NCJSC «L.N. GUMILYOV EURASIAN NATIONAL UNIVERSITY»

Module Handbook
Educational program
6B06112 Artificial intelligence technologies

Nur-Sultan
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Module 1

Module code and name	HIST 11001 Modern history of Kazakhstan
Semester(s), when the module is taught	1
Responsible for module person	Kushenova G.I.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Problem learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	School course of History of Kazakhstan.
Module objectives/intended learning outcomes	The purpose of the course is to form a system of scientific views on the history of modern Kazakhstani society in the context of the world historical process. Expected learning outcomes: - to systematize the conceptual foundations for studying the modern history of Kazakhstan; compare ideas about the continuity and continuity of historical and cultural development, the deep roots of the spiritual heritage of Kazakhstan; - reveal the significance of the formation of historical consciousness and worldviews in accordance with national priorities; - to classify historical sources reflecting the features of the modern history of Kazakhstan; - to identify the historical patterns of the development of society, paying attention to the study of historical originality; - master the techniques of historical description and analysis of the causes and consequences of the events of the modern history of Kazakhstan; - predict possible solutions to modern problems based on the analysis of the historical past and reasoned information; - to argue the features and significance of the modern Kazakh model of development; - explain the importance of educating patriotism in the spirit of the democratic values of modern society using the example of the life of historical figures.
Content	Introduction to the course. Kazakhstan on the way to independence: stages of formation of the idea of a national state. Civil-political confrontation. Implementation of the Soviet model of state building. Contradictions and consequences of Soviet reforms in Kazakhstan in the second half of the twentieth century. Formation of the state structure of the Republic of Kazakhstan. Kazakhstani model of economic development. Social modernization is the basis for the well-being of society. Ethno-demographic processes and strengthening of interethnic harmony. Prospects for socio-political development and spiritual modernization. The policy of forming a new historical consciousness and worldview of the peoples of the Great Steppe. Kazakhstan is a state recognized by the modern world. Nazarbayev is a personality in history. Formation of a nation of a single future.
Examination forms	At the end of the semester, the State exam is held in the form of computer testing.

Study and examination requirements	The activity of students in the educational process is obligatory, which is evaluated by the quality of implementation. Attendance at classes and participation in the educational process are mandatory. Students should not be absent from class without a valid reason. Late arrivals are not allowed. The code of conduct and ethics must comply with the requirements of the university. In this regard, marks are given from 0 to 100 points.
Technical, multimedia tools and software	Presentation projector
	1. Ayagan B.G., Abzhanov Kh.M., Seliverstov S.V., Bekenova M.S. Sovremennaya istoriya Kazakhstana: Almaty: Raritet, 2010. – 432 s., 16 s. 2. Kan G.V. Istoriya Kazakhstana: Uchebnoye posobiye dlya vuzov. – Almaty, 2005. 3. Uly Dala tarikhy: uchebnoye posobiye / Kan G.V., Tugzhanov Ye.L. – Astana: Zhasyl Orda, 2015. – 328 str. 4. Momynova Sh.R. Kazakhstan: drevneyshaya, drevnyaya i srednevekovaya istoriya. V 2 tomakh. - Karaganda, 2003 5. Kazakstan tarikhy. 5 tomdyk. 1-5-tomdar. – Almaty., 1996, 1997, 2000, 2010. 6. Kazakstan (Kazak Yeli) tarikhy. – 4 kytaptan turatyn okulyk. Tauelsiz Kazakstan: algyzharttary zhane kalyptasuy. 4 kytap / T. Omarbekov, B.S. Saylan, A.Sh. Altayev zhane t.b. – Almaty, Kazak universitety, 2016. – 264 b. 7. Uly Dala Tarikhy: uchebnoye posobiye /Kan G.V., Tugzhanov Ye.L. – Astana: Zhasyl Orda, 2015. – 328 s. 8. Ayagan B.G., Abzhanov Kh.M., Makhat D.A. Kazirgi Kazakstan tarikhy. – Almaty, 2010.

Module 2

Module code and name	ENGL 11103, ENGL 11203 Foreign language
Semester(s), when the module is taught	1, 2
Responsible for module person	Ustelimova N.A.
Language of study	English
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Group work. Problematic discussion. search method. Design. Essay. situational modeling. Text analysis. Creative writing.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours - 1 sem., (300 hours per year). Practical: 45 hours -1 sem, (90 hours per year), independent work of students: 105 hours (210 hours per year).
Credit points (total by discipline)	10 ECTS
Required and recommended prerequisites for joining the module	To master this module, there is a need of the knowledge, skills and abilities acquired in the course of studying the following courses: Foreign language I (English) minimum sufficient level (A1, common European competence).
Module objectives/intended learning outcomes	The purpose of the module is the formation of intercultural and communicative competence of students of non-linguistic specialties in the process of foreign language education at a sufficient level (A2) of the OEK / at the level of basic sufficiency (B1) of the OEK. Expected learning outcomes: - reveals the patterns of development of a foreign language, paying attention to the study of stylistic originality; - compares and selects the forms and types of speech /

	communication that correspond to the communicative intention with a logical construction adequate to the type of speech and adequately expresses their own communicative intentions with the correct selection and appropriate use of the necessary language means, taking into account their compliance with the socio-cultural norms of the language being studied; - owns the strategy and tactics of constructing a written communicative act, correctly forms speech in writing, based on lexical sufficiency within the framework of speech topics and grammatical correctness; - systematizes the conceptual foundations for understanding the partner's communicative intentions at this level; - owns the techniques of linguistic description and analysis of the causes and consequences of events in scientific and social texts;
Content	Social sphere of communication: Family in modern society. Socio-cultural sphere of communication: Entertainment. Socio-cultural sphere of communication. Self care. Sociocultural sphere of communication: cultural and historical background. Sociocultural sphere of communication: cultural and historical background. Socio-cultural sphere of communication: Cultural and historical background / Personal, private life. Sociocultural sphere of communication. Culture. Educational communicative sphere/World. Educational communication sphere. Student life. Sociocultural sphere of communication: Cultural and historical background. Education. Professional sphere of communication (the title of the topic depends on the specialty). Professional sphere of communication (the title of the topic depends on the specialty). Professional sphere of communication (the title of the topic depends on the specialty). Professional sphere of communication (the title of the topic depends on the specialty). Professional sphere of communication (the title of the topic depends on the specialty).
Examination forms	Combined exam: listening, reading, speaking.
Study and examination requirements	Students are required to attend practical classes in a foreign language and take an active part in the implementation of INDEPENDENT WORK OF STUDENTS tasks, the results of which are accepted by the teacher online or in the classroom of the university, depending on the type and form of the task.
Technical, multimedia tools and software	Presentation projector. Edpuzzle, Kahoot, Socrative, Edmodo.
Reading list	1. Latham-Koenig. English File: Pre-Intermediate Student's Book, 3d ed., Oxford University Press, 2016. 2. Latham-Koenig. English File: Intermediate Student's Book, 3d ed., Oxford University Press, 2016. 3. Latham-Koenig. English File: Pre Intermediate Student's Book, 3d ed., Oxford University Press, 2016. 4. Reading Extra: A resource book of multi-level skills activities / Driscoll Liz. - 9th printing. - Cambridge [etc.]: Cambridge university press, 2017. 5. Speaking extra: a resource book of multi-level skills activities / Gammidge Mick. - 13th print. - Cambridge: Cambridge university press, 2017. 6. Listening Extra: A resource book of multi-level skills activities / Craven Miles. - 10th printing. - Cambridge [etc.]: Cambridge university press, 2016. 7. Writing extra: a resource book of multi-level skills activities / Palmer Graham. - 11th print. - Cambridge: Cambridge university

	press, 2016.

Module 3

Module code and name	KAZK 11104, KAZK 11204 Kazakh language
Semester(s), when the module is taught	1,2
Responsible for module person	Kulmanov K.S.
Language of study	Kazakh
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Group work. Problematic discussion. search method. Design. Essay. situational modeling. Text analysis. Creative writing.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours - 1 sem., (300 hours per year). Practical: 45 hours -1 sem, (90 hours per year), independent work of students: 105 hours (210 hours per year).
Credit points (total by discipline)	10 ECTS
Required and recommended prerequisites for joining the module	To master this module, you need the knowledge, skills and abilities acquired by the student in the course "Kazakh language" (A1, A2, B1).
Module objectives/intended learning outcomes	To train students in listening (listening), speaking, reading and writing at level B2. Participate in communication in various situations in different areas of communication in order to realize their own intentions and needs (household, educational, social, cultural), declaring them ethically correct, meaningfully complete, lexico-grammatically and pragmatically adequate to the situation at level B2; To carry out the correct choice and use of language and speech means for solving certain problems of communication and cognition based on knowledge of a sufficient amount of vocabulary, a system of grammatical knowledge, pragmatic means of expressing intentions at level B2.
Content	Introduction to the course. Kazakhstan on the way to independence: stages of formation of the idea of a national state. Civil-political confrontation. Implementation of the Soviet model of state building. Contradictions and consequences of Soviet reforms in Kazakhstan in the second half of the twentieth century. Formation of the state structure of the Republic of Kazakhstan. Kazakhstani model of economic development. Social modernization is the basis for the well-being of society. Ethno-demographic processes and strengthening of interethnic harmony. Prospects for socio-political development and spiritual modernization. The policy of forming a new historical consciousness and worldview of the peoples of the Great Steppe. Kazakhstan is a state recognized by the modern world. Formation of a nation of a single future.
Examination forms	Combined exam: listening, reading, speaking.
Study and examination requirements	Interactive whiteboard, projector, electronic textbook, computer, assignments for practical exercises, specialty texts, additional handouts.
Technical, multimedia tools and software	Presentation projector.
Reading list	1. Asanova U.O., Abduova B.S., Adilbek A.M., Magzumbekova A.Q. Qazaq tili. B1 dengejine arnalgan oku quraly). Nur-Sultan: EUU, 2021. – 150 bet. 2. Alimbek G.R. Orystildilerge arnalgan Qazaq tili (B1, B2 orta

	dengejine arnalgan oqu quraly). Nur-Sultan: «AIIDA baspasy PUBLISHING», 2021. -232 bet. 3. Qulmanov Q.S., Adilbek A.M., Magzumbekova A.Q., Hamitova A.G. Qazaq tili (A1 dengeji. Sheteldik studentterge arnalgan oqu quraly). Nur-Sultan: L.N.Gumilev at. EUU, 2021. – 176 bet.

Module 4

Module code and name	RUSS 11104, RUSS 11204 Russian language
Semester(s), when the module is taught	1,2
Responsible for module person	Nurgazina A.B.
Language of study	Russian
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Group work. Problematic discussion. search method. Design. Essay. situational modeling. Text analysis. Creative writing.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours - 1 sem., (300 hours per year). Practical: 45 hours -1 sem, (90 hours per year), independent work of students: 105 hours (210 hours per year).
Credit points (total by discipline)	10 ECTS
Required and recommended prerequisites for joining the module	To master this module, you need the knowledge, skills and abilities acquired by the student in the Russian language course (A1, A2, B1).
Module objectives/intended learning outcomes	To train students in listening (listening), speaking, reading and writing at level B2. Participate in communication in various situations in different areas of communication in order to realize their own intentions and needs (household, educational, social, cultural), declaring them ethically correct, meaningfully complete, lexico-grammatically and pragmatically adequate to the situation at level B2; To carry out the correct choice and use of language and speech means for solving certain problems of communication and cognition based on knowledge of a sufficient amount of vocabulary, a system of grammatical knowledge, pragmatic means of expressing intentions at level B2.
Content	Actual problems of modern science. New discoveries of scientists: prospects for use and possible risks. Scientific discoveries and ethics. Achievements in the field of the studied science. The development of science (studied by students). The current state of the studied science. My specialty and globalization. Written business communication. Business email correspondence. Oral business communication. Terminology of science. Specialty language. Written academic text. Culture of professional speech. Types of professional communicative situations.
Examination forms	Combined exam: listening, reading, speaking.
Study and examination requirements	Interactive whiteboard, projector, electronic textbook, computer, assignments for practical exercises, specialty texts, additional handouts.
Technical, multimedia tools and software	Presentation projector. Reference and information Internet portal - www.gramma.ru Reference and information Internet portal - www.dic. academic.ru Reference and information Internet portal - www.slovari.yandex.ru

Reading list	1.Orys tılı: universitetterdıñ qazaq bölımderınıñ (bakalavriat) studentterıne arnalğan oqu qūraly / K.K. Ahmedärov, Ş.Q. Jarqynbekova redaksialağan. – 4-şı basylym. – Almaty: «Evero», 2019. – 241 b. 2. Juravleva E.A., Asmağambetova B.M., Taşimhanova D.S., İavorskaia E.E., Te M.V., Eşekeneva A.K. Käsıbi orys tılı: oqu-ädıstemelık qūral / E.A. Juravlevanyñ jalpy redausialauymen. – Almaty: «Evero» baspasy, 2021. – 242 b.

Module 5

Module code and name	MATH 12001 Mathematics
Semester(s), when the module is taught	1
Responsible for module person	Bayarystanov A., Professor, Candidate of Physical and Mathematical Sciences, Department of Higher Mathematics
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 210 hours. Lecture – 30 hours, Seminar – 45 hours, Independent work of students – 135 hours
Credit points (total by discipline)	7 ECTS
Required and recommended prerequisites for joining the module	For the successful completion of the Module you need to know the mathematics of the secondary school.
Module objectives/intended learning outcomes	This module is offered to students of technical specialties of the university in order to master the basic knowledge of mathematics. It is aimed at helping students to develop skills in using mathematical apparatus to solve the problems of everyday practice Students completing the module should be able: - fundamentals of linear algebra with elements of analytical geometry; must know the sections of mathematical analysis provided. - be able to use mathematical methods to solve typical professional problems. - to learn to create mathematical models of processes with simple systems in science. - to learn to choose the optimal numerical methods for solving mathematical and technical problems. - to learn to process the obtained results.
Content	Determinants and matrices and methods applied to them, methods for solving systems of linear equations, vectors and operations applied to them, analytical geometry in planes and spac, function, derivative of a function, higher order derivatives and differentials, research of functions, indefinite integrals, their properties, definite integrals and their applications. Logic elements, differential and integral calculus, the theory of series.
Examination forms	Written exam
Study and examination requirements	Attending lessons, active participation at lessons, on time completion and submission of independent work of students, attending at rating weeks, passing the tasks of final control. The final score will be weighted as follows: -20% for assignments and classroom work; -40% for two intermediate controls; -40% for the final written exam. Two intermediate controls end with a colloquium (discussion of the course content). The final written exam (90 min.) consists of short answer questions covering approximately half of the grades followed by

	one long practice problem solving exercise. In the written exam, students demonstrate their understanding of the course content by completing assignments.
Technical, multimedia tools and software	e-Learning MOODLE, interactive whiteboard, laptop, LCD projector
Reading list	1. Bayarystanov AO Higher Mathematics - I: textbook, Almaty, "Nur Print", 2018. 2. Bayarystanov AO Higher Mathematics - II: textbook, Almaty, "Nur Print", 2018. 3. Bayarystanov AO, Idrisov Zh.M. Theory and problems of linear algebra and analytical geometry: textbook, Almaty, "Nur Print", 2019. 4. Bayarystanov AO, Matin DT Theory and problems of boundaries and works: textbook, Almaty, "Nur Print", 2019. 5. Bayarystanov AO, Abylayeva AM, Aldibayeva LT Theory and problems of indefinite and definite integrals: textbook, Almaty, "Almanakh", 2020. 6. Minorsky VP Collection of tasks in higher mathematics: textbook, Moscow, 2018. 7. Danko P.E. and others. Higher Mathematics in Exercises and Tasks Part I: Textbook, Moscow, 2018.

Module 6

Module code and name	COMS 22002 Programming in language C++
Semester(s), when the module is taught	1
Responsible for module person	Turebayeva R.D.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 30 hours, laboratory – 60 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	For the successful completion of the Module you need to know the computer science of the secondary school.
Module objectives/intended learning outcomes	As a result of studying the discipline, the student must: - know the history of the creation of programming languages, the composition and functions of programming systems; - be able to develop programs using a programming environment with a text and graphical interface, to implement the basic principles of structured programming; competently use the basic data types, functions and classes of the standard library, components of the programming environment, the ability to handle exceptions; choose methods for solving a problem, create or select algorithms, implement algorithms in a programming language - have the skills to use the capabilities of the integrated programming environment, debug and find errors, as well as professional tools for solving applied programming problems in the domain.
Content	Discipline is designed to study standard data types, constants, variables, operations, one-dimensional and multidimensional arrays, pointers. Allows you to develop software in C ++ programming language. Concepts of programming technology

	Introduction to C / C ++. Preprocessor directives. Classification of operators of an algorithmic language. Assignment operator. Control operators in C ++. Conditional operator. Selection operator. Cycle operators. One-dimensional and multi-dimensional arrays. Strings. Functions. Text files. Binary files. Structures. Dynamic structures in C ++. The basics of object-oriented programming, memory organization and addressing, development of programs using pointers, peculiarities of C ++ programming.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40% for the final written exam. Two intermediate controls end with a colloquium (discussion of the course content). The final written exam (90 min.) consists of short answer questions covering approximately half of the grades, followed by one lengthy practical problem solving exercise. In the written exam, students demonstrate their understanding of the course content by completing assignments. The following aspects of teaching programming are assessed: designing algorithms, describing algorithms, using a programming environment to enter, edit, and debug code.
Technical, multimedia tools and software	e-Learning MOODLE, Computer software packages on the programming language C++, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Fedorenko Yu.P. Algorithms and programs in C ++ Builder. DMK Press. 2019.-544 p. 2. T. Cormen, C. Leiserson, R. Rivest, K. Stein. Algorithms: construction and analysis. 3rd ed. Per. From English. - M .: Williams, 2014. 3. S. Lippmann, J. Lajoye, B. Mu. C ++ programming language. Basic course. 5th ed. - M .: Williams, 2014. 4. Ogneva M.V., Kudrina E.V. - Programming in the C ++ language: Practical course. Textbook for undergraduate and specialty studies - M.: Yurayt Publishing House - 2019 – 335 p. - ISBN: 978-5-534-05123-0

Module 7

Module code and name	PhCS 14114, PhCS 14214, PhCS 14314, PhCS 14414 Physical Training
Semester(s), when the module is taught	1,2,3,4
Responsible for module person	Marchibaeva U.S., Nazarkina O.N.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Practices
Workload (incl. contact hours, self-study hours)	Total workload: 60 hours - 1,2,3,4 sem. (240 hours per year). Practical: 60 h -1,2,3,4 sem. (240 hours per year).
Credit points (total by discipline)	8 ECTS
Required and recommended prerequisites for joining the module	To master the course of physical culture, knowledge, skills and abilities acquired in the study of the following disciplines are necessary: anatomy, pedagogy, biology.

Module objectives/intended learning outcomes	Formation of competencies in physical culture, aimed at developing the student's personality and the ability to use the means and methods of physical culture and sports for the preservation and promotion of health, psychophysical training and self-preparation for future life and professional activities. Willingness to apply methods, means, fundamentals of the theory and methodology of physical culture and sports to ensure a full-fledged social and professional activity. - formation of a healthy lifestyle and lifestyle; - independently select and apply methods and means of physical culture for the formation and improvement of basic physical qualities and motor skills; -correctly perform physical exercises, calculate the dosage of the exercise and make up sets of exercises for the development of basic physical qualities. -preparation for professional activity and service in the Armed Forces of the Republic of Kazakhstan;
Content	The discipline "Physical culture" is the most important component of the integral development of the personality. Being an integral part of the general culture and professional training of a student throughout the entire period of study, physical culture is an obligatory section in all components of education, the significance of which is manifested through the harmonization of spiritual and physical forces, the formation of such universal values as health, physical and mental well-being, physical perfection . It ensures the continuity of the educational process with the programs of physical education of students in schools and secondary specialized educational institutions.
Examination forms	Differentiated offset
Study and examination requirements	Students who have not attended all the practical classes are not allowed to take a differentiated test. Repetitions of the topic and working out of the materials covered for each training session are required. The degree of mastering the educational practical material is checked by testing the physical fitness of students. Students may be tested without warning.
Technical, multimedia tools and software	Sports simulators, sports equipment, TV and video equipment
Reading list	1. Moiseyeva N.A.Gimnastika s metodikoy prepodavaniya : uchebnoye posobiye / N.A. Moiseyeva. - Almaty : New book, 2020. - 152, [1] s. : il., tabl. - Bibliogr.: s. 147. - ISBN 978-601-301-906-2.75.6ya7 2. Borodikhin V.A.Zdorov'yesberegayushchaya napravlennost' fizicheskogo vospitaniya i sporta shkol'nikov i uchashcheysya molodozhi : [monografiya] / V.A. Borodikhin, ZH.A. Usin, ZH.A. Usina. - Almaty : SSK, 2019. - 302, [1] s.: diagr., tabl. - Bibliogr. v kontse chastey. - ISBN 978-601-327-892-6.75.1 3. Teoriya i metodika obucheniya bazovym vidam sporta. Legkaya atletika : uchebnik dlya obrazovatel'nykh uchrezhdeniy vysshego professional'nogo obrazovaniya, po napravleniyu podgotovki "Fizicheskaya kul'tura" / G.V. Gretsov, S.Ye. Voynova, A.A. Germanova i dr.; pod redaktsiyey G.V. Gretsova i A.B. Yankovskogo. - 3-ye izd., ispr. - Moskva: Akademiya, 2016. - 287, [1] c: il., tabl. - (Vyssheye obrazovaniye. Fizicheskaya kul'tura i sport) (Bakalavriat). - Bibliogr.: s. 284-286. - ISBN 978-5-4468-3134-0. 4. Marchibayeva U.S. Metodicheskiye osnovy fizicheskoy kul'tury: elektronnyy uchebnik / Mubarakkyzy B.M., Tashkeyev

	D.S., Kulanova K.K.,Sidorova R.V. Astana: YENU im. L.N. Gumileva, 2015. Svidetel'stvo o gosudarstvennoy registratsii prav na obyekt avtorskogo prava. IS 002796.

Module 8

Module code and name	CSSE 11005 Information and Communication Technologies
Semester(s), when the module is taught	2
Responsible for module person	Karymsakova A.E.
Language of study	English
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Informatics
Module objectives/intended learning outcomes	The purpose of using ICT multimedia in the educational process is determined by the possibility of implementing intensive forms and methods of teaching, strengthening the motivational component of learning through the use of modern means of processing audiovisual information, increasing the level of emotionality of its perception, and developing skills to implement various forms of independent information processing activities. Knowledge: – to explain the purpose, content and development trends of information and communication technologies, to justify the choice of the most appropriate technology for solving specific problems; to know the features of the use of multimedia on the Internet; – to explain methods of collecting, storing and processing information, ways of implementing information and communication processes; to develop multimedia content; – to describe the architecture of computer systems and networks, the purpose and functions of the main components; – to use information Internet resources, cloud and mobile services to search, store, process and disseminate information; – to apply software and hardware of computer systems and networks for collecting, transmitting, processing and storing data; – to analyze and justify the choice of methods and means of information protection; – using digital technologies to develop analysis and data management tools for various types of activities; – to carry out project activities in the specialty using modern information and communication technologies. Competencies: – mastering by students of the conceptual foundations of the architecture of computer systems, operating systems and networks; evaluate the effectiveness of digitalization in professional areas; – formation of knowledge about the concepts of developing network and web applications, information security tools; – developing skills in the use of modern information and communication technologies in various areas of professional activity, scientific and practical work, for self-education and other

	purposes.
Content	The role of ICT in key sectors of the development of society. ICT standards. Introduction to computer systems. Architecture of computer systems. Software. Operating Systems. Human-computer interaction. Database systems. Data analysis. Data management. Networks and telecommunications. Cybersecurity. Internet technologies. Cloud and mobile technologies. multimedia technologies. Smart technologies. Electronic technologies. Electronic business. E-learning. Electronic government. Information technologies in the professional sphere. Industrial ICT. Prospects for the development of ICT.
Examination forms	Computer testing
Study and examination requirements	Mandatory attendance of online and classroom classes, active participation in the discussion of issues, preliminary preparation for lectures and practical exercises, high-quality and timely completion of tasks of the INDEPENDENT WORK OF STUDENTS, participation in all types of control.
Technical, multimedia tools and software	Personal computer, interactive whiteboard
Reading list	1. Brown G., Sargent B., and Watson D. Cambridge IGCSE ICT. - London: Hodder Education Group, 2015. -439 p. 2. Williams B. K. and Sawyer S. Using information technology: A practical introduction to computers & communications. - New York: McGraw-Hil., - 8th ed. -2010. -563 p. 3. Watson D. and Williams H. Cambridge IGCSE Computer Science: Hodder Edu.; 3 ed. 2015.-278 p. 4. Evans V. Information technology. Books 1-3: English for specific purposes.- 5th impr.- Newbury: Express Publishing, 2014.- 40 p.

Module 9

Module code and name	COMS 22003 Programming in Python
Semester(s), when the module is taught	2
Responsible for module person	Turebayeva R.D.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory classes – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The purpose of this course of study problem-solving methods and algorithm development. Includes procedural and data abstractions, program design, debugging, testing, and documentation. Covers data types, control structures, functions, parameter passing, library functions, arrays, inheritance and object oriented design. The course discusses the fundamental principles of Object-Oriented Programming, as well as in-depth data and information processing techniques. Students will solve problems, explore real-world software development challenges, and create practical and contemporary applications.

	Students completing the module should: - Understand basic principles of computers - Understand basics of binary computation - Understand the programming basics (operations, control structures, data types, etc.) - Be able Readily use the Python programming language - Understand the object-oriented program design and development.
Content	Conceptual introduction: topics in computer science, algorithms; modern computer systems: hardware architecture, data representation in computers, software and operating system; installing Python; basic syntax, interactive shell, editing, saving, and running a script. Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file. Program structure and design. Recursive functions. Modularization and Classes. Standard modules. Packages. Defining Classes. Defining functions. Functions and arguments (signature). Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects. OOP, continued: inheritance, polymorphism, operator overloading (_eq, _str, etc); abstract classes; exception handling, try block. Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; --40% for the final written exam. Two intermediate controls end with a colloquium (discussion of the course content). The final written exam (90 min.) consists of short answer questions covering approximately half of the grades, followed by one lengthy practical problem solving exercise. In the written exam, students demonstrate their understanding of the course content by completing assignments. The following aspects of teaching programming are assessed: designing algorithms, describing algorithms, using a programming environment to enter, edit, and debug code.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Zlatopolsky DM Basics of programming in the Python language. - M.: DMK Press, 2017. - 284 p. 2. Лутц М. Programming in Python, Volume I, 4th Edition. - Per. SPb.: Simvol-Plus, 2011. - 992 p. 3. Лутц М. Programming in Python, Volume II, 4th Edition.- Per. SPb.: Simvol-Plus, 2011. - 992 p. 4. Gaddis T. Let's start programming in Python. - 4th ed.: Per. SPb .: BHV-Petersburg, 2019. - 768 p.

Module 10

Module code and name	MATH 22004 Probability theory and mathematical statistics
Semester(s), when the module is taught	2

Responsible for module person	Bayarystanov A., Professor, Candidate of Physical and Mathematical Sciences, Department of Higher Mathematics
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory classes – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	School Mathematics, MATH 12001 Mathematics
Module objectives/intended learning outcomes	In this course, students of technical specialties of the university are introduced to the theory of probability and the application of mathematical statistics in science and industry, modern methods of statistics. The basic elements of combinatorics, the classical definition of probability, the basic theorems of probability, full probability, Bayesian, Bernoulli formulas, discrete and continuous random variables, limit theorems in Bernoulli's scheme, important laws of distribution, basic concepts of mathematical statistics are considered. Students completing the module should: - know the most important concepts, methodology and methods for calculating the main indicators of probability distributions, methods for calculating the parameters of random processes; - be able to independently conduct statistical research at each of its stages; model and analyze queuing systems; - have the skills to build and analyze mathematical models that take into account random factors, be able to apply analysis methods to evaluate the model parameters, to solve forecasting problems.
Content	Elements of combinatorics. Random events. Classical and statistical definition of probability. Theorems of probability theory. Total probability and Bayes formula. Repeated independent tests. Bernoulli's formula. Laplace's local and integral theorem. Random variables. Discrete random variables and the law of their distribution. The law of large numbers. Elements of mathematical statistics. Elements of correlation theory. Statistical verification of statistical forecasts. Basic concepts. Comparisons. Modeling of random variables. Monte Carlo method. Calculation of the definite integral by the Monte Carlo method
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Testing. Two Midterms are completed by a colloquium (a discussion of the course content). Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Bayarystanov AO Higher Mathematics - II: textbook, Almaty,

	"Light Print", 2018. 2. Minorsky VP Collection of tasks in higher mathematics: textbook, Moscow, 2018. 3. Gmurman VE Guide to solving the problem on the theory of probabilities and mathematical statistics: textbook, Moscow, 2016. 4. Danko P.E. and others. Higher Mathematics in Exercises and Tasks Part II: Textbook, Moscow, 2018. 5. Akanbay N. Probability theory and mathematical statistics Parts I and II: textbook, Almaty, "Kazakh University", 2017. 6. Ryabushko AP Individual tasks in higher mathematics Part IV: textbook, Minsk, "Higher School", 2016.

Module 11

Module code and name	EDIN 22005 Educational internship
Semester(s), when the module is taught	2
Responsible for module person	
Language of study	Kazakh/Russian/
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Practices
Workload (incl. contact hours, self-study hours)	90 hours (The duration of the practice is determined in weeks based on the student's standard working time in practice during the week, equal to 30 hours (6 hours per day with a 5-day working week)
Credit points (total by discipline)	3 ECTS
Required and recommended prerequisites for joining the module	Programming in language C++, Programming in Python
Module objectives/intended learning outcomes	Objectives of the Educational internship: - consolidation and deepening of theoretical knowledge consolidation and deepening of theoretical knowledge on programming in C++ and Python - formation and improvement of basic professional skills and abilities in the field of application of modern information technologies; - introduction and development of skills to work with real research, industrial and educational projects; - formation of information competence for the purpose of successful work in professional activity; - getting skills of independent work, as well as working as part of a team; - processing of the received materials and preparation of the report on the educational practic. Learning outcomes: - able to learn, acquire new knowledge, skills, including in a field other than professional; - able to work with information: find, evaluate and use information from various sources; - able to describe problems and situations of professional activity using programming languages - able to write, design, debug, and optimize program code in Python and C++
Content	1. Search, study and analysis of literature on the task at hand. 2. Creating a mathematical model of the task.

	3. Development of an algorithm for solving the problem and search for optimal solutions. 4. Writing and software implementation of the algorithm. 5. Testing debugging of program code.
Examination forms	Report
Study and examination requirements	Based on the results of the practice, students provide a report on the practice in the format of a paper and electronic document, which reflects the performance of an individual assignment during the practice, acquired skills and abilities, formed competencies. The student reports on the results, answers the questions posed, provides a package of documents based on the results of the professional internship and expresses his conclusions and proposals to the commission.
Technical, multimedia tools and software	C++, Python, PC
Reading list	1. S. Lippmann, J. Lajoye, B. Mu. C ++ programming language. Basic course. 5th ed. - M .: Williams, 2014. 2. Gaddis T. Let's start programming in Python. - 4th ed.: Per. SPb .: BHV-Petersburg, 2019. - 768 p 3. Zlatopolsky DM Basics of programming in the Python language. - M.: DMK Press, 2017. - 284 p

Module 12

Module code and name	PHIL 21002 Philosophy
Semester(s), when the module is taught	4
Responsible for module person	Tolgambayeva D.T.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Flipped class, problem lecture, case studies, brainstorming, game methods
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	History of Kazakhstan, Culturology
Module objectives/intended learning outcomes	The purpose of the course is to form students' holistic systemic understanding of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activities. - Know the meaning of the main philosophical concepts and categories, the content of the main philosophical concepts regarding fundamental philosophical problems, the patterns of development of nature, society and thinking; - Be able to apply the conceptual and categorical apparatus, the basic laws of the humanities and social sciences in professional activities; apply methods and means of cognition for intellectual development, raising the cultural level, professional competence; analyze the processes and phenomena occurring in society; interpret philosophical texts (primary sources and commentary literature), as well as express their interpretation both in writing and orally; - Have the skills of philosophical thinking to develop a systematic,

	holistic view of the problems of society; competently express and argue their point of view (orally and in writing) when borrowing and interpreting one or another of the learned ideas and concepts, the ability to trace the relationship between various traditions and trends.
Content	The emergence of a culture of thinking. The subject and method of philosophy. Fundamentals of philosophical understanding of the world. Consciousness, soul and language. Being. Ontology and metaphysics. Knowledge and creativity. Education, science, engineering and technology. Man and the Universe. World of things. Life and death. Meaning of life. Ethics. Philosophy of values. Axiology and morality. Philosophy of freedom. The concept of freedom in the history of philosophy. Philosophy of art. Society and culture. Philosophy of history. Philosophy of religion. “Mangilik el” and “Rukhani zhangyru” are the philosophy of the new Kazakhstan.
Examination forms	Computer testing
Study and examination requirements	Class attendance and active participation in the learning process are mandatory. High-quality and timely fulfillment of the tasks of the INDEPENDENT WORK OF STUDENTS, actively participate in the oral survey conducted by the teacher during classes, written express control. The preparation by the student of messages (reports) on certain issues of the topic being studied, participation in a free discussion organized by the teacher in order to consolidate and deepen the knowledge gained in lectures and in the process of independent work also contributes to a significant increase in the level of knowledge. For the qualitative mastering of the course, the student must be guided by the fact that he independently works with texts, approximately 40-60 pages per week. To successfully pass the final control, the student will have to pass test tasks in Platonus in the amount of 40 questions.
Technical, multimedia tools and software	Computer, projector, and applications: mook.enu.kz, moodle.enu.kz
Reading list	1. Abdil'din ZH.M., Abdil'dina R.ZH.. Istoriya filosofii. – Almaty, Asem-Sistem, - 2010. – 258 s. 2. Hess R. Filosofiyanyң tandauly 25 kitaby. /Fylymi red. Raev D.S. – Astana, 2018. –360 b. 3. Esim, G.. Metafizika cheloveka.- Almaty, 2012 4. Mironov V.V.Filosofiya. Uchebnik. – M.: Prospekt, 2016. – 289 s 5. Masalimova A.R., Altaev ZH.A., Kasabek A.K. Kazahskaya filosofiya. Uchebnoe posobie. – Almaty, 2018 6. Dzhonston D. Kratkaya istoriya filosofii/ per. E.E. Suharev. – M.: Astrel', 2010. – 236 s 7. Esim, G.. Hakim Abaj.- Astana, 2012 8. Esim, G.. Mudrost' SHakarima.- Almaty, 2008

Module 13

Module code and name	EDUC 22001 Social and Political Knowledge Module
Semester(s), when the module is taught	3
Responsible for module person	Burbaeva P.T
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (compulsory component)
Teaching methods	Flipped class, problem lecture, case studies, brainstorming,

	game methods
Workload (incl. contact hours, self-study hours)	Total workload: 240 hours. Lectures: 30 hours, practical: 60 hours, independent work of students: 150 hours.
Credit points (total by discipline)	8 ECTS
Required and recommended prerequisites for joining the module	History of Kazakhstan, Culturology
Module objectives/intended learning outcomes	The purpose of studying the course: the formation of the socio-humanitarian outlook of students in the context of solving the problems of modernizing public consciousness, defined by the state program "Looking into the Future: Modernizing Public Consciousness". Expected learning outcomes based on the results of mastering the course: - to explain and interpret the subject knowledge (concepts, ideas, theories) of sociology that make up the training courses of the module; - explain the socio-ethical values of society as a product of integration processes in the systems of basic knowledge of the courses of the socio-political module; - algorithmically represent the use of scientific methods and research techniques in the context of specific training courses and in the procedures for interacting module courses; - to explain the nature of situations in various areas of social communication based on the content of theories and ideas of the scientific areas of the courses being studied; - reasonably and reasonably provide information about the various stages of development of Kazakhstani society, public and interpersonal relations; - to analyze the features of a social institution in the context of their role in the modernization of Kazakhstani society.
Content	Subject and object of science. Introduction to the theory of sociology. sociological theory. The development of individual schools and trends (O. Comte, G. Spencer, E. Durkheim, M. Weber, K. Marx). Social structure and stratification of society. Society, equality and inequality. Open and closed society. Stratification as a structured inequality between different groups. Systems of stratification and differentiation. Brief review of theories of social stratification (K. Marx, M. Weber). Forms of social stratification (P. Sorokin). social mobility. Horizontal and vertical mobility. Socialization and identity. Relations between the individual and society. Theories of socialization and identity. (T. Parsons, G. H. Mead). Stages of socialization. primary socialization. Average socialization. Adult stage of socialization. Gender socialization. Gender order. Identity and personality. Social and personal identity. Roles and statuses. Sociological research. Sociological research design. Explore the issue. Hypotheses. Variables. Sample. Information collection methods. Qualitative and quantitative. Data analysis.
Examination forms	Computer testing
Study and examination requirements	Students are required to attend lectures and seminars, preparing in advance for lectures and seminars on the basis of textbooks and basic literature, participate in all types of control (current control, midterm control, final control), mandatory participation in intermediate and final certification tests, fulfillment of teacher's tasks. The activity of work at the seminar (the ability

	to lead a discussion, to argue one's position with references to the literature studied, a creative approach to the selection and analysis of texts), the quality of individual written assignments (glossary, etc.) and creative work (essays) are highly valued.
Technical, multimedia tools and software	PowerPoint, MindMeister, Miro.com, XMind, Lucidchart, Canva
Reading list	Basic references: 1. Biyekenov K.U., Biyekenova S.K., Kenzhakimova G.A. «Sotsiologiya: Uch. posobiye». – Almaty: Evero, 2016. – 584 s. 2. Äbdirayimova G.S. Jastar sociologiyasy: oku kuraly. 2-basylym. – Almaty: «Kazak universitety», 2012. – 224 s. 3. Brïnkerxof D, Weyts R., Ortega S. Aleumettanu negizderi.- Almaty: Ulttik audarma byurosy, 2018 4. Dj.Rïtcer, Dj. Stepnïckï Aleumettanu teoriyasi.- Almaty: Ulttik audarma byurosy, 2018. 5. Aitov N.K. Aleumettanu. Astana, 2015 6. Smagambet B.Zh. Sheteldik aleumettanu tarikhy. – Almaty: Evero, 2016.

Module 14

Module code and name	MATH 22006 Discrete mathematics
Semester(s), when the module is taught	3
Responsible for module person	Razakhova B.Sh.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture - 30, Seminar-15, Independent work of students - 105
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	MATH 12001 Mathematics
Module objectives/intended learning outcomes	The purpose of teaching the discipline "Discrete Mathematics" is to form students professional competencies related to the ability to use the basic laws of mathematical logic in professional activities and the use of methods of the mathematical apparatus of discrete mathematics to solve problems of the subject area. Students completing the module should: - to have the skills to use the appropriate mathematical apparatus of discrete mathematics in solving professional problems; - use simple versions of evidence to substantiate or refute various conclusions or hypotheses, to analyze the logical structure of reasoning, to study scientific problems; - mastering the skills of solving basic problems of the theory of discrete mathematics; - application of elements of discrete mathematics for new scientific and professional education with the use of modern educational and information technologies; - ability to solve scientific or industrial problems at a high level using elements of discrete mathematics.
Content	Sets. Methods applied to them and their properties. Basic rules of combinatorics. Input-output formulas. Selections and their types. Placements, substitutions and dials are repetitive, non-

	repetitive. Conclusions and methods applied to them. Reality table. Formulas. Classification of formulas of algebra of concepts. Boolean functions. Superposition of Boolean functions. Normal forms. Disjunctive and normal conjunctive forms. Perfect normal forms. Mature disjunctive and conjunctive normal forms. Zhegalkin polynomial. Algorithm for creating Zhegalkin polynomials. Closing methods. Basic closed classes: To, T1, S, M, L. Complete system of operations. The concept of a graph. Methods and classifications of graphs. Matrix representation of graphs. Graphs with weights. Weight matrix. Incident matrices. Routes and overpasses. Trees. Algorithms for tree paths. Algorithm for finding the shortest path. Network flows and two-way graphs. Colouring graphs.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Testing. Two Midterms are completed by a colloquium (a discussion of the course content). Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Gerasimov A.S. Course of mathematical logic and theory of computability. S. P. 2011. (in russian) 2. Dzhumadildaev A.S. Elements of discrete mathematics. Training manual. Part 1. Almaty, 2004. (in russian) 3. Igoshin V.I. Problems and exercises in mathematical logic and the theory of algorithms. Moscow, 2007 (in russian) 4. Shaporev S.D. Discrete mathematics, a course of lectures and practical classes. S. P., 2006. (in russian) 5. Zhetpisov, K. Mathematical logic and discrete Mathematics, 2011 (in kazakh) 6. Novikov. F.A. Discrete mathematics for bachelors and Masters, 2013 (in russian) 7. Tusupov DA Basics of discrete mathematics. Taraz, 2010 (in kazakh)

Module 15

Module code and name	COMS 23001 Knowledge representation models and languages
Semester(s), when the module is taught	3
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory classes – 30 hours,

	Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Mathematics, Programming in language C++
Module objectives/intended learning outcomes	This module provides an introduction to the theory and implementation of neural networks, both biological and artificial. It aims to give students sufficient knowledge to enable employment or postgraduate study involving neural networks. Students completing the module should be able: to demonstrate an understanding of the principles of Neural Networks and a knowledge of their main areas of application; -the ability to design, implement and analyse the behaviour of simple neural networks. - critically evaluate model performance and interpret results; -write reports in which results are assessed and summarized in relation to aims, methods and available data
Content	Models of knowledge representation and rules of inference are considered: production model of knowledge representation and rules for their processing; relational models of knowledge representation and corresponding ways of reasoning; frames, semantic networks; theory and technique of knowledge acquisition; principles of knowledge acquisition. Existing approaches and solution techniques, expert systems - a tool for automated training systems; knowledge base. Rules; objects; definition of the request; editor; procedural language; compiler of rules and objects. Expert systems; artificial intelligence languages. The concept of fuzzy sets and their relationship with the theory of constructing expert systems; implementation of expert systems in the Windows environment.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. V.V. Anisimov, R.A. Yeshenko. Intelligent information systems. Khabarovsk. Publishing house FVGUPS. 2017 2. Lapshin, V.A. Ontology in computer systems / V.A. Lapshin. - M.: Scientific world, 2010 .-- 224 p. 3. Shchipitsina L. Yu. Information technologies in linguistics. Moscow: Flinta, 2013 4. Fundamentals of building intelligent systems: textbook, G. V. Rybina, Moscow: Finance and statistics; Infra-M, 2014 5..Nesterov S.A. Databases: Tutorial. - SPb .: Publishing house of Polytechnic.University, 2013 .- 250 s 6.Khomonenko, Maltsev, Tsyganov: Databases: Textbook for

	higher educational institutions Publishing house: Korona-Print, 2019 - 736 p.

Module 16

Module code and name	COMS 23002 Databases and SQL queries
Semester(s), when the module is taught	3
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory classes – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Information and Communication Technologies
Module objectives/intended learning outcomes	In this course, students will explore issues related to database design. Learn languages of description and data manipulation. Students will gain knowledge of the basics of the SQL language. They will study such issues as: Creating a database. Controls for working with the database, their properties and methods. Examples of programs for performing basic data processing operations in the DBMS: - adding and deleting records, searching by various criteria, navigating the database. Students completing the module receive the following learning outcomes: - knowledge and use of modern instrumental and methodological tools database development; - acquaintance with the language of structured database queries (sql) and obtaining practical skills in working with data, organizing a database; - mastering a number of fundamental concepts, such as a data model, models for organizing user work with a database, normalization, indexing, database integrity; - knowledge of database architecture, have practical skills in using functional and supporting subsystems; - to complete course work related to the development of applied software, as well as be able to develop information systems of the widest profile in the future
Content	The information and data. Information relations and data interconnections. Database as an information model of the subject area. The centralized architecture. Computing model with network and file server (Architecture "File server"). Distributed computing model (Client-server architecture). Three-link (multi-link) architecture). Data Properties Supported in the database: independence, integration, protection, duplication. Data models. Abstract data types, data structure, basic data operations. Choice of data model. Relational data model. Attitude, attribute. Normalization of relations in the database. Relational algebra and relational calculus. SQL and QBE query languages. Creation of databases in a modern DBMS. Relational databases. Physical storage layer and file systems. SQL. Executing queries to retrieve data. Connections and theoretically

	multiple operations on relations. Defining the concepts of integrity Data in the SQL standard. Definitions of declarative and cascading referential integrity. SQL language. General rules access control. Modes Authentication and Components security structures. Implementing SQL statements in application programs
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, White-board, Laptop, LCD Projector
Reading list	1. Nesterov S.A. Databases: Tutorial. - SPb .: Publishing house of Polytechnic.University, 2013 .- 250 s 2.Khomonenko, Maltsev, Tsyganov: Databases: Textbook for higher educational institutions Publishing house: Korona-Print, 2019 - 736 p. 3. 3. E. Siore. Design and implementation of database management systems. DMK Press Publishing House, October 2020 - 466 pages 4.B. A. Novikov, E. A. Gorshkova. Basics of database technologies. DMK Press, 2018 - 240 pages 5.Tamer Yosu M., P. Valduries. Principles of organizing distributed databases. DMK Press, 2020 - 672 pages

Module 17

Module code and name	COMS 23003 Functional and logic programming for AI
Semester(s), when the module is taught	3
Responsible for module person	Turebayeva R.D.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture - 30, Laboratory -15, Independent work of students - 105
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Mathematics
Module objectives/intended learning outcomes	This module provides an introduction to the theory and implementation of neural networks, both biological and artificial. It aims to give students sufficient knowledge to enable employment or postgraduate study involving neural networks.

	Students completing the module should be able: - know methods for solving problems using logical and functional programming languages and their structure; - able to distinguish between different ways of solving logical programming problems, the use of program development using declarative programming languages; - analyze the possibilities, advantages and disadvantages of using different programming languages
Content	Base of the concepts of declarative language, transition from formal logic to logical programming, the first period of development of formal logic, logic of clauses and predicates, Horn disjuncts, introduction to the logic programming language Prolog, input and output predicates, return mechanism, recursion and lists, trees, string,. Natural language processing, predicates for string processing strings and files, dynamic database, system of functional programming, lists, definition of functions, list processing functions.
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Testing. Two Midterms are completed by a colloquium (a discussion of the course content). When compiling tests, the following are used: - selective method of entering answers (the student is invited to choose from one to 3 correct answers from 5-8 alternative answers for each test task), - a method for indicating the order of entering a response, - an effective method of entering answers (the tested one solves a numerical problem). Testing time is limited to 1.5 minutes per question. Each student is given a test of 40 questions of varying degrees of difficulty.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Ivanov D.A. Functional programming and more. - M. 2016 9. Graham P. ANSI Common LISP. -M. Symbol-Plus, 2012 2. Tsukanova N.I., Dmitrieva T.A. Theory and practice of logical programming language Visual Prolog 7. study guide. - M. 2013 3. Shreiner P.A. Fundamentals of programmirony in the Prolog language. - M. 2005 4. Adamenko A.I., Kuchukov A.M. Logic programming and Visual Prolog. - SPb .: BHV– Petersburg, 2003.– 992 p

Module 18

Module code and name	COMS 23004 Programming in R
Semester(s), when the module is taught	3
Responsible for module person	Turebayeva R.D.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture - 30, Laboratory -15, Independent work of students - 105
Credit points (total by discipline)	5 ECTS

Required and recommended prerequisites for joining the module	Information and communication technologies
Module objectives/intended learning outcomes	Learning outcomes Must know the basic objects used in the R language and how to work with them; ways of input and output of data from / to files of various formats; a set of tasks that can be solved using the R language; ways to update and expand the capabilities of free software "R". Must be able to use the vector version of object-oriented programming; Must be able to use R to solve the main problems of statistical data processing; connect program libraries to solve a wide class of statistical problems. Must be proficient in setting the tasks of statistical processing; searching the Internet for updates and language extensions, connecting them to work. Must demonstrate the ability and willingness to: use the statistical R language to solve statistical and processing problems data to improve language skills using reference and other official materials.
Content	Introduction to R language and the development environment course covers practical issues in statistical computing. Data types in R. Understanding the R type system. Vectors, lists, matrices and, arrays. Data types in R. Formulas and functions in R. Object attributes. Utility and Special Composite Objects. Expressions and commands in R. R Symbols, Constants, and Operations. Conditional statements (if ... else) For, while, and repeat loops. Interoperability with other programming languages. Writing Functions in R. Function Arguments and Argument Mapping. Object scope Environment. Mathematical calculations and modeling in R. Object Oriented Programming, Object class, Inheritance in R. Object Oriented Programming, management of objects. Build graphics. Graphics settings. Throwing exceptions / errors in R Catching and Handling Exceptions / Errors. Configuring Exception / Error Handling. Performance improvements: speed and memory. Useful functions from the core R library. Working with date and time Text / line processing Regular Expressions
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Testing. Two Midterms are completed by a colloquium (a discussion of the course content). When compiling tests, the following are used: - selective method of entering answers (the student is invited to choose from one to 3 correct answers from 5-8 alternative answers for each test task), - a method for indicating the order of entering a response, - an effective method of entering answers (the tested one solves a numerical problem). Testing time is limited to 1.5 minutes per question. Each student is given a test of 40 questions of varying degrees of difficulty.
Technical, multimedia tools and software	e-Learning MOODLE, Computer software packages on the programming language R, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Robert Kabakov. R in Action. - DMK-Press, 2014 .-- 588 p. - ISBN 978-5-947060-077-1. 2. Hadley Wickham, Garrett Growmund. R for Data Science: Visualize, Model, Transform, Tidy, and Import Data. - Williams, 2017 .-- 592 p. - ISBN 978-5-9909446-8-8, 978-1-491-91039-9. 3. Norman Matloff [en]. The Art of R Programming: A Tour of

	Statistical Software Design .. - Peter, 2019 .-- 416 p. - ISBN 978-5-4461-1101-5. 4. Mastitsky S.E., Shitikov V.K. Statistical analysis and data visualization using R. - M .: DMK Press, 2015 .-- 496 p.

Module 19

Module code and name	COMS 22007 Algorithms and data structures
Semester(s), when the module is taught	4
Responsible for module person	Turebayeva R.D.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture - 30, Laboratory -15, Independent work of students - 105
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Programming in language C++
Module objectives/intended learning outcomes	The purpose of mastering the discipline is to develop students' theoretical knowledge and practical skills in the field of the theory of algorithms, modern data structures and their implementation in a high-level programming language for building mathematical models of discrete structures and software development. Students completing the module should: - Knows elementary and specialized data structures used in various algorithms; main classes of algorithms: "divide and conquer", "greedy algorithms", algorithms for dynamic programming; - Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. - Knows how to estimate the complexity of algorithms on average and in the worst case; owns methods of developing effective algorithms - Able to choose the optimal algorithms and data structures, depending on specific constraints on the solution of the problem and apply approximate algorithms in cases where an effective exact solution is impossible. - Skills in the implementation of algorithms and data structures in procedural programming languages
Content	The concept of algorithms. Formal properties of algorithms. The complexity of the algorithm. Data structure concept. Classification of data structures. Operations on data structures. Dynamic data structures (arrays, lists, stacks, queues). Trees. Methods for storing trees in computer memory Binary search trees. Balanced search trees. Balance invariants support. Hash functions. Collision resolution methods: chaining method, open addressing. Priority queue. Binary heap. Graphs. Graph operations. Sequence processing algorithms. Basic sorting algorithms. Efficient sorting algorithms. Basic search algorithms. Recursive algorithms. Depth-first search and breadth-first search and its complexity. Application of data compression, classification of algorithms. Dynamic programming. "Greedy" algorithms and optimization problems.
Examination forms	Oral exam

Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Testing. Two Midterms are completed by a colloquium (a discussion of the course content). When compiling tests, the following are used: - selective method of entering answers (the student is invited to choose from one to 3 correct answers from 5-8 alternative answers for each test task), - a method for indicating the order of entering a response, - an effective method of entering answers (the tested one solves a numerical problem). Testing time is limited to 1.5 minutes per question. Each student is given a test of 40 questions of varying degrees of difficulty.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Fedorenko Yu.P. Algorithms and programs in C ++ Builder. DMK Press. 2019.-544 p. 2. T. Cormen, C. Leiserson, R. Rivest, K. Stein. Algorithms: construction and analysis. 3rd ed. Per. From English. - M .: Williams, 2014. 3.S. Lippmann, J. Lajoye, B. Mu. C ++ programming language. Basic course. 5th ed. - M .: Williams, 2014. 4. Algorithms and data structures: Textbook / Belov VV, Chistyakova VI. - M.: KURS, Research Center INFRA-M, 2016 .-- 240 p. 5. Structures and algorithms for data processing Author: Pavlov LA, Pervova NV Publisher: SPb .: Lan: 2020, 256 p. 6. Wirth N. Algorithms and data structures, DMK Press, 2010.

Module 20

Module code and name	COMS 22008 Neural network
Semester(s), when the module is taught	4
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture - 30, Laboratory -15, Independent work of students - 105
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Mathematics, Programming in Python
Module objectives/intended learning outcomes	This module provides an introduction to the theory and implementation of neural networks, both biological and artificial. It aims to give students sufficient knowledge to enable employment or postgraduate study involving neural networks. Students completing the module should be able: to demonstrate an understanding of the principles of Neural Networks and a knowledge of their main areas of application; -the ability to design, implement and analyse the behaviour of simple neural networks. - critically evaluate model performance and interpret results; -write reports in which results are assessed and

	summarized in relation to aims, methods and available data
Content	General information about neural networks, model of an artificial neuron, classification of types and architectures of artificial neural networks and their applications, the learning algorithms of neural networks, basic applied problems are solved using neural networks, methods and techniques the installation of software and hardware for modeling and application of artificial neural networks, principles of associative memory, theory of adaptive resonance.
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Testing. Two Midterms are completed by a colloquium (a discussion of the course content). When compiling tests, the following are used: - selective method of entering answers (the student is invited to choose from one to 3 correct answers from 5-8 alternative answers for each test task), - a method for indicating the order of entering a response, - an effective method of entering answers (the tested one solves a numerical problem). Testing time is limited to 1.5 minutes per question. Each student is given a test of 40 questions of varying degrees of difficulty.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Simon O. Haykin, Neural Networks and Learning Machines, 3rd Edition – Pearson, 2009.- 934 p. 2. Bishop, Ch. Neural Networks For Pattern Recognition.-2005. 3. Menshawy A. Deep Learning By Example: A hands-on guide to implementing advanced machine learning algorithms and neural networks. – Packt Publishing Ltd, 2018. 4. Levine D. S. Introduction to neural and cognitive modeling. – Routledge, 2018 5. Alanis A. Y., Arana-Daniel N., Lopez-Franco C. (ed.). Artificial neural networks for engineering applications. – Academic Press, 2019.

Module 21

Module code and name	MATH 22009 Operations research
Semester(s), when the module is taught	4
Responsible for module person	Kudubaeva S.A.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Operations Research is a discipline aimed at providing tools for preparation, analysis and efficient resolution of these systems

	using models which can quantitatively measure the results of the decisions of the leadership of organizations. Today, integration is key for this class of systems to aid decision making within the different information systems that can operate in organizations. The course begins by presenting a case study with which to illustrate these concepts and continues with an exhibition of models established in the Operations Research techniques and their efficient resolution. During the course students develop and solve one of these models adapted to the needs of the real case of an organization and evaluate and discuss their interaction with information systems present in it. Students completing the module should be able: - know the basic methodology and scope of operations research; - know principles of construction of mathematical models of conflicting situations and mathematical analysis methods of operations research; - be able to choose rational options in practical decision-making problems using standard mathematical models of operations research; - have skills in analysis of operations research objectives, mathematical methods and computer systems; - understand and identify the inputs and outputs of operations research models underlying various information systems and decision support systems described in the practical sessions
Content	Introduction to Operations Research. Introduction to linear programing (LP). Linear programming models with binary variables. Graphical method of solution of the linear programming problem. Simplex Algorithm and Goal Programming. Sensitivity Analysis and Duality. Transportation Models. Network Models and Algorithms. Integer Programming. Modeling with integer variables. Dynamic Programming. Queueing Models. Nonlinear Programming. Course Summary and Future Directions.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; - 40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Mathematical Programming: operations research - Winston W.L; Venkataramanan, M, Brooks/Cole, 2003. ISBN: 0534359647 http://cataleg.upc.edu/record=b1253743~S1*cat 2. AMPL a modeling language for mathematical programming - Fourer, R.; Gay, D.M.; Kernighan, B.W, Thomson/Brooks/Cole, 2003. ISBN: 0534388094 http://cataleg.upc.edu/record=b1237649~S1*cat 3. Model building in mathematical programming - Williams, H.P, John Wiley and Sons, 2013. ISBN: 9781118443330 http://cataleg.upc.edu/record=b1423642~S1*cat

	4. Introduction to operations research - Hillier, F.S, McGraw Hill, 2010. ISBN: 9780071267670 http://cataleg.upc.edu/record=b1358085~S1*cat Complementary: 1. Linear and integer programming: theory and practice - Sierksma, G, CRC , 2002. ISBN: 0824706730 http://cataleg.upc.edu/record=b1431608~S1*cat

Module 22

Module code and name	INEX 42105, INEX 42205 Industrial practice
Semester(s), when the module is taught	4,6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	4 semester - Basic (university component) 6 semester – Profile (university component) 8 semester – Profile (university component)
Teaching methods	Practices
Workload (incl. contact hours, self-study hours)	4 semester: 90 hours (Duration of practice is determined in weeks based on the student's standard working time in practice during the week, equal to 30 hours (6 hours per day with a 5-day working week) 6 semester: 150 hours (Duration of practice is determined in weeks based on the student's standard working time in practice during the week, equal to 30 hours (6 hours per day with a 5-day working week) 8 semester: 180 hours (Duration of practice is determined in weeks based on the student's standard working time in practice during the week, equal to 30 hours (6 hours per day with a 5-day working week)
Credit points (total by discipline)	4 semester – 3 ECTS 6 semester – 5 ECTS 8 semester – 5 ECTS
Required and recommended prerequisites for joining the module	Algorithms and data structures, Neural network Compulsory components of the theoretical Module
Module objectives/intended learning outcomes	Objectives of the Industrial practice: - consolidate and deepen theoretical knowledge of the main methods used in machine learning and instill skills in working with software that implements machine learning algorithms; - improvement of basic professional skills and abilities in the field of artificial intelligence - development of skills for working with real research and industrial projects; - getting skills of independent work, as well as working as part of a team; - processing of the received materials and preparation of the report on the industrial practic Learning outcomes: - able to develop software and information support for computer systems, services, computing systems, databases; - know the basic methods used in machine learning; - implement machine learning algorithms in a programming language; - able to conduct written and oral communication in Kazakh and Russian. The knowledge, skills and abilities obtained during the industrial practice are the basis for the industrial practice in the 4th year,

	and can be used in the implementation of the program project, the final qualifying work and the work of the graduate.
Content	1. Analysis of terms of reference 2. Development of an algorithm for solving the problem and searching for optimal solutions 3. Fulfillment of individual official assignments (assignments) of the head of practice 4. Writing and debugging code 5. Writing a report Report
Examination forms	Report
Study and examination requirements	Based on the results of the practice, students provide a report on the practice in the format of a paper and electronic document, which reflects the performance of an individual task during the practice, the acquired skills and abilities, and the competencies formed. The student reports on the results, answers the questions posed, provides a package of documents based on the results of professional practice and expresses his conclusions and proposals to the commission.
Technical, multimedia tools and software	
Reading list	1. Kuzmenko N.G. Computer networks and network technologies / N. G. Kuzmenko. - St. Petersburg: Science and technology, 2013. 2. Brink Henrik, Richards Joseph, Feverolf Mark 687 Machine learning. - St. Petersburg: Peter, 201 7. - 336 p.: ill. - (Series "Library of programs VISTA"). ISBN 978-5-496-02989-6 3. Cubic Meters. Introduction to machine learning / M. Kubat. - 2nd ed. - Cham: Springer, 2017. - 348 p.: tab.-Springer. - Foreword. decree: p. 347-348; Bibliography: p. 341 345. - ISBN 978-3-319-63912-3. - ISBN 978-3-319 63913-0 4. Flach P. Machine learning F70. The science and art of building algorithms that extract knowledge from data / translated from English by A. A. Slinkina. - M.: DMK Press, 2015. - 400 p.: ill. ISBN 978-5-97060-273- 5. Menshavi A. Deep Learning by Example: A Practical Guide to Implementing Advanced Machine Learning Algorithms and Neural Networks. – LLC "Pact Publishing Ltd", 2018. 6. Yan LeCun, Yoshua Bengio, Geoffrey Hinton. Deep Learning // Nature 521, 436-444 (May 28, 2015) 7. Blagodatskikh V.A., Volkov V.A., Poskakalov K.F. Standardization of software development / Ed. O.S. Razumova. - M.: Finance and statistics, 2003. -286 p., ISBN 5-279-02657-3. 8. Project management: / M.V. Romanov. - M.: ID FORUM: NITs INFRA-M, 2014.-- 256 p. Menshavi A. Deep Learning by Example: A Practical Guide to Implementing Advanced Machine Learning Algorithms and Neural Networks. – LLC "Pact Publishing Ltd", 2018. 9. Yan LeCun, Yoshua Bengio, Geoffrey Hinton. Deep Learning // Nature 521, 436-444 (May 28, 2015) 10. Blagodatskikh V.A., Volkov V.A., Poskakalov K.F. Standardization of software development / Ed. O.S. Razumova. - M.: Finance and statistics, 2003. -286 p., ISBN 5-279-02657-3. 11. Project management: / M.V. Romanov. - M.: ID FORUM: NITs INFRA-M, 2014.-- 256 p. Menshavi A. Deep Learning by Example: A Practical Guide to Implementing Advanced Machine Learning Algorithms and Neural Networks. – LLC "Pact Publishing Ltd", 2018.

	12. Yan LeCun, Yoshua Bengio, Geoffrey Hinton. Deep Learning // Nature 521, 436-444 (May 28, 2015) 13. Blagodatskikh V.A., Volkov V.A., Poskakalov K.F. Standardization of software development / Ed. O.S. Razumova. - M.: Finance and statistics, 2003. -286 p., ISBN 5-279-02657-3. 14. Project management: / M.V. Romanov. - M.: ID FORUM: NITs INFRA-M, 2014.-- 256 p.

Module 23

Module code and name	COMS 23005 The Theory of Automata and language
Semester(s), when the module is taught	4
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Organization of computing systems module provides is to give the student a deep knowledge in the field of formal teaching of languages necessary in the field of information technology, to familiarize students with various models for the formal assignment of languages (finite state machines generating grammars, regular expressions, finite automata with memory), with the properties of these models and the boundary their applicability. Then allows to study the principles of the structural and functional organization of modern computer systems. Also the formation of students' theoretical and practical knowledge of the basics of creation and use information security systems in telecommunications and information systems
Content	Bases of languages and automatons. Notations, concepts and abbreviations. Mathematical foundations. Language detection mechanisms. Regular languages. Mechanisms for generating regular languages. Recognition mechanisms of regular languages. Properties of regular languages. Equivalence of non-deterministic and deterministic automata. Context-free languages. Generative mechanisms of context-free languages. Recognition mechanisms of context-free languages. Properties of context-free languages. Context sensitive languages. Generative mechanisms of context sensitive languages. Recognition mechanisms of context sensitive languages. Properties of context sensitive languages. Recursively enumerable languages. Generative mechanisms of recursively enumerable languages. Recognition mechanisms of recursively enumerable languages.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams;

	-40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Fedoseeva, L.I. Fundamentals of the theory of finite automata and formal languages [Electronic resource]: textbook. allowance / L.I. Fedoseeva, R.M. Adilov, M.N.Shmokin. - Electron. Dan. - Penza: PenzGTU, 2013 .—136 p. - Access mode: https://e.lanbook.com/book/62703. - Title from the screen. 2. Malyavko A.A. Formal languages and compilers [Electronic resource] / Malyavko A.A. - Novosib .: NSTU, 2014 .-- 431 p .: ISBN 978-5-7782-2318-9 - Access mode: http://znanium.com/bookread2.php?book=548152 3. Korotkova, M.A. Problem book for the course "Mathematical linguistics and the theory of automata": textbook for universities [Electronic resource]: textbook. allowance / M.A. Korotkova, E.E. Trifonov. - Electron. Dan. - Moscow: NRNU MEPhI, 2012 .-- 92 p. - Access mode: https://e.lanbook.com/book/75843. - Title from the screen. 4. Sharipbay A. Theory of languages and automata: textbook / author. Sharipbay A.A. - Astana:

Module 24

Module code and name	MATH 23006 Statistical data processing in software packages
Semester(s), when the module is taught	5
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Mathematics, Probability theory and mathematical statistics, Programming in R
Module objectives/intended learning outcomes	This module provides an introduction to "theory of statistics as a science" and "statistical methods of information processing". It aims to give students sufficient knowledge about the main categories of statistics (statistical regularity, statistical population, attribute, variation) and the basic methods of collecting and processing data (statistical observation, grouping and summary of statistical observation data, building tables and graphs for the formation and analysis of indicators as "statistical quantities" and "statistical distributions") for employment or postgraduate studies using package programs.

	Students completing the module should be able: - perform statistical processing of data; - to process statistical indicators in order to draw conclusions about the state of the phenomenon and the patterns of its development; - to study the general characteristics of indicators of distribution lines and methods of their calculation; - analyze and predict technical and economic indicators using applied programs
Content	Introduction to the theoretical foundations of statistics as a science, statistical observation, summary and grouping of statistical materials, statistical quantities, indicators of variation and statistical distributions, statistical study of relationships, study of the dynamics of social phenomena, indices.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; - 40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1.Gromyko G.L. The theory of statistics. Workshop. - 3rd ed., Add. and revised - M .: Infra-M, 2010 .-- 205 p. 2. Efimova M.R., Petrova E.V., Rumyantsev V.N. General theory of statistics: Textbook. - 2nd ed., Add. And revised - M .: Infra-M, 2010 .-- 416 p. 3. Nazarov M.G. Statistics. Educational and practical guide. - M .: KNORUS, 2010 .-- 480 p. 4. Statistics: Textbook for universities (+ CD) / ed.Professor I.I. Eliseeva - SPb .:Peter, 2012 .-- 368 p. 5. Statistics: a training manual. Ed. M.G. Nazarov. - M.: KNORUS, 2011 .-- 480 p..

Module 25

Module code and name	ECON 22001 Entrepreneurship and Business
Semester(s), when the module is taught	3
Responsible for module person	Ryspekova M.O.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (elective component)
Teaching methods	Review, information, problematic lectures in the form of presentations, the method of conducting - lectures are combined into three main elements: presentation of new material, posing problem questions, joint search for answers, solving problem cases.
Workload (incl. contact hours, self-	Total workload: 150 hours.

study hours)	Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Recommended prerequisites: knowledge of the basics of economics within the framework of the secondary school program "Economics and Entrepreneurship".
Module objectives/intended learning outcomes	“Entrepreneurship and business” is the acquisition of the necessary entrepreneurial skills, understanding the mechanism of the functioning of the market structure in business. Knowledge: familiarity with the theory of business and entrepreneurship, systematization of regulatory, economic, organizational and managerial knowledge on the formation, conduct of entrepreneurship and business. Skills: cognitive and practical skills to develop an entrepreneurial mindset to solve specific problems and business situations. Skills in preparing, evaluating and implementing business development projects in various sectors of the economy; skills of organizing, reorganizing and liquidating business firms and preparing working documentation - tools for regulating economic relations between business entities. Competences: to form the readiness of students for entrepreneurial activity and for organizing their own business. Skills in preparing, evaluating and implementing business development projects in various sectors of the economy. Collect, analyze and process the data necessary to solve the set economic tasks in the field of business organization and development; Select and apply economic data processing tools in the field of business organization and management in accordance with the task, analyze the results of economic efficiency calculations and substantiate the conclusions.
Content	Introduction to Entrepreneurship and Business. Essence of business and entrepreneurship. Goals, functions and general characteristics of the business. Modern business system: subjects of business relations, business infrastructure, government support. Business forms. Small, medium and large businesses. Registration of a business company. Organization of a business firm. Reorganization and termination of the company. Economic activity in the business system. Business competition. Business activity and contracts of the firm. Tax system in business. Business interests in business. Entrepreneurial risk. Innovative entrepreneurship. Business infrastructure.
Examination forms	Oral exam
Study and examination requirements	Organization of the lesson using active forms and methods of the educational process, mandatory control. The exam serves as a form of checking the educational achievements of students throughout the professional curriculum of the discipline and provides for the development of educational achievements of students for the academic period, the theoretical knowledge gained, the strength of their assimilation, creative thinking, and independent work skills.
Technical, multimedia tools and software	Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).
Reading list	1. Esirkepova A.M. Sovremennoe predprinimatel'stvo: uchebnoe posobie /A.M. Esirkepova. - Almaty: New book, 2020. – 304 s. 2. Bajgelova A.N. Osnovy predprinimatel'stva: uchebnoe posobie /A.N. Bajgelova, ZH.E. Sadykova, T.M. Nasymhan. - Almaty: Lantar Trejd, 2019. - 292 s. 3. Ryspekova M.O. Osnovy predprinimatel'stva: uchebnoe

	posobie. - Almaty: Epigraf, 2019. – 231 s. 4. Majdyrova A.B. Predprinimatel'stvo i biznes: kejsy, delovye igry, zadachi i skhemy: uchebnoe posobie /A.B. Majdyrova, R.A. Bajzholova. - Nur-Sultan: ENU im. L.N. Gumileva, 2020. – 172 s. 5. Majdyrova A.B. Ekonomika malogo i srednego predprinimatel'stva: uchebnoeposobie /A.B. Majdyrova, M.O. Ryspekova. - Nur-Sultan: ENU im. L.N. Gumileva, 2019. -251 s.

Module 26

Module code and name	CSSE 22002 Digital technologies by branches of application
Semester(s), when the module is taught	3
Responsible for module person	Mukhtarova A.Zh.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (elective component)
Teaching methods	Review, information, problematic lectures in the form of presentations, the method of conducting - lectures are combined into three main elements: presentation of new material, posing problem questions, joint search for answers, solving problem cases.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Information and Communication Technologies
Module objectives/intended learning outcomes	Purpose: to introduce students to the prospects and examples of using digital technologies to improve the efficiency and quality of their activities. Knowledge: – to study the basic concepts of digital technologies, platforms and mobile devices; - know the features of using multimedia on the Internet; – be able to effectively use digital technologies and Internet resources; - develop multimedia content; - use the functionality of social networks; - use various means of processing and storing digital information; – analyze the reliability of means and methods of protection in the network; Competencies: - the formation of students' skills and abilities necessary for their further professional activities; – evaluate the effectiveness of digitalization in professional areas. – to synthesize the effective use of Internet services for work and life.
Content	Introduction to the course. State program "Digital Kazakhstan". Smart city. Basic concepts. Platforms and technologies of the organization. Roadmap of smart Astana. Computer networks. Internet. Internet access technologies. Internet by wire. Internet without wires. Mobile Internet. Mobile networks (3G, 4G/LTE). Cellular systems. Digital platforms for electronic public services. Electronic digital signatures (EDS). Information system "Electronic licensing". Digital e-commerce platforms. Electronic commerce. Virtual payment means and systems. Internet shops.

	Online shopping. Information security on the Internet. Cybersecurity. Strong passwords. two-step authentication. 3D modeling and animation. 3D graphics. 3D modeling. Virtual and augmented reality VR and AR. Introduction to Java. Java programming language. Introduction to the Python programming language. Processing of digital information in the professional field. Organization of texts, transformation of textual information. Processing of graphic images. Compression of digital information. Database. Big data and open data. Statistical processing of results using the program STATISTICA. Modern multimedia services. Social networks. Search engines. Electronic catalogs, libraries. Videoconferencing. The use of cloud technologies for storing digital information. General concepts of cloud technologies. Advantages and disadvantages of cloud services.
Examination forms	Testing
Study and examination requirements	The course "Digital Technologies by Industry" is an optional component. The work must be completed within the specified time frame. Students who do not complete all tasks are not allowed to take the exam. Refinement of the topic and development of the materials covered for each training session are required. The degree of assimilation of educational material is checked by testing. Students may be tested without warning.
Technical, multimedia tools and software	Programs Python, Java, STATISTICA
Reading list	1. Brown G., Sargent B., and Watson D. Cambridge IGCSE ICT. - London: Hodder Education Group, 2015. -439 p. 2. Williams B. K. and Sawyer S. Using information technology: A practical introduction to computers & communications. - New York: McGraw-Hil., - 8th ed. -2010. -563 p. 3. Watson D. and Williams H. Cambridge IGCSE Computer Science: Hodder Edu.; 3 ed. 2015.-278 p. 4. Evans V. Information technology. Books 1-3: English for specific purposes.- 5th impr.- Newbury: Express Publishing, 2014.- 40 p.

Module 27

Module code and name	COMU 22003 Business rhetoric
Semester(s), when the module is taught	3
Responsible for module person	Shakhin A.A., Tashimkhanova D.S.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (elective component)
Teaching methods	Review, information, problematic lectures in the form of presentations, the method of conducting - lectures are combined into three main elements: presentation of new material, posing problem questions, joint search for answers, solving problem cases.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Russian / Kazakh
Module objectives/intended learning outcomes	The goal is to develop the skills of effective public speaking, the skills of successful communication in various situations of

	business communication. Know the main rhetorical strategies and tactics, methods of argumentation aimed at achieving a communicatively meaningful result. To be able to apply knowledge of oratorios to the speech facts of business communication; build effective business communication in accordance with the students' own communicative intentions. Possess the skills of effective interaction with participants in the process of business communication in various genres of business communication.
Content	The course has a professional and practical focus. Its study involves mastering the technology of rhetorical activity in professionally significant situations. The objectives of the course include improving the speech education of students, gaining knowledge about the principles of effective business communication, the main factors and processes that ensure the successful impact of public speaking on listeners, forms and means of interaction between the speaker and the audience. The student gains knowledge about the main rhetorical strategies and tactics aimed at achieving a communicatively meaningful result; fundamentals of public speaking skills; knowledge of the terminological apparatus of the course; the ability to produce tests of an official business orientation, to be aware of one's own communicative intentions and to build effective business communication in accordance with this.
Examination forms	Combined exam
Study and examination requirements	Mandatory activity of students in the educational process, which is assessed by the quality of their performance. Attendance at classes and participation in the educational process are mandatory. Students should not miss classes without a valid reason. Late arrivals are not allowed. The code of conduct and ethics must comply with the requirements of the university. In this regard, marks are given from 0 to 100 points.
Technical, multimedia tools and software	Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).
Reading list	1. Sternin I.A. Prakticheskaya ritorika: ucheb. posobiye dlya studentov vysshikh uchebnykh zavedeniy. – M.: «Akademiya», 2016. – 272 s. 2. Shelamova G.N. Etiket delovogo obshcheniya: ucheb. posobiye dlya nach. prof. obrazovaniya. – M.: "Akademiya», 2015. – 192 s. 3. Vvedenskaya L.A. Delovaya ritorika: Uchebnoye posobiye dlya vuzov. – Rostov n/D, 2012. 4. Mal'khanova I.A. Delovoye obshcheniye: ucheb. posobiye. – M.: Akademicheskiy Proyekt, 2014. – 224 s. 5. Anisimova T.V., Gimpel'son Ye.G. Sovremennaya delovaya ritorika: ucheb .posobiye. – M. : NPO «MODEK», 2017. – 432 s. 6. Golub I.B. Ritorika: ucheb. posobiye. – M.: «Eksmo», 2015.– 384 s. 7. Kuzin F.A. Kul'tura delovogo obshcheniya. – M., 2017.

Module 28

Module code and name	ECLFST 22004 Fundamentals of ecology and life safety
Semester(s), when the module is	3

taught	
Responsible for module person	Kobetaeva N.K.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (elective component)
Teaching methods	Review, information, problematic lectures in the form of presentations, the method of conducting - lectures are combined into three main elements: presentation of new material, posing problem questions, joint search for answers, solving problem cases.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	School biology course
Module objectives/intended learning outcomes	Formation of an ecological outlook, obtaining deep systemic knowledge and ideas about the basics of ecology and life safety, theoretical and practical knowledge about modern approaches to the rational use of natural resources and environmental protection. As a result of studying this discipline, students should know: - the main patterns of interaction between nature and society; - fundamentals of functioning of ecosystems and development of the biosphere; - impact of harmful and dangerous production factors and environment on human health; - concept, strategies, problems of sustainable development and practical approaches to their solution at the global, regional and local levels; - Fundamentals of environmental legislation; - principles of organization of safe production processes; be capable of: - assess the ecological state of the natural environment; - to assess the technogenic impact of production; the environment have the skills to: - study of the components of ecosystems and the biosphere as a whole; - determination of optimal conditions for sustainable development of ecological and economic systems; - conducting a logical discussion of topics related to the solution of environmental problems; - knowledge of standard environmental monitoring methods
Content	Ecology and problems of modern civilization. Autoecology is the ecology of organisms. Demecology is the ecology of populations. Synecology-Ecology of the Community. Biosphere and its sustainability. Evolution of the biosphere. The concept of living matter. modern biosphere. Global biogeochemical cycles. Ecological crisis and problems of modern civilization. Strategies, goals and principles of safety and life. Green economy and sustainable development. Natural resource management. Ecoenergy. Global energy-ecological strategy for sustainable development XXI century. Water is a strategic resource of the 21st century. Renewable energy sources. Ecological policy of the Republic of Kazakhstan. The concept of sustainable development of the Republic of Kazakhstan. Atmospheric protection. Protection of water resources. Protection of land resources, soils and subsoil.

	Physical pollution of the environment. Protection of flora and fauna.
Examination forms	Computer testing
Study and examination requirements	Students are required to attend lectures and seminars, preparing in advance for lectures and seminars on the basis of textbooks and basic literature, participate in all types of control (current control, midterm control, final control), mandatory participation in intermediate and final certification tests, fulfillment of teacher's tasks. The activity of work at the seminar (the ability to lead a discussion, to argue one's position with references to the literature studied, a creative approach to the selection and analysis of texts), the quality of individual written assignments (glossary, etc.) and creative work (essays) are highly valued.
Technical, multimedia tools and software	Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation)
Reading list	1 Akimova T. A., Haskin V. V. Ekologiya. CHelovek-ekonomika-biota-okruzhayushchaya sreda: Uchebnik dlya studentov vuzov / 2-e izd., reprint. i prilozhenie-M: EDINSTVO, 2009. – 556 s. 2 Bigaliev A.B. Obshchaya ekologiya / Izdanie vtoroe, pererab. dopolnen. - Almaty: Izdatel'stvo NURPRESS, 2011. 3 Denisova V. V. Ekologiya: Uchebnik – M., 2004. 4 Abubakirova K. D., Kozhagulov S. O. Ekologiya i ustojchivoe razvitie. - Almaty, 2011 g. 5 Kolumbaeva S.ZH. i drugie. Ekologiya i ustojchivoe razvitie. - Almaty, «Kazahskij universitet», 2011 g. 6 Alimov M.SH. Ekologiya i ustojchivoe razvitie. - Almaty, 2012 g. 7 Korobkin V. I., Peredel'skij L. V. Ekologiya: Uchebnik dlya studentov vuzov. - Rostov n/D: Feniks, 2007-575 s. 8 Tonkopij M. S., Satbaev G. S., Imkulova N. P., Anisimova N. M. Ekologiya zhane turakty damu: okulyk: KR Bilim zhane gylym m-gi. Almaty: ZHSHS RPBK "Dauir", 2011-312 b. 9 Kolumbaeva S.ZH. ZHalpy ekologiya. - Almaty: 2006 g.

Module 29

Module code and name	CULS 22005 Rukhani Zhangyru
Semester(s), when the module is taught	3
Responsible for module person	Battalov K.K.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (elective component)
Teaching methods	Review, information, problematic lectures in the form of presentations, the method of conducting - lectures are combined into three main elements: presentation of new material, posing problem questions, joint search for answers, solving problem cases.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Modern history of Kazakhstan
Module objectives/intended learning outcomes	The course covers topical issues of modernization of modern Kazakh society. The course is aimed at forming an idea of modern world trends in the post-industrial development of society, a vision

	of one's own and the world's future, an understanding of the development trend of the world labor market, an idea of Kazakhstan's identity, and the main directions for the development of the country's spiritual modernization. The course covers the basic knowledge of leadership strategies in society. World examples of leadership in different historical periods are considered
Content	The educational program is based on three conceptual foundations: cognitive - the study of the foundations of the modernization of public consciousness and the patterns of development of modern society; patriotic - respect for history, the heroic past of their people, love for the Fatherland, native land, historical figures, involvement in national values; informational - popularization of spiritual and moral values that strengthen national self-consciousness, clarification of the tasks defined in the Program Article of the Head of State, strategic documents of the country, the Message of the President to the people of Kazakhstan. The discipline consists of 3 modules: 1. Modernization in the context of globalization. The world of the future. 2. Modernization of consciousness as a factor in the success of the nation. 3. Leadership in the conditions of modernization.
Examination forms	Oral exam
Study and examination requirements	Mandatory activity of students in the educational process, which is assessed by the quality of their performance. Attendance at classes and participation in the educational process are mandatory. Students should not miss classes without a valid reason. Late arrivals are not allowed. The code of conduct and ethics must comply with the requirements of the university. In this regard, marks are given from 0 to 100 points.
Technical, multimedia tools and software	Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).
Reading list	1.Nazarbaev N.Ä. Vzgläd v buduşee: modernizasia obşestvennogo soznania // Kazahstanskaia pravda, 2017. - 12 säuır. 2. Nazarbaev N. Era nezavisimosti. – Astana, 2017. – 508 s. 3. Qazaqstan Respublikasynyñ Prezidentı N.Ä.Nazarbaeva «Prezidenttıñ äleumettık bastamasy» // http://www.akorda.kz 4. İuväl Noi Harrari. «Homo Deus: Kratkaia istoria buduşego». – M.: Sindbad, 2018. – 496 s. 5. Qūttyqadam S. «10 primerov slujenia nasii». – Almaty: İNES-TSA, 2009. 356s. 6. Abai Qūnanbaev. İzbrannoe («Mudros vekov» seriasy), Mäskeu, 2006 7. Memleket basşynyñ 2017 jylğy 31 qantardağy «Qazaqstannyñ üşınşı jañğyruy: jahandyq negızge k¸–qabylettılık» atty Qazaqstan halqyna Joldauy // http://www.akorda.kz 8. Nazarbaev N.Tarih tolqynynda. – Almaty: «Atamūra», 1999 j 9. «Qazaqstan-2050» Strategiasy qalyptasqan memlekettıñ jaña saiasaty bağyty. Qazaqstan Respublikasynyñ Prezidentı – Elbasy N.A. Nazarbaevtyñ Qazaqstan halqyna Joldauy, Astana q., 2012 jyl 14 jeltoqsan // http://adilet.zan.kz/kaz/docs/K1200002050 10. Terminasova, S.G. Tıl jüne mädenietaralyq bailanys. – Almaty; Astana, 2018.

Module 30

Module code and name	LAWS 22007 Anti-corruption culture
Semester(s), when the module is	3

taught	
Responsible for module person	Ibragimov Zh.I., Temirzhanova L.A.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	General educational (elective component)
Teaching methods	Review, information, problematic lectures in the form of presentations, the method of conducting - lectures are combined into three main elements: presentation of new material, posing problem questions, joint search for answers, solving problem cases.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	School course "Man, society and law"
Module objectives/intended learning outcomes	The purpose of the anti-corruption culture is the education of values and the development of abilities necessary for the formation of a civil position in young people in relation to corruption, the formation of a negative attitude towards corruption manifestations. Learning outcomes: Students will gain knowledge about the essence of corruption and the causes of its occurrence. Students will be able to analyze the measure of moral, ethical and legal responsibility for corruption offenses. Students will be familiar with the anti-corruption policy of the state and the current anti-corruption legislation. Students will be able to realize the values of moral consciousness and follow moral standards in daily practice. Students will be able to determine the legal course of action in a situation of conflict of interest.
Content	The Fundamentals of Anti-Corruption Culture course aims to raise awareness of corruption and shape its image as a public policy issue. The purpose of studying the course is to form a system of knowledge on combating corruption, the existing legal responsibility and the development on this basis of a civil position in relation to this phenomenon. Development of a legal culture of an individual that contributes to the fight against corruption, the formation of skills and abilities for a critical analysis of corruption phenomena, the study of modern anti-corruption approaches and practices.
Examination forms	Computer testing
Study and examination requirements	Students are required to attend lectures and seminars, preparing in advance for lectures and seminars on the basis of textbooks and basic literature, participate in all types of control (current control, midterm control, final control), mandatory participation in intermediate and final certification tests, fulfillment of teacher's tasks. The activity of work at the seminar (the ability to lead a discussion, to argue one's position with references to the literature studied, a creative approach to the selection and analysis of texts), the quality of individual written assignments (glossary, etc.) and creative work (essays) are highly valued.
Technical, multimedia tools and software	Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).
Reading list	Basic references: 1. Osnovy antikorruptsionnoy kul'tury: uchebnoye posobiye.

	Pod obshchey redaktsiyey d. b. n., professora B.S. Abdrasilova. – Astana: Akademiya gosudarstvennogo upravleniya pri Prezidente Respubliki Kazakhstan, 2016. – 176 s. 2. Protivodeystviye korruptsii. Uchebnik i praktikum. Pod obshchey redaktsiyey Ye.V.Okhotskogo. – Moskva, 2016. 3. Protivodeystviye korrptsii: konstitutsionno-pravovyye podkhody. Kollektivnaya monografiya\ otv. Avak'yan S.A – M.: Yustitsinform, 2016. – 512s. 4. Rouz-Akkeman S. Korruptsiya i gosudasrstvo. Prichiny, sledstviya, reformy. M.: Logos, 2010. 5. Antikorruptsionnaya pravovaya politika: ucheb. posobiye / Ye. Alaukhanov. – Almaty: Zan adebiyeti, 2009. – 256 s. 6. Nravstvennost' kak osnova stanovleniya novoy generatsii gosudarstvennykh sluzhashchikh. / Kabykenova B.S., Shakhanov Ye.A., Dzhusupova R.S./. 2011. 7. Byurokratiya, korruptsiya i effektivnost' gosudarstvennogo upravleniya / V. D.Andrianov. - M.: Volters Kluver, 2009. - 248 s. - Bibliogr.: 234 s. 8. Korruptsiya i gosudarstvo: Prichiny, sledstviya, reformy: Per. s angl. O.A.Alyakrinskogo / S. Rouz-Akkerman. – M.: Logos, 2003. - 356 s. 9. Vlast', korruptsiya i chestnost': Nauch. izd.: Per. s angl. / A. A. Rogou. – M.: Izd-vo RAGS, 2005. – 176 s. (Antologiya zarubezh. i otech. mysli)

Module 31

Module code and name	COMS 32010 Machine learning
Semester(s), when the module is taught	5
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 30 hours, Laboratory – 15 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Neural network
Module objectives/intended learning outcomes	This module is devoted to the formation of an idea of the place and role of machine learning in solving actual practical problems, the study of the terminology that has developed in this field, and the development of systematic scientific approaches in machine learning Students completing the module should be able: -be able to analyze and list the differences between the types of machine learning -identify examples of classification problems, including available input characteristics and outputs that need to be predicted; -explain the difference between inductive and deductive learning. -describe over-fitting in the context of the problem - apply a simple statistical learning algorithm, such as a naive Bayesian classifier, to a classification problem and measure the accuracy of the classifier.
Content	General information about Machine Learning, Supervised Learning,Unsupervised Learning, Linear Regression with One

	Variable, Model Representation. Gradient Descent, Linear Algebra Review. Matrices and Vectors. Matrix Vector Multiplication. Matrix Multiplication Properties, Unsupervised Learning. K-Means Algorithm. Random Initialization,Dimensionality Reduction, Data Compression. Visualization. Principal Component Analysis Algorithm, Anomaly Detection. Gaussian Distribution. Developing and Evaluating an Anomaly Detection System. Multivariate Gaussian Distribution
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; - 40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, White-board, Laptop, LCD Projector
Reading list	1. Brink Henrik, Richards Joseph, Feverolf Mark 687 Machine-trained ie. - St. Petersburg: Piter, 201 7. - 336 p.: ill. - (Series "ISTA Program Library"). ISBN 978-5-496-02989-6 2. Flach P. F70 Machine learning. The Science and art of constructing algorithms that extract knowledge from data / translated from the English by A. A. Slinkin. - Moscow: DMK Press, 2015. - 400 p.: ill. ISBN 978-5-97060-273-7 3. Dr. Anasse Bari, Mohammed Chaouchi, Tommy Jung. Predictive analytics for Dummies / / For Dummies; 2nd edition, 2016 4. Cubic Meters. Introduction to machine learning / M. Kubat. - 2nd ed. - Cham : Springer, 2017. - 348 p.: table-Springer. - Prem. edict: pp. 347-348; Bibliogr.: pp. 341 345. - ISBN 978-3-319-63912-3. - ISBN 978-3-319 63913-0. 5. Jan LeCun, Joshua Bengio, Geoffrey Hinton. Deep Learning / / Nature 521, 436-444 (May 28, 2015)

Module 32

Module code and name	COMS 32011 Object-oriented programming on Java
Semester(s), when the module is taught	4
Responsible for module person	Turebayeva R.D.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture - 30, Laboratory -15, Independent work of students - 105
Credit points (total by discipline)	5 ECTS
Required and recommended	Programming in language C++, Algorithms and data structures

prerequisites for joining the module	
Module objectives/intended learning outcomes	Discipline aliows you to get the skills to solve practical problems using a high-level prograrnmiпg language Java, masterirrg the technology of object-oriented programmiпriпg, using various structures and algorithms for data processing, programming methods and implementing a graphical user interface, use the basic techniques of object-orieпted programming; create multi-threaded applications and GUI-interfbces, use JDBC technology to create a connection to tlre database. Students completing the module should: - know the principles of object-oriented programming; Java architecture - be able to write, compile and execute Java programs, use inheritance and polymorphism as implemented in Java, use the Java exception handling mechanism - have the skills to use Java API
Content	This course introduces object-oriented programming using the Java programming language. Students will learn how to program in Java and use some of its most important APIs. Special importance will be assigned to the object-oriented nature of Java and its use of polymorphism. Hands-on labs and exercises will enable students toward becoming highly skilled Java Application developers.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; - 40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, Computer software packages on the programming language Java, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Danny Poo, Derek Beng Kee Kiong, Swarnalatha Ashok. Object-Oriented Programming and Java, Publisher: Springer-Verlag Berlin, Heidelberg ISBN:978-1-84628-962-0, 2007 2. Rick Halterman. Object Oriented Programming in Java http://computing.southern.edu/halterman/OOPJ/ 3. R. Morelli and R. Walde. Java, Java, Java: Object-Oriented Problem Solving 4. Prentice Hall, 3 edition (January 1, 2006), eBook (Updated, February 5, 2012)

Module 33

Module code and name	COMS 32012 Architecture and organization of computer systems
Semester(s), when the module is taught	5
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)

Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	In this course, to study the principles of the structural and functional organization of modern computer systems, basic methods and algorithms implemented in various components of the computer system, elements and nodes of a digital computer are considered. Forming of students' basic knowledge on structural and functional organization of modern computer systems. Forming of student's abilities to apply basic methods to implement various components of the computer system, elements and nodes. Students completing the module should: - To understand the structure, function and characteristics of computer systems ; - To identify the elements of modern instructions sets and their impact on processor design - To explain the function of each element of a memory hierarchy - To carry out the selection of technologies, means of computer technology in the organization of the process of development and research of objects of professional activity, to ensure the protection of information in the network of software users
Content	Introduction to computer networks. The interaction of computers in the network. Network topology and data transmission medium. Communication lines. Network architectures. Communication devices. Protocol stacks. Basics of IP Addressing. Basics of IP routing: basics of IP addressing, IP address representations, subnet mask. Basics of IP routing: assigning IP addresses; IP addresses in local networks. Operating systems. Working in Networks. Means of communication and data exchange. Network services. Security concerns when working in networks
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1.Olifer V.G., Olifer N.A. Computer networks. Principles, technologies, protocols. - SPb.: Peter, 2016 - 944p. 2. Kurose, D. Computer networks. Top-down approach / D. Kurose, K. Ross. - M.: Eksmo, 2016 .- 912 p.

	3. Astakhova I.F. Computer science. Trees, operating systems, networks / I.F. Astakhova et al. - M .: Fizmatlit, 2017 .-- 88 p. 4. Kulgin M. Technologies for corporate networks. Encyclopedia. - SPb.: Peter, 2016 .-- 650s.

Module 34

Module code and name	COMS 33007 Natural Language Processing
Semester(s), when the module is taught	5
Responsible for module person	Zhetkenbai L.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The discipline allows to study the basics of text and speech processing, the construction of language models, approaches, models and methods of natural language processing, such as n-grams, hidden Markov models, the basics of machine and deep learning methods and use knowledge to solve tasks of POS tagging, syntactic, semantic and sentiment analysis, automatic summarization, NER, and information retrieval tasks. Students completing the module should be able: - formulate an efficient problem space for a problem expressed in natural language (e.g., Kazakh) in terms of initial and goal states, and operators. - define a NLP problem and find a suitable solution to it - implement a simple NLP systems, use Python to solve a NLP tasks. - simulate, apply, or implement classic and stochastic algorithms for parsing natural language. - identify techniques for information retrieval, language translation, and text classification
Content	General information about NLP, Language modeling, Phonology and Morphology, Linguistics. Syntax (Phrase Structure vs. Dependency), Word Classes for NLP tasks., Tagging methods. Manually designed Rules and Grammars. Statistical Methods, Grammars & parsing algorithms. Introduction to Parsing. Generative Grammars. Properties of Regular and Context-free Grammars, Probabilistic parsing. Treebanks, Text classification, categorization, Text Summarizers, Autocorrect
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the

	algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Daniel Jurafsky and James H. Martin. "Speech and language processing an introduction to natural language processing, computational linguistics, and speech." (2000). https://web.stanford.edu/~jurafsky/slp3/ 2. Manning, C. D. and H. Schütze: Foundations of Statistical Natural Language Processing. The MIT Press. 1999. ISBN 0-262-13360-1. 3. Allen, J.: Natural Language Understanding. The Benajmins/Cummings Publishing Company Inc. 1994. ISBN 0-8053-0334-0. 4. Jelinek, F.: Statistical Methods for Speech Recognition. The MIT Press. 1998. ISBN 0-262-10066-5. 5. Sharipbay A.A.Mathematics for computer science : training manual / A.A. Sharipbay. - Astana, 2017. - 158, [1] с. : ил., табл. - (0). - Библиогр.: с. 158. - ISBN 978-601 -326-012-9.

Module 35

Module code and name	COMS 33008 Analytics powered by the Hadoop ecosystem
Semester(s), when the module is taught	5
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Statistical data processing in software packages
Module objectives/intended learning outcomes	The discipline focuses on a Hadoop, which is an open source, that supports the storage and processing of extremely large data sets in a distributed computing environment. Also, it deals with applications of Hadoop, including the major Big Data frameworks used in Data Analytics. Students completing the module should: - know difference between tools for processing Big Data such as Hadoop, Pig, Hive, Cassandra, Spark, Kafka; - know ways of using Hadoop to solve various applied problems. - apply Hadoop to solve applied problems. - must own skills to coding on Hadoop.
Content	General information about Big Data, Types of Big Data, Big Data analytics. Types of Big Data Analytics., Hadoop, Techniques for integrating Oracle and Hadoop, Hadoop Core Components., Hadoop ecosystem: Hadoop tools for crunching Big Data. HDFS. YARN. MapReduce., Apache Hadoop HDFS architecture, MapReduce advantages. Explanation of MapReduce program
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -

	40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. T. White, Hadoop Definitive Guide, Publisher: O'Reilly Media. 2015.- 756 p. 2. C. Lam, Hadoop in Action, – M.: DMK Press. 2012. – 424p. 3. J. Owens, J. Lentz, B. Femiano. Hadoop Real-world Solutions, Publisher: Packt Publishing. 2013. -316 p. 4. J. Venner, Pro Hadoop, Publisher: Apress. 2016. -290p. 5. K. Tannir, Optimizing Hadoop for MapReduce, Publisher: Packt Publishing. 2014. – 120 p. 6. H. Karambelkar, Scaling Big Data with Hadoop Solr, Publisher: Packt Publishing. 2015.-144 p. 7. B. Lubinsky, K. T. Smith, A. Yakubovich, Professional Hadoop Solutions, Publisher: John Wiley & Sons. 2013. 506p. 8. B. Bengfort, J. Kim, Data Analytics with Hadoop, Publisher: O'Reilly Media. 2016. 288p.

Module 36

Module code and name	COMS 33009 Knowledge Engineering and Knowledge Base Design
Semester(s), when the module is taught	5
Responsible for module person	.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory classes – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The discipline is devoted to knowledge engineering, the scope of which includes scientific, technological and methodological issues of creating knowledge-based software systems. The main aspects of the development of knowledge bases, the principles of formation of requests to network knowledge bases are considered. typical methods for finding solutions in intelligent knowledge bases, the basics of project management for creating intelligent knowledge bases. As a result of studying the discipline, the student must: - know the methods of formalization of information and

	knowledge; - own the basic methods, methods and means of knowledge extraction and obtaining a conclusion based on knowledge; - is able to understand best practices in knowledge design, and knows how to design, implement and apply these techniques in the development of intelligent applications, services or systems.
Content	Modeling knowledge about subject areas as the basis of intelligent automated systems. Features of knowledge. Knowledge representation problems. Knowledge Representation Models: Production Model, Formal-Logical Models, Semantic Networks, Frame Model. Fuzzy knowledge representation. Use of fuzzy logic in knowledge-based systems. Ontological approach and its use. Classification of ontologies. Visual representation of knowledge. Development of knowledge-based systems. Theoretical aspects of knowledge engineering. Engineering knowledge technology. New trends and applied aspects of knowledge engineering. Software toolkit for the development of knowledge-based systems.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, Computer software packages on the programming language C++, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Zagorulko, Yu. A., Zagorulko, GB Engineering knowledge: textbook. allowance. Novosibirsk: RITs NSU, 2016 .-- 93 p. ISBN 978-5-4437-0452-4 2. Gavrilova TA, Khoroshevsky VF Knowledge bases of intelligent systems. Textbook. SPb. : Peter, 2001, 384 p. 3. Soviets, B. Ya. Intelligent systems and technologies. M .: Academia, 2015 .-- 624 p. 4. Tsukanova NI Ontological model of knowledge representation and organization. Textbook for universities. - M .: Hot line - Telecom, 2015 .-- 272 p.: Ill. ISBN 978-5-9912-0454-5

Module 37

Module code and name	COMS 33010 Data visualization
Semester(s), when the module is taught	5
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours,

	Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Programming in Python, Programming in R
Module objectives/intended learning outcomes	The discipline allows you to acquire the skills of data visualization; use and compare different visualization tools; create multiple versions of digital visualizations using different software packages; the ability to determine the appropriate methods of data visualization, taking into account the specific requirements for data; data visualization analysis. Students completing the module should be able: - learn and apply multiple data visualization techniques; -be able to use and compare different visualization tools; -be able to work with libraries for data visualization in the Python programming language: Matplotlib, Seaborn, Mayavi. -be able to analyze and select visualization methods for specific tasks -apply visualization techniques to extract useful information from a data set.
Content	Introduction to Data Visualization, Matplotlib library. Plotting a chart for categorical data Basics of working with the pyplot module. Text labels on the chart,Setting up the chart elements. Working with a legend. Layout of graphs. Text elements of the graph, Matplotlib class. Data visualization. Step, stack, dot, and other graphs, Seaborn library. Introduction. Working with categorical data, Customize the appearance of the charts. Configuring the grid and axes, Visualization of relationships in data. Basic arguments. Increase the informativeness of the schedule. Scatter plot, Visualization of categorical data. Visualization of categorical data in the form of dot charts, Visualization of distributions in data, Visualization of the linear regression model, Mayavi library,Setting up the view. Managing A Shape/The stage, Mayavi. Data visualization. Functions for working with one-dimensional and two-dimensional datasets,Mayavi. Working with data sources. Working with filters
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Kabakov, Robert I.R in action. Data analysis and visualization in the R program or Kabakov Robert I.; translated from English by Polina A. Volkova. - Moscow: DMK Press, 2014. - 587, [1] P.: ill., tab., diagr. - ISBN 978-1-93518-239-9. - ISBN 978-5-97060-077-1. 2. Python. Data visualization: Matplotlib, Seaborn, Mayavi”

	3. Everitt Bryan. Introduction to Applied Multivariate Analysis with R / Everitt Brian. - New York : Springer, 2011. - XIV, 273 p. - (Use R!). - ISBN 978-1-4419-9649-7. 4. Andy Kirk. Data Visualization-2012, 237 p.

Module 38

Module code and name	COMS 33011 Data processing
Semester(s), when the module is taught	5
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Programming in Python, Discrete mathematics, Algorithms and data structures
Module objectives/intended learning outcomes	This course is aimed at studying the object-oriented concept and principles, the development of abstract thinking and the development of professional skills of a future specialist, the development of a project structure, the formation and development of project implementation skills using data processing tools, data collection Students completing the module should be able: -develop and analyze conceptual and theoretical models of applied problems of big data analysis -use and apply advanced knowledge in the field of processing and analysis of big data -estimate the time and necessary hardware resources to solve the problems of data analysis and processing -create algorithms for analyzing and processing large amounts of data using Data Mining models -develop methods for the design and analysis of algorithms, programs
Content	General information about Data processing functions, History, Manual data processing, Automatic data processing, Electronic data processing, convenient and fast data acquisition, Data clean of data exploration, data transformation, data reduction, Applications, Commercial data processing, Data analysis
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector

Reading list	1. Practical Data Analysis 2 nd edition; Hector Cuesta, Dr. Sampath Kumar; Packt; 2016; Practical Business Intelligence; Ahmed Sherif; Packt; 2016 2.https://www.coursera.org/learn/python-data-processi ng#about 3.https://www.researchgate.net/publication/324797992 _Data_Proce ssing

Module 39

Module code and name	COMS 33012 Data analysis and optimization
Semester(s), when the module is taught	5
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Information and communication technologies, Databases and SQL querie
Module objectives/intended learning outcomes	The discipline provides for the study of questions about the features of working with large unstructured and semi-structured data, about tools for processing big data, about options for building distributed databases, replication, and fragmentation. Choice of tools for working with Big Data. Possibilities of NoSQL databases to ensure the integrity, availability of information processing speed. Students completing the module should be able: - know of storage technology, processing and analysis of big data; -have the ability to analyze data and evaluate the knowledge required to solve non-standard problems using mathematical methods and computer modeling methods; -have the ability to formalize the task of the applied field, in the solution of which it becomes necessary to use quantitative and qualitative assessments; - know of methods of building information systems based on non-relational databases and distributed storage systems; -ability to use data analysis tools using modern query languages, as well as their optimization
Content	Storage technologies big data, Tasks of decision support systems (DSS). DSS architecture. Fundamentals of Big Data Systems, Data warehouse concept. Data warehouse organization, Multidimensional data model. Definition of OLAP systems. Conceptual multidimensional. Representation. Twelve Rules of Codd.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline

	through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Barsegyan A.A. Analysis of data and processes, St. Petersburg:BHV-Petersburg, - 4th ed. - [B. m.]: Lan, 2018. - 356 p. – ISBN 978-5-9775-0368-6 2. Nazarov, D.M. Intelligent systems: foundations of the theory of fuzzy sets: textbook. Manual for academic bachelor's degree / 3. D.M. Nazarov, L.K. Konysheva. - 2nd ed., Rev. And add. - M .: Yurayt Publishing House, 2017 .- 202 p. 4. Afonin, A. Yu. Operational and data mining / A. Yu. Afonin, PP Makarychev. –SPB .: PSU, 2012. 5. Volkova P.A., Shipunov A.B. Statistical data processing in educational research works. - M . Forum, 2014 .- 96 p. 6. Vukolov E.A. Fundamentals of Statistical Analysis. Workshop on Statistical Methods and Operations Research Using the STATISTICA and EXCEL Packages: A Study Guide for University Students

Module 40

Module code and name	COMS 32013 Data mining
Semester(s), when the module is taught	6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Mathematics, Probability theory and mathematical statistics, Discrete mathematics, Functional and logic programming for AI, Statistical data processing in software packages
Module objectives/intended learning outcomes	This course is an introductory course on data mining. It introduces the basic concepts, principles, methods, implementation techniques, and applications of data mining. Topics covered include classification, association analysis, clustering. Students will create models and execute them using the RapidMiner data analysis application. Students completing the module should be able: - know basic notation and terminology used in data mining. - understand basic principles behind analysis algorithm of Association rules, Classification, Clustering. -visualize, summarize and analyze datasets. -formulate and solve analytical problems for given business problem. -create models and execute it with Rapid Miner
Content	Data Mining, Data Warehouse and OLAP, Data mining knowledge representation, Attribute-oriented analysis, Data mining algorithms: Association rules, Frequent Pattern Growth (FP-Growth) Algorithm, Classification. Hunt’s Algorithm, Estimation of Generalization Errors, Prediction, Nonlinear Partial

	Least Squares (NLPLS) Model, Clustering. DBSCAN, Supervised Learning for Text Classification, Text Sequence Modeling
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar. Introduction to Data Mining (Second Edition)https://wwwusers.cs.umn.edu/~kumar001/dmbook/index.php 2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar. Introduction to Data Mining. Instructor's Solution Manual.https://wwwusers.cs.umn.edu/~kumar001/dmbook/sol.pdf 3. Jiawei Han, Micheline Kamber, Jian Pei. Data Mining Concepts and Techniques (Third Edition) http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-MorganKaufmann-Series-in-Data-Management-Systems-Jia wei-Han-MichelineKamber-Jian-Pei-Data-Mining.-Conceptsand-Techniques-3rd-Edition-MorganKaufmann-2011.pdf

Module 41

Module code and name	COMS 32014 Cybersecurity basics
Semester(s), when the module is taught	6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	This course introduces the concept of cyber security, its interdisciplinary nature and its relation to nation, businesses, society and people. Participating students would gain knowledge of various cyber security terminologies, technologies, protocols, threat analysis, security principles, security mechanisms, policies, forensics, incidence response and methods/practices to secure systems.

	Students completing the module should: - Reasonable understanding of the fundamentals of the cybersecurity domain and related issues; - Practical knowledge of various tools, processes and methods to ensure security of systems through a minimum of two hands-on assignments involving attack and protection in a virtual environment; - Adequate level of cross-disciplinary knowledge of design, implementation, evaluation and testing of secure protocols, systems or applications - Basic knowledge to be able to build bug-free systems, dependable during malice or error - Foundational skills for developing expertise in one or more sub-domains of cyber-security - To carry out the selection of technologies, means of computer technology in the organization of the process of development and research of objects of professional activity, to ensure the protection
Content	The Security Environment. Threats, vulnerabilities, and Consequences. Advanced persistent threats. The state of security today. Cryptographic information security methods. Network and computer security. - Network Security: Network Security Protocols. Threats. Network security systems. Computer security: data types. Security Management - Standards, security policy and controls. - Risk Management, - Legal norms Basics of Windows Operating System Security - User and kernel mode, - File Systems, - Catalog Structure, - Shortcuts and com. Basics of Windows Operating System Security - User and kernel mode, - File Systems, - Catalog Structure, - Shortcuts and com. macOS Security Basics, macOS audit, macOS security settings, macOS recovery. Basics of virtualization and cloud computing. Cloud computing management, security and benefits. Information security standards. Client system management, workstation protection and error correction. Server and user administration. Information security and software audit securing. TCP / IP structure, Ethernet and Lan networks. Identification of threats inherent in wireless systems. Secure access to corporate applications via wireless devices. Cybersecurity industry and career. - Modeling of the information security industry. - Roles and careers in the information security industry. -Professionalization of information security.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; - 40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the

	algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Biryukov A.A. Information security: defense and attack. - M .:DMK Press, 2013.- 474 p. 2 Kolisnechenko D. Anonymity and security on the Internet. From the "teapot" to the user. - SPb .: BHV-Petersburg, 2012.-240s. 3 Melnikov V.P., Kleimenov S.A., Petrakov A.M. Information security and information protection. - M .: Publishing Center "Academy", 2011. - 336s. 4 Ryabko B.Ya., Fionov A.N. Cryptographic protection methods information. Textbook for universities. - M .: Hotline - Telecom, 2014 .-- 229 p. 5 Forousan B.A. Cryptography and security of networks. - M .: ECOM, 2014. 784s. 6 Khalyavin V. How to use the Internet after the adoption of the law “On Internet ". - M .: OOO "AST Publishing House", 2013.- 200s. 7 Khalyavin V. The latest secrets of the Internet. A practical guide user. - M .: MARTIN, 2013.-128s.

Module 42

Module code and name	COMS 33013 Information retrieval systems
Semester(s), when the module is taught	6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Mathematics, Programming in Python
Module objectives/intended learning outcomes	This module provides study of the theoretical foundations of information retrieval know the main types of information retrieval systems as well as the skills of using various IRS, including on the Internet. Provide an understanding of the underlying abstractions and arguments for intelligent systems. Allows to study the principles of the structural and functional organization of modern computer systems, basic methods and algorithms implemented in various components of the computer system, elements and nodes of a digital computer are considered. Students completing the module should be able: - Know the concepts of relevance and criteria of semantic correspondence; - Analyze and compare of the main Internet retrieval systems;. - Use the query languages and interfaces of these systems; - Apply AI techniques to real-world problems to develop intelligent systems; - using computational models for understanding the psychology and behavior of people, animals, and artificial agents

Content	The content provides students with the theoretical foundations of information retrieval, primarily documentary, and the skills to use various documentary IRS, including on the Internet
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Text Information Retrieval Systems, Third Edition (Library and Information Science) (Library and Information Science) (Library and Information Science)/pdfdrive.com/text-information-retrieval-systems-third-edition-library-and-information-science-library-and-informationscience-library-and-information-science-e156719774.html 2. Information Storage and Retrieval Systems: Theory and Implementation (The Information Retrieval Series, Vol.8)/https://www.pdfdrive.com/information-storage-and-retrieval-systems-theory-and-implementation-the-information-retrieval-series-vol-8-e184339009.html 3. Information Retrieval Systems/ https://www.pdfdrive.com/information-retrieval-systems e42203477.html

Module 43

Module code and name	COMS 33014 Design and development of intelligent systems
Semester(s), when the module is taught	6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (elective component))
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The acquisition by students of theoretical knowledge and sustainable skills of practical work with the means of intelligent systems and technologies, providing them with professional knowledge for a systematic approach to the creation of automated systems, computer decision-making systems, expert systems, project management and geoinformation systems.

Content	Acquaintance with intelligent systems. Elements of an intelligent system. An example of an intelligent system. Creation of an intelligent system. Analysis of the applicability of intelligent systems. Types of tasks for which intelligent systems are needed. Large tasks. Situations where intelligent systems are successful. Brief basics of working with data. Common mistakes when working with data. Violation of the confidence intervals. Determination of the goals of the intelligent system. An example of difficulty in choosing a target. Intelligent Experience Components Presenting intelligence to the user. Difficulty developing intellectual experience.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Hulten J."Building Intelligent Systems". ISBN: 978-5-97060-760-2 2. Vasiliev V.I. Intelligent control systems. Study guide M. Radio engineering, 2009-392 p .: ill.-Lit.: 387 3. Gladkov L.A., V.V. Kureichik, V.M. Kureichik. Genetic algorithms. M. Fizmatlit, 2010 - 320 p.

Module 44

Module code and name	COMS 33015 Game theory
Semester(s), when the module is taught	6
Responsible for module person	Turebayeva R
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (elective component))
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Neural network , Machine learning
Module objectives/intended learning outcomes	This module allows you to study the basic concepts of game theory used to describe the most important game models, methods for collecting and analyzing data processing, and apply game theory tools to solve theoretical and practical problems. As a result of studying the discipline, the student must know: the mathematical model of an antagonistic game, the concept of

	optimal strategies of players, the main theorems of matrix games, methods for solving games using applied programs. As a result of studying the discipline, the student should be able to: independently master new methods of game theory, formulate problems and look for ways to solve them; to build models of games for various situations, find optimal strategies for different classes of games, use the results obtained to make optimal decisions, build mathematical models of objects of professional activity. As a result of studying the discipline, the student must have the skills: the basic techniques and methods for solving matrix games. To have an idea of the theory of games as a scientific and applied discipline, on the methods of conflict resolution based on its mathematical model. Content General understanding of game theory. The
Content	General understanding of game theory. The subject of game theory. Uncertainty in game situations. Application of game theory. Classification of games. Matrix games. Endless antagonistic games. Non-antagonistic games. Multi-step games. Antagonistic differential games. Non-antagonistic differential games. Cooperative differential games in the form of a characteristic function. Discounted cooperative differential games of two persons.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Kolobashkina, L. V. Fundamentals of game theory: textbook / L. V. Kolobashkina - M.: Laboratory of Knowledge, 2017 2. Petrosyan LA Theory of games. SPb.: BHV-Petersburg, 2014. 3. Gadelshina G.A. and other Introduction to the theory of games [Electronic resource]: a tutorial. Moscow: Prometheus, 2018 .--169 pp. URL: https://www.twirpx.com/files/science/financial/mmethods/gametheory/https://eltc.kz/Courses/About/111 4. http://www.intuit.ru

Module 45

Module code and name	COMS 33016 Research methods and analysis of social network data
Semester(s), when the module is taught	6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle,	Profile (elective component))

component)	
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The main objective of the module is to familiarize students with the theoretical foundations of the theory of social networks and develop practical knowledge and skills in network data analysis. As a result of studying the discipline, students should: - know the methods of research, processing and analysis of data received from social networks; - understand the fundamental principles of building social networks; - understand the possibilities and limitations of existing methods for analyzing networks and data obtained from social networks; - possess the skills of conducting analytical research on various topics in social networks, drawing up a scheme for disseminating information; - have the skills to independently formulate their own research methodology, search query technology, search (platform for analysis) of information that is important in the analysis.
Content	The discipline is devoted to the study of the main types of data in social psychology, data collection, tools for collecting and processing complex and heterogeneous socio-psychological data, text content analysis in social networks, text message classification algorithms, clustering, forecasting and visualization of social network data, modeling of social networks (Erdos–Renyi, Barabashi–Albert models, Watts–Strogatz), applied aspects of the use of modern web analytical tools for the analysis of large arrays of behavioral data of innovative methods of analysis.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; - 40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Pleskunov, M.A. Methods of statistical analysis of sociological data: textbook. allowance / M.A. Pleskunov. - Yekaterinburg: Ural Publishing House. un-ta, 2017.— 144 p. ISBN 978-5-7996-1988-6 2. Leonov, A.K. Fundamentals of the application of SPSS in sociology: Proc. allowance / comp. A.K. Leo is new. - Blagoveshchensk: Amur State. un-t, 2016. - 167

	3. Rzhevsky, S.V. Operations research. - St. Petersburg. : Lan, 2013. - 476 p. - Access mode: http://e.lanbook.com/books/element.php?pl1 id=32821. 4. Benjamin Bengforth, Rebecca Bilbro, Tony Ojeda Applied Text Data Analysis with Python. Machine learning and building natural language processing applications. - St. Petersburg: Peter, 2019. - 368 p.: ill. — ISBN 978-5-4461-1153-4 5. Nothing personal: How social networks, search engines and special services use our personal data / Keane E. - M.: Alpina Pub., 2016. - 224 p.: ISBN 978-5-9614-5128-3 - Access mode: http://znanium.com/catalog/product/915406

Module 46

Module code and name	COMS 33017 Virtualization and containerization technologies
Semester(s), when the module is taught	6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (elective component))
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The purpose of the discipline: to acquaint students with the specifics of containerization and virtualization technologies used for the organization of cloud computing systems, the principles of implementation of applications with the use of containerization technology, containerization and virtualization systems. To know the principles of organization and architectural features of application of technologies of virtualization and containerization for cloud computing systems; to have a presentation on the principles of using containerization for the development and organization of cloud applications; apply in practice the principles of development and deployment of multi-container cloud applications
Content	The discipline is aimed at studying the principles of organization and architectural features of the use of virtualization technologies for various resources and containerization for cloud computing systems, the basics of working with containers using Docker and Podman, as well as Kubernetes container orchestration systems, the basic principles and methods for building cloud applications based on containers, the concept to manage different types of interaction between containers and platforms.
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one

	long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod..
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Bizley D. Python. Detailed reference book. - Per. with English-SPb: Symbol-Plus, 2014. 2. Мараң, M. M. Program software: textbook / M. M. Maran. - Saint-Petersburg: Lan, 2018. - 196 p. - ISBN 978-5-8114-3032-1. 3. Yakovlev VV Technologies of virtualization and consolidation of information resources: textbook.-M: .FGBOU. 2015, 156 p.

Module 47

Module code and name	COMS 33018 Technologies of virtual and augmented reality
Semester(s), when the module is taught	6
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (elective component))
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The purpose of the discipline is the formation of knowledge and skills taught in the field of digital technology and in the field of application of virtual and augmented reality. Learning module: You need to know: the scope of application of the virtual and augmented reality system, the basic concepts, principles and tools of the AR / AR system development, as well as the equipment for the implementation of the R technology, the stages of AR implementation. It should be noted: to apply the acquired knowledge when designing VR systems, to import 3D models in the midst of VR / AR development, to develop and delay effective algorithms for the development of virtual and extended realization applications. Must have: skills in VR / AR system development, work with design tools and development of applications with immersive content, development of technical documentation for information systems with immersive content.
Content	The discipline considers the main tasks, models, methods and algorithms in the field of computer vision, the basic concepts, principles and tools for developing AR / VR systems, as well as equipment for implementation, stages and technologies for creating VR / AR systems, its components, the scope of virtual and augmented reality, security and privacy risks in virtual and augmented reality
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -

	40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Selyankin VV Computer vision. Image analysis and processing: textbook / VV Selyankin. - St. Petersburg: Lan, 2019. - 152 p. - ISBN 978-5-8114-3368-1. 2. Modeling and virtual prototyping: Tutorial / Kosenko I.I., Kuznetsova L.V., Nikolaev A.V. - M.: Alfa-M, INFRA-M Publishing House, 2016. - 176 p. 3. Bondarenko S. V. Blender. Brief guide / S. V. Bondarenko, M. Yu. Bondarenko. - Dialectics, 2015. - 144 p. 4. Linoves J. Virtual reality in Unity / J. Linoves; per. from English. R. N. Ragimov. — M.: DMK Press, 2016. — 316 p. 5. Systems of virtual, augmented and mixed reality: textbook / A. A. Smolin, D. D. Zhdanov, I. S. Potemin et al. - St. Petersburg: ITMO University, 2018. - 59 p.

Module 48

Module code and name	COMS 42015 Deep learning
Semester(s), when the module is taught	7
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 30 hours, Laboratory – 30 hours, Independent work of students – 120 hours
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	Neural network , Machine learning
Module objectives/intended learning outcomes	This module will allow you to acquire knowledge in the field of artificial intelligence systems and decision-making, to study software tools for constructing intelligent systems for various subject areas.
Content	Class introduction. Examples of deep learning projects. Deep Learning Intuition. Full-cycle of a Deep Learning Project. Adversarial examples – GANs. Attacking neural networks with Adversarial Examples and Generative Adversarial Networks. Generative Adversarial Nets, Conditional GAN, Super-Resolution GAN, CycleGAN. AI and Healthcare. Deep Learning Strategy. Deep Inside Convolutional Networks. Visualizing and Understanding Convolutional Networks.
Examination forms	Oral exam

Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. François Cholle., Deep Learning with Python, Manning Publications; 1st edition India. 2017. - 384 p. 2. Rowel Atienza. Advanced Deep Learning with Keras: Apply deep learning techniques, autoencoders, GANs, variational autoencoders, deep reinforcement learning, policy gradients, and more. Packt Publishing; 1st edition. 2018.- 368 p.

Module 49

Module code and name	MATH 42016 Decision theory
Semester(s), when the module is taught	7
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 30 hours, Laboratory – 30 hours, Independent work of students – 120 hours
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	On completion of this discipline, students will be able to explain and apply the basic methods of discrete (noncontinuous) mathematics in computer science. They will be able to use these methods in subsequent courses in the design and analysis of algorithms, computability theory, software engineering, and computer systems
Content	This course covers elementary discrete mathematics for computer science. It emphasizes mathematical definitions and proofs as well as applicable methods. Topics include formal logic notation, proof methods; induction, well-ordering; sets, relations; elementary graph theory; integer congruences; asymptotic notation and growth of functions; permutations and combinations, counting principles; discrete probability.
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams;

	-40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Francis Cholle. 2017, Deep Learning with Python, Manning Publications; 1st edition 384 p. India. 2. Rowel Atienza. Advanced Deep Learning with Keras: Apply deep learning techniques, autoencoder, GAN, variational autoencoders, deep reinforcement learning, policy gradients and more. Package Publishing House; 1st edition. 2018, 368 p.

Module 50

Module code and name	COMS 42017 Software and Systems Engineering Standards
Semester(s), when the module is taught	7
Responsible for module person	Niyazova R.S.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 30 hours, Seminar – 30 hours, Independent work of students – 120 hours
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The purpose of the discipline is to analyze the current state of the system of international standards of educational programs in the field of information technology. As a result of studying the discipline, the student must: - know software quality standards, methods and tools for developing software documentation, features of software systems standards; - are able to assess the quality of software in accordance with the studied methods and models; - have the skills: • use of criteria for assessing the quality and reliability of the information system; application of the testing methodology for the developed AI applications; • the use of new information technologies in the practical implementation of the requirements of domestic and international standards.
Content	Software life cycle processes in international standards. Guidance on the application. Software life cycle processes. Software and systems engineering — Requirements for assessors and testers of user documentation. Standard for Software Product Evaluation. Standard Quality characteristics and guidance for their application. Assessment of software development. Standard Software packages. Quality and Testing Requirements. Standard Software engineering -- Systems and software Quality

	Requirements and Evaluation
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Martyushev S.M., Software development technologies. Laboratory workshop: method. instructions / S. M. Martyushev, N. N. Lapina. - Ukhta: USTU, 2013 .-- 64 p. 2. Blagodatskikh V.A., Volnin V.A., Poskakalov K.F. Standardization of software development / Ed. O.S. Razumova. - M: Finance and Statistics, 2003. –286 p., ISBN 5-279-02657-3. 3.V. Lipaev Software quality assurance. Methods and standards. - M: SINTEG, 2001 - 30 p., ISBN 5-89638-044-5.

Module 51

Module code and name	COMS 43022 Machine translation
Semester(s), when the module is taught	7
Responsible for module person	.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 15 hours, Laboratory classes – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Neural network
Module objectives/intended learning outcomes	This module is an introduction to the field of machine translation, including the related and more broad field of computer-aided translation. The course is novel in that it will also involve interdisciplinary learning with materials from and possibly team-based interactions with faculty in students in other, non-technical courses at Villanova. This unique offering affords all involved students and faculty the opportunity to accumulate and apply expertise from their respective disciplines to develop approaches and machine translation tools, much in the way such collaboration is done in academic research and the software industryStudents completing the module should be able: - localize software and applications by using latest technologies available. - to transfer theory into practice by examining the place of technology and automatic translation in translation process. - to

	create corpora and use corpora in the translation process. - to compare traditional translation with computer-assisted translation by editing computer-assisted translation and by using computer-assisted translation tools -to define main components of machine translation.
Content	General information about Machine Translation, Approaches to MT , Syntax tree, Statistical Machine Translation, Language Model, Phrase based Machine Translation, Feed Forward Neural Network Language Model, Neural Translation Mode, Encoder-Decoder, Monolingual Data, NMT - Architectures
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Kenny, D. (Ed.) (2017). Human Issues in Translation Technology. Routledge. (available in the library) 2. Cronin, M. (2013). Translation in the Digital Age. Routledge. (available in the library) 3. Poibeau, T. (2017). Machine Translation. Massachusetts Institute of Technology. 4. Balling, L. W., & Carl, M. (Eds.). (2014). Post-editing of machine translation: Processes and applications. Cambridge Scholars Publishing. 5. Schwieter, J. W. & Ferreira, A. (Eds.). (2017). The Handbook of Translation and Cognition. Wiley-Blackwell. 6. Jiménez-Crespo, M. A. (2013). Translation and web localization. Routledge. (available in the library) 7. Esselink, B. (2000). A practical guide to localization (Vol. 4). John Benjamins Publishing. (available in the library)

Module 52

Module code and name	COMS 43023 Project management
Semester(s), when the module is taught	7
Responsible for module person	Niyazova R.S.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 15 hours, Laboratory classes – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	6 ECTS

Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The discipline covers project management tools and techniqucs such as project selection techniques, work breakdown structures, network diagrams, critical path analysis, critical chain planning, cost estimation, earned value management, motivation theory, aпd team building. It discusses the factors contributing to the growing importance of AI, describes how to prepare for disruption, hone skiIls, usc AI to effectively initiate, plan, execute, monitor and control, close and irrtegrate projects. As a result of studying the discipline, the student must: - know the content, stages, work of engineering projects; - know the basic and instructive regulations governing project activities; - have the skills to manage the application development process using tools
Content	What is project management. Project life cycle. Project life cycles in IT. Project environment. Project and organizational structures of the enterprise. An Introduction to PMBOK. The main groups of project management processes. Major areas of knowledge in project management. Project Integration Management. Project domain management. Time management in a project. Project cost management. Quality Management in a Project. Human Resource Management in a Project. Project Communications Management. Project Risk Management. Project procurement management. Project Stakeholder Management
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; - 40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, Interactive whiteboard, projector, electronic textbook, electronic lectures, exercises for practical / laboratory classes, additional material, White-board, Laptop, LCD Projector
Reading list	1. Leach, L. On Time and On Budget: Critical Chain Project Management [Electronic resource] / Lawrence Leach; Per. from English - M .: Alpina Publishers, 2014 .-- 354 p. 2. Blank, S. Four Steps to Insight: Strategies for Building Successful Startups [Electronic resource] / Steve Blank; Per. from English ? M .: Alpina Publisher, 2014.? 368 p/ 3. Project Management: Textbook / M.V. Romanov. - M .: ID FORUM: NITs INFRA-M, 2014 .-- 256 p. 4. Project Management: Textbook / Yu.I. Popov, O.V. Yakovenko; Institute of Economics and finance "Synergy". - M .: NITs INFRA-M, 2013 .-- 208 p. 5. Information technology project management: Textbook / N.M. Svetlov, G.N. Svetlova. - 2nd ed., Rev. and add. - M .: NITs INFRA-M, 2015 .-- 232 p. 6. Bukharaev, N.R. Problems of managing innovative projects in

	the field of IT technologies. Introduction to flexible project management: lecture notes [Electronic resource] /N.R.Bukharaev. - Kazan: [b.i.], 2014. - 106 p.

Module 53

Module code and name	COMS 43024 AI Workshop
Semester(s), when the module is taught	7
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 30 hours, Laboratory – 30 hours, Independent work of students – 120 hours
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The study of the course "AI Workshop " is designed to form a holistic view of the current state of the theory and practice of building intelligent systems for various purposes. Transfer knowledge about artificial intelligence. Provide an understanding of the underlying abstractions and arguments for intelligent systems. To enable students to understand the basic principles of artificial intelligence in various applications.
Content	Artificial intelligence as a scientific field. Theoretical aspects of knowledge engineering. Representation of tasks in the state space. State-space search methods. Reducing a task to a set of subtasks. Search methods for reducing tasks to a set of subtasks. Representation of knowledge in intelligent systems. Semantic networks. Representation of knowledge by rules and inference. Representation of knowledge in frames. Modeling linguistic activity. Understanding Natural Language Queries in Intelligent Systems. Analysis of formal concepts as a tool for conceptual clustering. Linguistic information resources and their application for the problems of computer processing of natural language constructions. Automatic compression of texts and recognition of semantic equivalence.
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector

Reading list	1. George F.Luger. Artificial Intelligence. Structures and Strategies for Coomplex Problem Solving. Fourth Edition.-2003. – 432 p. 2. Bolshakova E.I., Malkovsky M.G., Pil'shchikov V.N.Artificial intelligence. Algorithms for heuristic search (textbook) - Moscow: Publishing Department of the Faculty of Computational Mathematics and Cybernetics, Moscow State University (license ID No. 05899 from 24.09.01), 2002. 83 p. 3. Bessmertny, I.A.Artificial intelligence systems: a textbook for academic bachelor's degree / I.A.Bessmertny. - 2nd ed., Rev. and add. - M.: Yurayt, 2017.- 130 p. 4. Borovskaya, E. Fundamentals of artificial intelligence / E. Borovskaya. - M .: Binom, 2015.- 128 p. 5. Burakov, M.V. Artificial intelligence systems. Study guide / M.V. Burakov. - M .: Prospect, 2017.- 440 p. 6. Kudryavtsev, VB Intelligent systems: textbook and workshop for undergraduate and graduate programs [Text] / VB Kudryavtsev, E. E. Gasanov, A. S. Podkolzin. - 2nd ed.,Rev. and add. ; Moscow State University M.V. Lomonosov. - M.: Yurayt, 2017.- 219 p. 7. Yasnitsky, L.N. Introduction to artificial intelligence: textbook

Module 54

Module code and name	COMS 43025 Data Analysis Workshop
Semester(s), when the module is taught	7
Responsible for module person	Niyazova R.
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 30 hours, Laboratory – 30 hours, Independent work of students – 120 hours
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	Data mining
Module objectives/intended learning outcomes	The main goal of this discipline is to form students' basic theoretical knowledge in the field of Data Analysis Workshop. Students completing the module should: - to understand the problems, and the solutions to problems in the professional practice of Artificial Intelligence application in business environment. - to solve the analysis of information needs from different organizations, identifying the uncertainty and variability sources. - managing the acquisition, the structuring, analysis and visualization of data and information in the field of specialization, and for critically assessing the results of this management. - analyze and solve complex technical problems.
Content	Basics of combinatorics, Determination of probability, Conditional probabilities, Test sequences, Random Variables Determination of a random variable, Discrete random variables and their most important numerical characteristics, Absolutely continuous random variables and their most important numerical characteristic, Relation measures of random variables, Central

	limit theorem
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Soloviev Data analysis in economics. Probability theory and applied statistics in Microsoft Excel: textbook. / V.I.Soloviev. - Moscow: KNORUS, 2018.- 324 p. 2. Kalinina V.N. Data analysis: Computer workshop: tutorial / V.N. Kalinin, V.I. Soloviev. Moscow: KNORUS, 2017 .-- 166 p. 3. Mirkin B.G. Introduction to data analysis [Electronic resource]: textbook and workshop / BG Mirkin. - Moscow: Yurayt, 2017. - 174 p. - Access mode: https://biblioonline.ru/book/46A41 F93-BC46-401C-A30E-27C0FB60B9DBrailov A.V. Collection of problems for the course "Mathematics in Economics". Part 3. 4. Probability theory / AV Brailov, AS Solodovnikov. - Moscow: Finance and Statistics, 2010, 5. 2013, 2017. — 125 p

Module 55

Module code and name	COMS 43026 Technology entrepreneurship and IT StartUp
Semester(s), when the module is taught	7
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, project method, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 30 hours, Laboratory – 30 hours, Independent work of students – 120 hours
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The course is intended for those students who will one day start their own digital startup, as well as for those students who will one day work in or with digital startups. The course focuses on the critical skills of planning and developing digital startups. Students completing the module must: Be able to design business modes Use flexible methodologies Create wireframes, high-precision designs and prototypes Create product and feature set roadmaps Be able to apply business skills and use IT StartUp to present

	knowledge.
Content	Introduction to IT start-ups.Team. Founders and employees. Roles and team dynamics. CultureProduct Research. Research competitive landscape. Product Management. Minimum viable product. Product vision. Product roadmap. Features and requirements5.UX Design. User research. Personas and scenarios. Wireframes.High fidelity designs. Prototypes. Usability testing. A/B testing toolsProduct Development. Agile development, SCRUM, Waterfall. Development frameworks. Databases, NoSQL, SQL. SaaS, buy vs. build. Hosting environments. Outsource vs. insource.Customers. Customer acquisition. Customer relationships. Customer segments.Revenue. Revenue streams. Pricing. Common mistakes. Revenue first companies.Market type, size and share. Sales. Sales strategies. Pitch decks. Fund Raising. Investors' perspective. Fund raising process. Valuation. Term sheetsAnalytics and Metrics. Key performance indicators. Tools and platformsMarketing. Marketing channels. Inbound marketing. Funnel analysis. Social media marketing. Legal and Accounting. Equity. Fundraising. Investor requests Introduction to IT start-ups.Team. Founders and employees. Roles and team dynamics. CultureProduct Research. Research competitive landscape. Product Management. Minimum viable product. Product vision. Product roadmap. Features and requirements5.UX Design. User research. Personas and scenarios. Wireframes.High fidelity designs. Prototypes. Usability testing. A/B testing toolsProduct Development. Agile development, SCRUM, Waterfall. Development frameworks. Databases, NoSQL, SQL. SaaS, buy vs. build. Hosting environments. Outsource vs. insource.Customers. Customer acquisition. Customer relationships. Customer segments.Revenue. Revenue streams. Pricing. Common mistakes. Revenue first companies.Market type, size and share. Sales. Sales strategies. Pitch decks. Fund Raising. Investors' perspective. Fund raising process. Valuation. Term sheetsAnalytics and Metrics. Key performance indicators. Tools and platformsMarketing. Marketing channels. Inbound marketing. Funnel analysis. Social media marketing. Legal and Accounting. Equity. Fundraising. Investor requests
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Maurya, Ash (2012). Running Lean. O'Rielly Media. ISBN-10 1449305172.

	2. Blank, Steve and Dorf, Bob (2012). The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch Publishing. ISBN-10 0984999302. 3. https://web-app.usc.edu/soc/syllabus/20173/32055.pdf

Module 56

Module code and name	COMS 43027 Intelligent control systems and cognitive systems
Semester(s), when the module is taught	7
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lecture – 30 hours, Laboratory – 30 hours, Independent work of students – 120 hours
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The discipline allows to study the principles of the structural and functional organization of modern computer systems, basic methods and algorithms implemented in various components of the computer system, elements and nodes of a digital computer are considered.
Content	Introduction. Artificial Intelligence. Five Laws of Intelligent Behavior. Main Directions of Advanced AI Research. Expert Systems and Knowledge Engineering Problems. Knowledge Representation Models. Propositional Logic. Script-based Knowledge Representation. Knowledge Processing. : Human Decision Making and Fuzzy Sets. Fuzzy Logic. From Fuzzy Logic to Fuzzy Systems. Genetic Algorithms: Theoretical Backgrounds and Applications. GA Application in Intelligent Control Systems Design. Artificial Neural Networks: Background and Application.
Examination forms	Oral exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments, laboratory reports and Class work; -40 degrees for two Midterm exams; -40 degrees for final Written Exam. Two Midterms are completed by a colloquium (a discussion of the course content) Final written examination (90 min.) have short answer questions, covering around half the marks, and then one long problem-solving practice task. On the written exam students are demonstrating their understanding of the course outline through the completion of tasks. The next aspects of learning to program or an intellectual system development are assessed: the algorithms design, description of algorithms, the use of a programming environment to enter, edit, and debug cod.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Turing A.M. (1950) Computing machinery and intelligence. Mind, 59, 433-460. 2. Oxford dictionary of computing (1991) 3. Kasabov N.K. (1996) Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, MIT Press, Cambridge,

	Massachusetts; Smolensky P. (1988) On the proper treatment of connectionism, Behavioral and Brain Sciences, Vol.2, N 1.

Module 57

Module code and name	PWEX 42505 Pre – diploma practice
Semester(s), when the module is taught	8
Responsible for module person	
Language of study	Kazakh/Russian
Relationship with curriculum (cycle, component)	Profile (university component) Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning
Workload (incl. contact hours, self-study hours)	Lecture – 15 hours, Laboratory – 30 hours, Independent work of students – 105 hours
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Pre-graduate practice is organized for students who perform a thesis (project). The purpose of the pre-graduate practice is to complete the writing of the thesis (project). Objectives of the Pre- diploma practice: - acquisition of professional skills, skills and competencies of students, expansion and systematization of knowledge gained in the study of academic disciplines; - improvement of basic professional skills and abilities in the field of artificial intelligence - development of skills for working with real research and industrial projects; - getting skills of independent work, as well as working as part of a team; - processing of the received materials and preparation of the report on the industrial practice Learning outcomes: - apply theoretical and practical knowledge in solving tasks of artificial intelligence. - be able to develop modules of artificial intelligence systems, taking into account the knowledge of regulatory documents and the subject area. - solve and analyze problems in the field of artificial intelligence - able to conduct written and oral communication in Kazakh and Russian. The knowledge, skills and abilities acquired in the course of practice help to implement the program project, write the final qualifying work and in the professional activities of the graduate.
Content	1. Study and analysis of special literature on the topic of the diploma work; 2. Compilation of a literature review. 3. Fulfillment of an individual task from the department; 4. Writing and debugging program code 5. Verification and testing of program code 6. Writing the final qualifying work 7. Writing a report
Examination forms	Report
Study and examination requirements	Based on the results of the practice, students provide a report on the practice in the format of a paper and electronic document, which reflects the performance of an individual task during the

	practice, the acquired skills and abilities, and the competencies formed. The student reports on the results, answers the questions posed, provides a package of documents based on the results of professional practice and expresses his conclusions and proposals to the commission.
Technical, multimedia tools and software	e-Learning MOODLE, methodical development labs, individual cards, White-board, Laptop, LCD Projector
Reading list	1. F ENU 705-01-19 The program of professional practice of the educational program in the direction of training personnel with higher and postgraduate education. 2. F ENU 705-02-19 Guidelines for practice for students.

Considered and approved at the meeting of the department «Artificial intelligence technologies».
date 22.03 2022 Record № 8.1

Razakhova B.Sh. _____ 28.03.22
(Name) (signature) (date)