundations of life safety. Mastering the necessary first aid techniques for injuries, emergency conditions and acute diseases.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of mastering the discipline, the student: • 1. must know: • on modern theories and practice of ensuring life safety in emergency situations of natural, industrial and social origin; • on the theory of risk and the factors causing emergencies of natural, man-made and social origin; • on forecasting emergencies and their consequences, on the main ways, means and methods of individual and collective protection in emergency situations; • state policy in the field of training and protection of the population from dangerous and emergency situations; • rights and obligations of citizens to ensure life safety; • a unified state system for the prevention and elimination of emergency situations, its structure and tasks;characteristics of the dangers of natural, industrial and social origin; principles, rules and requirements of safe behavior and protection in various conditions and emergency situations; means and methods of personal and collective protection; emergency conditions, causes and factors causing them; acute diseases and their prevention; fundamentals of microbiology, immunology, epidemiology, resuscitation; about health and a healthy lifestyle, physiological tests for determining health and the stages of its formation. • 2. must be able to: assess the possible risk of local dangerous and emergency situations, apply timely measures to eliminate their consequences; own a

	technique for the formation of psychological stability of behavior in dangerous and emergency situations: respect for your health, the environment; correctly apply practical safety skills in hazardous situations arising from work and everyday life; organize rescue operations in emergency situations of various nature; use the acquired knowledge, skills and abilities when organizing training sessions and events; perform abstract work; make a scientific report and educational conversation; clearly articulate the basic concepts; have skills in the provision of first aid; master the methods of caring for the injured and sick; anticipate possible complications of emergency conditions and diseases; carry out primary, secondary and tertiary disease prevention; • 3. must own: - skills to assess the possible risk of local dangerous and emergency situations; - Skills in the formation of psychological stability of behavior in dangerous and emergency situations; - skills in the application of practical skills to ensure safety in dangerous situations arising in the workplace and everyday life; - skills for the provision of first aid; - skills for caring for the injured and sick 4. must demonstrate the ability and willingness: to apply the acquired knowledge and skills in their professional activities - choose the necessary research methods;

Description of discipline	
Code of discipline	ChMMM 4218
Nameofdiscipline	**Mathematical simulation and numerical methods**
Number of credits(ECTS)	5 ECTS (1+2+0)
Course, semester	4, 8
Department	RET
Courseauthor (s)	Manatuly A.
Prerequisites	MMF 3301 Methods of mathematical physics
Postrequisites	no
The aim of study of a discipline	To study the basic numerical methods for solving problems for which, due to the complexity of the model, any other methods are impractical or there is no analytical solution.
Brief course description (main sections)	This course will cover the numerical methods currently used to solve mathematical and physical problems, as well as the programming methods associated with them.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Результатыобучения: After completing the course, students will be able to - know errors, precision and stability; - know and apply numerical integration: trapezoid, Simpson rules, Gauss method; - apply interpolation, extrapolation and approximation using curves: polynomial interpolation, Neville algorithm, cubic spline, least squares method; - to study methods for finding the root and solving equations: methods of bisection, chords, false positions, Brent, Newton-Raphson; - apply the Monte Carlo method; - apply Gaussian exception, L-U decomposition, eigenvalue problems to solve a system of equations; - apply methods using finite differences to find derivatives; - know the methods of Runge-Kutta and Euler for solving ordinary differential equations; - know the sampling theorem, the discrete Fourier transform, the fast Fourier transform.

Description of discipline	
Code of discipline	OPPU 4220
Name of discipline	**Basics of semiconductor devices**
Number of credits(ECTS)	5
Course, semester	4 course, 8 semester
Department	Radio engineering, electronics and telecommunications
Course author (s)	Manatuly A.
Prerequisites	Electricity and magnetism
Postrequisites	no
The aim of study of a discipline	The goal of this course is to master the fundamentals of semiconductors and solid state electronics.
Brief course description (main sections)	This course teaches the basics of semiconductors and semiconductor electronics, explains the principle of operation of transistors and semiconductor devices. The course also includes models of semiconductor devices and predicts how they can be used for electronic devices.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Having successfully completed this course, the student will be able to: • master the basics of semiconductors and solid-state electronics • understand how transistors and amplifiers work • understand how semiconductor devices can be used for electronic devices • model and predict the behavior of semiconductor devices

Description of discipline	
Code of discipline	TFKP 2220
Name of discipline	**Theory of complex variable function**
Number of credits(ECTS)	6 ECTS (2+2+0)
Course, semester	2, 4
Department	MCM
Course author (s)	Abdikalikova Z.
Prerequisites	DU(III) 2209 Differential equations
Postrequisites	MMF 3301 Methods of mathematical physics
The aim of study of a discipline	Learn the basics of the functions of a complex variable, the differentiation and integration of functions of a complex variable.
Brief course description (main sections)	Complex numbers and actions on them. Algebraic form of a complex number. Trigonometric and exponential form of a complex number. Moor's formula. Integrated Variable Functions. The basic elementary functions of a complex variable. Inverse trigonometric functions. The relationship between exponential and trigonometric functions. Differentiation of functions of a complex variable. Terms of Cauchy-Riemann. Harmonic functions. Integration of functions of a complex variable. The integral of a single-valued branch of multi-valued functions. Branch points. The integral Cauchy formula. Rows in a complex area. Power series. Convergence. Rows of Taylor and Laurent. The area of convergence. Zeros of functions. Isolated singular points. Pole features. Deductions. Calculation of the integral using a residue. Cauchy's residue theorem. The application of residues to the calculation of certain integrals. Lemma of Jordan. Logarithmic deduction.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	After completing the course, students will be able to: - conduct elementary mathematical operations with complex numbers; - describe the behavior of the functions of a complex variable on the complex plane; - distinguish between the forms of complex numbers; - calculate the differential function of a complex variable; - calculate the integral of the function of a complex variable; - determine the poles of the functions for the deduction. - find function deductions; - calculate integrals with residues.

Description of discipline	
Code of discipline	MIO 2222
Name of discipline	**Methods of investigation in education**
Number of credits(ECTS)	6
Course, semester	2 course, 4semester
Department	Radio engineering, electronics and telecommunications
Course author (s)	Manatuly A.
Prerequisites	no
Postrequisites	no
The aim of study of a discipline	The goal of this course is to develop the ability to characterize quantitative and qualitative research, and to develop research in education.
Brief course description (main sections)	A basic understanding of educational research and the scope of educational research; the process of conducting systematic scientific research (problem statement, literature review, sampling, data collection, data analysis and reporting) in the field of education; quantitative studies of design options and characteristics of each design alternative; concepts, methods and tools with which educational research is developed, conducted, interpreted and critically evaluated
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Having successfully completed this course, the student will be able to: • Compare and contrast the main characteristics of research design. • Understand and interpret the importance of a research problem, research question, and goal statement. • Understand and discuss literature review features • Develop and implement of data collection tools for hypothetical and real situations • Assess the results of the study

Description of discipline	
Code of discipline	OVTA 2222
Name of discipline	**Basics of vector and tensor analysis**
Number of credits(ECTS)	4 ECTS (1+2+0)
Course, semester	2, 3
Department	RET
Course author (s)	Kabatayeva R.S.
Prerequisites	Mat(I) 1203 Mathematical Analysis - 1
Postrequisites	TM 2232 Theoretical Mechanics
The aim of study of a discipline	To study the basic concepts and techniques of the mathematical apparatus of vector and tensor analysis for solving problems of theoretical physics.
Brief course description (main sections)	Vector algebra, coordinate system rotation, nabla vector differential operator, gradient, divergence, rotor, sequential use of the nabla operator, writing expressions in curved coordinates: Cartesian coordinates, spherical coordinates, cylindrical coordinates, Ostrogradsky-Gauss theorem, Stokes theorem, Green's theorem, elements tensor analysis.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	After completing the course, students will be able to: - master the necessary mathematical apparatus, methods for solving problems; - have a modern understanding of the coordinateless method of defining vectors and tensors; - demonstrate the knowledge gained on the basics of vector and tensor analysis and their understanding; - demonstrate an understanding of the general structure of the field of study and the relationships between its elements; - develop the skills of independent research of specific issues of the theory, the ability to pose a problem and choose methods of solution, both in analytical form and using computational methods; - include new knowledge in the context of the basic knowledge of the specialty, interpret its content; - analyze the educational situation, suggest a direction for its solution; use the methods (research, calculation, analysis, etc.) inherent in the field of studying the basics of vector and tensor analysis. - in an individual or group educational research activity, to generalize, interpret and evaluate the learning outcomes in the context of the discipline, the training module on the basics of vector and tensor analysis; - to constructive educational and social interaction and cooperation in the group; to propose a problem, to argue its importance; - recognize the role of the course taken in the implementation of the individual learning path.

Description of discipline	
Code of discipline	FRS 2224
Nameofdiscipline	**Physiology of school student development**
Number of credits(ECTS)	4
Course, semester	2 course, 3 semester
Department	Radio engineering, electronics and telecommunications
Courseauthor (s)	Kaypoldayev O.E.
Prerequisites	no
Postrequisites	no
The aim of study of a discipline	The purpose of this course is to familiarize yourself with the basic concepts of the physiology of development of a student.
Brief course description (main sections)	The discipline covers: current information about the anatomical and physiological characteristics of the body of children and adolescents, its relationships with the environment; knowledge of the laws underlying the preservation and strengthening of the health of schoolchildren, maintaining their high performance in various types of educational activities; familiarization of students with the problems that arise at the border of pedagogical and physiological sciences; familiarization of students with basic hygiene standards and requirements for the organization of the educational process at school.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Students who studied the course "Physiology of development of schoolchildren" will be able to solve the following professional problems: • take into account the peculiarities of age-related development and functioning of the body when organizing all types of activities of the child (labor, rest, all regimen moments); • organize an educational process that impedes the development of overwork, taking into account age-related features and capabilities; • contribute to the preservation and promotion of health; • carry out preventive measures to prevent diseases; • form a healthy lifestyle.

Description of discipline	
Code of discipline	Ped 1224
Nameofdiscipline	**Pedagogy**
Number of credits(ECTS)	5 ECTS (1 + 2 + 0)
Course, semester	3, 5
Department	M and HK
Courseauthor (s)	Imatova B.
Prerequisites	no
Postrequisites	MPF 3111 Physics teaching methodology
The aim of study of a discipline	Formation of professional and pedagogical competence of future specialists
Brief course description (main sections)	"Pedagogy" as a science in the system of humanitarian knowledge is focused on the formation of an intellectual personality, the implementation of which requires the implementation of interdisciplinary ties. The teaching of a pedagogy course is preceded by the study of social and humanitarian disciplines (philosophy, sociology, developmental psychology, cultural studies, etc.), as well as a number of subjects of the pedagogical cycle: "Introduction to the teaching profession", "Development of school and teaching thought in the history of mankind". This makes it possible to take into account various pedagogical phenomena, especially the pedagogical process from an interdisciplinary point of view, when teaching a pedagogy course.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	1.Train students in the theory of professional activity as the basis for preparing a future teacher. 2. To shape future teachers with a systematic vision of their own professional activity. 3. To form professionally significant personal qualities of the future teacher (humanism, pedagogical thinking, sociability, pedagogical tact, tolerance, etc.) 4. Form the key competencies of the future teacher as the ability to translate theoretical knowledge into practical skills. 5. To form students' readiness for self-education, for creative research work. As a result of studying the course, students should master the knowledge of: - On the theoretical and methodological foundations of pedagogy; - on the theory and practice of a holistic pedagogical process; - on technologies for the implementation of a holistic pedagogical process; - manage a holistic pedagogical process; Workshop skills: - carry out educational work in accordance with the law, the educational mechanisms of the pedagogical process; - carry out diagnostics of the educational process in the classroom according to the main characteristics (variables) and predict its further development; - to formulate training tasks, choose the appropriate activities, forms and methods; - develop their own approaches to the process of training and education.

Description of discipline	
Code of discipline	OASD 2225
Nameofdiscipline	**Basics of Algorithms and Data Structures**
Number of credits(ECTS)	5
Course, semester	3 course, 5 semester
Department	Radio engineering, electronics and telecommunications
Courseauthor (s)	Kaypoldayev O.E.
Prerequisites	ICT
Postrequisites	no
The aim of study of a discipline	The goal of this course is to introduce you to the basic concepts of algorithms and data structures.
Brief course description (main sections)	This discipline teaches the analysis of the computational complexity of algorithms to design, implement and analyze basic data structures and graphs. Writing, evaluating and adapting standard basic sorting and search algorithms. Design and coding C programs.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of studying this discipline, "Basics of Algorithms and Data Structures" students should know and be able to: • Varieties of data structures used at different levels of data representation, determined by the stages of program design; • Basic algorithms for processing data structures; • Language tools for describing various data structures; • Structuring the information space of a given subject area; • Based on the analysis of the developed task (program), choose the most rational and economical data structures that ensure the effective implementation of the task (program); • Develop effective data processing algorithms and program them in well-known programming languages.

Description of discipline	
Code of discipline	TSP 3228
Nameofdiscipline	**Thermodynamics and statistical physics**
Number of credits(ECTS)	5 ECTS (1+2+0)
Course, semester	4, 7
Department	RET
Courseauthor (s)	Manatuly A.
Prerequisites	Mol 1206 Molecular physics
Postrequisites	no
The aim of study of a discipline	To learn the fundamentals of thermodynamics and statistical mechanics, and the introduction to quantum statistical mechanics
Brief course description (main sections)	This course covers zeroth, first, and second laws of the thermodynamics, statistical ensembles, and quantum statistical distributions.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Learning outcomes After completing the course, students will be able to: - know and be able to apply such concepts as work, energy, thermal capacity, specific heat, and enthalpy; - demonstrate knowledge of the zeroth and first laws of thermodynamics; - know the second law of thermodynamics; - be able to calculate entropy for various states; - be able to use Maxwell's relations; - use the free energies of Helmholtz and Gibbs to calculate available work; - know the relationship between thermodynamics and the microscopic description used in classical statistical mechanics; - know the Fermi-Dirac and Bose-Einstein distributions - be able to derive the Planck’s formula.

Description of discipline	
Code of discipline	EMFI 4230
Nameofdiscipline	**Electronic methods in physical investigations**
Number of credits(ECTS)	5
Course, semester	4 course, 7 semester
Department	Radio engineering, electronics and telecommunications
Courseauthor (s)	Kaypoldayev O.E.
Prerequisites	Atomic and nuclear physics
Postrequisites	no
The aim of study of a discipline	The purpose of this course is to introduce you to the basic concepts of electronic methods in physical research.
Brief course description (main sections)	This course gives the student an understanding of the fundamental principles and practical capabilities of physical research methods, familiarity with their hardware and experimental conditions, the ability to interpret and correctly evaluate experimental data, including those published in the scientific literature. The student must also learn the optimal choice of methods for solving the tasks and make conclusions based on the analysis and comparison of the totality of the available data.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of studying this discipline "Electronic methods in physical research", students should know and be able to: • interpretation and competent assessment of experimental data; • the optimal choice of methods for solving the tasks and to draw conclusions based on the analysis and comparison of the totality of the available data; • the basics and practical capabilities of physical research methods, hardware and experimental conditions.

Description of discipline	
Code of discipline	IMOF 4230
Nameofdiscipline	**Innovative methods of physics teaching**
Number of credits(ECTS)	5 ECTS (1+2+0)
Course, semester	4, 7
Department	RET
Courseauthor (s)	Shapiyeva A.Ye.
Prerequisites	MPF 3111 Physics teaching methodology
Postrequisites	no
The aim of study of a discipline	to acquaint students with contemporary methodological content of science, methodology of studying the individual year of high school physics at the profile level, with modern techniques and methods of organization of cognitive activity of pupils in upper secondary educational institutions. The objectives of the discipline: - deepening and consolidation of theoretical knowledge gained by students in the study of the discipline "Methods of teaching physics"; - the formation of students' professional skills necessary for the implementation in the classroom of modern teaching principles, ideas of developing, personality-oriented learning; - acquaintance with the best practices of physics teachers in organizing the experimental activities of schoolchildren; - Education of students in a steady interest in the teaching profession, the need for pedagogical self-education, a creative and research approach to teaching.
Brief course description (main sections)	Modern methods of physics teaching (MMPT) as a science, its subject and the main objectives of the study. The connection of the MMPT with other sciences and its place in the system of pedagogical sciences. Methods of scientific research used in the MMPT. The history of the formation and development of the MMPT as a science. MMPT as a subject in a pedagogical university. The objectives of the teaching methodology as an educational discipline. The content and construction of the course, educational methods, basic teaching aids. Physics as a scientific subject in a comprehensive school. Possible systems for constructing a physics course at school, their analysis. General pedagogical requirements for the content of the school physics course. Reform of the school course in physics and its analysis. System and content of a physics course in a modern comprehensive school. The main tasks of teaching physics at school. Methods of teaching physics in a secondary school. Overview of teaching methods, their classification. Oral teaching methods: story, explanation, conversation, lecture. The problem of increasing the cognitive activity of students. Problematic physics training. A demonstration experiment in physics as a teaching method, its significance and place in the educational process, the main methodological requirements for it.

Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result, the study of the discipline, the student must: Know: - the goals of teaching physics in institutions of secondary (complete) general education; ways of their task and methods of achievement; - the content of the requirements for knowledge and skills of students in physics, reflected in the State educational standard; - physical education systems in secondary (complete) general education institutions and the place of the physics course in the basic curriculum; - forms of organization of studies in physics, requirements for modern classes in physics; - means of teaching physics and their application in the educational process. Be able to: - set pedagogical goals and objectives and outline ways to solve them; - to analyze teaching aids from the point of view of their conformity to the goals of teaching physics, the age characteristics of students, didactic and particularly methodological principles, to make their informed choice; - carry out the selection of methods, means and forms of training in accordance with the goals and content of the educational material; - conduct classes in physics of various types, using appropriate methods, forms and means of training. Own: - skills to implement the process of self-development of students in physics classes.

Description of discipline	
Code of discipline	FKS 4232
Name of discipline	**Condensed state physics**
Number of credits(ECTS)	5
Course, semester	4 course, 7 semester
Department	Radio engineering, electronics and telecommunications
Course author (s)	Manatuly A.
Prerequisites	KM 3314 Quantum mechanics
Postrequisites	no
The aim of study of a discipline	This course aims to establish fundamental concepts in condensed matter physics.
Brief course description (main sections)	Acquaintance with the basic methods of research and calculation of the physical characteristics of solids, the study of the physical properties of condensed matter at the atomic- molecular level. The formation of systematic knowledge among students in the following areas: methods for studying the atomic structure of a condensed state; types of bonds and defects of the crystal lattice; mechanical properties of solids; vibrations of atoms of the crystal lattice and thermal properties of crystals; thermal, electrical, optical and magnetic properties; superconductivity; properties of amorphous solids.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• distinguish between different types of lattices and explain the concepts of reciprocal lattice and crystalline diffraction. • predict the electrical and thermal properties of solids and explain their origin. • explain the concept of energy zones and their influence on electrical properties. • describe the dielectric properties of insulators. • explain the various types of magnetic phenomena, the physics behind them, their properties and applications. • explain superconductivity, its properties, important parameters related to possible applications.

Description of discipline	
Code of discipline	KMO 4232
Name of discipline	**Computer simulation in education**
Number of credits(ECTS)	5
Course, semester	4, 8
Department	RET
Course author (s)	Manatuly A.
Prerequisites	ONM 2214 Basics of scientific computation
Postrequisites	no
The aim of study of a discipline	Master the COMSOL package to solve application problems
Brief course description (main sections)	COMSOL Multiphysics - software that allows you to simulate various physical processes. The solution includes an extensive set of engineering tools, including tools for model development and meshing, descriptions of physical processes, modeling and subsequent adjustments. The product is expanded with additional modules in the disciplines: structural mechanics, chemical industry, electromagnetic processes, microelectronics, geological processes and acoustics.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- the functions of setting the geometry of the studied object, adding additional parameters, calculating the obtained values and visualizing the model of the object's behavior. - The solution of such applied problems as the design of mechanical stresses in MEMS devices and heat distribution. - design a wide variety of physical models: fluid flows, heat dissipation, electromagnetic and acoustic phenomena. - take into account the properties of materials, sources of exposure and other effects.

Description of discipline	
Code of discipline	TSE 4234
Name of discipline	**Technique of school experiment**
Number of credits(ECTS)	5
Course, semester	4, 8
Department	RET
Course author (s)	Manatuly A.
Prerequisites	EMFI 4230 Electronic methods in physical investigations
Postrequisites	no
The aim of study of a discipline	The objectives of the course to familiarize with: -basic ideas and methods of setting up new educational experiments in physics; - methods for solving experimental problems of physics; -method of conducting a physical experiment.
Brief course description (main sections)	This course includes basic information about the methodology for setting up a lecture and laboratory physical experiment, solving experimental problems, and forms students' practical skills in setting up a physical experiment. Course Objectives: -to give students practical skills in the design, assembly and tuning of experimental schemes and installations; -develop students' practical skills in solving experimental problems of physics; -to give students practical skills in the methodology of conducting a physical experiment.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- clearly understand and represent the structure of a physical experiment; - be able to draw up basic equations, relationships when calculating specific experimental physical problems; - own a system of knowledge and practical skills in organizing and staging a physical experiment (laboratory, demonstration, computer).

Description of discipline	
Code of discipline	TM 2232
Name of discipline	**Theoretical Mechanics**
Number of credits(ECTS)	5 ECTS (1+2+0)
Course, semester	2, 4
Department	RET
Course author (s)	Manatuly A.
Prerequisites	Mech 1201 Mechanics
Postrequisites	MMF 3301 Methods of mathematical physics
The aim of study of a discipline	To deeply study the basic laws of mechanics and consider physical problems in the field of theoretical mechanics
Brief course description (main sections)	The fundamental principles of theoretical mechanics about space and time in the modern representation, which contain the clearest formulation of the basic physical assumptions of theoretical mechanics. The law of conservation of momentum, angular momentum and energy and their relationship with the properties of space-time and with the symmetry of force fields. The role of covariant forms of equations of motion. Methods of Lagrange, Hamilton, and Hamilton-Jacobi. The basic equations of motion of a rigid body.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	As a result of studying the course, students will be able to: - apply Newton's laws to solve problems of physics; - demonstrate knowledge of oscillatory motion; - demonstrate knowledge and understanding of dynamics of the system of particles - model and solve physical problems by the least action method; - apply the methods of Lagrange and Hamilton for modeling and solving problems; - demonstrate knowledge of rigid body mechanics

Description of discipline	
Code of discipline	IO 2240
Name of discipline	**Inclusive education**
Number of credits(ECTS)	5
Course, semester	2, 4
Department	RET
Course author (s)	Manatuly A.
Prerequisites	no
Postrequisites	no
The aim of study of a discipline	To acquaint students with the basic principles of the theory of inclusive and integrated learning, the conceptual apparatus, scientific and methodological provisions and give ideas about integrated learning as an important sociocultural phenomenon of general and special education.
Brief course description (main sections)	Education, upbringing, socialization, individual and personal development of students, students' health, psychological, pedagogical and social support of students, teachers and parents (legal representatives) in various types of educational organizations. -conducting corrective and developing classes according to the recommended methods; -help students in the process of vocational guidance and professional self-determination; -participation in the development of individual development paths for children and adolescents.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	to know: - the concept of inclusive education; - Features of the inclusive pedagogical process, education and training; - Aspects and tasks of upbringing and development of children with disabilities at different age stages, taking into account their personal characteristics in an inclusive education; - determine the main forms and methods of correctional and educational work with people with disabilities at different age stages in an inclusive education; own: - skills to interact professionally with specialists and parents to ensure coordination of the psychological impact on the child with disabilities within the framework of a holistic pedagogical process in an inclusive education;

Description of discipline	
Code of discipline	OET 3306
Name of discipline	**Fundamentals of electronic engineering**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	3, 5
Department	RET
Course author (s)	Manatuly A.
Prerequisites	EM 2207 Electricity and Magnetism
Postrequisites	ORZSV 3312 Basics of radio circuits and signals
The aim of study of a discipline	Preparing students for work with electronic equipment. Develop a student's literacy skills in the field of physical fundamentals of electronic technology; To develop critical thinking abilities of a student in the study of electronic technology; Develop a student's practical skills in developing electrical concepts for semiconductor technology; To promote the interests of students in learning, to develop their logical thinking.
Brief course description (main sections)	Introduction The history of the development of electronic technology. Physical foundations of electronic technology. Electrophysical properties of semiconductors. The electrical conductivity of semiconductors in strong electric fields. Electron-hole transition. Semiconductor and optoelectronic semiconductor devices. Special types of diodes. Rectifier devices, stabilizers. Bipolar transistors. Field effect transistors. Switching semiconductor devices. Optoelectronic semiconductor devices. Characteristics of analog electronic devices. Logic integrated circuits. Functional Electronics.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• After completing the course, students will be able to: • Recognize different types of semiconductor and optoelectronic devices, distinguish their parameters, characteristics and principle of operation; • Read electrical schematic diagrams of analog devices, determine their parameters, build current-voltage characteristics; • Develop the simplest electrical circuit diagrams of amplifying devices; • Distinguish microcircuits and logical integrated circuits; • Distinguish the basics of functional electronics • Find and troubleshoot the simplest analog electronic devices.

Description of discipline	
Code of discipline	AP 3307
Name of discipline	**Algoritmization and programming**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	3, 5
Department	EngInfSaf
Course author (s)	Ipalakova M.T.
Prerequisites	VVP 1205 Introduction to programming
Postrequisites	WT 4311 Web-technologies
The aim of study of a discipline	Students learn the basics of algorithmization of tasks, classification of programming languages, data types and classification of C ++ language operators, development of programs using subprograms, standard modules, programming style, programming quality indicators, debugging and testing methods, the basics of object-oriented programming.
Brief course description (main sections)	The discipline studies the basic concepts of object-oriented programming, the structure and principles of developing programs in a high-level language using a visual programming environment, the fundamentals of programming technology and methods for debugging programs.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	know: – methods and tools of object-oriented programming; –Know modern programming languages and working methods; be able to: – analyze the task in order to determine the composition, data structure, restrictions on them and the choice of solution; –Develop algorithms for solving problems associated with the manipulation of data of various types; acquire practical skills: –development, debugging and design of programs; be competent: - in the use of a visual programming environment for the implementation of design and experimental research activities.

Description of discipline	
Code of discipline	TES 3308
Name of discipline	**Theory of Electrical Communication**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	3, 6
Department	RET
Course author (s)	Omarov A.T.
Prerequisites	TEP 3302 Theory of Electromagnetic Field
Postrequisites	ORZSV 3312 Basics of radio circuits and signals
The aim of study of a discipline	Have an idea of the basic laws of information transfer in telecommunication systems, the basics of generating, converting and transmitting signals over communication channels, analyzing processes in communication systems and solving problems of noise immunity and the efficiency of message transfer in communication systems. to acquire knowledge of the characteristics of signals, interference, communication channels and their requirements, types of modulation, noise-resistant coding, optimal signal reception, channel separation methods, ways to increase the information transfer rate in communication channels and reception noise immunity in communication systems; master the principles of signal conversion in communication systems; to master the methods of analyzing processes in communication systems that allow solving problems of increasing the efficiency of communication systems; master the skills to apply the acquired knowledge in the professional field.
Brief course description (main sections)	Scheme and characteristics of the telecommunication system. Characteristics of a discrete message source and a discrete channel. Signal Levels. Convert an analog signal to digital and restore it. PCM. Theorem and Kotelnikov series. Correlation function and energy spectrum of analog and discrete signals. Barker Signals. Spectrum of a periodic signal. Spectral diagrams of the periodic sequence of rectangular video and radio pulses. The width of the spectrum. The spectrum of a non-periodic signal. Spectral diagrams of single video and radio pulses. The width of the spectrum. Characteristics of random variables. Distribution functions and probability densities, expectation and variance. Characteristics of random signals (processes). The correlation function and energy spectrum. Stationary and ergodic random processes. "White noise". Fundamentals of the theory of modulation and detection. Types of modulation. Analog modulation. Single-tone amplitude, frequency and phase modulation. Characteristics of modulated signals. Types of amplitude modulation. Balanced and single-band modulation. Characteristics of modulated signals. Digital and pulse modulation. Types of modulation. Characteristics of modulated signals. Fundamentals of error-correcting coding. Principles for detecting and correcting errors. Parameters and types of correction codes. Hamming Code. The algorithm for determining the verification elements of the code combination. Schemes of the encoder and decoder. Loop code. The algorithm for determining the verification elements of the code combination. Schemes of the encoder and decoder. Fundamentals of the theory of noise immunity of signal

	reception. Schemes and algorithms of optimal and non-optimal receivers. Calculation of the probability of error.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	After completing the course, students will be able to: • describe signal and interference transformations in communication systems; • to name ways to increase noise immunity and transmission speed in communication systems, ways to increase the efficiency of communication systems; • use theoretical knowledge in the study of the characteristics of telecommunication systems, the technical and informational characteristics of a message source and communication channels, the spectral characteristics of signals, the probabilistic characteristics of random signals and interference, modern methods of signal modulation, methods of noise-tolerant message reception and noise-resistant coding; • own methods for analyzing physical processes in analog and digital devices for generating, converting and processing signals; • evaluate the real and ultimate capabilities of the bandwidth and noise immunity of telecommunication systems. • put the acquired knowledge into practice.

Description of discipline	
Code of discipline	PBD 3309
Name of discipline	**Database design. Introduction to SQL**
Number of credits(ECTS)	5
Course, semester	3, 6
Department	EngInfSaf
Course author (s)	Ipalakova M.T.
Prerequisites	AP 3307 Algoritmization and programming
Postrequisites	PAD 3313 Python for data analysis
The aim of study of a discipline	Students gaining knowledge about the stages of developing a database, about promising areas of development of a DBMS; the acquisition by students of skills in the field of design, development and administration of a database; the formation of students' conceptual ideas about the basic principles of building a database, database management systems, mathematical models that describe the database, as well as the basic technologies for implementing the database.
Brief course description (main sections)	Discipline involves the formation of database design skills, creating, modifying tables and databases, manipulating data using the SQL language, developing database applications, and using tools.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- - the ability to work with a computer as a means of managing information, work with information from various sources, including global computer networks; Ability to design and implement components of the enterprise's IT infrastructure that ensure achievement of strategic goals and support of business processes. database design.– about modern approaches to database development; –- have an idea: work with modern DBMS.– use of the SQL language; – development of database applications; – developing a data model; –- own, have experience:

Description of discipline	
Code of discipline	TPEM 3310
Name of discipline	**Theory of Electromagnetic Waves Transmission**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	3, 6
Department	RET
Course author (s)	Luganskaya S.P.
Prerequisites	TEP 3302 Theory of Electromagnetic Field
Postrequisites	SBTT 4316 Modern wireless telecommunication technologies
The aim of study of a discipline	Students learn the basics of the theory of electromagnetic processes occurring in various environments, in electromagnetic energy transmission lines and linear microwave and optical devices. master the basic laws of the electromagnetic field; master the basic principles of the formation of electromagnetic waves; to master the methods in the calculation, analysis and synthesis of electromagnetic fields in special disciplines and for the successful solution of engineering problems of a future specialty.
Brief course description (main sections)	The equations of the electromagnetic field. Maxwell's equations. Classification of electromagnetic fields. Electromagnetic waves, and their characteristics and parameters. Harmonic wave, spatial and temporal scales of the wave. Plane, cylindrical and spherical waves. Longitudinal and transverse waves. Physical interpretation of the stability condition for difference schemes for the wave equation. Propagation of electromagnetic waves in unlimited isotropic media. Propagation of plane electromagnetic waves in an ideal dielectric. Flat electromagnetic waves in lossy environments. Electromagnetic waves at the interface. Laws of reflection and refraction. Electromechanical analogy in the theory of waves. Earth refraction. Rainbow. Refraction of sound into the ocean. Full internal reflection. Mirages. Fiber optics. Fiber optic communication lines. Fiber optic fibers. Fundamentals of the theory of electromagnetic wave radiation. The electromagnetic field of an elementary vibrator. Field zones of an elementary electric vibrator. Electromagnetic waves in guiding systems. The main characteristics of transmission lines. Electromagnetic waves in a rectangular waveguide. Electromagnetic waves in a circular waveguide. Round waveguide. Flexible waveguides. Features of excitation of electromagnetic waves in waveguides. Electromagnetic vibrations in volume resonators. General information about cavity resonators. Electromagnetic waves in slowing down structures. Ways to slow down electromagnetic waves. Properties of "slow" waves. Electromagnetic waves in anisotropic media. Anisotropic properties of ferrites. Phenomena and effects in EMW. The influence of the earth's surface on the propagation of radio waves. Propagation of radio waves in free space. Propagation of electromagnetic waves near the surface of the earth. The influence of the troposphere on the propagation of radio waves. Tropospheric propagation of radio waves. Dependence of the refractive index of air on height. The influence of the ionosphere on

	the propagation of radio waves. Propagation of radio waves in ionized gas. Range features of the propagation of radio waves. Features of the propagation of radio waves of the VLF, LF, MF, and HF ranges. Peculiarities of the propagation of VHF, UHF, UHF, UHF bands and optical radio waves. Radio wave propagation in rough terrain and in the presence of obstacles. The latest discoveries and trends in the development of electromagnetic field theory, the prospects for their use in the construction of radio devices.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	• After completing the course, students will be able to: • clearly determine the refraction and diffraction of electromagnetic waves; • describe the interference of electromagnetic waves; • calculate the characteristics of the electromagnetic field, calculate the main parameters of the devices, measure their parameters.

Description of discipline	
Code of discipline	WT 4311
Name of discipline	**Web-technologies**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	3, 6
Department	EngInfSaf
Course author (s)	Uatbayev M.M.
Prerequisites	AP 3307 Algoritmization and programming
Postrequisites	KS 4317 Computer Networks (Cisco 1)
The aim of study of a discipline	Familiarize students with basic web technologies and teach them how to develop front-end and background web development using modern tools. Explain basic web technology concepts to students. Explain to students how to create user-friendly web design and make good use of front-end tools. Teach you how to develop background applications using PHP, including Web 2.0 elements. Get the basic principles of object-oriented PHP. Learn to create web databases using relational data models (MySQL, DBMS).
Brief course description (main sections)	Introduction to the course. Front-end web development. Features HTML5 and CSS3. Bootstrap and Themes. Frontal frames. Vue.js. Using Vue.JS. Internal programming languages. Introduction to PHP. Expressions. Control structures and file usage. PHP arrays and strings. Web Form Processing. Cookies and sessions. Object Oriented PHP Web databases. MySQL, Mongo DB. Cassandra. Creating a web database. Access my SQL database from the Internet using PHP. PHP - frameworks. Website development with frameworks (Django).
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	After completing the course, students will be able to: - analyze web technologies to solve various types of tasks; - explain and justify the use of web development tools for specific purposes; - optimize the operation of websites and applications; - develop background applications using the server scripting language and Web 2.0 tools; - use the principles of object-oriented programming on the network; - design and create web databases; - Be skilled in front-end web development, background web developer and web server administrator.

Description of discipline	
Code of discipline	ORZSV 3312
Name of discipline	**Basics of radio circuits and signals**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	4, 7
Department	RET
Course author (s)	Aitmagambetov A.Z.
Prerequisites	TES 3308 Theory of Electrical Communication
Postrequisites	no
The aim of study of a discipline	Have an idea of the methods and fundamentals of building radio circuits and devices, a description of signals and interference in radio systems of information transfer. To assimilate the physical essence of the processes occurring in the radio circuits of devices for processing the reception and transmission of radio signals; master the methods of converting messages and signals in analog and digital forms.
Brief course description (main sections)	The main stages of the development of radio engineering. Radio frequency ranges Types of electronic circuits. Types of signals and their characteristics. Temporal and frequency representation of signals. Nonlinear radio circuits and methods for their analysis. Nonlinear resonant gain. Frequency multiplication. Types of modulation. Time and frequency representations of modulated signals. Kotelnikov's theorem. Discretization of signals. Continuous signal recovery. Receiving modulated signals. Demodulation of signals. The correlation function of signals. Types of feedback in radio circuits. Harmonic oscillators. Types of interference. The principles of consistent filtering of signals against a background of interference. Matching filters for different signals. Principles of digital signal processing. Types of signal processing in modern radio engineering information transmission systems.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- After completing the course, students will be able to: - describe the basic processes of processing, receiving and transmitting signals in radio devices; - use theoretical knowledge in the study of the characteristics and principles of the construction of radio devices of modern telecommunication systems; - own methods for analyzing various radio circuits and signals; - use the knowledge gained in processing signals in the nodes of radio devices and systems.

Description of discipline	
Code of discipline	PAD 3313
Name of discipline	**Python for data analysis**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	4, 7
Department	EngInfSaf
Course author (s)	Ipalakova M.T.
Prerequisites	PBD 3309 Database design. Introduction to SQL
Postrequisites	no
The aim of study of a discipline	The objectives of mastering the discipline are to develop programming skills in Python, an understanding of the collection, processing and analysis of data in the Jupyter interactive environment, an introduction to automated methods of working with data - machine learning and neural networks.
Brief course description (main sections)	Python programming basics (refresher). Mathematical apparatus (refresher). Introduction to the NumPy module. Basics of working with Pandas. Intelligence data analysis. Data visualization. Presentation of research results. Work with text data. Data collection from open sources. Preprocessing text data. Text analysis. Network analysis. Introduction to machine learning. Sklearn module. Classification problems and linear models. Decision trees. Random forest. Ensembles of models. Introduction to neural networks.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- able to work with information: to find, evaluate and use information from various sources necessary for solving scientific and professional problems (including on the basis of a systematic approach). - able to conduct research activities, including analysis of problems, setting goals and objectives, highlighting the object and subject of research, choosing a method and methods of research, as well as evaluating its quality. - able to select research methods that are adequate to the research objectives and apply them.

Description of discipline	
Code of discipline	SBTT 4316
Name of discipline	**Modern wireless telecommunication technologies**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	4, 7
Department	RET
Course author (s)	Kulakayeva A.E.
Prerequisites	TPEM 3310 Theory of Electromagnetic Waves Transmission
Postrequisites	no
The aim of study of a discipline	Studying construction methods and characteristics of modern systems and networks in the field of wireless communications technology (BS).
Brief course description (main sections)	The principle of operation of trunked communication systems. Generations and standards of mobile communications. Fundamentals of designing cellular networks. UMTS mobile networks. Calculation of the BS coverage area based on the Okamura-Hata model. Satellite systems with moving objects. Calculation of parameters of wireless radio access systems. Cellular networks and ways of their modernization. Wireless LANs. Basic concepts of spread spectrum systems. Signal diversity techniques. Satellite wireless networks and data transmission systems. Wireless LANs. Calculation of parameters of extended-range wireless communication systems. The principles of channel separation in BS systems.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	After completing the course, students will be able to: - have an idea of the main trends in the development of wireless telecommunication technologies and understand the regulatory legal documents in the field of wireless communications; - to learn the basic principles of construction, structures and functioning algorithms of wireless telecommunication technologies; - master the skills to apply the acquired knowledge to the analysis of physical processes occurring in devices for the formation, conversion and processing of signals; - reproduce the operating conditions of systems and principles of building BS.

Description of discipline	
Code of discipline	KS 4317
Name of discipline	**Computer Networks (Cisco 1)**
Number of credits(ECTS)	5
Course, semester	4 , 7
Department	RET
Course author (s)	Ongenbayeva Zh.
Prerequisites	WT 4311 Web-technologies
Postrequisites	no
The aim of study of a discipline	The purpose of this course is to introduce you to the basic concepts and technologies of networks.
Brief course description (main sections)	The course program is devoted to the practical study of tools for developing networks and using the Internet, as well as hardware specific to home networks and networks of small businesses.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	Students who have studied the course "Computer Networks" will be able to solve the following professional problems: • Evaluation and description of devices and services used to facilitate data exchange on networks and the Internet; • assessment and description of the roles of protocol layers in data transmission networks; • assessment and description of the importance of addressing and name assignment schemes at various levels of data networks in IPv4 and IPv6 environments; • development, calculation and application of subnet masks and addresses to meet the requirements in IPv4 and IPv6 networks; • An explanation of basic Ethernet concepts, such as media, services, and operations; • creating a simple Ethernet network using routers and switches; • Using Cisco Command Line Interface (CLI) commands to configure basic routers and switches. • use of common network utilities to verify operations of small networks and analyze data traffic.

Description of discipline	
Code of discipline	ZOS 4318
Name of discipline	**Digital signal processing**
Number of credits(ECTS)	5
Course, semester	4 , 7
Department	RET
Course author (s)	Dzhapparkulov B.K.
Prerequisites	ORZSV 3312 Basics of radio circuits and signals
Postrequisites	no
The aim of study of a discipline	The purpose of the course is the theoretical and practical development of methods and means of digital signal processing, digital filtering, the use of modern software in the tasks of signal processing.
Brief course description (main sections)	The discipline "Digital signal processing" currently occupies one of the central places among the disciplines of professional training in radio engineering and telecommunications. Professionally competent and efficient registration of information, its processing, interpretation and use are possible only with good knowledge of the theory of methods and systems for digital signal processing. The basic methods and algorithms of digital signal processing (DSP) and their computer simulation using the MATLAB system are considered. The specifics of the representation of signals and DSP systems in MATLAB are examined in detail, linear discrete systems, the synthesis of FIR and IIR filters, and the modeling of these objects and DSP processes by MATLAB software are described.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	- the study of the basics of signal conversion in digital processing, the advantages of digital signals and a mathematical apparatus for describing digital signals, methods for mathematical description of linear discrete systems, typical algorithms for digital signal processing, and methods for synthesizing digital filters. - have experience using modern software in tasks of digital signal processing. - Be competent in modeling digital filters in the mathematical package MatLab.

Description of discipline	
Code of discipline	AD 4319
Name of discipline	**Software Design and Architecture (SDP5)**
Number of credits(ECTS)	5 ECTS (1+0+2)
Course, semester	4, 7
Department	EngInfSaf
Course author (s)	Tokanov O.
Prerequisites	PBD 3309 Database design. Introduction to SQL
Postrequisites	no
The aim of study of a discipline	The formation of knowledge about the basics of algorithms and their use for program development; algorithm concept, sorting and search algorithms, Big O notation concept, dynamic memory concept, pointer concept, basic OOP concept, C ++ language templates.
Brief course description (main sections)	Arrays, strings. Sorting algorithms: heap, speed, merge. Search algorithms: linear and binary. Dynamic memory. Index Basics. Arithmetic of pointers. Pointers to pointers. Introduction to structures. Nested struts. Introduction to OOP, Complex Jobs on Structures. Templates. Introduction. Piles Vectors. Overloading operators.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	After completing the course, students will be able to: - Compare different algorithms with respect to their memory and compilation time; - Manage memory using pointers; - Development of the necessary data structures depending on the requested task. - Write programs in the style of OOP; - Analyze the effectiveness of algorithms.