NCJSC «L.N. GUMILYOV EURASIAN NATIONAL UNIVERSITY»

Module Handbook
Educational program
7M06112 Artificial Intelligence Technologies

Nur-Sultan
2022

Contents

Module 1

Module code and name	EDUC 52003 Higher Education Pedagogy
Semester(s), when the module is taught	1
Responsible for module person	Kalkeeva K.R.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (university component)
Teaching methods	Traditional. Active and interactive teaching methods
Workload (incl. contact hours, self-study hours)	Total workload: 120 hours. Lectures: 15 hours, practical: 22 hours, independent work of students: 83 hours.
Credit points (total by discipline)	4 ECTS
Required and recommended prerequisites for joining the module	Methods of studying private methods, Teaching technologies at the university.
Module objectives/intended learning outcomes	The development of professional and pedagogical thinking of teachers, the formation of scientific and pedagogical knowledge and skills necessary both for teaching activities and for improving general professional competence and pedagogical culture.
Content	The proposed course is aimed at familiarizing undergraduates with scientific and pedagogical approaches to the organization of the pedagogical process, as well as with the principles of pedagogical activity carried out in the system of vocational education. The sphere of professional pedagogical activity of the teacher is: - higher educational institutions; - colleges and other educational institutions; - organizations and enterprises whose activities are related to various aspects of teaching. The presented discipline involves the creation of pedagogical conditions that ensure the development of the pedagogical position of masters, the formation of which determines the manifestation of the subjective characteristics of the teacher's personality in the system of vocational education.
Examination forms	Matrix test
Study and examination requirements	Visit to the MOOC platform. Studying the materials proposed on the basis of MOOC and PLATONUS, timely completion of tasks and, according to the test schedule, pass tests for the main course and individual work of students.
Technical, multimedia tools and software	Recording video lectures accompanied by slides and films. Study and feedback is carried out on the basis of MOOC and PLATONUS.
Reading list	1.Ahmetova G.K., Isaeva Z.A. Pedagogika: Uchebnik dlya magistratury universitetov. – Almaty: Қazaқ universiteti, 2018 – 328 s. 2.Pedagogicheskie tekhnologii: uchebnoe posobie dlya studentov pedagogicheskih special'nostej / pod red. V. S. Kukushina. — Rostov n/D: Mart, 2017. — 320 s. 3.Pedagogika vysshej shkoly: Uchebnik / Okolelov O.P. – M.:NIC INFRA-M, 2017. – 176 s. 4.Pedagogika vysshej shkoly: Uchebnik / K.R.Kalkeeva i dr – Astana-TOO «Master PO», 2017. – 253 s.

Module 2

Module code and name	PSYC 52004 Management Psychology
Semester(s), when the module is taught	1
Responsible for module person	Mambetalina A.S.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (university 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: 120 hours. Lectures: 15 hours, practical: 22 hours, independent work of students: 83 hours.
Credit points (total by discipline)	4 ECTS
Required and recommended prerequisites for joining the module	Psychology, Rukhani zhangyru
Module objectives/intended learning outcomes	Objectives: to train Master's degree students in management fundamentals that ensure the preservation of a certain structure, organized systems; maintaining the mode of management activities, the implementation of the program and management goals in professional activities. Intended learning outcomes: Know: the essence of the subject psychology of management; basic theories and concepts of management psychology in modern domestic and foreign science; methodological and technological features of management in the professional sphere. Skills: be able to: analyze the processes of management activities; identify psychological control schemes; develop management schemes taking into account psychological patterns; determine the features of psychological interaction in management Own: modern methods of socio-psychological analysis and diagnosis of the content and forms of management activities; methods of implementation of the main management approaches in the field of public procurement.
Content	Introduction to the psychology of management. Leader personality. Management styles, delegation and business career of the leader. Psychology of staff motivation. Socialization of personality as a social phenomenon. Characteristics of the process of adaptation of the subordinate to the conditions of the organization. The system of regulation of behavior and activity of the individual in the organization. Communication as a social phenomenon. Features of managerial communication. Communication between the leader and subordinates as the exchange of information, interaction and influence. Problems of interpersonal perception in managerial communication. Features of communication of the leader in a modern organization. Social organization as an object of management. Psychology of conflict management in the activities of the leader. Social intelligence in the activities of the leader. Leader health. Prevention and overcoming stresses and life crises.
Examination forms	Matrix test
Study and examination requirements	It is necessary to participate in all types of control: current, intermediate, final, control of students' independent work. The discipline determines the final grade, which consists of the results of the rating control and the exam, while 60% are rating control, 40% are the result of the exam. The exam must score at least 50% to successfully complete the course.
Technical, multimedia tools and software	Recording video lectures accompanied by slides and films. Study and feedback is carried out on the basis of MOOC and PLATONUS.
Reading list	1. Bazarov, T.YU. Psihologiya upravleniya personalom: Uchebnik i praktikum dlya akademicheskogo bakalavriata / T.YU. Bazarov. - Lyubercy: YUrajt, 2016. - 381 c. 2. Kozlov, V.V. Psihologiya upravleniya: Uchebnik / V.V. Kozlov. - M.: Akademiya, 2016. - 240 c. 3. Mal'ceva YU. A, YAcenko O. YU. Psihologiya upravleniya. Ekaterinburg : Izd-vo Ural. un-ta, 2016.— 92 s.

	4. Litvak, M.E. Komandovat' ili podchinyat'sya? Psihologiya upravleniya / M.E. Litvak. - Rn/D: Feniks, 2018. - 384 c. 5. Konovalenko, V. A. Psihologiya upravleniya personalom: uchebnik dlya akademicheskogo bakalavriata / V. A. Konovalenko, M. YU. Konovalenko, A. A. Solomatin. — M.: Izdatel'stvo YUrajt, 2015. — 477 s. — (Seriya : Bakalavr. Akademicheskij kurs). 6. Bazarov T.YU. Psihologiya upravleniya personalom: uchebnik i praktikum dlya akademicheskogo bakalavriata.2015, Izdatel'stvo YUrajt M. - 381 s. 7. Kozlov, V.V. Psihologiya upravleniya / V.V. Kozlov. - M.: Academia, 2017. - 48 c. 8. Konovalenko, V.A. Psihologiya upravleniya personalom: Uchebnik dlya akademicheskogo bakalavriata / V.A. Konovalenko, M.YU. Konovalenko, A.A. Solomatin. - Lyubercy: YUrajt, 2016. - 477 c. 9. Korolev, L.M. Psihologiya upravleniya: Uchebnoe posobie / L.M. Korolev. - M.: Dashkov i K, 2016. - 188 c.

Module 3

Module code and name	COMS 52005 Computational models
Semester(s), when the module is taught	1
Responsible for module person	Razakhova B.Sh.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Algorithms and data structure
Module objectives/intended learning outcomes	The main goal of the discipline is to study computational models of algorithms for teaching masters the problems of formalization of algorithms, directions for the development of the theory of algorithms and computational models, methods for constructing algorithms; to acquaint them with practical applications in the construction of various programming systems. The goals of mastering the discipline: - study of the basic principles of construction of calculation models and analysis of the results obtained; - use of the acquired knowledge and practical skills in the study of disciplines of the basic and optional parts, as well as in writing master's theses; - formation of algorithmic thinking; - familiarization with the basic concepts of the theory of algorithms, computational models, methods of analysis and construction of various computational models; - training and development of skills in the application of methods for constructing computational models for scientific research. Know: analytical and numerical methods for solving various mathematical problems, basic techniques for processing experimental data, including using mathematical packages and systems; Skills: Approximately solve real mathematical problems using the methods of computational mathematics and analyze the results obtained in the course of calculations; use the means of modern mathematical packages when making calculations;

	Competences: experience in analytical and numerical solution of various mathematical problems, skills in using the main methods of processing experimental data, including using mathematical packages and systems.
Content	The discipline will allow you to study computational models and their features (Turing, Post machines, recursive functions, formal Markov orhythms, etc.) in practice. 1. Introduction to the theory of algorithms. The concept of formalization of algorithms. Classification of algorithms. Basic computational models. 2. Turing machine. The Church-Turing thesis. Variants and schemes of the Turing machine. 3. A way to prove the correctness of the program. 4. Recursive functions. Lambda calculation. 5. Verbal algorithms. Normal Markov algorithms. 6. Post's algorithm. 7. Procedural computational models. 8. Functional computing models. 9. Graph algorithms. Graphical analysis. Scheduled search. Efficient graph construction algorithms. Algorithms of Dijkstra, Prim and Kruskal. 10. Logical computational models, production computational models. 11. Neural network computing models. 12. Parallel algorithms. Polynomial and exponential algorithms. 13. Greedy algorithms. 14. Algorithms for prime and random numbers. Genetic algorithms. Ant algorithms.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Semenova T.I., Kravchenko O.M., Shakin V.N. Computational models and algorithms for solving problems by numerical methods. Textbook: MTUCI. – M.: 2017. – 84 p. 2. Stephen Skin. Algorithms. Development guide. 2nd edition, 720 pages, BHV-Petersburg, 2011 3. Krupsky V.N. Theory of algorithms: a textbook for students. universities. - M.: Publishing house. Center "Academy", 2009. -208 p. 4. Aho A., Hopcroft J., Ulman J. Data structures and algorithms. - M .: Williams Publishing House, 2012. - 384 p. 5. .Michael Sipser (2013). Introduction to the Theory of Computing (3rd ed.). Cengage Learning. 480 pp., published 2013 by Hsm Management. ISBN 978-1-133-18779-0 6. Mar, Austin. "Quantum Computing in Complexity".

	Theory and Theory of Computing" (PDF). page 2. Retrieved June 7, 2014

Module 4

Module code and name	EDUC 54101, EDUC 54201, EDUC 54301, EDUC 54101 Scientific-research work of graduate students
Semester(s), when the module is taught	1,2,3,4
Responsible for module person	Research supervisors of undergraduates
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Search, researcher
Workload (incl. contact hours, self-study hours)	Total workload: 720 hours. 1st semester: 210 hours, 2nd semester: 210 hours, 3rd semester: 120 hours, 4th semester: 180 hours.
Credit points (total by discipline)	24 ECTS
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The main purpose of the research work of the undergraduate is the development of the ability of independent research work, associated with the decision of complex professional tasks. Learning Outcomes: - to master the methods of search, processing and analysis of scientific literature on the topic of research; - be able to formulate a statement of the task; - to master the technology of conducting independent scientific research on the topic of the master's dissertation; - to be able to justify the chosen scientific direction, to adequately select the means and methods for solving the tasks assigned to the scientific research; to conduct research in accordance with the developed scientific research program; - be able to present the results obtained in the form of research reports and scientific publications
Content	Analysis of problems and selection of research directions. Management of bibliographic work with a focus on modern information and communication technologies. Study of new scientific results in accordance with the theme of the master's dissertation. Compilation of scientific reviews on the topic of research. The solution of the assigned task is in accordance with the individual plan. Review and evaluation of research results: preparation of research results in the form of reports, articles, participation in scientific conferences and scientific seminars of the department
Examination forms	report
Study and examination requirements	Timely fulfillment of the individual plan of the master
Technical, multimedia tools and software	Search databases of scientific literature
Reading list	On the topic of scientific research

Module 5

Module code and name	COMS 53001 Formal Grammars
Semester(s), when the module is taught	1
Responsible for module person	Sharipbay A.A.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105

	hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Algorithms and data structures, Theory of languages and automata, Discrete mathematics
Module objectives/intended learning outcomes	Undergraduates know how to provide an introduction to the key ideas and issues of computational linguistics from the position of formal grammar, to introduce the fundamental concepts of formal language, formal grammar and automata theory. Undergraduates know how to become familiar with standard terminology and the most important theoretical tools and concepts related to formal grammar. Undergraduates can classify machines by their ability to recognize languages, use automata to solve problems in computational linguistics.
Content	Mathematical foundations of formal grammar and automation. Elements of mathematical logic. Elements of the theory of languages. Mechanisms of language generation Formal probabilistic grammar. Language recognition mechanisms. Automata and their classification.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Pentus AE, Pentus MR Theory of formal languages: textbook. - M.: Publishing House of the Central Polytechnic Institute at the Faculty of Mechanics and Mathematics of Moscow State University, 2004. - 80 p. 2. Willem J.M. Levet. Introduction to the theory of formal languages and automata. Max Planck Institute for Psycholinguistics, Nijmegen. 3. John Benjamins Publishing. Amsterdam / Philadelphia, 2008, -404 p.

Module 6

Module code and name	COMS 53002 Ontologies, Semantic Technologies
Semester(s), when the module is taught	1
Responsible for module person	Niyazova R.S.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105

	hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Algorithms and data structures, Theory of languages and automata, Information and communication technologies, Intelligent information systems and technologies for their development
Module objectives/intended learning outcomes	Ontologies, semantic technologies: Undergraduates know the theory of ontological engineering. Undergraduates can study the methodological and technological foundations of designing semantic technologies. Undergraduates have the opportunity to create an ontological model of the chosen subject area
Content	Information, data and knowledge. The main ways of representing knowledge: frames, scenarios, products. semantic networks. Frame model. Ontology. RDF data representation format. SPARQL Query Language. OWL language constructs. Syntax. Descriptive logic EL and others. Knowledge base. Axioms and TBox. Statements and ABox. Logical analysis.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. T. A. Gavrilova, D. V. Kudryavtsev, and D. I. Muromtsev, Knowledge Engineering. Models and methods: textbook. SPb., 2016. S. 300-301. 2. Semantic network for a working ontologist / ed. D. Allemang, J. Hendler. Elsevier, 2011. 330 p. 3. Statistical Methods in Language and Linguistic Research Publisher: Equinox Publishing Limited, October 2020 - 256 p.

Module 7

Module code and name	COMS 53003 Analysis and processing of large amounts of information
Semester(s), when the module is taught	1
Responsible for module person	
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 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 mastering the discipline "Analysis and processing of large amounts of information" is the formation of competencies in the subject area related to solving the problems of collecting and analyzing huge amounts of structured or semi-structured information, developing data models based on it and extracting new knowledge. Expected learning outcomes: Know methods for solving problems of processing and analyzing big data Be able to develop and analyze conceptual and theoretical models of applied problems of big data analysis; Be able to formulate machine learning problems for big data and offer solutions to the tasks. Get hands-on big data skills with Python (R) programming language-based environments
Content	Big data (Big Data): modern approaches to processing and storage. The problem of multiple data comparison. Analysis process. General scheme of analysis. Data extraction and visualization. Stages of modeling. Model building process. Forms of data representation, types and types of data. Representations of datasets. Fundamentals of Hadoop, Sparkand other systems. Big Data Algorithms: Clustering, dimensionality reduction, popular subject sets and association rules. Analysis and processing of data from social networks. Application of big data processing algorithms in decision making problems. Architecture of big data processing systems. Big data storage and processing technologies. Data retraining. Data visualization. Data understanding. The problem of retraining. Regularization. Neural networks. Support vector machine.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Matloff Norman. The Art of R Programming. Dive into Big Data. - St. Petersburg: Piter, 2019. 416 p. - ISBN 978-5-4461-1101-5. - URL: 2. Mirkin, B. G. Introduction to data analysis: textbook and workshop / B. G. Mirkin. - Moscow: Yurayt Publishing House, 2020. 174 p. - ISBN

	978-5-9916-5009-0 3. Leskovec J. Mining of Massive Datasets [Electronic Resource] / Jure Leskovec, Anand Rajaraman, Jeffrey David Ulman. – 2nd. ed. - Cambridge: Cambridge University Press, 2014. - 482 p. - Authorized access: http://library.books24x7.com/toc.aspx?bookid=74213 (Online Digital Library "Books24x7"). 4. Guller M. Big Data Analytics with Spark: A Practitioner's Guide to Using Spark for Large-Scale Data Processing, Machine Learning, and Graph Analytics, and High-Velocity Data Stream Processing [Electronic Resource] / Mohammed Guller. - Apress, 2015. - 290 p. - Authorized access: http://library.books24x7.com/toc.aspx?bookid=112020 (Online Digital Library "Books24x7"). 5. Coelho Luis Pedro. Building machine learning systems in Python. - Moscow: DMK Press, 2016. - 302 p. - ISBN 978-5-97060-330-7

Module 8

Module code and name	COMS 53004 Machine learning and applications
Semester(s), when the module is taught	1
Responsible for module person	Turebayeva R.D.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Neural networks
Module objectives/intended learning outcomes	The purpose of studying the discipline is to study modern mathematical methods of machine learning designed to analyze data and build predictive models. Discipline tasks: Know the mathematical foundations of machine learning methods and related algorithms; Be able to analyze, highlight features and combine machine learning methods; Apply modern software environments and libraries that allow you to analyze, visualize data, Possess the skills of practical use of machine learning methods in applied problems.
Content	Problems of learning by precedents. Probabilistic formulation of the learning problem. Retraining, generalizing ability. Tasks of classification, regression recovery, ranking, clustering, association search. Formal model of machine learning. Basic algorithms for solving problems of classification and regression recovery. Visualization and clustering. Artificial neural networks. Application of intelligent diagnostic methods in various subject areas.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Plas J. Vander Python for Complex Problems: Data Science and Machine Learning. - St. Petersburg: Peter, 2018. - 576 p. 2. Silen Davy, Meisman Arno, Ali Mohamed. Fundamentals of Data Science and Big Data. Python and data science. - St. Petersburg: Piter, 2017. -336 p. 3. A resource dedicated to machine learning, pattern recognition and data mining. - http://machinelearning.ru

Module 9

Module code and name	ENGL 52002 Foreign language (professional)
Semester(s), when the module is taught	2
Responsible for module person	Sagimbayeva D.E.
Language of study	English
Relationship with curriculum (cycle, component)	Basic (university 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: 120 hours. Practical: 37 hours, independent work of students: 83 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Foreign language B2
Module objectives/intended learning outcomes	The purpose of the discipline: The acquisition and improvement of competencies in accordance with international standards of foreign language education, allowing the use of a foreign language (the level of superbasic standardization (C1) as a means of communication for the successful professional and scientific activities of a future master who is able to compete in the labor market. Intended learning outcomes: - know the functional and stylistic characteristics of the scientific presentation of the material in the studied foreign language; - be able to use general scientific terminology and the terminological sublanguage of the relevant specialty in a foreign language; - freely read, translate original literature in the chosen specialty with subsequent analysis and evaluation of the extracted information; - make a presentation of scientific research (at seminars, conferences, symposiums, forums); - perceive by ear and understand public speeches in direct and indirect communication (lectures, reports, TV and Internet programs); - have the skills to prepare written forms of presentation of information material in the specialty (scientific report, message, theses, abstract,

	abstract); - have the skills to work with lexicographic sources in a foreign language (traditional and online).
Content	Introduction to the course. Developing a focus. How to write master's dissertation (introductory course). Sourcing information for your project. Developing your project. Using evidence to support your ideas. Avoiding plagiarism. Paraphrasing and summarizing. Academic Style – some guidelines (Part I). Academic styles (Part II). Writing introductions. Incorporating data and illustrations. Writing conclusions. Presentation skills. Preparing for conference presentation. Preparing for a conference presentation.
Examination forms	Oral exam
Study and examination requirements	Master's degree students are required to attend practical classes in a foreign language and take an active part in the implementation of tasks for the individual works of Master's degree students, 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	Databases: https://library.enu.kz/MegaPro/Web https://englishforacademicstudy.com https://garneteducation.com http://presentationexpressions.com http://wiki.ubc.ca/Presentation_Skills https://global.oup.com/?cc=kz, https://www.macmillanyounglearners.com/macmillanenglish/ https://www.britishcouncil.kz/kk https://edpuzzle.com/
Reading list	1. Sagimbayeva J.E., Moldakhmetova G.Z., Kurmanayeva D.K. Tazhitova G.Z., Kassymbekova N.S. English course book for Master programme students of "Governmental audit and Financial control" specialty (from extended reading to academic writing) - Astana: L.N. Gumiloyv Eurasian National University, 2018. – 357p. 2. Sagimbayeva J.E., Kurmanayeva D.K., Tazhitova G.Z., Kassymbekova N.S. Electronic manual - English course book "Environment and Natural Resources Protection" for Master students of "Management and Engineering in the field of Environmental Protection educational programs" – Nur-Sultan, 2022 3. English for Academic Study. Joan McCormack and John Slaght - Extended Writing and Research Skills, University of Reading, 2012 – 152 p. 4. Tamzen Armer - Cambridge English for Scientists – Cambridge University Press, 2013 – 128 p. 4. Martin Hewings – Cambridge Academic English – Upper Intermediate-Cambridge University Press, 2012 – 176 p. 5. Dorothy E. Zemach, Lisa A. Rumisek - Academic Writing: from paragraph to essay. – London: Macmillan Education, 2016 - 130 p. 6. Academic Writing. A Handbook for International students. Stephen Bailey. Routledge. 2011

Module 10

Module code and name	PHIL 52001 History and Philosophy of Science
Semester(s), when the module is taught	2
Responsible for module person	
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle,	Basic (university component)

component)	
Teaching methods	Traditional. Active and interactive teaching methods
Workload (incl. contact hours, self-study hours)	Total workload: 120 hours. Lectures: 15 hours, practical: 22 hours, independent work of students: 83 hours.
Credit points (total by discipline)	4 ECTS
Required and recommended prerequisites for joining the module	World History, Political Science, Sociology
Module objectives/intended learning outcomes	The main goal of the course is to develop undergraduates' interest in fundamental knowledge, stimulate the need for philosophical assessments of the formation and development of sciences, critical analysis of modern scientific achievements, develop a methodological culture of research work Expected learning outcomes: Analyze the main worldview and methodological problems, including those of an interdisciplinary nature, studied in science at the present stage of its development and use the results professionally; understanding the dynamics of the development of science, its impact on the development of society, the formation of a holistic image of science, mastering the theory of method, mastering the logic and methodology of science; mastering in-depth skills in analyzing texts on philosophical problems of various sciences; critical reflection on various concepts of the growth of scientific knowledge; mastering the methodological culture of research work and the ability to use the acquired skills in their own professional activities.
Content	Relationship between the philosophy of science and the history of science. Philosophical ideas as heuristics of scientific research. The problem of demarcation in the philosophy of science. The genesis of science. Discussions about the origin of science. The problem of scientific rationality. classical science. Scientific picture of the world. Ethos of classical science. Non-classical science and post-non-classical science. Scientific picture of the world. The ethos of science. Philosophy of science: basic meanings. Problems of the boundaries of scientific knowledge in the philosophy of I. Kant. Positivist tradition Analytical philosophy and its influence on the philosophy of science. The transition from the logic of science to the history of science. The structure of scientific knowledge. Basic types of sciences. Types of cognitive procedures. Philosophy of natural sciences. Circle of problems of philosophy of natural sciences. Philosophy of technology and technical sciences. The role of technology in science. Information and computer technologies in non-classical technical sciences. Ecological aspects of the social assessment of technology. Specificity of socio-humanitarian knowledge. The problem of the formation of social theory. The theme of "death of the subject" in postmodern philosophy. Time, space, chronotope. The problem of values. post-colonial studies.
Examination forms	Oral exam
Study and examination requirements	To successfully pass the final control, the undergraduate needs to know the terminology, theories and concepts of the discipline. Know personalities and their works. 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	Computer, projector. https://mooc.enu.kz/, https://moodle.enu.kz/
Reading list	1. Kanke V.A. Osnovnye filosofskie napravleniya i koncepcii nauki. M.,2013 2. Kohanovskij V.A. Istoriya i filosofiya nauki.-M., - 2010 3. Klyagin N. Sovremennaya nauchnaya karta mira [Elektronnyj resurs]:

	uchebnoe posobie / N. Klyagin.- 1, 02 MB.- Moskva: Logos, 2017.- 186 s 4. Kun T. Struktura nauchnyh revolyucij. -M. AST.- 2015 ISBN 978-5-17-089239-6 http://www.psylib.ukrweb.net/books/kunts01/index.htm 5. Filosofiya nauki: Obshchie problemy poznaniya. Metodologiya estestvennyh i gumanitarnyh nauk: hrestomatiya - M.: Progress-Tradiciya : MPSI : Flinta, 2005. - 992 s. 6. Nurmanbetova, D.N. Istoriya i filosofiya nauki [Tekst] / D.N. Nurmanbetova.- Astana: ENU, 2012

Module 11

Module code and name	COMS 52005 Intelligent information systems and technologies for their development
Semester(s), when the module is taught	2
Responsible for module person	Kudubaeva S.A.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Computing models; Analysis and processing of large volumes of information.
Module objectives/intended learning outcomes	The discipline is aimed at studying the signs of intelligence of information systems; modern information technologies that provide intellectual properties; main classes of intelligent information systems: expert systems, systems with an intelligent interface, self-learning and adaptive systems, technology design features and tools and tools for the development of intelligent information systems. Undergraduates will acquire skills in the development of intelligent information systems. Students have knowledge in the field of artificial intelligence systems and decision making, studied software for building intelligent systems for various subject areas. development of a conceptual model of ACS, focused on the management of educational and economic activities of the university; Students are able to conduct experimental testing of the created system and develop recommendations for its use. Know the concepts and methods of creating IS based on the theory of artificial intelligence using a semantic-frame model of knowledge representation; They have skills in the development of intelligent information management systems that effectively, efficiently and efficiently manage certain activities of a company, enterprise, and ensure the full satisfaction of information requests.
Content	Signs of intellectuality of information systems; modern information technologies that provide the property of intellectuality; main classes of intelligent information systems: expert systems, systems with an intelligent interface, self-learning and adaptive systems; design features of intelligent information systems; technologies and development tools Classification of systems with artificial intelligence. The problem of knowledge representation in information systems. Production model of knowledge representation. Fundamentals of expert systems design. Fuzzy sets and fuzzy logic. Frames and semantic networks. ontological approach.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows:

	-20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Chan, K.C.C., 2004, Intelligent Information Systems: Course Notes, Department of Computer Science, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong. 2. Kukharenko B.G. Intelligent systems and technologies: textbook / B.G. Kukharenko; - Moscow: Altair: MGAVT, 2015. - 115 p. 3. Batyrkanov, Zh.I. Development of an automated system for managing the educational process.//Izv. KSTU, Bishkek, 2019, No. 19. — P.115-118. 4. Boskebeev, K.D. B85. Intelligent information systems // Monograph. Information Center "Tekhnik", Bishkek, 2017. - P. 148. 5. Makarenko S. I. Intelligent information systems: textbook. - Stavropol: SF MGGU im. M. A. Sholokhova, 2019.– 206 p.: ill 6. Gusarova N.F., Dobrenko N.V. Intelligent systems and technologies. St. Petersburg. 2019. - 105 p. 7. Smagin A.A., Lipatova S.V., Melnichenko A.S. Intelligent information systems. Ulyanovsk 2017. - 197 p.

Module 12

Module code and name	COMS 53005 Statistical methods in Natural Language Processing
Semester(s), when the module is taught	2
Responsible for module person	Kudubaeva S.A.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Algorithms and data structures, Theory of languages and automata, Information and communication technologies, Intelligent information systems and technologies for their development
Module objectives/intended learning outcomes	Undergraduates can study the methods of collecting, organizing and processing linguistic statistical data to identify existing patterns. Undergraduates know the methodology of the linguistic mathematical-

	statistical method and its application
Content	Probability theory and mathematical statistics in linguistics. Random value. Fundamentals of mathematical statistics. The subject of mathematical statistics. Statistical observation. Generalization and grouping of statistical materials in linguistics. Basic selection methods. General and special methods used in linguistics. Practical use of statistical methods of linguistic research. Hypotheses and their application in linguistics. Types of statistical hypotheses. The level of static significance and quantitative assessment of the reliability of the established connection. Markov chains and processes in linguistics. Processes in linguistics in the language of Markov chains. Hidden Markov models in speech recognition. The problem of learning in a probabilistic setting. Fundamentals of speech. Acoustics of speech production. Physical feasibility, sustainability. Introduction to "H - L" - processing. Signal smoothing. Using special tools. Review of algorithms for continuous speech reconstruction. Introduction to recognition using hidden Markov models, neural networks.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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	Enterprise Architect. Microsoft project. Methodological developments, customized maps, interactive whiteboard, laptop, LCD projector
Reading list	1. Chan, K.C.C., Intelligent Information Systems: Course Notes, Department of Computer Science, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong. 2004 2. Kukharenko B.G. Intelligent systems and technologies: textbook / B.G. Kukharenko; - Moscow: Altair: MGAVT, 2015. - 115 p. 3. Batyrkanov, Zh.I. Development of an automated system for managing the educational process.//Izv. KSTU, Bishkek, 2019, No. 19. — P.115-118. 4. Boskebeev, K.D. B85. Intelligent information systems // Monograph. Information Center "Tekhnik", Bishkek, 2017. - P. 148. 5. Makarenko S. I. Intelligent information systems: textbook. - Stavropol: SF MGGU im. M. A. Sholokhova, 2019.– 206 p.: ill 6. Gusarova N.F., Dobrenko N.V. Intelligent systems and technologies. St. Petersburg. 2019. - 105 p. 7. Smagin A.A., Lipatova S.V., Melnichenko A.S. Intelligent information systems. Ulyanovsk 2017. - 197 p.

Module 13

Module code and name	COMS 53006 Machine learning algorithms for data processing
Semester(s), when the module is taught	2
Responsible for module person	Kintonova A.Zh.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Basic (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Computing models; Analysis and processing of large volumes of information.
Module objectives/intended learning outcomes	Study of machine learning algorithms for the implementation of machine learning methods; study and application of machine learning algorithms for data processing; application of developed technologies for machine learning and use of software for data analysis.
Content	Introduction to machine learning algorithms. Data processing. Modern algorithms and calculation methods. Linear regression. Algorithms for the method of logistic regression. Logistic regression. Algorithms for data processing. Logistic function. Algorithms for the method of K-close neighbors (KNN). Processing algorithms for the tree method of accepting solutions. Decision Trees and Random Forests Algorithms for Support Vector Machines K-Means Clustering method. Principal Component Analysis method. Vector Quantization Network Method (LVQ) The Bagging method and the random forest. Software development tools for data analysis. The Busting and AdaBoost method. Software development tools for data analysis. Application of the method for linear discriminant analysis (LDA). Application of trees to the adoption of decisions.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector

Reading list	1. Aggarwal C.C. Data mining: the textbook. - Cham: Springer, 2016. - 734 p. 2. Kubat M. An introduction to machine learning / M. Kubat. - 2nd ed. - Cham: Springer, 2017. - 348 p. 3. Skobtsov Yu.A. Fundamentals of evolutionary calculations: textbook. - Donetsk: DonNTU, 2017. - 326p. 4. Kuhn M. Applied predictive modeling / M. - New York: Springer Science + Business Media, 2018. - 600 c. 5. Vyugin, VV Mathematical bases of machine learning and forecasting: textbook / VV Vyugin. —Moscow: MCNMO, 2013. - 304 p

Module 14

Module code and name	COMS 53007 Speech Processing
Semester(s), when the module is taught	2
Responsible for module person	
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Algorithms and data structures, Theory of languages and automata, Information and communication technologies, Intelligent information systems and technologies for their development
Module objectives/intended learning outcomes	Students can express a speech signal in terms of its representations in the time and frequency domains and various ways of modeling it; derive expressions for simple functions used in speech classification applications; synthesize flowcharts for speech applications, explain the purpose of the various blocks and describe in detail the algorithms that could be used to implement them; implement components of speech processing systems.
Content	The problem of machine learning in a probabilistic environment. Fundamentals of speech. Acoustics of speech production. Physical feasibility, sustainability. Introduction to "H - L" - processing. Signal smoothing with special tools. Overview of algorithms for continuous speech recognition. Introduction to recognition using hidden Markov models, neural networks.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Actual problems of modern linguistics: textbook. - Moscow: Flint; Nauka, 2017 - - 412 p. 2. Hobson Lane, Hannes Hapke, Cole Howard X68 Natural language processing in action. - St. Petersburg: Peter, 2020. - 576 p.: ill. - (Series "For professionals"). ISBN 978-5-4461-1371-2 3. Reese R. Natural language processing in Java / per. from English by A.V. Snastina. -M.: DMK Press, 2016. - 264 p.

Module 15

Module code and name	COMS 53008 Programming languages for data analysis and data processing
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)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 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 goal of this discipline is the formation of undergraduates' ability to apply big data processing technologies and machine learning to solving applied problems. Intended learning outcomes: Be able to visualize data, process data, perform exploratory data analysis using the basic tools of R, Python, Scala, MATLAB, etc. Be able to formulate algorithms, choose the right big data analysis tool, choose the right big data storage technology. Analyze data received from external sources, justify conclusions, work with data sets and find patterns in numbers. Have the skills to work with the main software technologies and methods of data mining, the use of modern software packages for data mining on a computer
Content	Language and environments for statistical computing and graphics in data science. SAS is a programming language for extracting, modifying and manipulating data from various sources for advanced statistical analysis. General purpose programming languages to perform the ETL (Extract-Transform-Load) process. Java, Julia - languages for writing production-specific ETL codes and computationally intensive machine learning algorithms. Scala is a language that allows you to use both object-oriented and functional approaches to process a large amount of disparate data. MATLAB is a programming language and environment for iterative analysis and process design.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls;

	-40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Philip R. Holland. SAS Programming and Data Visualization Techniques. 2015.- 245 p. ISBN: 1484205693 2. Ken Kleinman, Nicholas J. Horton. SAS and R: Data Management, Statistical Analysis, and Graphics, Second Edition. Chapman and Hall/CRC. 2014, 428 rubles ISBN:1466584491 3. D. Silen, A. Meisman, M. Ali - Fundamentals of Data Science and Big Data. Python and data science. SPb.: Peter. 2018, 336 p. 4. Odersky M., Spoon L., Wenners B. O-41 Scala. Professional programming. 4th ed. - St. Petersburg: Peter, 2021. - 720 p.: ill. - (Series "Programmer's Library"). ISBN 978-5-4461-1827-4 5. Rutkovsky, L. Methods and technologies of artificial intelligence / L. Rutkovsky. - M .: Hot line - Telecom, 2010. - 520 p.

Module 16

Module code and name	COMS 62006 Decision support systems
Semester(s), when the module is taught	3
Responsible for module person	Niyazova R.S.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 30 hours, independent work of students: 105 hours.
Credit points (total by discipline)	5 ECTS
Required and recommended prerequisites for joining the module	Intelligent information systems and technologies for their development
Module objectives/intended learning outcomes	Objectives: to teach undergraduates theoretical knowledge in the field of managerial decision-making, familiarization with methods for solving practical problems of decision-making, the formation of practical skills in using specialized software Know: capabilities of decision support systems (DSS); basic theoretical provisions and concepts of the logic of decision-making processes in the economy; basics of modeling management decisions; methods of execution of decisions at various stages of the decision-making cycle; types of information and instrumental support for a decision maker (DM), criteria for choosing DSS tools; multi-criteria decision-making methods.

	Skills: be able to: able to how to build and evaluate formalized mathematical models that describe real situations, evaluate data, and identify patterns in them; use models for choosing the best options for formalizing and solving various problems in the field of social and economic processes; skills in formulating requirements for the SDS, developing their individual elements. Own tools for monitoring the execution of decisions at various stages decision cycle; practical skills of working in the Mathcad application package.
Content	Decision making process. Tasks and methods of decision making. Scales and methods of measurement in the decision-making process. Decision making in non-linear distributive problems. Decision making in ordering problems. History, tasks and varieties of games. The fundamental theorem of antagonistic games of two persons with zero sum. Geometric solution of games. Solving games by the method of successive approximations. Solving games by linear programming. Statistical criteria and solutions in the game with nature. Axioms of rational choice. Choice based on experiment, under facilitation and fuzzy uncertainty. Decision making in the assignment problem. Multicriteria tasks. Pareto optimal solutions. Decision making in planning problems. Markov decision making models.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	References 1. Rodzin S.I. Decision Theory: Lectures and Workshop: Textbook. - Taganrog: Publishing House of TTI SFU, 2012. - 336 p. 2. Mikoni, SV Theory of managerial decision-making: textbook. allowance for universities. St. Petersburg: Lan, 2015 3. Aksenov, K. A. Decision support systems. At 2 o'clock Part 1: textbook. manual for universities / K. A. Aksenov, N. V. Goncharova; under scientific ed. L. G. Dorosinsky. - M .: Yurayt Publishing House, 2018; Yekaterinburg: Publishing House Ural. university — 103 p. — (Series: Universities of Russia) 4. Aksenov, K. A. Decision support systems. At 2 o'clock Part 2: textbook. manual for universities / K. A. Aksenov, N. V. Goncharova; under scientific ed. L. G. Dorosinsky. - M .: Yurayt Publishing House, 2018; Yekaterinburg: Publishing House Ural. university — 126 p. —

	(Series: Universities of Russia). 5. Theory of decision making in economic research: study guide / E.N. Zhivitskaya-Minsk: BSUIR, 2017.-294 p. 6. Zakharova A.A., Grigorieva A.A. Mathematical and instrumental methods of decision support for the innovative development of the region. - Tomsk: Tomsk State. University of Control Systems and Radioelectronics (TUSUR), 2019. - 214 p. 7. Zakharova A.A., Chernysheva T.Yu., Mitsel' A.A. Mathematical and instrumental methods of decision support in municipal management / Tomsk State University. University of Control Systems and Radioelectronics (TUSUR). - Tomsk, 2019. - 212 p. 8. Aksenov, K. A. A42 Modeling and decision making in organizational and technical systems: a tutorial. At 2 p. Part 2 / K. A. Aksenov, N. V. Goncharova, O. P. Aksenova. - Yekaterinburg: Ural Publishing House. un-ta, 2015. - 128 p.

Module 17

Module code and name	COMS 62007 Fuzzy modeling techniques
Semester(s), when the module is taught	3
Responsible for module person	Sharipbay AA
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion.
Workload (incl. contact hours, self-study hours)	Total workload: 150 hours. Lectures: 15 hours, practical: 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 module: Acquaintance with the apparatus of non-classical logics and its application to the construction of decision-making models. Develop the ability to determine the general forms and patterns of a particular subject area. Expected learning outcomes: Know: Fuzzy models of data analysis and decision making of intelligent systems. Be able to: Develop fuzzy models for data analysis and decision making of intelligent systems. Own: Skills of fuzzy modeling of practical problems from various subject areas.
Content	Intuitionistic, multivalued, fuzzy, modal logics. Fuzzy information and conclusions. Fuzzy sets. Main characteristics of fuzzy sets. Membership functions of fuzzy sets and methods for their construction. Operations on fuzzy sets. Logical, algebraic operations. Fuzzy and linguistic variables. Fuzzy numbers. Fuzzy conclusions. Algorithms Mamdani, Tsukamoto, Sugeno, Larsen. Simplified fuzzy inference algorithm. Clarity reduction methods. Efficiency of decision-making systems using fuzzy logic methods. Fuzzy Logic Toolbox.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Gorbachenko V. I., Akhmetov B. S., Kuznetsova O. Yu. Intelligent systems: fuzzy systems and networks: Textbook for universities. M.: Yurayt Publishing House, 2018 2. Nazarov D.M., Konysheva L.K. Intelligent systems: fundamentals of fuzzy set theory. M.: Yurayt Publishing House, 2018 3. Leonenkov A. Fuzzy modeling in MATLAB and fuzzyTECH. - St. Petersburg: "BHV - Petersburg", 2012 - 720 p. ISBN, 5-94157-087-2 www. ipr bookshop. Ru 4. Bronevich, A. G., Lepsky, A. E. Fuzzy models of data analysis and decision making: a tutorial. — M.: Ed. house of the Higher School of Economics, 2022. — 264 p. — ISBN 978-5-7598-2317-9.

Module 18

Module code and name	TEIN 61001 Teaching internship
Semester(s), when the module is taught	3
Responsible for module person	
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	e.g. lecture, lesson, lab works, project, seminar etc.
Workload (incl. contact hours, self-study hours)	120 hours (The duration of the practice is determined in weeks based on the standard work time of the student 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 ECTS
Required and recommended prerequisites for joining the module	Higher School Pedagogy, Management psychology
Module objectives/intended learning outcomes	The goal of master students' teaching practice is to consolidate and deepen knowledge in general scientific, cultural, psychological, pedagogical, methodological and special disciplines, as well as to form pedagogical skills, skills and competencies on the basis of theoretical knowledge. The main tasks of teaching practice are: 1) the acquisition of initial experience in teaching; 2) mastering the teaching and learning methodology; 3) application of the foundations of pedagogical skills; 4) instilling the skills and abilities of independent teaching and educational and teaching work; 5) mastering the skills of scientific, psychological and pedagogical research;

	6) mastering the methodology of educational work; 7) knowledge of innovative teaching technologies; 8) implementation of an individual approach to students, students, undergraduates in the course of educational and educational work, taking into account the peculiarities of their development. As a result of passing teaching practice, the student must acquire the following practical skills, abilities and general cultural competence: GPC 1 - readiness for self-development, self-realization, use creativity. As a result of mastering the program of teaching practice undergraduate must Know: - selected subject area of research; - forms, methods, techniques of teaching, aimed at the effective achievement of the educational goals of the lesson; - active teaching methods, technologies for the development of a student's personality; - continuity between topics, types of activities, in the selection of educational material. Be able to: - to professionally conduct an independent author's scientific research; - prepare and conduct training courses on the instructions of the head of the practice - classes, attend and review the classes of experienced teachers and their colleagues; - formulate and solve their problems arising in the course of pedagogical activity; - to work effectively as part of a research team. Own: - knowledge related to the object of scientific research; - methods of methodically grounded use of demonstration and handouts; - pedagogical technique of the teacher.
Content	At the beginning of the Teaching practice, the department holds an orientation conference to familiarize master students with: - normative documents for practice (program, guidelines for practice); - tasks and goals of practice; - safety rules in places of practice (with the obligatory signature of students in the journal of introductory instruction on safety at the department); - the requirements for traineres. - the procedure for registration and delivery of reporting documentation for practice. The orientation conference is formalized by the protocol (F ENU 403-02-14) During the practice p, supervisors appointed by order must monitor the progress of practice. At the end of the research practice, the master students submit a diary-report to the department, which is checked by the supervisor from the department and defended before the Commission (F ENU 403-02-14).
Examination forms	The practice is assessed by the supervisor based on the report prepared by the master student. Teaching practice report should include a description of the work done by the graduate student. As an attachment to the report, the texts of lectures and / or plans of lectures and / or seminars, tasks, cases, etc., as well as the opinion of the head of the master's program on

	the participation of the master student in the implementation of tasks in teaching practice should be submitted. The report on the results of the passage of teaching practice includes a description of the work done. As an attachment to the report, the texts of lectures and plans of seminars, tasks, cases, etc. should be submitted. Reporting documents on the practice are submitted for control no later than five days after the end of the practice (including weekends and holidays) to the head of the teaching practice and after the defence are handed over to the department. All documents must be printed and presented in a separate folder with a cover page.
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	Main literature: *1.* Kosherbayeva A.N. and ets. Educational management. Textbook.- Almaty, 2017 *2.* Alkozhayeva N. C. Fundamentals of scientific pedagogical research: textbook / The name of Al-Farabi. KazNU. - Almaty: Kazakh University, 2019. - 127 p. (in Kazakh). *3.* Mukhametzhanova A. O. Methods of educational work and technology: textbook / Ministry of Education and Science of the Republic of Kazakhstan, KSTU. - 2nd bass. - Karaganda: “Medet Group », 2019. - 169, [7] p. (in Kazakh). *4.* H.Schunk Dale. Learning Theories. An Educational Perspective / - Seventh ed. - Boston. - ISBN 978-601-7943-22-6 : *5.* Bordovskaya, Nina Valentinovna. Psychology and pedagogy [Text]: textbook / N. V. Bordovskaya, S. I. Rozum. - Moscow; St. Petersburg [and others]: Peter, 2013. - 620, [4] p. (in Russian). *6.* Active and interactive educational technologies (forms of conducting classes) in higher education: textbook / compiled by T.G. Mukhina. - N. Novgorod: NNGASU, 2013 .-- 97 p. (in Russian). *7.* Teaching methodology in higher education: study guide / V. I. Blinov, V. G. Vinenko, I. S. Sergeev. - M.: Yurayt Publishing House, 2014 .-- 315 p. (in Russian). Additional literature: *1.* Podlasiy, Ivan Pavlovich. Pedagogy [Text]: textbook / I. P. Podlasy. - 2nd ed., Add. - Moscow: Yurayt: Vyssh. education, 2010. - 574, [2] p. (in

	Russian). *2.* Pedagogy [Electronic resource]: textbook. manual / ed. P.I. Pidkasistogo. - 2nd ed., Rev. and add. - Electron. text data. - Moscow: Yurayt: ID Yurayt, 2011. - 502, [1] p.Miniurova S. A., & Leonenko N. O. (2015). Pedagogical practice as an innovative project of the University. Higher education in Russia (10), 37-47. (in Russian). *3.* Miniurova, S. A., & Leonenko, N. O. (2016). Pedagogical practice as a form of School-University partnership. Paper presented at the XII international scientific and practical conference "Psychology of personal and professional development: modern challenges and risks", Moscow, Russia. Normative references: *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. *3.* F ENU 705-03-19 Work schedule of professional practice. *4.* F ENU 705-04-19 Cooperation agreement for professional practice. *5.* F ENU 705-04-19 Cooperation agreement for professional practice (with payment). *6.* F ENU 705-04-19 Agreement on joint activities (with payment). *7.* F ENU 705-05-19 Tripartite agreement for professional practice. *8.* F ENU 705-06-19 Schedule of professional practice. *9.* F ENU 705-07-19 Direction to professional practice. F ENU 705-08-19 Diary-report on the passage of professional practice.

Module 19

Module code and name	COMS 63009 Methods of processing text corpora
Semester(s), when the module is taught	3
Responsible for module person	Kudubaeva S.A.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lectures: 30 hours, practical: 30 hours, independent work of students: 120 hours.
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	Algorithms and data structures, Theory of languages and automata, Information and communication technologies, Intelligent information systems and technologies for their development
Module objectives/intended learning outcomes	Techniques for developing software for natural language processing: Students know the techniques for developing software for natural language processing.
Content	NLP tools: OpenNLP and CoreNLP. Using a Uml class diagram when creating natural language text. UMGAR to generate Uml parsing. WordNet, Java RAP, SPIDER tool, OpenNLP, RAPID, nlrpBENCH, BrainTool.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Bolshakova EI Automatic processing of texts in the natural language and analysis of data: textbook / Bolshakova EI, Vorontsov KV, Efremova NE, etc. // M .: HSE Publishing House, 2017. - 269 c 2. Manning K.D. Introduction to information search / Manning KD, Raghavan P., Schutze H.//M .: 2011. - 528 p. 3. Nikolenko S.Deep learning: immersion in the world of neural networks. / Nikolenko S., Kadurin A., Arkhangelskaya E. // SPb .: Peter, 2018. - 480 p.

Module 20

Module code and name	COMS 63010 Natural language processing software development methods
Semester(s), when the module is taught	3
Responsible for module person	
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lectures: 30 hours, practical: 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	Techniques for developing software for natural language processing: Students know the techniques for developing software for natural language processing.
Content	NLP tools: OpenNLP and CoreNLP. Using a Uml class diagram when creating natural language text. UMGAR to generate Uml parsing. WordNet, Java RAP, SPIDER tool, OpenNLP, RAPID, nlrpBENCH, BrainTool.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Bolshakova E.I. Automatic processing of texts in natural language and data analysis: textbook / Bolshakova E.I., Vorontsov K.V., Efremova N.E., et al. // M.: NRU HSE, 2017. - 269 p. 2. Manning K.D. Introduction to information retrieval / Manning K.D., Raghavan P., Schutze H.// M.: 2011. - 528 p. 3. Nikolenko S. Deep learning: immersion in the world of neural networks. / Nikolenko S., Kadurin A., Arkhangelskaya E. // St. Petersburg: Peter, 2018. - 480 p.

Module 21

Module code and name	COMS 63011 Artificial intelligence in project management
Semester(s), when the module is taught	3
Responsible for module person	
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lectures: 30 hours, practical: 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 will allow you to explore the possibilities of using AI for project management: creating a virtual assistant to the project manager, for automating the distribution of tasks and resources; project analytics (identifying risks of failure of deadlines); automatic selection of the optimal project team, evaluating the quality of the software development plan (resources, deadlines, risks), adjusting the software development plan, checking compliance with regulatory technical documents.
Content	An overview of the PMI standard PMBOK Guide Sixth Edition. Project life cycle. General issues of project management. Application of AI methods in project integration management, project scope management, project timeline management, project cost management, project quality management, project human resource management, project communication management, project risk management, project procurement management, stakeholder management.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. P.Boudreau. Applying Artificial Intelligence to Project Management. 2019. -183 p. 2. Svetlov N.M. Information technology project management: textbook. allowance / N.M. Svetlov, G.N. Svetlov. - 2nd ed., revised. and additional - Moscow: Infra-M, 2020. - 232 p. 3. Grekul, V.I. Project management in the field of information technology: [proc. ed.] / V.I. Grekul, N.L. Korovkina, Yu.V. Kupriyanov. - Moscow: Binom. Knowledge Laboratory, 2017. - 336 p. – ISBN 978-5-9963-1121-7

Module 22

Module code and name	COMS 63012 Development of algorithms for the implementation of machine learning methods
Semester(s), when the module is taught	3
Responsible for module person	Kintonova A.Zh.
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lectures: 30 hours, practical: 30 hours, independent work of students: 120 hours.
Credit points (total by discipline)	6 ECTS
Required and recommended prerequisites for joining the module	Computing models; Analysis and processing of large volumes of information.
Module objectives/intended learning outcomes	Study of the method of developing machine learning algorithms for the implementation of machine learning methods; development of machine learning algorithms for data processing; Use of technologies developed for machine learning and use of software for data analysis.
Content	The discipline is aimed at studying existing approaches and methods for developing algorithms for machine learning to solve problems of classification, clustering, regression and forecasting. Undergraduates will acquire the skills to develop algorithms for machine learning based design of natural language processing applications, speech recognition, computer vision, online recommendation systems, bioinformatics, video games, etc.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls;

	-40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. Aggarwal C.C. Data mining: the textbook. - Cham: Springer, 2016. - 734 p. 2. Kubat M. An introduction to machine learning / M. Kubat. - 2nd ed. - Cham: Springer, 2017. - 348 p. 3. Skobtsov Yu.A. Fundamentals of evolutionary calculations: textbook. - Donetsk: DonNTU, 2017. - 326p. 4. Kuhn M. Applied predictive modeling / M. - New York: Springer Science + Business Media, 2018. - 600 c. 5.Kudryavtsev EM Formation of diploma projects on the computer: textbook / E.M. Kudryavtsev. - 2nd ed., Processing. and the ball. - Moscow: ASV, 2015. - 412 p.

Module 23

Module code and name	COMS 63013 Soft computing
Semester(s), when the module is taught	3
Responsible for module person	
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lectures: 30 hours, practical: 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 familiarize undergraduates with the basic principles and methods of using the soft computing apparatus to solve various applied problems that arise in programming, as well as in the development and use of modern information technologies. Study the basic concepts of fuzzy set theory, the basics of fuzzy logic and fuzzy computing, build fuzzy models for applied problems, choose fuzzy modeling methods in relation to information technology. Magistrates must know soft computing technologies focused on solving control problems with weakly structured control objects; be able to use soft computing tools - the technique of fuzzy systems (fuzzy sets, fuzzy logic, fuzzy controllers), artificial neural networks, genetic algorithms and

	evolutionary modeling
Content	Fuzzy decision-making methods. Method of hierarchical analysis. Decision support system. Mathematical and software tools for decision support systems. Mathematical model of the rating model of product competitiveness. Fuzzy systems. Models and methods of decision making with fuzzy information. linguistic variable. Fuzzy sets. Membership features. Basic definitions and operations on fuzzy sets. Basic operations and relations of fuzzy logic. Approximate output scheme, interpolation problem. Mamdani and Sugeno fuzzy inference algorithms. Fuzzy databases.
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. E.S. Volkova, V.B. Gisin, Fuzzy sets and soft computing in economics and finance, Moscow: KNORUS, 2019. 156 p. 2. Averkin A.N., et al. Fuzzy sets in artificial intelligence control models / ed. D.A.Pospelova - M.: Science. 2016. -312 p. 3. Liu B. Theory and practice of indefinite programming. –M.: BINOM. Knowledge Lab. 2016.- 416 p. 4. Leonenkov A.V. Fuzzy modeling in the MATLAB environment and fuzzy TECH. - St. Petersburg: BHV-Petersburg. 2015. -736 p. 5. Wang X., Ruan D. and E. Kerre E.E. Mathematics of Fuzziness - Basic Issues. – Berlin-Heidelberg: Springer-Verlag. 2019. -219 p.

Module 24

Module code and name	COMS 63014 Design and creation of artificial intelligence systems
Semester(s), when the module is taught	3
Responsible for module person	Kudubayeva S.A
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (elective component)
Teaching methods	Interactive, case study, student-centered learning, problematic discussion
Workload (incl. contact hours, self-study hours)	Total workload: 180 hours. Lectures: 30 hours, practical: 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 deals with the architecture of artificial intelligence systems, image recognition systems, issues of adaptation, training and self-learning of AI systems, perceptrons, methods and algorithms for analyzing the structure of multidimensional data, informal procedures, algorithmic models, the basics of REFAL and Prolog languages, key concepts of binary trees, basic concepts expert systems, automated synthesis, search for physical principles of action, methods for synthesizing human speech. Students have knowledge in the field of artificial intelligence systems and decision making, studied software for building intelligent systems for various subject areas. Students are able to conduct experimental testing of the created system and develop recommendations for its use. Know the concepts and methods of creating AIS based on the theory of artificial intelligence using a semantic-frame model of knowledge representation; Have skills in logic programming and creation of expert systems.
Content	Architecture and main components of AI systems. The brain as a biological computer. Knowledge representation models. Intelligent systems and means of protection. Software agent and multi-agent system. Multi-agent IS architecture. Stages of IS development. Pattern recognition systems (identification). Methods and algorithms for analyzing the structure of multidimensional data. A logical approach to building AI systems. Expert systems
Examination forms	Written exam
Study and examination requirements	The final mark will be weighted as follows: -20 degrees for assignments and Class work; -40 degrees for two intermediate controls; -40 degrees for final Written Exam. Two intermediate controls end with a colloquium (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. 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, individual cards, White-board, Laptop, LCD Projector
Reading list	1. K. Naylor How to build your own expert system M. "Energoatomizdat" 2017.- 287 p. 2. Kukharenko B.G. Intelligent systems and technologies: textbook / B.G. Kukharenko; - Moscow: Altair: MGAVT, 2015. - 115 p. 3.A.V. Timofeev Robots and artificial intelligence M. "Science" 2018-192 p. 4. Laurier J.-L Systems of artificial intelligence M.: "Mir", 2015.—342 p. with illustration 5. Makarenko S. I. Intelligent information systems: textbook. - Stavropol:

	SF MGGU im. M. A. Sholokhova, 2019.– 206 p.: ill

Module 25

Module code and name	RhIN 61001 Research internship
Semester(s), when the module is taught	4
Responsible for module person	Supervisors from the artificial intelligence technology Department
Language of study	Kazakh/Russian/English
Relationship with curriculum (cycle, component)	Profile (university component)
Teaching methods	Methods of conducting research: - working with primary sources, monographs, abstracts and dissertation research; - consultation with the practice supervisor or scientific advisor, teachers of the department; - seminars.
Workload (incl. contact hours, self-study hours)	360 hours
Credit points (total by discipline)	12 ECTS
Required and recommended prerequisites for joining the module	Computation models, Machine learning and application, Analysis and processing of large amounts of information, Intelligent information systems and technologies for their development
Module objectives/intended learning outcomes	The research practice of a master student is carried out with the aim of acquainting with the latest theoretical, methodological and technological achievements of domestic and foreign science, with modern methods of scientific research, processing and interpretation of experimental data. Research practice objectives: - practical approbation of theoretical aspects of the dissertation topic; - development of practical skills for the creative implementation of the assigned research tasks; - practical mastery of research methods: - practical implementation of a creative approach to research methods; - practical verification of the research results, its analysis and interpretations; - practical test of their readiness for innovative activities in the field of education and science. On successful completion of this module the master students will be able to: - Know of the main provisions of the methodology of scientific research and apply them when working on the chosen topic of the master's thesis; - Use modern methods of collection, analysis and processing of scientific information; - Develop a research proposal defining the project aims, objectives and research methodology that will be applied to the research project. - Review the current state of the art in the topic related to the proposed research outlining the contribution the research will make to the general field. - Evaluate the main research integrity and ethical considerations that need to be considered in the proposed project. - Communicate effectively the idea and contribution of the proposed research project. - Present scientific knowledge on the problem of research in the form of reports, publications.
Content	The base of the research practice of the master students is the implementation place of the dissertation work (research institutes, large companies, department laboratories, research laboratories, educational and innovation centers, other universities).

	At the beginning of the research practice, the department holds an orientation conference to familiarize master students with: - normative documents for practice (program, guidelines for practice); - tasks and goals of practice; - safety rules in places of practice (with the obligatory signature of students in the journal of introductory instruction on safety at the department); - the requirements for trainees; - the procedure for registration and delivery of reporting documentation for practice. The orientation conference is formalized by the protocol (F ENU 403-02-14) During the practice, supervisors appointed by order must monitor the progress of the practice. At the end of the research practice, the master students submit a diary-report to the department, which is checked by the supervisor from the department and defended before the Commission (F ENU 403-02-14). Research Methods and Methodologies Definitions. Knowledge kinds and interrelationships. Empirical Research. Basic Research. Applied Research. Practical Research. Action Research. Parameters of research. Kinds of research: qualitative, descriptive and experimental. Applying research methodologies to computing, software and software development. Case studies and examples. Research and Research Strategies Constitution of research papers. Standards. Search strategies including: web, library, inter-library loan, databases such as IEEE and ACM, search engines. Literature review and systematic literature review. Research Planning Issues within a research project that relate specifically to computing/software projects including: problem definition, software planning, specification and system definition, choosing environments for development, timing issues relating to the software process, prototyping, iteration, risk evaluation, slippage, performance issues, evaluations and conclusions. Research Documentation Documentation appropriate to research and the programme specifications. This includes research proposal documentation, report documentation, research paper formats and citation formats.
Examination forms	Report - 100% Assessment Breakdown: essay (40%) and research proposal (60%)
Study and examination requirements	Requirements for successfully passing the module 1. Essay – 40% – week 2 The master student will propose an initial research topic and will define some initial context behind the idea. In addition, the master student will define some preliminary research aims and objectives. The master student will then be expected to present their idea with the aim of effectively communicating the broad research topic and context. 2. Research proposal – 60% – at the end of the semester The master student will develop the research proposal detailing fully the idea and relevant state of the art, aims, objective, methodologies, work plan schedule and ethical issues that need to be considered. The master student may also be required to present their proposal. Master Students must have a final grade of 60% or higher to pass this module

Technical, multimedia tools and software	
Reading list	Book Resources: 1. Zina O'Leary 2020, The essential guide to doing your research project [in Kazak version], 3 Ed., Almaty: -National Translation Bureau. ISBN: 9786017943981 2. Steven J. Taylor, Robert Bogdan, Marjorie DeVault 2016, Introduction to Qualitative Research Methods: A Guidebook and Resource, 4 Ed., Wiley. ISBN: 9781118767214 3. Nick Bostrom 2016, Superintelligence: Paths, Dangers, Strategies, OUP Oxford. ISBN: 9780198739838 4. Prabhat Pandey, Meenu Mishra Pandey 2015, Research Methodology: Tools and Techniques, 1 Ed., Bridge Center. ISBN: 9786069350270 5. Recommended Article/Paper Resources 6. Francine Berman and Vinton G. Cerf 2017, Social and Ethical Behavior in the Internet of Things, Communications of the ACM, 60(2) 7. Nick Bostrom, Eliezer Yudkowsky 2014, The Ethics of Artificial Intelligence, The Cambridge handbook of artificial intelligence, 316-3 8. Other Resources 9. https://library.enu.kz/MegaPro/Web ENU Library 10. http://nabrk.kz National Academic Library of Republic of Kazakhstan 11. https://www.acm.org/ Association for Computing Machinery 12. https://dl.acm.org/ ACM Digital library 13. https://ieeexplore.ieee.org/ IEEE Xplore 14. https://www.scopus.com/ Scopus 15. https://webofknowledge.com/ Web of Science Normative references: 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. 3. F ENU 705-03-19 Work schedule of professional practice. 4. F ENU 705-04-19 Cooperation agreement for professional practice. 5. F ENU 705-04-19 Cooperation agreement for professional practice (with payment). 6. F ENU 705-04-19 Agreement on joint activities (with payment). 7. F ENU 705-05-19 Tripartite agreement for professional practice. 8. F ENU 705-06-19 Schedule of professional practice. 9. F ENU 705-07-19 Direction to professional practice. 10. F ENU 705-08-19 Diary-report on the passage of professional practice.

Considered and approved at the meeting of the department «Artificial intelligence technologies».
date 28.03 2022 Record № 8.1

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