NPJSC«L.N. GUMILYOV EURASIAN NATIONAL UNIVERSITY»

Module Handbook
Educational program
6B05107Biology (BA)

Nur-Sultan
2022

Module 1

Module code and name	*HIST 11001 Modern history of Kazakhstan*
Semester(s) when the module is taught	*1*
Person responsible for the module	*Kushenova G.I.*
Language of instruction	*Russian*
Within the curriculum (cycle, component)	*General education (mandatory component).*
Teaching methods	*Problematic learning.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5 ECTS*
Required and recommended prerequisites for joining the module	*School course of the History of Kazakhstan.*
Module objectives / expected learning outcomes	*The purpose of mastering the module is to form a system of scientific views on the history of modern Kazakh society in the context of the world historical process. Expected learning outcomes:* *- to systematize the conceptual foundations of the study of the modern history of Kazakhstan; to compare ideas about the continuity and continuity of historical and cultural development, the deep roots of the spiritual heritage of Kazakhstan;* *- to reveal the significance of the formation of historical consciousness and worldview attitudes in accordance with national priorities;* *- classify historical sources reflecting the features of the modern history of Kazakhstan;* *- to identify historical patterns of development of society, paying attention to the study of historical originality;* *- to master the techniques of historical description and analysis of the causes and consequences of events in the modern history of Kazakhstan;* *- to predict possible solutions to modern problems based on the analysis of the historical past and reasoned information;* *- to argue the features and significance of the modern Kazakh model of development;* *- - to explain the importance of fostering patriotism in the spirit of democratic values of modern society by the example of the life of historical figures.*

Content of the module	*Introduction to the course. Kazakhstan on the way to independence: stages of formation of the idea of a national state. Civil-political confrontation. Implementation of the Soviet model of state construction. Contradictions and consequences of Soviet reforms in Kazakhstan in the second half of the twentieth century. Formation of the state structure of the Republic of Kazakhstan. Kazakhstan's model of economic development. Social modernization is the basis of the well–being of society. Ethnodemographic processes and strengthening of interethnic harmony. Prospects of socio-political development and spiritual modernization. The policy of forming a new historical consciousness and worldview of the peoples of the Great Steppe. Kazakhstan is a state recognized by the modern world. N.A. Nazarbayev is a personality in history.* *Formation of a nation of a single future.*
Examination forms	*At the end of the semester, the State exam is conducted orally. Examination tickets are used for passing the state exam.*
Study and examination requirements	*The activity of students in the educational process is mandatory, which is evaluated by the quality of performance. Attendance of classes and participation in the educational process are mandatory. students should not be absent from classes without a valid reason. Tardiness is not allowed. The Code of Conduct and Ethics must comply with the requirements of the university. In this regard, scores from 0 to 100 points are given.*
Technical and electronic learning tools	*Projector for a presentation.*
Reading list	*1. Ayagan B.G., Abzhanov H.M., Seliverstov S.V., Bekenova M.S. Modern history of Kazakhstan: Almaty: Rarity, 2010. – 432 p.,* *2. Kan G.V. History of Kazakhstan: Textbook for universities. – Almaty, 2005. - 232 p.,* *3. Uly dala tarikhy: textbook / Kan G.V., Tugzhanov E.L. – Astana: Zhasyl Orda, 2015. – 328 p.* *4. Momynova S.R. Kazakhstan: ancient, ancient and medieval history. In 2 volumes. - Karaganda, 2018 – 342 p.,* *5. Kazakhstan tarikhy.5 tamdyk. 1-5-tomdar. – Almaty., 1996, 1997, 2000, 2010.* *6. Kazakhstan (Cossack Ate) tarikhs. – 4 kitaptan turatyn okulyk. Tauelsiz Kazakhstan: algyshartary zhane kalyptasuy.4 kitap / T. Omarbekov, B.S. Sailan, A.Sh. Altaev zhane T.b. – Almaty, Kazakh University, 2016. – 264 p.* *7. Uly Dala Tarikhy: textbook /Kan G.V., Tugzhanov E.L. – Astana: Zhasyl Orda, 2015. – 328 p.* *8. Ayagan B.G., Abzhanov H.M., Mahat D.A. Kozyri Kazakhstan tarikhs. – Almaty, 2010. – 341 p.,*

Module 2

Module code and name	*ENGL 11103 (11203)Foreign language*
Semester(s) when the module is taught	*1*
Person responsible for the module	*Ustelimova N.A.*
Language of instruction	*English*
Within the curriculum (cycle, component)	*General education (mandatory component)*
Teaching methods	*Group work. Problematic discussion. Search method. Construction. Essay. Situational modeling. Text analysis. Creative writing.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours - 1 semester., (300 hours per year).* *Practical: 45 hours -1 semester, (90 hours per year), independent work of students: 105 hours (210 hours per year).*
Credit points (total by module)	*5 ECTS*
Required and recommended prerequisites for joining the module	*To master this module, you need the knowledge, skills and abilities acquired during the study of the following courses: Foreign language I (English) minimum-sufficient level (A1, pan-European competence).*

Module objectives / expected learning outcomes	*The purpose of the module is to form the intercultural and communicative competence of students of non-linguistic specialties in the process of foreign language education at a sufficient level (A2) of the OEC / at the level of basic sufficiency (B1) of the OEC.* *Expected learning outcomes:* *- identifies patterns of development of a foreign language, paying attention to the study of stylistic originality;* *-compares and selects the forms and types of speech/communication corresponding to the communicative intention with a logical construction adequate to the type of speech and adequately expresses its own communicative intentions with the correct selection and appropriate use of the necessary language tools, taking into account their compliance with the socio-cultural norms of the language being studied;* *- knows the strategy and tactics of constructing a written communicative act, correctly forms speech on the letter, relying on lexical sufficiency within the framework of speech topics and grammatical correctness;* *- systematizes the conceptual foundations of understanding the partner's communicative intentions at this level;* *- knows the techniques of linguistic description and analysis of the causes and consequences of events in texts of a scientific and social nature;*
Content of the module	*Social sphere of communication: Family in modern society. Social and cultural sphere of communication: Entertainment. Social and cultural sphere of communication. Taking care of yourself. Sociocultural sphere of communication: cultural and historical background. Sociocultural sphere of communication: cultural and historical background. Sociocultural sphere of communication: Cultural and historical background/Personal, private life. Sociocultural sphere of communication. Culture. Educational communicative sphere/World. Educational communicative sphere. Student life. Sociocultural sphere of communication: Cultural and historical background. Education. Professional sphere of communication (the name of the topic depends on the specialty). Professional sphere of communication (the name of the topic depends on the specialty). Professional sphere of communication (the name of the topic depends on the specialty). Professional sphere of communication (the name of the topic depends on the specialty). Professional sphere of communication (the name of the topic depends on the specialty).*
Examination forms	*Combined exam:listening, reading, speaking.*
Study and examination requirements	*Students are required to attend practical classes in a foreign language and take an active part in the performance of SRS tasks, the results of which are accepted by the teacher online or in the classrooms of the university, depending on the type and form of the task.*
Technical and electronic learning tools	*Projector for a presentation. Edpuzzle, Kahoot, Socrative, Edmodo.*
Reading list	*1. Latham-Koenig. English File: Pre-Intermediate Student's Book, 3d ed., Oxford University Press, 2016.* *2. Latham-Koenig. English File: Intermediate Student's Book, 3d ed., Oxford University Press, 2016.* *3. Latham-Koenig. English File: Pre Intermediate Student's Book, 3d ed., Oxford University Press, 2016.* *4. Reading Extra: A resource book of multi-level skills activities / Driscoll Liz. - 9th printing. - Cambridge [etc.]: Cambridge university press, 2017.* *5. Speaking extra: a resource book of multi-level skills activities / Gammidge Mick. - 13th print. - Cambridge: Cambridge university press, 2017.* *6. Listening Extra: A resource book of multi-level skills activities / Craven Miles. - 10th printing. - Cambridge [etc.]: Cambridge university press, 2016.* *7. Writing extra: a resource book of multi-level skills activities / Palmer Graham. - 11th print. - Cambridge: Cambridge university press, 2016.*

Module 3

Module code and name	*KAZK 11104 (11204) Kazakh language*
Semester(s) when the module is taught	*1/2*
Person responsible for the module	*Kulmanov K.S.*
Language of instruction	*Kazakh*
Within the curriculum (cycle, component)	*General education (mandatory component)*
Teaching methods	*Group work. Problematic discussion. Search method. Construction. Essay. Situational modeling. Text analysis. Creative writing.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours - 1 semester., (300 hours per year).* *Practical: 45 hours -1 semester, (90 hours per year), independent work of students: 105 hours (210 hours per year).*

Credit points (total by module)	*5 ECTS*
Required and recommended prerequisites for joining the module	*To master this module, the knowledge, skills and abilities acquired by the student in the course "Kazakh language" (A1, A2, B1) are necessary.*
Module objectives / expected learning outcomes	*To teach students listening (listening), speaking, reading and writing at the B2 level.* *To participate in communication in various situations of different spheres of communication in order to realize one's own intentions and needs (domestic, educational, social, cultural), stating them ethically correctly, meaningfully fully, lexically-grammatically and pragmatically adequate to the situation at the B2 level;* *To make the right choice and use of language and speech means to solve certain problems of communication and cognition on the basis of knowledge of a sufficient volume of vocabulary, a system of grammatical knowledge, pragmatic means of expressing intentions at the B2 level.*
Content of the module	*Introduction to the course. Kazakhstan on the way to independence: stages of formation of the idea of a national state. Civil-political confrontation. Implementation of the Soviet model of state construction. Contradictions and consequences of Soviet reforms in Kazakhstan in the second half of the twentieth century. Formation of the state structure of the Republic of Kazakhstan. Kazakhstan's model of economic development. Social modernization is the basis of the well–being of society. Ethnodemographic processes and strengthening of interethnic harmony. Prospects of socio-political development and spiritual modernization. The policy of forming a new historical consciousness and worldview of the peoples of the Great Steppe. Kazakhstan is a state recognized by the modern world. Formation of a nation of a single future.*
Examination forms	*Combined exam: listening, reading, speaking.*
Study and examination requirements	*Interactive whiteboard, projector, electronic textbook, computer, assignments for practical classes, texts on the specialty, additional handout.*
Technical and electronic learning tools	*Projector for a presentation.*
Reading list	*1. Asanova U. O., Abduova B. S., Adilbek a.m., Magzumbekova A. K. Kazakh language. Training manual for Level B1). Nur-Sultan: ENU, 2021. - 150 pages.* *2. Alimbek G. R. Kazakh language for Russian speakers (textbook for secondary levels B1, B2). Nur-Sultan: "AIIDA baspasy PUBLISHING", 2021.- 232 pages.* *3. Kulmanov K. S., Adilbek a.m., Magzumbekova A. K., Khamitova A. G. Kazakh language (A1 level. Textbook for international students). Nur-Sultan: L. N. Gumilyov Eurasian National University ENU, 2021. - 176 pages.*

Module 4

Module code and name	*RUSS 11104 (11204) Russian language*
Semester(s) when the module is taught	*1/2*
Person responsible for the module	*Nurgazina A.B.*
Language of instruction	*Russian*
Within the curriculum (cycle, component)	*General education (mandatory component)*
Teaching methods	*Group work. Problematic discussion. Search method. Construction. Essay. Situational modeling. Text analysis. Creative writing.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours - 1 semester., (300 hours per year).* *Practical: 45 hours -1 semester, (90 hours per year), independent work of students: 105 hours (210 hours per year).*
Credit points (total by module)	*5 ECTS*
Required and recommended prerequisites for joining the module	*To master this module, the knowledge, skills and abilities acquired by the student in the course "Russian language" (A1, A2, B1) are necessary.*
Module objectives / expected learning outcomes	*To teach students listening (listening), speaking, reading and writing at the B2 level.* *To participate in communication in various situations of different spheres of communication in order to realize one's own intentions and needs (domestic, educational, social, cultural), stating them ethically correctly, meaningfully fully, lexically-grammatically and pragmatically adequate to the situation at the B2 level;* *To make the right choice and use of language and speech means to solve certain problems of communication and cognition on the basis of knowledge of a sufficient volume of vocabulary, a system of grammatical knowledge, pragmatic means of expressing intentions at the B2 level.*

Content of the module	*Actual problems of modern science. New discoveries of scientists: prospects of use and possible risks. Scientific discoveries and ethics. Achievements in the field of the studied science. Development of science (studied by students). The current state of the studied science. My specialty and globalization. Written business communication. Business correspondence by e-mail. Oral business communication. Terminology of science. The language of the specialty. Written academic text. The culture of professional speech. Types of professional and communicative situations.*
Examination forms	*Combined exam:listening, reading, speaking.*
Study and examination requirements	*Interactive whiteboard, projector, electronic textbook, computer, assignments for practical classes, texts on the specialty, additional handout.*
Technical and electronic learning tools	*A projector for a presentation.* *Reference and information Internet portal - www.gramma.ru* *Reference and information Internet portal- www.dic.academic.ru* *Reference and information Internet portal -www.slovari.yandex.ru*
Reading list	*1. Russian language: textbook for students of Kazakh departments of universities (Bachelor's degree) / edited by K. K. Akhmedyarov, Sh.K. Zharkynbekova. - 4th edition. - Almaty: "Evero", 2019. - 241 P.* *2.Zhuravleva E. A., Asmagambetova B. M., Tashimkhanova D. S., Yavorskaya E. E., Te M. V., Eshekeneva A. K. professional Russian language: a textbook / with general Editing by E. A. Zhuravleva. - Almaty: Evero publishing house, 2021. - 242 P.*

Module 5

Moduledesignation	*MATH 12001 Mathematics*
Modulelevel,ifapplicable	*Basic Module University Component(BDUC)*
Code,ifapplicable	*SCIN22003*
Subtitle,ifapplicable	*-*
Courses,ifapplicable	*Mathematics*
Semester(s)inwhichthemoduleistaught	*4*
*Personresponsibleforthemodule *	*Gulmira Kenzhebekova,Zauresh Suleimenova*
Lecturer	*Gulmira Kenzhebekova, Zauresh Suleimenova*
Language	*Kazakh, Russian*
Relationtocurriculum	*6B05107–Biology,Bachelor'sdegree,Qualificationlevel:6NQF,6EQF*
Typeofteaching,contacthours	*45(Lectures-15,LaboratoryClasses-30)*
Workload	*Lectures-15,LaboratoryClasses-30,StudentsIndividualWork-105*
Creditpoints	*5ECTS*
Requirementsaccordingtotheexaminationregulations	*Matrixtesting*
Recommendedprerequisites	*Elementarymathematics*
Moduleobjectives/intendedlearningoutcomes	*Asaresultofstudyingthemodule,thestudentmustknow:* *Bases of linear algebra elements of analytic geometry, the elements ofthemathematical analysis.* *How to choose the optimal numerical methods for solving mathematicalandbiological problems.* *Howtoprovidetheprocessingoftheresults.* *As a result of studying the module, the student should be able to:construct mathematical models of simple systems and processes in thenaturalsciences.* *As a result of studying the module, the student must have the skills:applyingmathematicalmethodsforsolvingtypicalprofessionaltasks.*

Content	*Thecontentofthe module coversthewholerangeof problems Linearalgebra,vectoralgebra,analyticalgeometry,mathematicalanalysis. Systems of linear equations. Matrix method. Gauss method.Basis.Decomposition of vectors into components. The scalar product ofvectors. Vector product of vectors. Mixed product of vectors. Rectangularcoordinate system. Polar coordinate system. Various equations line ontheplane.Limit.Continuityoffunction.Derivativeofthefunction.Differentialfunction. Function study using derivative. Indefinite integral.Definiteintegral.Someapplications ofthedefiniteintegral. Complexnumbers.Functions ofseveralvariables.*
Study and examinationrequirementsandformsof examination	*Matrix testing*
Mediaemployed	*Presentationforeachlessonusingacomputer,projector,interactivewhiteboard*
Readinglist	*D.Pismenny. Abstractoflecturesonhighermathematics.-M.:Airis-press,2011. K.Lungu.Collectionofproblemsinhighermathematics.1course.-M.:Airis-press,2011. Highermathematicsforeconomists:Textbookforuniversities/Kremer, B.A.Putko,I.M.Trishin,M.N.Friedman;Ed.Prof.N.Sh.Kremer.–M.:UNITI,2011. Collectionofindividualtasksinhighermathematics.EditedbyA.P.RyabushkoPart1-2.Minsk:HigherSchool.2010.*

Module 6

Module code and name	*LATN 21001 Latin language*
Semester(s) when the module is taught	*1*
Person responsible for the module	*Nurgazina A.B.*
Language of instruction	*Kazakh, Russian*
Within the curriculum (cycle, component)	*General education (mandatory component)*
Teaching methods	*Group work. Problematic discussion. Search method. Construction. Essay. Situational modeling. Text analysis. Creative writing.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours* *Lectures-15, LaboratoryClasses-30,Students Individual Work-105*
Credit points (total by module)	*5 ECTS*
Required and recommended prerequisites for joining the module	*English language*
Module objectives / expected learning outcomes	*The objectives of mastering the module are to prepare a specialist who is capable of consciously and freely using professional Latin terminology in his practical and scientific activities.* *As a result of mastering the module, the student must know the lexical and grammatical elements that form biological terms; the lexical minimum necessary for reading and understanding Latin and Latinized terms; be able to work with a dictionary; do a grammatical analysis of the names of all systematic groups of flora and fauna; own: the skills of translating Latin and Latinized terms, the rules for nominating terms of uninominal and binomial taxonomic categories; the ability to freely navigate the grammatical material necessary for understanding biological nomenclatures.*
Content of the module	*Latin alphabet Latin pronunciation and spelling. Stress rules, consonant pronunciation rules, vowel combinations and diphthong reading rules. Archaic Latin (Old Latin). Classical Latin. Latin in modern times. place in international relations. Influence on other languages. Latin in biology. International rules for the formation of specific epithets. taxonomic units. The semantic meaning of Latin names.*
Examination forms	*Oral exam*
Study and examination requirements	*The final score, consists of the results of the rating control and the exam,with 60% being the rating control, 40% - the result of the exam. Studentsmusthaveafinalgradeof50%orhighertopass*
Technical and electronic learning tools	*https://edu.enu.kz/, https://www.microsoft.com/*

Reading list	*1. Solopov A.I. Latin language // Great Russian Encyclopedia. Volume 17. - M., 2010. - S. 55.* *2. Bright V. N. and others. Latin language. - 8th ed. - M., 2010.* *3. Tsisyk A.Z., Shevchenko G.I. Latin for biologists - http://graecolatini.bsu.by/textbooks-data/latin/tsisyk-2015.pdf* *4. Rules for reading biological terms in Latin - www.piboc.dvo.ru/structure/ext_labs/met/latprVS.doc* *Brief dictionary of medical terms in Latin - http://praxis.my1.ru/publ/4-1-0-7* *5. Latin (Latin language) - All about the Latin language (Latin) - latinum.ru/* *6. https://www.mustgo.com/worldlanguages/latin/* *7. https://www.britannica.com/topic/Latin-language*

Module 7

Course code and name	*PhCS 14114 (14214, 14115, 14215) Physical Training*
Semester(s) when the course is taught	*1/2/3/4*
Person responsible for the module	*Marchibaeva U.S., Nazarkina O.N.*
Language	*English*
Within the curriculum (cycle, component)	*Basic module*
Teaching methods	*Practices*
Workload (incl. contact hours, self-study hours)	*Total workload: 60 hours- 1,2,3,4 sem. (240 hours per year).* *Practical: 60 hours -1,2,3,4 sem. (240 hours per year).*
Credit points (total by module)	*8ECTS*
Required and recommended prerequisites for joining the course	*To master the course of physical education, knowledge, skills and abilities acquired during the study of the following modules are necessary: anatomy, pedagogy, biology.*
Course objectives/intended learning outcomes	*Formation of competencies in physical culture aimed at developing the student's personality and the ability to use means and methods of physical culture and sports to preserve and strengthen health, psychophysical training and self-preparation for future life and professional activity. Willingness to apply methods, tools, fundamentals of theory and methodology of physical culture and sports to ensure full-fledged social and professional activities.* *- formation of a healthy lifestyle and lifestyle;* *-independently select and apply methods and means of physical culture for the formation and improvement of basic physical qualities and motor skills;* *-correctly perform physical exercises, calculate the dosage of the exercise and make up sets of exercises for the development of basic physical qualities.* *-preparation for professional activity and service in the Armed Forces of the Republic of Kazakhstan.*
Content of the course	*The module "Physical culture" is the most important component of the holistic development of the individual. Being an integral part of the general culture and professional training of the student during the entire period of study, physical culture is a mandatory section in all components of education, the importance of which is manifested through the harmonization of spiritual and physical forces, the formation of such universal values as health, physical and mental well-being, physical perfection. It ensures the continuity of the educational process with the programs of physical education of students of schools and secondary specialized educational institutions.*
Examination forms	*Differentiated credit*
Study and examination requirements	*Students who have not attended all practical classes are not allowed to take differentiated credit. Repetition of the topic and working out of the materials passed for each training session are mandatory. The degree of mastering the educational practical material is checked by testing the physical fitness of students. Testing of students can be carried out without warning.*
Technical and electronic learning tools	*Sports equipment, sports equipment,TV and video equipment*

Reading list	*1. Moiseeva N.A. Gymnastics with teaching methods: textbook / N.A. Moiseeva. - Almaty: New book, 2020. - 152, [1] p.: ill., tab. - Bibliogr.: p. 147.* *2. Borodikhin V.A.Health-saving orientation of physical education and sports of schoolchildren and students: [monograph] / V.A. Borodikhin, Zh.A. Usin, Zh.A. Usina. - Almaty: SSK, 2019. – 302 p.* *3. Theory and methodology of teaching basic sports. Athletics: textbook for educational institutions of higher professional education, in the direction of training "Physical culture"/G.V. Gretsov, S.E. Voynova, A.A. Germanova, etc.; edited by G.V. Gretsov and A.B. Yankovsky. - 3rd ed., ispr. - Moscow: Academy, 2016. – 287 p.* *4. Marchibaeva U.S. Methodological foundations of physical culture: electronic textbook/Mubarakkyzy B.M., Taskeev D.S., Kulanova K.K., Sidorova R.V. Astana: L.N.Gumilyov ENU, 2015.Certificate of state registration of rights to the copyright object. IS 002796*

Module 8

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

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

Module 9

Moduledesignation	*BOTN 22002 Botany*
Semester(s)inwhichthemoduleistaught	*2*
Person responsible for themodule	*Asya Dukenbayeva*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory* *Introduction to Biology, Training-field practice of Botany*
Teachingmethods	*Lecture (interactive method, communicative method, lab works (works ingroup, communicative method)*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contact hours: Lectures - 15,Laboratory Classes – 30StudentsIndividual Work:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*IntroductiontoBiology*
Module objectives/intended learning outcomes	*The purpose of the module: To give students a deep knowledge of the structure and functions of plants, reproduction and distribution methods, as well as plant systematics.* *As a result of mastering the module, the student should be able to: make a morphological description of plants according to herbariums; find and identify plants, including medicinal plants, in various phytocenoses. The student must* ***know****: morphology, anatomy of plant tissues and plant systematics; latin names of the families of the studied plants and their representatives; protection of the plant world, and the basics of rational use of plants.* ***Have skills:*** *preparation of a preparation for microscoping, performing an anatomical section of an object that is optimal for microscoping description of a biological object.*
Content	*The importance of plants in nature and in human life. Protection of the plant world. The origin of higher plants and their anatomical and morphological differentiation in connection with life on land. A plant cell. Plant tissues. Early stages of higher plant development. Structure of the embryo, seeds and seedlings. The structure of reproductive organs and plant reproduction. Ecological groups and plant life forms. Age andseasonal changesin plants.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. MukhitdinovN.Morphologyandanatomyofplants:textbook/N.Mukhitdinov, A.Begenov,S.Aidosova.-Almaty:Epigraph,2019.-343* *2. Torsykbaeva B. B. Educational and methodological complex on themodule Anatomy and morphology of plants-Almaty: Almanac, 2019. –215p.* *3. Dukenbayeva A.D. Plant systematics / A.D. Dukenbayeva. - Almaty:Epigraph,2019.-193,P.* *4. Botany: S. K.Imankulova,L. B. Seilova, K. I. Shalabaev, D. M.Amanbekova, A.ShShokanova ; Ministry of education and science of theRepublicofKazakhstan.-Almaty:Association of higher educational institutions of Kazakhstan,2016. -280* *5. KaripbaevaN.S.Illustrated version of flowering plants /N.S.Karipbaeva,V.V.Polevik,B.M.Silybaeva.-Almaty:Evero,2019.- 246* *6. Abiyev S. A. Rusty mushrooms of cereals of Kazakhstan. Almaty,2002* *7. AmetovA.A.Botany,Almaty,2000* *8. Ametov A. A. Myrzakulov P. M., Systematics of higher plants, Almaty,2000*

Module 10

Course code and name	*HIM22024 Chemistry*
Semester(s) when the course is taught	*2*
Person responsible for the module	*F.O. Suyundikova, Ph.D., Associate Professor*
Language	*English*
Within the curriculum (cycle, component)	*Basic module(elective component)*
Teaching methods	*Lecture: Multimedia lecture. Questions and answers. Show of short videos on the topic of the lecture. Seminar assignments (practice): Divide the group into several subgroups. Each subgroup is prepared individually and each subgroup makes its own calculation on the topic of practical work. SIW tasks: each subgroup prepares scientific news on the topic for the last 3 years; videos on the topic of practical work, presentations, and debates on the topic will be organized.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5 ECTS*
Required and recommended prerequisites for joining the course	*Existing competences in chemistry and knowledge of basic information of physics*
Course objectives/intended learning outcomes	*To form the ability to use knowledge about the structure of matter, the nature of the chemical bond, the properties of chemical elements, simple and complex compounds and materials based on them to solve problems of professional activity*
Content of the course	*Teaching students to apply knowledge and demonstrate practical skills in setting up a chemical experiment in the field of ecology and environmental protection; know the features of the structure of atoms of metals and non-metals based on their position in the PSCE; find the dependence of the physical and chemical properties of metals and non-metals on the type of chemical bond and structural features; understand technogenic flows of substances in biogeocenosis; ecological properties of chemical elements and their compounds; know the migration of chemical pollutants in natural waters, soil solution, atmosphere and their entry into the human body, acquire skills and abilities to use methods to solve environmental problems.*
Examination forms	*During the academic semester, two intermediate examinations are conducted (the first after the seventh week of study and the second after the 15th week before the exam) to test students' knowledge. The time for intermediate control is 50 minutes. The exam is conducted orally. The ticket for each exam consists of three questions and is issued to the student for 30 minutes.*
Study and examination requirements	*Taking an oral exam has certain advantages, as it allows you to prepare an answer in the most complete, reasoned and detailed form with examples and explanations. Forms a creative approach of students to the subject, promotes the development of skills of analysis and generalization of the studied material, which, in turn, leads to a deep understanding and formation of a comprehensive, holistic and interrelated understanding of the subject. The examination ticket for this module can be evaluated in the form of calculations, and students should can perform some chemical reactions.*
Technical and electronic learning tools	*Interactive whiteboard, projector, computer*
Reading list	*1. Akhmetov N.S. General and inorganic chemistry. –M: Lan,- 2018. – 744 p.* *2. Glinka N.L. General chemistry. M.: KnoRus, - 2020. - 750 p.* *3. Astafyeva L.S. Ecological chemistry. – M.: Asadema.-2006.- 223 p.* *4. Blinov L.N. Fundamentals of ecological chemistry. St. Petersburg: - 2001. - 75 p.* *5. Huey J. Inorganic chemistry. – M.: Chemistry, - 2016. – 545 p.* *6. Kukushkin Yu.N. Chemistry of coordination compounds. – M.: Higher School. -2015. -455 p.* *7. Nikolsky A.B., Suvorov A.V. General and inorganic chemistry. – Yurayt, - 2021. – 378 p.*

Module 11

Moduledesignation	*EDIN 22015Educational practice* *Training-field practice in botany*
Semester(s)inwhichthemodule istaught	*2*
Person responsible for themodule	*Nursafina Akmaral*
Language	*Kazakh,Russian*
Relationtocurriculum	*Compulsory* *IntroductiontoBiology,Botany*
Teaching methods	*Conducting a guided tour*
Workload(incl.contacthours,self-studyhours)	*-*
Credit points	*3ECTS*
Required and recommended prerequisites for joining the module	*Botany*
Module objectives/intended learning outcomes	*The purpose of field practice in botany is to consolidate and improve the theoretical knowledge gained by students during the implementation of lecture and laboratory classes on the anatomy, morphology and systematics of plants, the acquisition by future pharmacists of the skills of determining medicinal plants in nature, making observations.* *As a result of studying the module, the student should know: the natural environment, the diversity of plant species in different habitatsandgetacquaintedwiththeadaptationofplantstodifferentenvironmentalconditions.* ***Be able to:*** *design a herbarium and consolidate the skills of working withdeterminantsthatcontributetotheprotectionofnature.* ***Have skills:*** *know the food, forage, poisonous and economically harmful plants in pastures, meadows and heaths, as well as the morphological and biological characteristics of the plants and the families to which they belong.*
Content	*Structure and composition of forest phytocenoses. Compilation of geobotanical descriptions. Herbarium collection. Definition and morphological description of plant samples. Vegetation of meadows. Types of meadows. Coastal and aquatic vegetation. Biological and anatomical and morphological features of hydrophytes and hygrophytes. Medicinal species. Preparation of geobotanical descriptions. Collecting herbarium. Agrophytocenoses. Cultivated,weed-ruderal and roadside plants.*
Exams and assessment formats	*Defense of practice report*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1 Muranets A.P., Netesova M.A. Workshop on botany. - Astana, 2006 .--209p.* *2 KaripbaevaN.Sh, Polevik VA Educational workshop on botany. - Semey,2013.-46p.* *3 AKSkvortsov"Herbarium"(Methodicalandtechnicalmanual).-Almaty,2002.-p.45.* *4 Explanatory Dictionary Of Terms Of Bio Morphology/-Almaty:"Sozdik-Slovar",2009.ISBN 9965-822-54-9* *5 E. Ageleuov,K. Donenbaevaandothers. Botany, plant anatomyandmorphology.-Almaty,1998.-366p.*

Module 12

Module code and name	*PHIL 21002 Philosophy*
Semester(s) when the module is taught	*3*
Person responsible for the module	*Tolgambayeva D.T.*
Language of instruction	*English*
Within the curriculum (cycle, component)	*General education (mandatory component)*
Teaching methods	*Inverted class, problem lecture, case study, brainstorming, game methods*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5 ECTS*
Required and recommended prerequisites for joining the module	*History of Kazakhstan, Cultural Studies*
Module objectives / expected learning outcomes	*The purpose of the course is to form students' holistic systemic understanding of philosophy as a special form of cognition of the world, its main sections, problems and methods of their study in the context of future professional activity.* *- To know the meaning of the main philosophical concepts and categories, the content of the main philosophical concepts regarding fundamental philosophical problems, the laws of the development of nature, society and thinking;* *- Be able to apply the conceptual and categorical apparatus, the basic laws of the humanities and social sciences in professional activity; apply methods and means of cognition for intellectual development, raising the cultural level, professional competence; analyze processes and phenomena occurring in society; interpret philosophical texts (primary sources and commenting literature), as well as present their interpretation in writing, and in oral form;* *- - Have the skills of philosophical thinking to develop a systematic, holistic view of the problems of society; competently express and argue their point of view (orally and in writing) when borrowing and interpreting certain of the learned ideas and concepts, the ability to trace the relationship between different traditions and trends.*
Content of the module	*The emergence of a culture of thinking. The subject and method of philosophy. Fundamentals of philosophical understanding of the world. Consciousness, soul and language. Genesis. Ontology and metaphysics. Cognition and creativity. Education, science, technology and technology. people and the Universe. The world of things. Life and death. The meaning of life. Ethics. The philosophy of values. Axiology and morality. The philosophy of freedom. The concept of freedom in the history of philosophy. Philosophy of art. Society and culture. Philosophy of history. Philosophy of religion. "Mangilik el" and "Rukhani zhangyru" – the philosophy of new Kazakhstan.*
Examination forms	*Computer testing*
Study and examination requirements	*Attendance of classes and active participation in the educational process are mandatory. High-quality and timely performance of SRO tasks, actively participate in the oral survey conducted by the teacher during classes, written express control. The preparation by the student of messages (reports) on certain issues of the topic under study, participation in a free discussion organized by the teacher in order to consolidate and deepen the knowledge gained at lectures and in the process of independent work also contributes to a significant increase in the level of knowledge. For the qualitative development of the course, the student should focus on the fact that he works independently with texts, approximately 40-60 pages per week. To successfully pass the final control, the student will have to pass test tasks in Platonus in the amount of 40 questions.*
Technical and electronic learning tools	*Computer, projector, and applications: mook.enu.kz , moodle.enu.kz*

Reading list	*1. Abdildin Zh.M., Abdildina R.Zh.. History of philosophy. – Almaty, Asem-System, - 2010. – 258 p.* *2. Hess R. Philosophiyanyn tandauly 25 kitabs. /Gylym ed . Raev D.S. – Astana, 2018. -360 b.* *3. Yesim, G. Metaphysics of man. - Almaty, 2012* *4. Mironov V.V. Philosophy. Textbook. – M.: Prospect, 2016. – 289 p.* *5. Masalimova A.R., Altaev Zh.A., Kasabek A.K. Kazakh philosophy. Study guide. – Almaty, 2018* *6. Johnston D. A brief history of philosophy/ per. E.E. Sukharev. – M.: Astrel, 2010. – 236 p.* *7. Yesim, Mr. Hakim Abai.- Astana, 2012* *Yesim, G. The wisdom of Shakarim.- Almaty, 2008*

Module 13

Module code and name	*EDUC 22001 Social and Political Knowledge Module*
Semester(s) when the module is taught	*1*
Person responsible for the module	*Burbaeva P.T.*
Language of instruction	*English*
Within the curriculum (cycle, component)	*General education (mandatory component)*
Teaching methods	*Inverted class, problem lecture, case study, brainstorming, game methods*
Workload (incl. contact hours, self-study hours)	*Total workload: 240 hours.* *Lectures: 30 hours, practical: 60 hours, independent work of students: 150 hours.*
Credit points (total by module)	*8*
Required and recommended prerequisites for joining the module	*History of Kazakhstan, Cultural Studies*
Module objectives / expected learning outcomes	*The purpose of the course: the formation of the socio-humanitarian worldview of students in the context of solving the tasks of modernization of public consciousness, defined by the state program "Looking into the future: modernization of public consciousness".* *Expected learning outcomes based on the results of the course development:* *- explain and interpret the subject knowledge (concepts, ideas, theories) of sociology that make up the training courses of the module;* *- explain the socio-ethical values of society as a product of integration processes in the systems of basic knowledge of the courses of the socio-political module;* *- algorithmically represent the use of scientific methods and research techniques in the context of specific training courses and in the interaction procedures of the module courses;* *- explain the nature of situations in various spheres of social communication based on the content of theories and ideas of scientific directions of the courses studied;* *- provide reasoned and reasoned information about the various stages of development of Kazakhstan's society, social and interpersonal relations;* *- to analyze the features of the social institution in the context of their role in the modernization of Kazakh society.*

Content of the module	*The purpose of the course: the formation of the socio-humanitarian worldview of students in the context of solving the tasks of modernization of public consciousness, defined by the state program "Looking into the future: modernization of public consciousness".* *Expected learning outcomes based on the results of the course development:* *- explain and interpret the subject knowledge (concepts, ideas, theories) of sociology that make up the training courses of the module;* *- explain the socio-ethical values of society as a product of integration processes in the systems of basic knowledge of the courses of the socio-political module;* *- algorithmically represent the use of scientific methods and research techniques in the context of specific training courses and in the interaction procedures of the module courses;* *- explain the nature of situations in various spheres of social communication based on the content of theories and ideas of scientific directions of the courses studied;* *- provide reasoned and reasoned information about the various stages of development of Kazakhstan's society, social and interpersonal relations;* *- to analyze the features of the social institution in the context of their role in the modernization of Kazakh society.*
Examination forms	*Computer testing.*
Study and examination requirements	*Students are required to attend lectures and seminars, pre-preparing for lectures and seminars based on textbooks and basic literature, participate in all types of control (current control, boundary control, final control), mandatory participation in intermediate and final certification tests, teacher assignments. The activity of work at the seminar (the ability to conduct a discussion, to argue your position with references to the literature under study, a creative approach to the selection and analysis of texts), the quality of individual written assignments (glossary, etc.) and creative work (essays) highly appreciated.*
Technical and electronic learning tools	*PowerPoint, MindMeister, Miro.com, XMind, Lucidchart, Canva*
Reading list	*1. Biekenov K. U., Biekenova S. K., Kenzhakimova G. A. "Sociology: Textbook". – Almaty: Evero, 2016. - 584 P.* *2. Abdiraimova G. S. sexual sociology: a textbook. Chapter 2. – Almaty: "Kazakh University", 2012. - 224 p.* *3. Brinkerhoff D., Veits R., Ortega S. The basics of Aleumettanu.- Almaty: Ultik audarma Bureau, 2018. – 584 p.* *4 and J. Ritzer, J. Stepnitsky's Theory.- Almaty: Ultik Audarma Bureau, 2018.* *5) Aitov N. Astana, 2015.* *6. Smagambetov B. J. the history of Sheteldik Aleutstvo. – Almaty: Evero, 2016.*

Module 14

Moduledesignation	*BIOL22006 Invertebrate Zoology*
Semester(s) when the module is taught	*3*
Person responsible for the module	*DaniyarTagayev*
Language	*Kazakh,Russian*
Relationtocurriculum	*Compulsory* *Vertebrate zoology, Training-field practice in zoology*
Teachingmethods	*Lecture (interactive method, communicative method, lab works (works ingroup, communicative method)*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*School Zoology course*
Module objectives/intended learning outcomes	*The purpose of studying this module is to form basic knowledge about the structure and diversity of representatives of various types of invertebrates, their phylogenetic relationships and systematic position.* *As result of studying the module, the student should* ***know****:* *the features of the external and internal structure, diversity, the reasons for progress and the role of different groups of invertebrates.* ***Be able to:*** *apply the acquired knowledge in solving scientific and practical problems in future professional activities.* ***Possess the skills of:*** *diagnostics and classification of various groups of invertebrates, master the methods of research of animal organisms*
Content	*Introduction to zoology, introduction to animal-like protists and sponges.Primordial invertebrates. Secondary-cavity invertebrates.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obq*
Readinglist	*1. DzerzhynskiyF.,Vasilyev B.,MalakhovV.VertebrateZoology.Textbook.—M.:"TheAcademy",2013* *2. KonstantinovV.M.,NaumovS.P.,ShatalovaS.P.VertebrateZoology.M.:"TheAcademy",2000* *3. Kardong K.V. Vertebrates. Comparativeanatomy, function,evolution;6thed.—NewYork:McGraw-Hill,2012.—794p.*

Module 15

Moduledesignation	*BIOL22015 Human Anatomy*
Semester(s)inwhichthemoduleistaught	*3*
Person responsible for themodule	*Oralbek Ilderbayev*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory* *HumanMorphology*
Teachingmethods	*Lectures,LaboratoryClasses*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*
Creditpoints	*8ECTS*
Required and recommended prerequisites for joining the module	*Cytologyandhistology*

Module objectives/intended learning outcomes	*The purpose of teaching human anatomy is to give knowledge about the structure of the body, about the changes that occur in the process of its development, taking into account biological patterns.* *At the end of the Normal Anatomy course, students must* ***To know:****the main directions and stages of the development of anatomical science, its significance for medicine and biology, methods of anatomical research; basic patterns of development and vital activity of the human body on the basis of the structural organization of organs and systems; structure, functions, topography and development of all organs and systems of the body, taking into account age, gender and individual characteristics; possible variants of the structure, the main anomalies in malformations of organs and their systems; anatomical and topographical relationship of individual organs and parts of the human body; blood supply, lymph flow pathways, and organ innervation; anatomical terms in accordance with the International Anatomical Nomenclature.* ***Be able to (****on anatomical preparations, models, images obtained by various visualization methods, in the sitter): accurately and precisely identify the parts and areas of the human body; identify the main bone formations, joint crevices, muscle contours and their projection on the surface of the body; accurately and precisely determine the location and projection of the organs on the surface of the body and in relation to the skeleton; accurately and precisely determine the location of the main blood vessels and nerves, the places of pulsation of the arteries.*** ***Your own:*** *medical-anatomical conceptual apparatus and mastery of its use; ability to work with biological material and use the simplest medical tools– scalpel and tweezers; basic technologies of information transformation: independent work with educational literature on paperand electronic media, Internet resources on human anatomy.*
Content	*Anatomy as a science. A brief outline of the development of anatomy. The skeletal system. Connecting the bones. The muscular system. The digestive system. Respiratory system. Urogenital system. Vascular system. Organs of hematopoiesis and the immune system. Central nervous system. Peripheral nervous system. Analyzers. The doctrine of internal secretions*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1 Sapin M.R. Human anatomy. In2vols.: textbook for students of institutions of higher pedagogical education. Vol. 2. Moscow: Akademiya, 2015.344p* *2 Lysov P.K. Human anatomy (with the basics of sports morphology). In* *2 points :a textbook for students of higher educational institutions studyingin the direction of "Physical culture and sport". Vol. 2. Moscow: Akademiya,2015.287p. (inRussian).* *3 Tsekhmistrenko T.A. Human Anatomy: a textbook for students of higher educational institutions studying. Moscow: Akademiya, 2016. 250p.* *4 Shvyrev A. A. Human anatomy and physiology with the basics of general pathology: a textbook for students of educational institutions of secondary vocational education, studying in medical schools and colleges. Rostov-on-Don: Phoenix, 2018. 411p.* *5 Omash, K.Anatomy: textbook/Karaganda:AKNUR,2013.375.* *6 Aubakirov, A.B. Human anatomy. Atlas. Volume 4. Astana: Saryarka, 2014.399* *7 Atlas Of Anatomy And Physiology [electronic resource]/AVT.: R.I.Yessimbekova, T.A.Izmukhambetov, S.Sh.Sakhisheva,M.K. Musazhanova; Almaty:Arys,2007.170.*

Module 16

Moduledesignation	*BIOL22015 Human Morphology*
Semester(s)inwhichthemoduleistaught	*3*
Person responsible for the module	*Oralbek Ilderbayev*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory* *Human Anatomy*
Teachingmethods	*Lectures-30,LaboratoryClasses*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30 Students* *Individual Work:105*
Creditpoints	*8ECTS*
Required and recommended prerequisites for joining the module	*Cytologyandhistology*
Module objectives/intended learning outcomes	*The purpose of the module is to study the variations in the structure ofthe human body, its organs and parts (individual, age, gender, ethno-territorial,etc.).* *The student should* ***know****: changes in morphofunctional characteristics of the process of individual human development.* ***Must be able to****: study the variants of combinations of morphological, physiological and psychological parameters of organisms (constitution) found in modern humans.* ***Must have the skills****: to study the course of various morphological, functional and psychological changes in ontogenesis, and to take into account the biological and social factors of human development.*
Content	*Human morphology and its place among the biological sciences. Periodization of human ontogenesis. The main stages of human development in the prenatal period. The main stages of human development in the postnatal period. The constitution of the human body. Physical development and acceleration of a person. Human body composition and constitution.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obq*
Readinglist	*1 Nikityuk B. A. Morphology of man / B. A. Nikityuk, V. P. Chytetsov. - M.:Izd-voMSU,1990-343c.* *2 Sapin M. R., Bilich G. A. Human anatomy. - M.: GABORN-MED-2001, -463s.* *3 GreenN.Biology:In3t./N/dGrin,I.Stadion,D.Taylor.-Per.sengl. -M.:Mir,1990T1.-368s.* *4 Sapin M. R. Anatomy and human physiology (with age-related featuresof the child's body) / M. R. Sapin, V. I. Sivoglazov. - M.: Akademiya,2002-448s* *5 Ermolenko E.K.Age morphology/E.K.Ermolenko-Rostovn /A:Fenix,2006-464c.* *6 Tegako L. Antropologiya /L. Tegako, E. Klitinsky-M.: Novoeznanie,2004-400s.*

Module 17

Moduledesignation	*BIOL22015 Cytology and Histology*
Semester(s)inwhichthemoduleistaught	*3*
Person responsible for themodule	*Zhannat Bazarbayeva*
Language	*Russian,Kazakh*

Relationtocurriculum	*Compulsory* *CytologyandHistologywith thebasicsofEmbryology*
Teachingmethods	*Lecture (interactive method, communicative method, lab works (works ingroup, communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory Classes – 30* *Students Individual Work:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*Zoology Course*
Module objectives/intended learning outcomes	*As a result of studying the module the student should* ***know****:* *history of Cytology and histology; light, electron microscopy, digital cytochemical, autoradiographic methods; structure and function of cells and tissues; the basic principles of the cell theory; structure and function of the cell nucleus, cell organellesasan important part of cells; mechanisms of cell division; classification of tissues; structure and function of epithelial, connective, muscle and nervous tissues.* ***Be able to:*** *work with the main types of light microscopes; microscopy of cytological and histological preparations, cell culture; differentiation of different types of cells and tissues; find and describe the main elements of cells and tissues under a microscope; describe and analyze the structural elements of cells and tissues on microphotographs electrograms; systematize and summarize the data obtained by statistical methods; search for scientific information in the field of cytology and histology by analyzing domestic and foreign literature.* ***Have the skills to:*** *conduct experimental studies at the tissue, cellular and subcellular levels; apply and analyze the knowledge gained in the study of cells and tissues under normal and pathological conditions.*
Content	*The emergence and development of cytology and histology. Cell structure. Structural and functional organization of biological membranes. The vesicular system of the cell. Mitochondria and plastids. The cytoskelet on of the cell. Ribosome structure and protein biosynthesis. The cell nucleus. Cell cycle, mitosis, meiosis. General histology.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Myrzagalieva, AB Cytology: textbook / A.B. Myrzagaliyeva; Ministry ofEducation and Science of the Republic of Kazakhstan. - Almaty: Dauir,2013.–214* *2.BazarbaevaZh.M.Cytologyandhistology.textbookAlmaty,2011,208.* *3. K.A. Saparov, Zh.M. Bazarbayeva, B.A. Abdullaeva. Glossary of termscytology,histology,embryology. Almaty,2012,454p.* *4. NurtazinS.T. Generalhistology.textbook Almaty,2010* *5. ChentsovY.S. Introductiontocellularbiology.Textbook.Moscow,2015,495p.* *6. MyadeletsO.D. Human histology, cytology and embryology.Part1.Cytology,embryology and general histology:textbook.-Vitebsk:VSMU,2014-439p.*

Module 18

Moduledesignation	*BIOL22015Cytology and Histology with the basics of Embryology*
Semester(s) in which themoduleistaught	*3*
Person responsible for themodule	*Zhannat Bazarbayeva*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory* *CytologyandHistology*

Teachingmethods	*Lecture(interactivemethod, communicativemethod,llabworks (works ingroup,communicativemethod)*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	*Zoology Course*
Module objectives/in tended learning outcomes	*As a result of studying the module the students hould* ***know:*** *history of Cytology, histology and embryology; light, electron microscopy,digital cytochemical, autoradiographic methods; structure and function ofcells and tissues; the basic principles of the cell theory; the mechanisms of cell division; classification of tissues; structure and functions of epithelial, connective, muscle and nervous tissues; the main stages of embryonic development.* ***Be able to*** *work with the main types of light microscopes; microscopy of cytological and histological and embryological preparations; find and describe the main elements of cells and tissues under a microscope; describe and analyze the structural elements of cells and tissues on microphotographs and electrograms.* ***Possess the skills of:****conducting experimental studies at the tissue,cellular and subcellular levels; applying and analyzing the knowledge gainedin the study of cells, tissues and embryological preparations under normal and pathological conditions.*
Content	*The doctrine of the cell. Structure and function of the cell nucleus. Organization of the cytoplasm, biomembrane, structure of the cell wall. Chemical composition of hyaloplasm. Structure and functions of cellular organoids.Cell reproduction. Reproduction of organisms. Types of reproduction. Embryonic development or embryogenesis. Crushing. Gastrulation. Neurulation. Development of organisms. Periods of development of organisms. Experimental embryology or developmental mechanics. Predictive maps of the development of the body.General* *histology.*
Exams and assessment formats	*Two oralrating (20 minutes each)and one final oral exam (40 minutes)*
Study and examination requirements	*The final score, consists of the results of the rating control and the exam,with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Myrzagalieva, AB Cytology: textbook / A.B. Myrzagaliyeva; Ministry ofEducation and Science of the Republic of Kazakhstan. - Almaty: Dauir,2013.–214* *2.BazarbaevaZh.M.Cytology and histology.textbookAlmaty,2011,208.* *3. K.A. Saparov, Zh.M. Bazarbayeva, B.A. Abdullaeva. Glossary of terms cytology,histology,embryology.Almaty,2012,454p.(inKazakh)* *4. Nurtazin ST General histology.TextbookAlmaty,2010(inKazakh)* *5. ChentsovY.S.Introduction tocellular biology.Textbook.Moscow,2015,495p.* *6.NurtazinS.T.,VsevolodovE.B.Biology of Individual Development: ATextbook.-Almaty:KazakhUniversity,2005.-260p.* *7. Myadelets OD Human histology,cytology and embryology.Part1.Cytology,embryology and general histology: textbook.-Vitebsk:VSMU,2014-439p.*

Module 19

Moduledesignation	*BIOL2214 Vertebrate zoology*
Semester(s) in which themoduleistaught	*4*
Person responsible for themodule	*DaniyarTagayev*
Language	*Kazakh,Russian*

Relation to curriculum	*Compulsory* *Invertebrate Zoology, Training-field practice of Zoology*
Teaching methods	*Lecture(interactivemethod, communicativemethod,llabworks (works ingroup,communicativemethod)*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30 Students* *Individual Work: 105*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	*Cytology and Histology, Invertebrate Zoology*
Module objectives/in tended learning outcomes	*As a result of studying the module, the student must* ***know:*** *The features of the external and internal structure, the variety, the reasons for the progress and the role of various groups of chordates.* *As a result of studying the module, the student should* ***be able to:*** *apply the acquired knowledge in solving scientific and practical problems in the future professional activity.* *As a result of studying the module, the student must have* ***the skills:*** *of diagnosing and classification of different groups of vertebrates, to own methods of research of animal organisms.*
Content	*General characteristics of the Chordate Type. Phylogeny of chordates. Fossil chordates. Vertebrates (Vertebrata). Jawless (Agnatha). Cyclostomata. Cartilaginous fish (Chondrichthyes). Bony fish (Osteichthyes).* *Amphibians (Amphibia). Reptiles (Reptilia). Birds (Aves). Mammals (Mammalia).*
Exams and assessment formats	*Two oral rating (20 minutes each)and one final oral exam(40 minutes)*
Study and examination requirements	*The final score, consists of the results of the rating control and the exam,with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*1. DzerzhynskiynF., Vasilyev B., Malakhov V.Vertebrate Zoology. Textbook.— M.:"The Academy", 2013 (in Russian)* *2. Konstantinov V.M., Naumov S.P., Shatalova S.P. Vertebrate Zoology. M.: "TheAcademy", 2000 (in Russian)* *3. Kardong K.V. Vertebrates. Comparative anatomy, function, evolution; 6thed.—New York: McGraw-Hill, 2012.—794p.*

Module 20

Moduledesignation	*BIOC 2212 Biochemistry*
Semester(s) in which themoduleistaught	*4*
Person responsible for themodule	*Ainash Suleimenova*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory* *Humanandanimalphysiology*
Teachingmethods	*Lecture(interactivemethod, communicativemethod,llabworks (works ingroup,communicativemethod)*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contacthours:Lectures-15,laboratoryclasses-30StudentsIndividualWork:105*
Creditpoints	*5ECTS*
Requiredandrecommendedprerequisites for joining themodule	*Chemistry*

Module objectives/in tended learning outcomes	*As a result of studying the module,the students hould* ***know:*** *about the chemical composition of living organisms; methods of isolationand study of substances in the wild; chemical properties of the structural components of biopolymers.* ***Be able to:*** *use the modern material and technical and methodological base for the biochemical characteristics of proteins and nucleicacids; use in practice modern methods of studying proteins and nucleicacids* ***Possess the following skills:*** *interpretation of the results obtained*
Content	*The structure and properties of proteins. Classification and nomenclature of enzymes. Breeders' metabolism: dichotomous and apotomic degradation of glucose. Mechanism of glycolysis and gluconeogenesis. biosynthesis of glycogen. Nucleic acids: DNA, RNA. Replication, repair, transcription and translation. Energy exchange. Chemistry of the Krebs cycle. tissue respiration. respiratory chain. Lipid metabolism. Vitamins.* *Hormones.*
Exams and assessment formats	*Two oral rating(20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score, consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://www.labster.com/,https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obq*
Readinglist	*1.Komov, V.P. Biochemistry: atextbook for academic under graduate studies/ V.P. Komov,V.N. Shvedova; under the general editor ship of V.P. Komov. 4thed.,Revandadd.Moscow:YuraytPublishingHouse, 2016.640p.ISBN978-5-9916-3929-3* *https://biblio-online.ru/bcode/396209* *2. Seitov, ZS Biochemistry: textbook.4th ball. and processing. ed.- Almaty:Akbar,2011.-795,p.ISBN978-601-278-298-1.* *https://www.twirpx.com/file/3066655/* *3. Biochemistry,Genetics&MolecularBiology.2016. 117pages,https://www.pdfdrive.com/biochemistry-genetics-molecular-biology-e18198970.html* *4. Ukbaeva TD, Suleimenova AE Classification and biochemistry ofhormonesTeachingaidNMSENUAstana,ENUthem.L.N.Gumilyov2017.-90s.* *https://www.enu.kz/ru/nauka/sborniki-konferentsiy/* *5.Shamraev A.V.Biochemistry:textbook.OSU.2014.P.186.* *https://www.twirpx.com/file/2206794/*

Module 21

Moduledesignation	*HAPh2213 Human and animal physiology*
Semester(s)inwhichthemoduleistaught	*4*
Person responsible for themodule	*ZhanatMukataeva*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory* *Biochemistry*
Teachingmethods	*Lecture (interactive method, communicative method, lab works (works ingroup, communicative method)*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contact hours: Lectures - 15,Laboratory Classes – 30StudentsIndividual Work:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*HumanAnatomy,CytologyandHistology*

Module objectives/intended learning outcomes	*As a result of studying the module, the student must **know**: about the physiological functions of the body and the systems of their regulation, their regulatory mechanisms of ensuring the homeostasis of living systems, about the functions of the nervous, endocrine, cardiovascular, respiratory, excretory and other systems of the body.* *As a result of studying the module, the student should **be able to**: analyze scientific literature, carry out experiments in the framework of a laboratory workshop, evaluate the functional state of various body systems.* *As a result of studying the module, the student must have practical skills and basic methods of experimental physiological research.*
Content	*Physiology of excitable tissues. Physiology of the central nervous system. Physiology of the endocrine system. The main functions of the blood and lymph. Physiology of the cardiovascular system. Physiology of the heart. Physiology of the respiratory system. Metabolism and energy. Physiology of digestion. Functions of the kidneys and additional excretory organs. Sensor system.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. "Human and animal physiology": / U. K. Akhanov. Almaty: Epigraph,2016.-235,p.* *2. "Age-related anatomy and physiology":forstudents.vuzov /N.F.Lysova,R.I.Aizman. -M.:INFRA,2016.-352p.(Russian)* *3. "Humanandanimalphysiology":U.K.Akhanov.-Almaty:Epigraph,2016.-178,p.(Russian)* *4. "Age-related human physiology". / Sarsekeeva G. Zh., - Almaty: Nur-Print,2018–-148p.(Russian)* *5."Physiologyofsensorysystems":educational and methodological manual: S. V. Moryakina, V. A. Anzarov. - Groznyi: 2015 – - 153 p.(Russian)* *6. "Age-related anatomy and physiology": for academic undergraduatestudies. / Z. V. Lyubimova, A. A. Nikitina ; MSPU. - 2nd ed., reprint. Andadd.-M.:Yurayt,2014. -447p.(Russian)* *7. "Anatomy and age physiology": for bachelors / A. O. Drobinskaya;MGPPU.-M.:Yurayt,2014.-527p.(Russian)* *8. "Fundamentals of sensory physiology": a textbook/ R. Schmidt. - M.: -HERMedia,2012. -287p.(Russian)* *9. "Research and assessment of the state of health of schoolchildren": /MukataevaZh.M., Dinmukhamedova A. S. – Nur - Sultan 2020. - 122 p.(inKazakh).* *10. "Human physiology": / H. K. Satpayeva, A. A. Utepbergenov, Zh. B.Nildibayeva.-Revised And Supplemented Second Edition.-Almaty:Everopubl.,2014. -664p.(inKazakh).* *11. Human and animal physiology: / Z. A. Askarova, G. T. Srailova, S. S.Markeeva-Almaty:Kazakhuniversity,2015.–204p.(inKazakh)*

Module 22

Moduledesignation	*PHYS 22005 Physics*
Modulelevel,ifapplicable	*BasicModuleUniversityComponent(BDUC)*
Code,ifapplicable	*SCIN22003*
Subtitle,ifapplicable	
Courses,ifapplicable	*Physics*
Semester(s)inwhichthemoduleistaught	*3*
Person responsible for themodule	*AliyaMukasheva*
Lecturer	*AliyaMukasheva*

Language	*Kazakh,Russian*
Relationtocurriculum	*6B05107–Biology,Bachelor'sdegree,Qualificationlevel:6NQF,6EQF*
Typeofteaching,contacthours	*45(Lectures-30,PracticalClasses-15)*
Workload	*Lectures-15,PracticalClasses -30,StudentsIndividualWork-105*
Creditpoints	*5ECTS*
Requirements according to the examination regulations	*At the end of the semester, the exam is given orally. Exam tickets are used for the examination. The list of questions included in the exam tickets is known to students in advance for preparation. Retaking the exam to improve the score is not allowed. Each exam ticket contains three questions. Students are given 30 minutes to prepare for the answers to the exam questions.*
Recommended prerequisites	*SchoolPhysicscourse*
Module objectives/intended learning outcomes	*The purpose of studying this module is to form the bachelor's understanding of the modern physical picture of the world and the scientific worldview, knowledge, and skills of using fundamental laws, theories of classical and modern physics, as well as methods of physical research as the basis of the system of professional activity.* *To know: - general laws of physics for solving specific problems;* *-formulations and proofs of the main theorems, be able to apply them when performing laboratory work; use physical devices,* *process, analyze and evaluate the results obtained;* *be able to: - use reference and educational literature when working, find the necessary sources of information and work with them;* *-understand the essence of the main methods used in physical research;* *-independently study individual topics and write essays on the set pics and speak on them;* *Have skills:* *- and methods of using this knowledge for theoretical and practical purposes;* *- use knowledge of physics in the study of other academic* *modules;*
Content	*Physical fundamentals of mechanics. Kinematics. Dynamics of a material point and the translational motion of a solid body. Dynamics of the rotational motion of a rigid body. Conservation laws. Energy as a universal measure of various forms of motion and interaction. Fundamentals of thermodynamics. Reversible and irreversible thermal processes. Transfer phenomena. Real gases. Electrostatics and direct current. Direct electric current.*
Study and examination requirements	*The student must complete the assigned tasks within a strictly defined timeframe. Being late for classes is not welcome. A student who misses classes or fails to complete a task is not allowed to take the exam.* *Attendance is mandatory; absence can only be for a valid reason. All missed classes are worked out in the form of individual tasks, problem-solving, preparation of presentations, etc.* *Exam form: Combined exam.*

Mediaemployed	*Presentation for each lesson using a computer, projector, interactive whiteboard*
Readinglist	*1. SavelyevI.V.Courseofgeneralphysicsin5books.-M.:Astrel:AST,2008.* *2. Trofimova T.I.CourseofPhysics–-M.:ACADEMIA,2008.* *3. DetlafA.A.,YavorskyB.M.Courseofphysics.-M.:ACADEMIA,2008* *4. IrodovI.E.Problemsingeneralphysics.-M.: Fizmatlit.,2009* *5. TrofimovaT.I.Collectionofproblemsinthecourseofphysicsforuniversities.-M.:Onyx21century, 2008* *6. VolkenshteinV.S.Collection of problems on the general course of physics .-St.Petersburg:KnizhnyMir,2008.* *7. Collection of tests for students of high educational in stitutions in the following modules interim state control.NationalCenterforStateStandardsofEducationandTesting.-Astana,2008*

Module 23

Moduledesignation	*INEX 22026 Industrial practice* *Training-field practice in zoology*
Semester(s)inwhichthemoduleistaught	*4*
Person responsible for themodule	*Daniyar Tagayev*
Language	*Kazakh, Russian*
Relationtocurriculum	*Compulsory* *Invertebrate Zoology,Vertebrate zoology*
Teachingmethods	*Conducting a guided tour*
Workload(incl.contacthours,self-studyhours)	*-*
Creditpoints	*3ECTS*
Required and recommended prerequisites for joining the module	*Invertebrate Zoology,Vertebrate zoology*
Module objectives/intended learning outcomes	*As a result of studying the module, the student must* ***know****:* *- the main features of the structure and development of animals; ecology and distribution of animals; representatives of the fauna of Kazakhstan. As a result of studying the module, the students should be able to: - to navigate in the species composition of animals in given environmental zone; carry out environmental education and popularization of students and the population.* *As a result of studying the module, the student must have* ***the skills****: of using field and laboratory methods of zoological research and study of material on zoology and animal ecology.*
Content	*Observe animals in their natural habitat and evaluate all the complex relationships of animals with each other and their habitat. Guided tours with a teacher, laboratory processing of collected material, field documentation, students' own observations of animals.*
Exams and assessment formats	*Defense of practice report*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*

Readinglist	*1. DaudaT.A., KoschaevA.G. Workshop on zoology.–2014 (in Russian)* *2. Yazykova I.M. Workshopon Invertebrate Zoology.-2010. (in Russian)* *3. Koneva L.A. ,Mashinskaya N.D. Workshop on the zoology of vertebrates.–2011(in Russian)*

Module 24

Module code and name	*ECON 22001 Entrepreneurship and business*
Semester(s) when the module is taught	*4*
Person responsible for the module	*Ryspekova M.O.*
Language of instruction	*English*
Within the curriculum (cycle, component)	*General education (optional component)*
Teaching methods	*Overview, informational, problem lectures in the form of presentations, the method of conducting lectures are combined into three main elements: presentation of new material, formulation of problematic questions, joint search for answers, solving problem cases.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5*
Required and recommended prerequisites for joining the module	*Recommended prerequisites: knowledge of the basics of economics in the framework of the secondary school program "Economics and Entrepreneurship".*
Module objectives / expected learning outcomes	*"Entrepreneurship and business" is the acquisition of the necessary skills of entrepreneurship, understanding the mechanism of functioning of the market structure in business.* *Knowledge: familiarity with the theory of business and entrepreneurship, systematization of regulatory, economic, organizational and managerial knowledge on the formation and conduct of entrepreneurship and business. Skills: cognitive and practical skills, for the development of entrepreneurial thinking for solving specific tasks and business situations. Skills of preparation, evaluation and implementation of business development projects in various sectors of the economy; skills in organizing, reorganizing and liquidating entrepreneurial firms and preparing working documentation - tools for regulating economic relations between business entities. Competencies: to form students' readiness for entrepreneurial activity and for the organization of their business. Skills of preparation, evaluation and implementation of business development projects in various sectors of the economy. Collect, analyze and process the data necessary to solve the set economic tasks in the field of organization and business development; To select and apply tools for processing economic data in the field of business organization and management in accordance with the task, analyze the results of calculations of economic efficiency and justify the conclusions.*
Content of the module	*Introduction to the course "Entrepreneurship and business". The essence of business and entrepreneurship. Goals, functions and general characteristics of the business. The system of modern business: subjects of business relations, business infrastructure, government support. Forms of business. Small, medium and large businesses. Registration of an entrepreneurial company. Organization of an entrepreneurial firm. Reorganization and termination of the company. Economic activity in the business system. Competition in business. Business activity and contracts of the company. The tax system in business. Business interests in business. Entrepreneurial risk. Innovative entrepreneurship. Business infrastructure.*
Examination forms	*The exam is conducted orally*
Study and examination requirements	*The organization of the lesson using active forms and methods of the educational process, mandatory control. The exam serves as a form of checking the educational achievements of students throughout the professional curriculum of the module and provides for the development of educational achievements of students during the academic period, the theoretical knowledge gained, the strength of their assimilation, creative thinking, independent work skills.*
Technical and electronic learning tools	*Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).*

Reading list	*1. Esirkepova A.M. Modern entrepreneurship: a textbook / A.M. Esirkepova. - Almaty: New book, 2020. – 304 p* *. 2. Baigelova A.N. Fundamentals of entrepreneurship: textbook /A.N. Baigelova, Zh.E. Sadykova, T.M. Nasymkhan. - - Almaty: Lankar Trade, 2019. - 292 p.* *3. Ryspekova M.O. Fundamentals of entrepreneurship: study guide. - Almaty: Epigraph, 2019. – 231 p.* *4. Maidyrova A.B. Entrepreneurship and business: cases, business games, tasks and schemes: textbook /A.B. Maidyrova, R.A. Baizholova. - - Nursultan: L.N. Gumilyov ENU, 2020. – 172 p.* *5. Maidyrova A.B. Economics of small and medium-sized enterprises: textbook /A.B. Maidyrova, M.O. Ryspekova. - - Nursultan: L.N. Gumilyov ENU, 2019. - 251 p.*

Module 25

Module code and name	*CSSE 22002 Digital technologies by branches of application*
Semester(s) when the module is taught	*4*
Person responsible for the module	*Mukhtarova A.J.*
Language of instruction	*Russian*
Within the curriculum (cycle, component)	*General education (optional component)*
Teaching methods	*Overview, informational, problem lectures in the form of presentations, the method of conducting lectures are combined into three main elements: presentation of new material, formulation of problematic questions, joint search for answers, solving problem cases.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5*
Required and recommended prerequisites for joining the module	*Information and communication technologies*
Module objectives / expected learning outcomes	*Purpose: to introduce students to the prospects and examples of the use of digital technologies to improve the efficiency and quality of their activities.* *Knowledge:* *– to study the basic concepts of digital technologies, platforms and mobile devices;* *– know the specifics of using multimedia on the Internet;* *– be able to effectively use digital technologies and Internet resources;* *– develop multimedia content;* *– use the functionality of social networks;* *– use various means of processing and storing digital information;* *– analyze the reliability of means and methods of protection in the network;* *Competencies:* *– formation of students' skills and abilities necessary for their further professional activity;* *– evaluate the effectiveness of digitalization in professional fields.* *– synthesize the effective use of Internet services for work and life.*
Content of the module	*Introduction to the course. The state program "Digital Kazakhstan". Smart city. Basic concepts. Platforms and technologies of the organization. Smart Astana roadmap. Computer networks. The Internet. Internet access technologies. Internet by wire. Internet without wires. Mobile Internet. Mobile networks (3G, 4G/LTE). Cellular systems. Digital platforms for electronic public services. Electronic digital signatures (EDS). Information system "Electronic licensing". Digital e-commerce platforms. E-commerce. Virtual means of payment and systems. Online stores. Online shopping. Information security on the Internet. Cybersecurity. Strong passwords. two-step authentication. 3D modeling and animation. 3D graphics. 3D modeling. Virtual and augmented reality VR and AR. Introduction to Java. The Java programming language. Introduction to the Python programming language. Processing of digital information in the professional sphere. Organization of texts, transformation of text information. Processing of graphic images. Compression of digital information. Database. Big data and open data. Statistical processing of results using the STATISTICA program. Modern multimedia services. Social network. Search engines. Electronic catalogs, libraries. Video conferences. The use of cloud technologies for storing digital information. General concepts of cloud technologies. Advantages and disadvantages of cloud services.*
Examination forms	*Testing.*

Study and examination requirements	*The course "Digital Technologies by industry" is an optional component. The work must be completed within the specified time frame. Students who have not completed all the tasks are not allowed to take the exam. Revision of the topic and working out of the materials passed for each training session are mandatory. The degree of assimilation of the educational material is checked by testing. Students may be tested without warning.*
Technical and electronic learning tools	*Программы Python, Java, STATISTICA.*
Reading list	*1. Brown G., Sargent B., and Watson D. Cambridge IGCSE ICT. - London: Hodder Education Group, 2015. -439 p.* *2. Williams B. K. and Sawyer S. Using information technology: A practical introduction to computers & communications. - New York: McGraw-Hil., - 8th ed. -2010. -563 p.* *3. Watson D. and Williams H. Cambridge IGCSE Computer Science: Hodder Edu.; 3 ed. 2015.-278 p.* *4. Evans V. Information technology. Books 1-3: English for specific purposes.- 5th impr.- Newbury: Express Publishing, 2014.- 40 p.*

Module 26

Module code and name	*COMU 22003 Business rhetoric*
Semester(s) when the module is taught	*4*
Person responsible for the module	*Shakhin A.A., Tashimkhanova D.S.*
Language of instruction	*Russian*
Within the curriculum (cycle, component)	*General education (optional component)*
Teaching methods	*Overview, informational, problem lectures in the form of presentations, the method of conducting lectures are combined into three main elements: presentation of new material, formulation of problematic questions, joint search for answers, solving problem cases.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5*
Required and recommended prerequisites for joining the module	*Kazakh and Russian languages*
Module objectives / expected learning outcomes	*The goal is to develop effective public speaking skills, successful communication skills in various business communication situations.* *Know the basic rhetorical strategies and tactics, argumentation techniques aimed at achieving a communicatively significant result.* *Be able to apply knowledge about oratorios to the speech facts of business communication; build effective business communication in accordance with students' own communicative intentions.* *Have the skills of effective interaction with participants in the process of business communication in various genres of business communication.*
Content of the module	*The course has a professional and practical orientation. Its study involves mastering the technology of rhetorical activity in professionally significant situations. The objectives of the course include improving students' speech education, gaining knowledge about the principles of effective business communication, the main factors and processes that ensure the successful impact of public speaking on listeners, forms and means of interaction between the speaker and the audience.* *The student receives knowledge about the main rhetorical strategies and tactics aimed at achieving a communicatively significant result; the basics of public speaking skills; knowledge of the terminological apparatus for the course; the ability to perform tests of an official business orientation, to realize their own communicative intentions and build effective business communication in accordance with this.*
Examination forms	*Combined exam*
Study and examination requirements	*The activity of students in the educational process is mandatory, which is evaluated by the quality of their performance. Attendance of classes and participation in the educational process are mandatory. Students should not miss classes without a good reason. Tardiness is not allowed. The Code of Conduct and Ethics must comply with the requirements of the university. In this regard, scores from 0 to 100 points are given.*

Technical and electronic learning tools	*Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).*
Reading list	*1. Sternin I.A. Practical rhetoric: studies. manual for students of higher educational institutions. – M.: "Academy", 2016. – 272 p.* *2. Shelamova G.N. Etiquette of business communication: studies. manual for the beginning of Prof. education. – M.: "Academy", 2015. – 192 p.* *3. Vvedenskaya L.A. Business rhetoric: A textbook for universities. – Rostov n/A, 2012.* *4. Malkhanova I.A. Business communication: studies. manual. – M.: Academic project, 2014. – 224 p.* *5. Anisimova T.V., Gimpelson E.G. Modern business rhetoric: studies.manual. – M. : NPO "MODEK", 2017. – 432 p.* *6. Golub I.B. Rhetoric: studies. manual. – M.: "Eksmo", 2015. – 384 p. Kuzin F. A. Culture of business communication. – M., 2017.*

Module 27

Module code and name	*ECLFST 22004 Fundamentals of ecology and life safety*
Semester(s) when the module is taught	*4*
Person responsible for the module	*Kobetaeva N.K.*
Language of instruction	*English*
Within the curriculum (cycle, component)	*General education (optional component)*
Teaching methods	*Overview, informational, problem lectures in the form of presentations, the method of conducting lectures are combined into three main elements: presentation of new material, formulation of problematic questions, joint search for answers, solving problem cases.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5*
Required and recommended prerequisites for joining the module	*School Biology course*
Module objectives / expected learning outcomes	*Formation of an ecological worldview, obtaining deep systemic knowledge and ideas about the basics of ecology and life safety, theoretical and practical knowledge about modern approaches to the rational use of natural resources and environmental protection.* *As a result of studying this module, students should know:* *- the main patterns of interaction between nature and society;* *- fundamentals of ecosystem functioning and biosphere development;* *- the impact of harmful and dangerous factors of production and the environment on human health;* *- the concept, strategies, problems of sustainable development and practical approaches to their solution at the global, regional and local levels;* *- fundamentals of environmental legislation;* *- principles of organization of safe production processes;* *be able to:* *- to assess the ecological state of the natural environment;* *- to assess the technogenic impact of production;* *have the skills to influence the environment:* *- study of the components of ecosystems and the biosphere as a whole;* *- determination of optimal conditions for sustainable development of ecological and economic systems;* *- conducting a logical discussion of topics related to solving environmental problems;* *- knowledge of standard methods of environmental monitoring.*

Content of the module	*Ecology and problems of modern civilization. Autoecology is the ecology of organisms. Demecology – ecology of populations. Synecology Is The Ecology Of A Community. The biosphere and its stability. Evolution of the biosphere. The concept of living matter. Modern biosphere. Global biogeochemical cycles. Ecological crisis and problems of modern civilization. Strategies, goals and principles of safety and vital activity. Green economy and sustainable development. Natural resource management. Ecoenergy. Global energy-ecological strategy for sustainable development of the XXI century. Water is a strategic resource of the XXI century. Renewable energy sources. Environmental policy of the Republic of Kazakhstan. The concept of sustainable development of the Republic of Kazakhstan. Protection of the atmosphere. Protection of water resources. Protection of land resources, soils and subsoil. Physical pollution of the environment. Protection of flora and fauna.*
Examination forms	*Computer testing*
Study and examination requirements	*Students are required to attend lectures and seminars, pre-preparing for lectures and seminars based on textbooks and basic literature, participate in all types of control (current control, boundary control, final control), mandatory participation in intermediate and final certification tests, teacher assignments. The activity of work at the seminar (the ability to conduct a discussion, to argue your position with references to the literature under study, a creative approach to the selection and analysis of texts), the quality of individual written assignments (glossary, etc.) and creative work (essays) highly appreciated.*
Technical and electronic learning tools	*Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).*
Reading list	*1 Akimova T. A., Haskin V. V. Ecology. Man-economy-Biota-Environment: Textbook for university students / 2nd ed., reprint. and appendix-M: UNITY, 2009. – 556 p.* *2 Bigaliev A.B. General ecology / Second edition, reprint. updated. - - Almaty: NUR PRESS Publishing House, 2011.* *3 Denisova V. V. Ecology: Textbook – M., 2004.* *4 Abubakirova K. D., Kozhagulov S. O. Ecology and Sustainable development. - Almaty, 2011* *5 Columbayeva S.Zh. and others. Ecology and sustainable development. - Almaty, "Kazakh University", 2011* *6 Alimov M.S. Ecology and sustainable development. - Almaty, 2012* *7 Korobkin V. I., Peredelsky L. V. Ecology: Textbook for university students. - Rostov n/A: Phoenix, 2007-575 p.* *8 Tonkopiy M. S., Satbaeva G. S., Ishkulova N. P., Anisimova N. M. Ecology of zhane terrorist attacks at home: okulyk: KR Bilim zhane gylym m-gi. Almaty: ZHSHS RPBC "Dauir", 2011-312 b.* *9 Columbayeva S.Zh. Zhalpa ecology. - Almaty: 2006*

Module 28

Module code and name	*CULS 22005 Rukhani Zhangyru*
Semester(s) when the module is taught	*4*
Person responsible for the module	*Battalov K.K.*
Language of instruction	*English*
Within the curriculum (cycle, component)	*General education (optional component)*
Teaching methods	*Overview, informational, problem lectures in the form of presentations, the method of conducting lectures are combined into three main elements: presentation of new material, formulation of problematic questions, joint search for answers, solving problem cases.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5*
Required and recommended prerequisites for joining the module	*Modern history of Kazakhstan*

Module objectives / expected learning outcomes	*The course highlights topical issues of modernization of modern Kazakh society. The course is aimed at forming an idea of modern global trends in post-industrial development of society, a vision of their own and the world's future, awareness of the trend in the development of the world labor market, an idea of Kazakhstan's identity, the main directions of development of the spiritual modernization of the country. The course covers basic knowledge about leadership strategies in society. The world examples of leadership in different historical periods are considered.*
Content of the module	*The educational program is based on three conceptual foundations: cognitive – the study of the basics of modernization of public consciousness and the laws of development of modern society; patriotic – respect for history, the heroic past of their people, love for the Fatherland, native land, historical figures, involvement in national values; informational – popularization of spiritual and moral values that strengthen national identity, clarification of tasks defined in the Program Article of the Head of State, strategic documents of the country, the President's Message to the people of Kazakhstan. The module consists of 3 modules: 1. Modernization in the context of globalization. The world of the future. 2. Modernization of consciousness as a factor of success of the nation. 3. Leadership in the conditions of modernization.*
Examination forms	*The exam is conducted orally*
Study and examination requirements	*The activity of students in the educational process is mandatory, which is evaluated by the quality of their performance. Attendance of classes and participation in the educational process are mandatory. Students should not miss classes without a good reason. Tardiness is not allowed. The Code of Conduct and Ethics must comply with the requirements of the university. In this regard, scores from 0 to 100 points are given.*
Technical and electronic learning tools	*Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).*
Reading list	*1. Nazarbayev N. A. looking to the future: modernization of public consciousness // Kazakhstanskaya Pravda, 2017. - April 12.* *2. Nazarbayev N. era of independence. - Astana, 2017. - 508 P.* *3.President of the Republic of Kazakhstan N. A. Nazarbayeva "social initiative of the President" // http://www.akorda.kz* *4. Yuval NOI Harrari. "Homo Deus: the history of the future". Moscow: Sinbad, 2018. - 496 P.* *5. Kuttykadam S. "10 examples of the service of the nation". - Almaty: Ines-TSA, 2009.356C.* *6. Abay Kunanbayev. Izbrannoe (Series" wise vekov"), Moscow, 2006* *7. address of the head of State to the people of Kazakhstan dated January 31, 2017 "the third modernization of Kazakhstan: tolerance on a universal basis" / / http://www.akorda.kz* *8. Nazarbayev N. on the wave of history. - Almaty: "Atamura", 1999* *9. strategy "Kazakhstan-2050" direction of the new policy of the established state. Address of the president of the Republic of Kazakhstan – Elbasy N. A. Nazarbayev to the people of Kazakhstan, Astana, December 14, 2012 // http://adilet.zan.kz/kaz/docs/K1200002050* *10. Terminasova S. G. language and intercultural communication. - Almaty; Astana, 2018.*

Module 29

Module code and name	*LAWS 22006Anti-corruption culture*
Semester(s) when the module is taught	*4*
Person responsible for the module	*Ibragimov Zh. I., Temirzhanova L.A.*
Language of instruction	*Russian*
Within the curriculum (cycle, component)	*General education (optional component)*
Teaching methods	*Overview, informational, problem lectures in the form of presentations, the method of conducting lectures are combined into three main elements: presentation of new material, formulation of problematic questions, joint search for answers, solving problem cases.*
Workload (incl. contact hours, self-study hours)	*Total workload: 150 hours.* *Lectures: 30 hours, practical: 15 hours, independent work of students: 105 hours.*
Credit points (total by module)	*5*
Required and recommended prerequisites for joining the module	*School course "Human, society and law".*

Module objectives / expected learning outcomes	*The purpose of the anti-corruption culture is the education of values and the development of abilities necessary for the formation of a civil position in young people in relation to corruption, the formation of a negative attitude to corruption manifestations.* *Learning outcomes:* *Students will gain knowledge about the essence of corruption and the causes of its occurrence. Students will be able to analyze the measure of moral, ethical and legal responsibility for corruption offenses. Students will know the anti-corruption policy of the state and the current anti-corruption legislation. Students will be able to realize the values of moral consciousness and follow moral norms in everyday practice. Students will be able to identify legitimate actions in a conflict of interest situation.*
Content of the module	*The course "Fundamentals of Anti-Corruption Culture" is aimed at raising awareness about corruption and shaping its image as a problem of public policy. The purpose of the course is to form a system of knowledge on combating corruption, existing legal responsibility and on this basis to develop a civil position in relation to this phenomenon. The development of a legal culture of the individual contributing to the fight against corruption, the formation of skills and abilities of critical analysis of corruption phenomena, the study of modern anti-corruption approaches and practices.*
Examination forms	*Computer testing*
Study and examination requirements	*Students are required to attend lectures and seminars, pre-preparing for lectures and seminars based on textbooks and basic literature, participate in all types of control (current control, boundary control, final control), mandatory participation in intermediate and final certification tests, teacher assignments. The activity of work at the seminar (the ability to conduct a discussion, to argue your position with references to the literature under study, a creative approach to the selection and analysis of texts), the quality of individual written assignments (glossary, etc.) and creative work (essays) highly appreciated.*
Technical and electronic learning tools	*Types of technical means: computers, interactive whiteboards, projectors. Teaching methods using visualization (presentation).*
Reading list	*Main Links:* *1. Fundamentals of anti-corruption culture: a textbook. Ed. B.S. Abdrasilova. – Astana: Academy of Public Administration under the President of the Republic of Kazakhstan, 2016. – 176 p* *. 2. Anti-corruption. Textbook and workshop. Under the general editorship of E.V.Okhotsky. – Moscow, 2016. – 146 p.* *3. Anti-corruption: constitutional and legal approaches. Collective monograph/ ed. Avakian S.A. – M.: Justicinform, 2016. – 512 p.* *4. Rose-Akkeman S. Corruption and the state. Causes, consequences, reforms. Moscow: Logos, 2010.* *5. Anti-corruption legal policy: studies. Manual / E. Alaukhanov. – Almaty: Zan adebieti, 2009. – 256 p.* *5. Morality as the basis for the formation of a new generation of civil servants. / Kabykenova B.S., Shakhanov E.A., Dzhusupova R.S. - 2011.* *6. Bureaucracy, corruption and efficiency of public administration / V. D. Andrianov. - Moscow: Volters Kluver, 2009. - 248 p. - Bibliogr.: 234 p.* *7. Corruption and the State: Causes, consequences, reforms: Translated from the English by O.A.Alyakrinsky / S. Rose-Ackerman. – M.: Logos, 2003. – 356 p.* *8. Power, corruption and honesty: Scientific ed.: translated from English / A. A. Rogov. – M.: Publishing House of RAGS, 2005. – 176 p.*

Module 30

Moduledesignation	*MCR 33011Microbiology*
Semester(s)inwhichthemoduleistaught	*5*
Personresponsible forthemodule	*Aigul Dinmukhamedova*
Language	*Russian, Kazakh*
Relationtocurriculum	*Compulsory* *Virology,Biophysics,Plant physiology*
Teachingmethods	*Lecture(interactivemethod,communicativemethod,labworks(worksingroup ,communicativemethod)*
Workload(incl.contacthours,self-studyhours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*

Creditpoints	*5ECTS*
Requiredandrecommendedprerequisitesforjoiningthe module	*Chemistry;CytologyandHistology; Biochemistry*
Moduleobjectives/intendedlearningoutcomes	*To teach students the features of prokaryotes, their physiology and biochemistry, to show the general biological and practical significance, to determine the relationship of microbiology with other modules, to emphasize the ideological and social and ethical significance of discoveries in the field of microbiology.* *As a result of studying the module, students should know: about the world of microbes, their place in nature, the main properties of microorganisms and viruses, the principles of their classification, ecology, role in nature and human life.* *Be able to: set up demonstration experiments, carry out sanitary and hygienic measures, use microorganisms as objects of scientific research. Possess the skills of isolating and cultivating microorganisms, microbiological analysis of water and soil, compliance withmicroorganism requirements.*
Content	*History and development of microbiology. Subject and methods of microbiology. Diversity of the microbial world - the structure and functions of prokaryotic and eukaryotic microorganisms. Cultivation and growth. Metabolism: energy and biosynthetic processes. regulation of metabolism. Heredity and variability of microorganisms. The relationship of microorganisms with micro- and macro-organisms. Environmental factors affecting microorganisms. Systematics of microorganisms.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://www.labster.com/, https://moodle.enu.kz/ , https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. ShigaevaM.Kh. General microbiology: textbook foruniversities / M. Kh. Shigaeva, V. L. Tszyu; Ministry of Educationand Science of the Republic of Kazakhstan. Kazakh NationalUniversitynamedafterAl-Farabi.-Almaty:Kazakhun-ti,2008.--320p.(inKazakh)* *2. Saparbekova A.A. Microbiology and virology. Almaty: Epigraph,2016.-187p.* *3. Steinier,R. The world of microbes: in 3 volumes / R.Steinier,E.Edelberg,J.Ingram.- M.:Mir,1979(inRussian)* *4. DinmukhamedovaA.S.Microbiology: textbook / Ministry ofEducation and Science of the Republic of Kazakhstan, L.N.L.N.GumilyovEurasianNationalUniversity.-Almaty:SSK,2019. –179p..(inKazakh)* *5. EmtsevV.T.,MishustinE.N.Microbiology:textbook.forstud.universities. - 6th ed., Rev. - M .: Bustard, 2006 .-- 445 p. (inRussian)* *6. Persing, David H. Molecular Microbiology : DiagnosticPrinciples and Practice. Ed.: 3rd ed. Washington, DC : ASMPress.2016*

Module 31

Module designation	*BIOL22015Virology*
Semester(s) in which the module is taught	*5*
Person	*AigulDinmukhamedova*
Language	*Russian,Kazakh*
Relation to curriculum	*Compulsory Microbiology,Biophysics,Plantphysiology*
Teaching methods	*Lecture(interactivemethod,communicativemethod,seminar(casestudy,communicativemethod)*

Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contacthours:Lectures-15,PracticalClasses-30StudentsIndividualWork:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Chemistry;CytologyandHistology; Biochemistry*
Module objectives/intended learning outcomes	*In the course of studying the discipline, students should know:* *the structure of viruses, the stages of interaction of viruses with host cells, classification of viruses, main types of viruses, pathogenic* *for people; epidemiological features of viral infections with different transmission mechanisms, methods of laboratory diagnostics of viral infections;* *be able to: use methods for diagnosing viral infections, evaluate* *results of virological studies, plan the course of the study depending on intended goal,* *pathogens of viral infections; knowledge of serological studies, diagnosis of viral infections*
Content	*The history of the development of virology. Morphology and structure ofviruses. Interaction of viruses with the host cell. Cultivation of viruses.Taxonomyofviruses.Reproductionofviruses.Featuresofantiviralimmunity andpathogenesisviraldiseases.Prevention,principlesofdiagnosisandtreatmentofviraldiseases.RNAviruses.DNAviruses.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://moodle.enu.kz/ , https://mooc.enu.kz/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Stamkulova A.A., Kudaibergenuly K.K., Ramazanova B.A. "Generalandindividualvirology".Educational-methodicalmanual.-Almaty.-2010 -380p.(inKazakh)* *2. Microbiologyandvirology:educationalmanual/I.S.Savitskaya,A.S.Kistaubayeva, L.V. Ignatova, I.V. Blavachinskaiya ; Kazakh nationaluniversityafteral-Farabi.-Almaty:KazakhUniversity,2014. -156* *3. VorobievA.A.Medicalmicrobiology,virologyandimmunology-Moscow: " Medical Information Agency ", 2015. - 704 p.https://talk.ictvonline.org/* *4. https://viralzone.expasy.org/* *5. Principles of Virology. Vol I: Molecular Biology, Vol. II:Pathogenesisand Control (S.J. Flint et al., Third Edition, ASM Press 2015).http://www.mcb.uct.ac.za/sites/default/files/image_tool/images/261/Resources/Introduction_to_Molecular_Virology.pdf* *6. Acheson, N. H. Fundamentals of molecular virology, 2011, 528p.https:///doc22843263_445123269?hash=9ed5fac628577bb53f&dl=50a396efb680b4a738pdf* *7. John B. Carter and Venetia A. Saunders. Principles and Applicationshttps:///doc14170503_392054780?hash=dca9be10c4cf2afae6&dl=8364106a224eaeee95pdf* *8 Borisov, L.B. Medical microbiology, virology, immunology: a textbookfor university students / 4th ed., Add. and revised - Moscow: MedicalInformationAgency,2005. -734(inRussian)*

Module 32

Module designation	*MB 3305Molecular biology*
Semester(s) in which the module is taught	*5*
Person	*RakhmetkazhyBersimbay*
Language	*Russian,Kazakh*
Relation to curriculum	*Compulsory*

Teaching methods	*Lecture (interactive method, communicative method, lab works (works ingroup, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures - 15,Laboratory Classes – 30StudentsIndividual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*cytology,histology,biochemistry*
Module objectives/intended learning outcomes	*As a result of studying the module, the student should know: about the properties of macromolecules that make up living matter, the molecular mechanisms of heredity and the adaptation of biochemical processes in organisms to changing environmental conditions.* *Students should be able to: solve situational problems in biochemistry and molecular biology.* *Possess the following skills: use the acquired knowledge in the study of other biological modules, apply them in the biochemical monitoring of the environment, assess metabolic disorders in pathological conditions, apply the acquired knowledge for setting up and conducting experiments..*
Content	*Structure and functions of DNA. Central dogma of molecular biology and the world of RNA. DNA replication in pro- and eukaryotes. The problem of underreplication of the terminal sections of feukaryotic chromosomes. Transcription of pro- and eukaryotes. Regulation of transcription in pro- and eukaryotes. eukaryotic transcription factors. RNA processing and splicing in eukaryotes. Translation of prokaryotes. eukaryotic translation. Folding of proteins. Solving the problems of protein biosynthesis and the genetic code. Solving the problems of protein biosynthesis and the genetic code. Molecular mechanisms of mutagenesis and DNA repair in prokaryotes. Molecular mechanisms of mutagenesis and DNA repair.* *repair of inukaryotes. Apoptosis. Patterns of epigenetic inheritance.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Bersimbay R.I. Molecular biology: textbook / - Astana : L.N. Gumilyov ,2015.-254(inKazakhandinRussian)* *2. BazhenovI.A.FundamentalsofMolecularBiology.TheoryandPractice: textbook / - Saint Petersburg; Moscow; Krasnodar: Lan, 2018. –139(inRussian)* *3. GenesaccordingtoLewin/M.:PublishinghouseLaboratoryofKnowledge.-2017.ISBN978-5-00101-582-6(inRussian)* *4. Lewin'sGENESXIKindleEdition.-2015.-p.2637* *5. KukharE.V.Practicumonmolecularbiology;ontheimplementationof laboratory andpracticalworkforstudentsofbiological, molecularbiology / E. V. Kukhar. - 2nd Ed., reprint. - Almaty : SSK, 2019. - 117, [1]s(inRussian)*

Module 33

Module designation	*BIOL 33005Plant physiology*
Semester(s) in which the module is taught	*5*
Person	*Asya Dukenbayeva*
Language	*Russian,Kazakh*
Relation to curriculum	*Compulsory* *Microbiology,Virology,Biophysics*
Teaching methods	*Lecture(interactivemethod, communicativemethod,labworks (works ingroup,communicativemethod)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*
Credit points	*5ECTS*

Required and recommended prerequisites for joining the module	*Botany,biochemistry.*
Module objectives/intended learning outcomes	*The purpose of studying the subject:* *To form students' ideas about the essence of the main physiological processes in plants, their regulation and the patterns of interaction of a plant organism with the environment.* *The objectives of the modules: to give students knowledge about the structure and functions of plant cells, the physiological foundations of the resistance of the whole organism to the external environment.*
Content	*The content of the module covers the whole range of problems, such as: plant physiology; The main structural components of a plant cell; Plant cell culture. General characteristics of the nutrient medium. Optimization of nutrient media; Water exchange between plant cells and plants;* *respiratory plants; Mineral nutrition; Growth and development of plants; plant tolerance;*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Bozshataeva G.T. Osimdikter fiziologiyasy : oku kuraly / G.T. Bozshataeva. - Almaty: Evero, 2019. - 259, [1] b* *2. Dauylbay Amina Duysenkhankyzy. Osimdikter physiologiyasy : oku kuraly /Dauylbay Amina Duysenkhankyzy, Abildaeva Roza Abdrakhmanovna. - Almaty: Evero, 2016. - 64, [1] b.* *3. Atabayeva S. Zh. Osimdikter fiziologiyasy: okukuraly/ S. Zh. Atabayeva; Kazakhstan Republikasy Bilim zhanegy lymministerligi.- Almaty: Bastau, 2015. - 266, [1] b.* *4. Torsykbaeva B. B. Osimdikter anatomiyasy zhane morphologiyasy paninen oku - adistemelik keshen: B. B. Torsykbayeva; Kazakhstan Republikasy Densauly kak tauministerligi.- Almaty: Almanac, 2019. - 215, [1] b.* *5. Kenzheev Zh. Osimdikter fiziologiyasynyn praktikumy.Almaty, 1994.* *6. Arystanova Sh. E. Osimdik fiziologiyasy.Kokshetau, 2003.*

Module 34

Moduledesignation	*BIOL22015 Evolutionary Science*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Daniyar Tagayev*
Language	*Russian, Kazakh*
Relationtocurriculum	*Profile/University*
Teachingmethods	*Lecture (interactive method, communicative method),seminar (case study,communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory* *Classes – 30 Students Individual Work:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*Cell biology; Biochemistry*
Module objectives/intended learning outcomes	*As a result of studying the module, the student must know:* *the main provisions of the evolutionary theory and the mechanisms of evolution of the organic world.* *As a result of studying the module, the student should be able to: to use knowledge about the ways and mechanisms of evolution of the organic world in professional activity.* *As a result of studying the module, the student must have the skills: of analysing of evolutionary processes in connection with modern achievements of natural sciences.*

Content	*Main provisions of the evolutionary theory. Microevolution. Macroevolution. Natural selection. Adaptation. Sexual selection. Speciation. Evolution of ontogeny, organs and functions. Biological progress. Transfer of genetic material, gene, chromosome and genome mutations; relationship between genotype and phenotype, mutation induced by radiation, the combined effects of radiation and other environmental factors.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	*1. Iordansky,N.N.Evolutionoflife:a textbook for academic bachelor's degree /N.N.Iordansky.-M.:YuraytPublishingHouse,2018(inRussian)* *2. Douglas J. Futuyma. Evolution. 2nd ed. Sinauer Associates,Sunderland,Massachusetts,2009* *3. Yablokov A.V., Yusufov A.G. Evolutionary science, Moscow,2006(inRussian)*

Module 35

Moduledesignation	*BIOL22015Parasitology*
Semester(s) in which the module is taught	*6*
Person	*ZhibekSembayeva*
Language	*Russian,Kazakh*
Relation to curriculum	*Basic/Elective*
Teaching methods	*Lecture (interactive method, communicative method),seminar (case study,communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:210* *Contacthours: Lectures-30,Seminars-45StudentsIndividualWork:135*
Credit points	*7ECTS*
Required and recommended prerequisites for joining the module	*InvertebrateZoology;VertebrateZoology*
Module objectives/intended learning outcomes	*As a result of studying the module, the student must know: know the ways of human infection with various protozoa, diagnosis and prevention of protozoan diseases;* *As a result of studying the module, the student should be able to: correctly explain the methods of diagnosis and prevention of protozoal diseases;* *As a result of studying the module, the student must have the skills: to form an idea of parasites as permanent components of ecosystems, the patterns of their evolution and dispersal.*
Content	*Parasitism as a form of existence of living organisms. Adaptation to a parasitic lifestyle. Life cycles of parasitic organisms. The host organism as a parasite's habitat. The relationship between the parasite and the host. Population ecology of parasites.*

Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. E.E. Kornakova- Medicalparasitology. /HER.Kornakov.-M.:Academy,2010.* *2. PavlovichS.A.,AndreevV.P.-Medical Parasitology With Entomology.Minsk"HigherSchool",2012.* *3. MyandinaG.I.,TarasenkoE.V.-Medicalparasitology,TextbookM.:2013.* *4. YafaevR.Kh. Medicalparasitology:atextbook./R.Kh.Yafaev. -SPb.:Foliant,2007.*

Module 36

Module designation	*BIOL22015Basics of systematics and phylogeny*
Semester(s) in which the module is taught	*5*
Person	*Daniyar Tagayev*
Language	*Russian*
Relation to curriculum	*Electivemodule BioresourcesofKazakhstan,Methodsofinvestigationofbiopolymers,Hormonesinphylo-andontogenesis*
Teaching methods	*Lecture (interactive method, communicative method),seminar (case study,communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory Classes – 30* *Students Individual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Botany, Invertebrate Zoology, Vertebrate Zoology*
Module objectives/intended learning outcomes	*As a result of studying the module, the student must* ***know****:* *the past and present principles of building a system of the living world As a result of studying the module, the student should* ***be able to****:* *understand the basics and problems of the classification of living organisms* *As a result of studying the module, the student must have* ***the skills****: of using modern methods of phylogenetic analysis.*
Content	*The content of the module covers a range of issues related to thetheory and practice of creating a taxonomic information system, as well as the theory and practice of reconstruction and interpretation of phylogenesis.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. ShatalkinA.I.Taxonomy.Foundations,principlesandrules.Moscow:KMK ScientificPublishingAssociation.2012(inRussian)* *2. PavlinovI.Ya.,LyubarskyG.Yu.Biologicaltaxonomy:theevolutionofideas.2012(inRussian)* *3. V.V.Lukashov Molecularevolutionand phylogenetic analysis.Tutorial. -M:BINOM,2009 .--256p. (inRussian)* *4. WileyE.O.,LiebermanB.S.Phylogenetics:theoryandpracticeofphylogeneticsystematics. –JohnWiley&Sons,2011.* *5. WägeleJ.W.FoundationsofPhylogeneticsystematics.–Munich:Pfeil,2005.*

Module37

Module designation	*BIOL22015Methods of investigation of biopolymers*
Semester(s) in which the module is taught	*5*
Person	*AinashSuleimenova*
Language	*Russian,Kazakh*
Relation to curriculum	*Electivemodule*
Teaching methods	*Lecture (interactive method, communicative method, lab works (works ingroup, communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory Classes – 30* *Students Individual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Molecularbiology,biochemistry*
Module objectives/intended learning outcomes	*As a result of studying the module, the student must* ***know****: physicochemical principles underlying the methods and devices used in molecular biology,and on this basis understanding the possibilities and limitations of these methods and devices.* *As a result of studying the module, the student should* ***be able to****: use independently plan complex experiments for the analysis of biopolymers that are part of complex biological objects.* *As a result of studying the module, the student must have* ***the skills****: interpretation of the received results*
Content	*1. The main types of biopolymers. Their physical and chemical properties* *2. Methods for the detection of biopolymers. The use of radioisotopes for the detection of biopolymers* *3. Absorption of light by a substance (spectrophotometry).* *4. Electrophoresis. Principles of the method Electrophoresis buffers.* *5. Electrophoresis in gels. Nucleic acid electrophoresis* *6. Protein electrophoresis. Special variants of electrophoresis. Elution of biopolymers from gel.* *7. Centrifugation. Principles of the method. General arrangement of the centrifuge.* *8. Variants of the practical use of sedimentation.* *9. Chromat* *10. Mass spectrometry as a method for the analysis of biopolymer molecules.* *11. Quantitative aspects of PCR "Semi-quantitative" PCR (detection on the non-exponential part of the product accumulation curve). Real-time PCR (detection on the exponential portion of the product accumulation curve).* *12. Digital PCR in isolated microscopic volumes* *13. Method of molecular colonies - PCR in Digital PCR gel in inverted water-oil emulsions using the example of Bio Rad QX100.* *14. Mass Parallel Sequencing Systems (MPSS). Methods of clonal amplification and determination of nuclei used in MPSS. Amplification sequences. Principles of the method. Classification and examples of chromatographic methods.Column, paper chromatography* *15. Gel Filtration. Ion Exchange Chromatography.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*

Readinglist	*1. ProskurinaIrinaKonstantinovna.Biochemistry:atextbookforuniversity students ,.- 2nd ed., Erased.- Moscow: Academy, 2014.- 333,https://search.rsl.ru/ru/record/01005501123* *2. Seitov, ZS Biochemistry: textbook. /.- 4th ball. and processing. ed.- Almaty:Akbar,2011.-795,[1]p.ISBN978-601-278-298-1. https://www.twirpx.com/file/3066655/* *3. Principles andMethodsofBiochemistryandMolecularBiology,Aitken,E.;Beidone,A.R.;Fiff,J.; Wilson,K.,2012. https://rucont.ru/efd/443513* *4. Molecularbiology,Konichev,AlexanderSergeevich;Sevastyanova,GalinaAndreevna,2015.https://rucont.ru/efd/443513*

Module 38

Module designation	*BIOL22015Hormones in phylo-and ontogenesis*
Semester(s) in which the module is taught	*5*
Person	*TamaraUkbaeva*
Language	*Russian,Kazakh*
Relation to curriculum	*Electivemodule*
Teaching methods	*Lecture (interactive method, communicative method, lab works (works in group, communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory Classes – 30* *Students Individual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Molecularbiology,humanphysiology,evolutionarytheory*
Module objectives/intended learning outcomes	*The main goal of the module is to acquire students' knowledge about the molecular mechanisms of signal transduction of hormones, neurotransmitters and tissue factors, the emergence and formation of these mechanisms during evolution, as well as their significance in the individual development of the body.* *As result of mastering the module, the student* ***must****:* *Have an idea of the formation of signal transduction mechanisms in phylogeny and their significance for the individual development of the organism. Know the basics of molecular physiology of signaling molecules and their receptors; molecular-genetic and evolutionary-ontogenetic organization of the humoral regulatory system. Be able to apply information about the molecular-genetic and evolutionary-ontogenetic organization of the humoral signal system to analyze the* *regulatory effects of hormones, neurotransmitters and tissue factors.*
Content	*The significance of signal transduction systems for living organisms. Bacterial signal transduction systems. Increasing the role of signal transduction genes in the course of evolution. The main types of signal molecule receptors. G - protein-coupled receptors (GPCRs). The main types of signal molecule receptors. Receptors with enzymatic activity. Ligand-Gated Ion Channels (LGICs). The main types of signal molecule receptors. Ligand-activated transcription factors (nuclear receptors-NR). Regularities of the evolution of the endocrine system. Formation of the endocrine glands. Formation of multilevel neuroendocrine systems. Continuation of the evolution of endocrine regulation in modern organisms. A new primate hormone. Signaling molecules, their effects, and receptors in ontogenesis. functions of humoral factors invertebrate onto genesis. Signaling molecules, their effects, and receptors in ontogenesis. Morphogenetic, programming the subsequent properties and functions of the adult body, the effect of hormones in early ontogenesis. Critical Periods Of Development.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*

Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obq*
Readinglist	*1. Dygalo N. N. Receptors of hormones, neurotransmitters and tissuefactors.Textbookforthecourse" Hormones in phylogeny and ontogenesis ",NSU PublishingHouse.-Novosibirsk.–2009118c.* *2. Dygalo N. N. Receptors of hormones, neurotransmitters and tissue factors. textbook for the course "Hormones in phylogeny and ontogenesis",NSU PublishingHouse.-Novosibirsk.-200136c.* *3. Dygalo N. N. Subtypes of receptors, their specific functions and Significance For The clinic (using the example of alpha 2-adrenergic receptors).Textbookforthecourse" Hormones in phylogeny and ontogenesis",2003* *http://www.bionet.nsc.ru/HormEvDev/posobie1.html* *4. Dygalo N.N.Genetic and hormonal regulation of male phenotype ontogenesis and mechanisms of formation of sexual orientation disorders .Textbookforthecourse" Hormones in phylogeny and ontogenesis ",2003* *http://www.bionet.nsc.ru/HormEvDev/posobie2.html* *DygaloN.N Acquisition of hormonal functions by steroids in evolution and their effects in early ontogenesis.AdvancesinModernBiology,1993,vol.113,issue2,pp.162-175.*

Module39

Moduledesignation	*BIOL22015Methods of teaching biology*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*AigulDinmukhamedova*
Language	*Russian,Kazakh*
Relationtocurriculum	*Profile/University*
Teachingmethods	*Lecture (interactive method, communicative method),seminar (case study,communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory* *Classes – 30 Students Individual Work:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*Cytology and Histology; Biochemistry, Botany, Zoology, Genetics,HumanAnatomy,HumanandAnimalphysiology,Plantphysiology*
Module objectives/intended learning outcomes	*Formation of a system of knowledge about the methods, techniques and technologies of teaching biology in secondary schools. As a result of studying the module, the student should have an idea of the methodology of teaching biology as a science and the system of practical activities implemented in the professional activity of a biology teacher, about the features of the methodological systems of teaching biology at school; know the main provisions of the traditional methodology of teaching biology at school, the specifics, the basic principles of designing the content of education, as well as the methodology of teaching students; be able to conduct a logical-biological, methodological and didactic analysis of the content of education; possess the skills of drawing up long-term and thematic plans, developing various types of lessons.*

Content	*Subject and problems of methods of teaching biology, its scientific base. The main stages in the development of methods of teaching biology. The role of biological education in modern society. The content and goals of biological education. Education in the process of teaching biology. Vocational training of Teachers in modern conditions. Pedagogical technologies of teaching in biology. Biology forms of education. Biology teaching methods. The material base of teaching biology. The use of new information technologies in preparation for a biology lesson.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://moodle.enu.kz/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. IzbassarovaR.Sh. Methodology of teaching biology, Almaty. -2016..--378p.* *2. IshmukhamedovaN.B.Methods of teaching general biology: a textbook for university students; AbaiKazakhNationalPedagogical University. - Almaty: Luxe Media Group, 2010. –181(inKazakh)* *3. TormanovN.Innovative methodsofteaching biology:textbook/ N.Tormanov,NTАбылайханова;Al-FarabiKazakhNationalUniversity.-Almaty,2013.–259p.(inKazakh)* *4.TasimovaA.A.Moderneducationaltechnologies:textbook/ A.A.Tasimova.-Almaty:Evero,2019.—216p.(inRussian)* *5.YakunchevM.A.Methodsofteachingbiology,Moscow,2014, 332.(in Russian)*

Module 40

Moduledesignation	*GNET 33006Genetics*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*OlgaBulgakova*
Language	*Russian,Kazakh*
Relationtocurriculum	*Profile/University*
Teachingmethods	*Lecture (interactive method, communicative method),seminar (case study,communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory Classes – 30 Students Individual Work:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*Cellbiology;Biochemistry*

Module objectives/intended learning outcomes	*As a result of studying the module, the student must know: Understand the basic processes of gene transmission, mutation, expression, and regulation;* *Fundamental laws of inheritance and patterns of variability; material about the gene, which is the structural the functional unit of heredity; genetic basis of selection; history formation of genetics and its place in the system of natural sciences.* *As a result of studying the module, the student should be able to: solve genetic problems; find a logical connection between the main sections of the course; draw up crossings, pedigree, gene locations, and genetic drawings.* *As a result of studying the module, the student must have the skills: hybridization of plant objects and crossbreeding of animals by the example of the Drosophila.*
Content	*The content of the module covers the whole range of problems related to the phenomenon of heredity and variability. A number of points related to organization of the course should be noted: Mendelism and Cyromosomal Theory; Transmission of Genetics: The Principle of Segregation; Chromosomes and Sex Inheritance; Genetic Linkage and Chromosome Mapping; Molecular Biology of DNA Replication and Recombination; Molecular Organization of chromosomes; Human Karyotypes and Chromosome, Behavior; Genetics of Bacteria and Their Viruses; Molecular Biology of Gene Expression; Molecular Mechanisms of Gene Regulation; Non-Mendelian inheritance; Quantitive and Evolutionary Genetics; Population Genetics; The Genetic Basis of Complex Traits*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://www.labster.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. ZhimilovI.F.GeneralandMolecularGenetics,Novosibirsk,2003Textbook(inRussian)* *2. Inge-Vechtomov S.G. Genetics with Fundamentals ofselection,2010,Sankt-Peteersburg.Textbook(inRussian)* *3. Bersimbay R.I.Genetics.Astana,2015 Textbook(in Kazakh)* *4. Bersimbay R.I.Genetics,Almaty,2017 Textbook(in Kazakh)* *5. TamarininR.H.PrinciplesofGenetics,DrownPublishers,FifthEdition,1996*

Module41

Moduledesignation	*BIOL22015Biophysics*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*BekbolatZhetpisbayev*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory Microbiology,Virology,Plantphysiology*
Teachingmethods	*Lecture (interactive method, communicative method),seminar (case study,communicative method)*
Workload (incl. contact hours, self-study hours)	*Total workload:150* *Contact hours: Lectures - 15, Laboratory Classes – 30* *Students Individual Work:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*Physics,chemistry,humananatomy,humanphysiology*

Module objectives/intended learning outcomes	*Biophysics is necessary for the formation of scientific methodology and scientific knowledge, the theoretical foundations of clinical, laboratory, and functional research methods, molecular diagnostics, and the use of modern technical means in biophysical research. After studying the module, students should develop the following competencies:* ***Knowledge****: fundamentals of bioelectrical, respiration, thermodynamics, kinetics, bioelectric potentials of photosynthesis, one of the main processes occurring in organisms that are important for the life of organisms;* ***have skills****: on the relationship of physical processes with each other;* ***the ability to create****: the physical processes that occur in the body.*
Content	*Elements of information theory. Homeostasis. Concepts of thermodynamics, its 1 law. Thermodynamics 2 the law. Stationary systems. Membrane biophysics. Functions and composition. Membrane models. Permeability of biomembranes and transport of substances. Bioelectric potentials. Methods for studying potentials. Calmness and action potential. Nernst and Goldman equations. Hodgkin and Huxley the equation. Action potential. Photobiological processes. Laws of light absorption. Optical methods. Spectral instruments. Luminescence. Luminescent analysis. Optical radiation biological effect the effect of ultraviolet light on protein and lipids. Photo Cancerogenesis lasers and their types. Application Of Lasers: in biology and medicine. Physical factors for a living organism influence. Ultrasound Radioactivity. Ionization the effect of rayson the body.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. AntonovV. F.andDr.:Biophysics.M.GITZ"VLADOS",1999.* *2. RemizovA.N.MedicalandBiologicalPhysics.Moscow:DrofaPubl.,2003.* *3. TöleubaevZh.S.Biophysics.Evero,2013* *4. ZhatkanbayevZh..BiologicalPhysics.Almaty,20118.* *5. Urgaliyevzh.Sh.SarzhanovF. medical biophysics laboratory workshop on the topic:Turkestan,2012*

Module 42

Module designation	*BIOL22015 Biometrics*
Semester(s) in which the module is taught	*6*
Person responsible for the module	*Nurmukhambetova Gaziza*
Language	*Russian, Kazakh*
Relation to curriculum	*Profile/University*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl.contact hours,self-study hours)	*Total workload: 150* *Contact hours: Lectures-15,Seminars- 30* *Students Individual Work: 105*
Credit points	*5 ECTS*
Required and recommended prerequisites for joining the module	*Mathematics,Genetics*

Module objectives/in tended learning outcomes	*Know:* *Numerical characteristics, descriptions of a set of empirical data; distribution laws, variance and regression analysis, the criterion for the reliability of estimates;* *Be able to:* *- Determine by biometric method the average values of the studied trait;* *Acquire practical skills:* *- Determination of the most important biometric indicators;* *- Positional and mathematical presentation of the results of biometric studies;* *- the use of biometric methods in the processing of their scientificre search.*
Content	*The content of the module covers the entire range of issues, related to the classification, processing and analysis of experimental data in the field of biology, medicine and agriculture by methods of mathematical statistics. Onovnyere presentations, probability the ories. Discreter and om variables.* *Non-trivial random variables.*
Exams and assessment formats	*Two oral rating(20 minutes each)and one final oral exam (40 minutes)*
Study and examination requirements	*The final score, consists of the results of the rating control and the exam, with 60% being the rating control, and 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/,* *https://www.microsoft.com/,https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Aubakirov H.A. Biometrics. – Almaty: Epoch, 2011–-408P. (in Kazakh)* *2. Ramankulova A.A. Biological statistics. –Almaty, 2014.-210 P.(in Kazakh)* *3. Shulembayeva K.K. Biological statistics.–Almaty, 2013-97 p.(in Kazakh)* *4. Koychubekov B.K., Bukeeva A.S. Biology fundamentals of Statistics. –Karaganda, 2010. (in Kazakh)* *5. Tolegenov S. Biometrics. – Almaty, 2016. - 372 P.(in Kazakh)*

Module 43

Moduledesignation	*BIOL22015Bioresources of Kazakhstan*
Semester(s) in which the module is taught	*5*
Person responsible for the module	*AbiyevSardarbek*
Language	*Russian,Kazakh*
Relationtocurriculum	*Electivemodule Basicsofsystematicsandphylogeny,Methodsofinvestigationofbiopolymers,Hormonesinphylo-andontogenesis*
Teachingmethods	*Lectures,PracticalClasses*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150 Contacthours:Lectures-15,PracticalClasses-30StudentsIndividualWork:105*
Creditpoints	*5ECTS*
Required and recommended prerequisites for joining the module	*Botany,Vertebratezoology*
Module objectives/intended learning outcomes	*Provide students with in-depth knowledge about the bioresources of Kazakhstan, their current state, rational use and protection. The student should* ***know****: the diversity and state of the bioresources of the republic, as well as the legal basis for the protection of bioresources.* ***Must be able to:*** *effectively use bioresources.* ***Have skills****: use the acquired knowledge in practice.*
Content	*Types and characteristics of silk soft the forest-steppe zone of Kazakhstan and their economic use. Types and characteristics of soils of the steppe zone of Kazakhstan and their economic use. Types and characteristics of the soils of the desert zone of Kazakhstan and their economic use. Types and characteristics of soils of high-altitude mountain be lts Kazakhstan and their economic use. Arable land of Kazakhstan, directions of economic use. Chernozem soil types of the forest-steppe zone of Kazakhstan, humus content, directions of economicuse. Types and characteristics of the soils of the steppe zone of Kazakhstan and the application of their economic use. Types and characteristics of the soils of the desert zone of Kazakhstan and their economic use. Types and characteristics of the soils so high-altitude mountain be lts Kazakhstan and their economic use. Arable land(cultivated land) Kazakhstan, directions of economic use. Wild medicinal plants of Kazakhstan,rational use and protection of theirnatural resources. Wild food plants of Kazakhstan, rational use and protection of their natural resources. Wild-growing tannic and spicy-aromatic plants Kazakhstan, rational use and protection of their natural resources. Cultural (agricultural) plants of Kazakhstan, the area of their cultivation, yields,gross collections. Export and import of Kazakhstan's crop production and wild-growing useful plants.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Bioresources of Kazakhstan: fauna: textbook. Vol. 3: Resources ofanimals / A. II. Berkinbay, O. K. Shabdarbayeva D. Second. Khusainov, \Ma. T. Akoev; Republic of Kazakhstan. - 2nd Ed., supplement-Almaty:Nur-Print,2015.-130,[1]s* *2. BioresourcesofKazakhstan:fauna:textbook.Vol.2:Birdresources/ A. Ii. Berkinbay, D. C. Shabdarbayeva, G. Ii. Khusainov, M. T. Akoev ;. -Ed.2-e,add.-Almaty:Nur-Print,2015.-279,[2],c* *3. Bioresources of Kazakhstan: fauna: textbook. Vol. 1: Fish resources,amphibian resources,reptile resources/A.Ii.Berkinbay,D.C.Shabdarbayeva, G. Ii. Khusainov, M. T. Akoev ;. -Ed. 2-e, add. - Almaty:Nur-Print,2015.-155,[1],v.* *4. Kazakhstanika: encyclopedia of the Kazakhstan way. In 6 vols., vol. 2,part 2: Geography of Kazakhstan / under the general editorship of D. N.Nazarbayeva.-Astana:Institute ofEurasianIntegration,2015.–259p* *5. Alybaeva R.A.Protectionof terrestrial and aquatic ecosystems:atextbook / R. A. Alybaeva; Ministry of Education and Science of theRepublicofKazakhstan.-Almaty:Bastau,2014.-320,[1]c*

Module 44

Module designation	*INEX 32050Industrial practice* *Teaching Practice*
Semester(s) in which themoduleistaught	*6*
Person responsible for the module	*NurmukhambetovaGaziza*
Language	*Russian,Kazakh*
Relationto curriculum	*Profile/University*
Teaching methods	*seminar*
Workload(incl.contacthours,self-study hours)	*150*
Credit points	*5 ECTS*
Requiredandrecommendedprerequisites for joining the module	*MethodsofteachingbiologyIntroductiontoBiology*
Module objectives/intendedlearning outcomes	*Toknow:* *- Thesystemofeducationalworkoftheschool;* *- structureandcontent ofteachingbiologyinschools;* *Beableto:* *- conductbiologylessonsusinga varietyoftethnologies,teachingmethods;conductextracurricularandextra curricularactivities* *Possess:* *-skillsofusingtheequipmentofthebiologyclassroom-skillsofprofessionalcommunicationineducationalsituations*
Content	*Acquisitionofpracticalskillsnecessaryfortheworkofabiologyteacher,includingtheskillsof educationalworkwithchildren*
Examsandassessment formats	*Defenseofpracticereport*
Studyandexaminationrequirements	*The student must complete the assigned tasks within a strictlydefinedtimeframe.* *Being late for practice is not welcome. A student who misses aninternship or fails to complete a task is not allowed to submit areportontheinternship.* *Attendance is mandatory; absence can only be for a valid reason.Allomissionsareworkedoutintheformofindividualtasks,preparationofpresentations,etc.* *Examform:presentationofthepractice report.* *Studentreport(generalreport,diaries,practicedocuments,presentations)*
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg

Readinglist	*1. Ponomareva I. N. General methodology of teaching biology:textbook.manualforstudentsofpedagogicaluniversities/Ponomareva Irina Nikolaevna, Solomin V. P., Sidelnikova G. D.;ed.PonomarevaI.N.-M.:Akademiya,2013.-272 p.(inRussian)* *2. "I Don't Know,"I Said. Biology coursenewappro-aches tolearning.-Almaty–2008-263b.(inKazakh)* *3. Ishmukhamedova.B. general biology teaching methods: highereducationforstudentsofeducational institutions textbook-Almaty:2010.-184P.(inKazakh)* *4. Kemelkyzy, T. biology training methodology: educational andmethodical complex / "I Don't Know," She Said. OngarbayevaRamazanovna;–Kyzylorda:Pearl-Marzhan,2010.–83(inKazakh)* *5. Solovyova.A.R,Ibraimova.B,Biology8thgradeAlmaty,Atamura,2018(inKazakh)*

Module 45

Module designation	*BIOL22015Cell Biology*
Semester(s) in which themoduleistaught	*7*
Person responsible for the module	*ZhannatBazarbayeva*
Language	*Russian,Kazakh*
Relationtocurriculum	*Compulsory/elective*
Teaching methods	*Lecture(interactivemethod,communicativemethod,labworks(worksingroup,communicativemethod)*
Workload(incl.contacthours,self-study hours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars- 30* *StudentsIndividualWork:105*
Credit points	*5ECTS*
Requiredandrecommendedprerequisitesforjoiningthe module	*Introductionto Biology,Botany,HumanAnatomy*
Module objectives/intendedlearningoutcomes	*As a result of studying the module, the student must know:history of cytology; light, electronmicroscopy, digitalcytochemical,autoradiographic,methods;structureandfunctionofcells;basicprinciplesofcelltheory;structureandfunctionofthecell nucleus,cellorganelleasanimportantpartofthecell;mechanismsof celldivision; celldeaththestudent shouldbeableworkwiththemaintypesoflight microscopes;microscopyofcytological and histological preparations, cell culture;differentiationofdifferenttypesofcellsand tissues;findanddescribethebasicelementsofcellsand tissuesundermicroscopy;describeandanalyzethestructuralelementsofcells and tissues inmicrographsandelectron grams;systematizationand generalizationoftheobtaineddatabystatisticalmethods;searchfor scientificinformationinthefieldofCellBiologythroughtheanalysisofdomestic-and foreign literature.* *As a result of studying the module, the student must have theskills: conducting experimental research at the tissue, cellular andsubcellular levels; apply and analyze the knowledge gained in thestudyofcellsinnormal andpathologicalconditions.*
Content	*Know the basic laws and modern achievements of Cell Biology,demonstrates knowledge in the field of modern methods for thestudyofcells. Understandsmodern problemsofbiologyand uses Fundamentalbiologicalconceptstosolveresearchproblems.*
Examsandassessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*

Studyandexamination-requirements	*The final score,consists of theresultsof therating control and the exam, with 60% being the rating control, 40% - the result of-the exam. Students must have a final grade of 50% or higher to-pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1.Myrzagalieva,A.B. Cytology:textbook/A.B.Myrzagaliyeva;MinistryofEducationandScienceoftheRepublicofKazakhstan. -Almaty:Dauir,2013.–214(inKazakh)* *2..Bazarbaeva.Zh.M. Cytology and histology. TextbookAlmaty,2011,208.(inKazakh)* *3 K.A..Saparov, Zh.M. Bazarbayeva, B.A. Abdullaeva. Glossaryof terms cytology, histology, embryology. Almaty, 2012, 454p. (inKazakh)* *4. NurtazinSTGeneralhistology.textbookAlmaty,2010(inKazakh)* *5. ChentsovY.SIntroductiontocellularbiologyTextbook.Moscow,2015,495p.(inRussian)* *6. MyadeletsODHumanhistology,cytologyandembryology.Part 1.Cytology, embryology and general histology: textbook. -Vitebsk:VSMU,2014-439p.(inRussian)*

Module 46

Module designation	*BIOL22015Immunology*
Semester(s) in which themoduleistaught	*7*
Person responsible for the module	*AlmiraAkparova*
Language	*Russian,Kazakh*
Relationto curriculum	*Compulsory/elective*
Teaching methods	*Lecture(interactivemethod,communicativemethod,seminar(casestudy,communicativemethod)*
Workload(incl.contacthours,self-study hours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*
Credit points	*5ECTS*
Requiredand recommended Prerequisitesforjoiningthemodule	*cytology,biochemistry,anatomyandphysiologyofhumansandanimals*
Module objectives/intendedlearning outcomes	*To present students with modern ideas about the structure andfunctioningoftheimmunesysteminnormal andimmunopathological conditions; study of the role of the immunesysteminmaintanningthegeneticconstancyof the internalenvironmentofthebody,themechanismsofimmunologicalrecognition and regulation of individual parts of the immunologicalresponse at themolecular and cellular levels; topromote thedevelopment of scientific thinking among students, to introducethem to work with special literature. Students should know: thestructure of antigens, their main typesand characteristics; thestructureandfunctionsof thehumoralimmunitysystem,individualclassesof immunoglobulins;geneticcontrolofthesynthesis of immunoglobulins; the structure and functions of thecellularimmunitysystem;themainsubpopulationsofT-lymphocytesandtheirfunctions;theconceptofnaturalandinduced immunological tolerance. They should be able to: classifythe main characteristics of cytokines, their functions. Have skills:onthestructureofthemainhistocompatibilitycomplex,thefunctionofitsloci;identifytheroleofHLAantigensasgenetic Markersofhereditarypredispositiondiseases.*

Content	*Organs and cells of the immune system. Basic properties and structure of antigens. The main complex of histocompatibility andHLA. The structure of immunoglobulins. Primary and secondaryimmuneresponses.Thesystemofhumoralimmunity.The systemofcellularimmunity.Thesystemofmononuclearphagocytes. The system of mononuclear phagocytes. Antitumor immunity. Primary and secondary immunodeficiency states. Themaintypesofvaccines.Modernresearchmethodsin immunology.*
Examsandassessment formats	*Twooralrating(20minuteseach)andonefinaloralexam(40minutes)*
Studyandexamination-requirements	*The final score,consists of theresultsof therating control andthe exam, with 60% being the rating control, 40% - the result oftheexam.Studentsmusthaveafinalgradeof50%orhigherto pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. GabrielVirella.MedicalImmunology(SeventhEdition)//Taylor& Francis Group. – 2020. - 474 p. ISBN: 9781000537130,1000537137(inEnglish)* *2. TengchuanJin, Qian Yin. Structural Immunology // SpringerSingapore. –2019.–234p.ISBN978-981-13-9367-9(inEnglish)* *3. GavinSpickett. OxfordHandbookofClinicalImmunologyandAllergy // Oxford University Press. – 2019. – 705 p. ISBN:0198789521,9780198789529(inEnglish)* *4. Ukbaeva T.D., Babaeva K.S. B-immune system. Differentiationof B-lymphocytes, immunoglobulins. Teaching aid NMS ENUAstana,ENUnamedafterL.N.Gumilyov 2017, 92p. (inRussian)* *http://www.ncbi.nlm.nih.gov/pubmed*

Module 47

Module designation	*BIOL22015Immunology and Allergology*
Semester(s) in which themoduleis taught	*7*
Person responsible for the module	*AlmiraAkparova*
Language	*Russian,Kazakh*
Relationto curriculum	*Compulsory/elective*
Teaching methods	*Lecture(interactivemethod,communicativemethod,seminar(casestudy,communicativemethod)*
Workload(incl.contacthours,self-study hours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*
Credit points	*5ECTS*
Requiredandrecommendedprerequisites for joining the module	*CytologyandHistology;Biochemistry;HumanAnatomy*
Module objectives/intendedlearning outcomes	*Asaresultofstudyingthemodule,thestudentmustknow:* *The principles of the organization and functioning of the immunesystem,themechanismsofimmunologicalrecognitionandregulation of the immunological response at the molecular andcellularlevels,causesofallergy,typesofallergicreactions,mechanismsunderlyingtheclinicalsignsofallergy.* *As a result of studying the module, the student should be ableto: use knowledge to solve scientific problems; find links betweenimmunology and other biological sciences (cellular and molecularbiology,physiology,biochemistry,genetics).* *As a result of studying the module, the student must have theskills:be ableto perform samplepreparationofbiologicalmaterial Forimmunologicalresearch;toapplycommonlyusedimmunologicaltechniques;correctlyinterprettheresults.*

Content	*Organs and cells of the immune system. Basic properties andOrganization and functioning of the immune system, structure ofantigens and antibodies, mechanisms of the immune response,molecular and cellular mechanisms of immune reactions, causesofallergicreactions,mechanismsofdevelopmentandmanifestationof allergies,methodsofallergydiagnostics.*
Examsandassessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Studyandexamination-requirements	*The final score,consists of theresultsof therating control andthe exam, with 60% being the rating control, 40% - the result ofthe exam. Students must have a final grade of 50% or higher topass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. GabrielVirella.MedicalImmunology(SeventhEdition)//Taylor& Francis Group. – 2020. - 474 p. ISBN: 9781000537130,1000537137(inEnglish)* *2. TengchuanJin, Qian Yin. Structural Immunology // SpringerSingapore. –2019.–234p.ISBN978-981-13-9367-9(inEnglish)* *3. GavinSpickett. OxfordHandbookofClinicalImmunologyandAllergy // Oxford University Press. – 2019. – 705 p. ISBN:0198789521,9780198789529(inEnglish)* *4. Ukbaeva T.D., Babaeva K.S. B-immune system. DifferentiationofB-lymphocytes,immunoglobulins. TeachingaidNMSENU Astana,ENUnamedafterL.N.Gumilyov2017,92p. (in Russian)http://www.ncbi.nlm.nih.gov/pubmed*

Module 48

Module designation	*BIOL22015Gene engineering*
Semester(s) in which themoduleis taught	*7*
Person responsible for the module	*AsyaDukenbayeva*
Language	*Russian,Kazakh*
Relationto curriculum	*Compulsory/elective*
Teaching methods	*Lecture(interactivemethod,communicativemethod,seminar(casestudy,communicativemethod)*
Workload(incl.contacthours,self-study hours)	*Totalworkload:150* *Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105*
Credit points	*5ECTS*
Requiredandrecommendedprerequisites for joining the module	*MolecularBiology,Genetics,CytologyandHistology*
Module objectives/intendedlearning outcomes	*The objectives of the study of the module are to form theoreticalandpracticalknowledgeaboutgeneticengineeringaimedatcreating new forms of biologically active DNA and genetically newforms of cells and whole organisms using artificial methods ofgenetransfer,includingtechnologiesofrecombinantDNA,genetictransformation,cellhybridization,etc.* *The objectives of the module include the study of the molecularfoundations of genetic engineering, methods of recombinant DNAtechnology,construction of restriction maps and methods for determiningnucleotide sequences, construction of recombinantDNA and their cloning, methods of introducing a gene into a cell,geneticmanipulationofmammalianandplantcells.*

Content	*The content of the module covers the whole range of problemsas:IntroductiontoGeneticEngineering;Geneticengineeringenzymes; Restriction enzymes; Construction of vector molecules;DNA sequencing methods; Introduction of a new gene into a cell;Genetic manipulation of bacterial cells; Directed mutagenesis of aDNA molecule in vitro; Protein Engineering; Introduction of genesinto mammalian cells; Geneticengineering of plants; Based ontheanimalvirussystem;Gene therapy;Antiviralvaccines; Vaccinesagainst humanimmunodeficiencyvirus;*
Examsandassessment formats	*Twooralrating(20minuteseach)andonefinaloralexam(40minutes)*
Studyandexaminationrequirements	*The final score,consists of theresultsof therating control andthe exam, with 60% being the rating control, 40% - the result of the exam.Studentsmusthavea finalgradeof50%or higherto pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://www.labster.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Readinglist	*1. Shchelkunov.S.N.Geneticengineering//Novosibirsk:SiberianUniversityPublishingHouse,2017.367s.https://www.twirpx.com/file/1942652/* *2.Kurnaz I. A. Techniques in Genetic Engineering // CRC PressTaylor& FrancisGroup, BocaRatonLondonNewYork,2015.– 334pp.https://www.taylorfrancis.com/books/9780429076343* *3.Kormann M. S. D. Modern Tools for Genetic Engineering //PublishedbyExLi4EvA,2016.– 220pp.https://www.twirpx.com/file/1955799/* *4. RustenovA.R.Genomicswiththebasicsofgeneticengineering: a textbook / A. R. Rustenov. - Almaty: Epigraph,2019.-301,[1]s* *5. ShulembayevaK.K.Chromosomalengineering[Electronicresource]: e-book / K. K. Shulembayeva. - Karaganda: MedetGroup,2019–-1electron.Disk;* *5. Zhimulev I. F. General and molecular genetics. Novosibirsk,2012* *6.LynnB.Jorde, JohnC.Carey,MichaelJ.Bamshad.MedicalGenetics. Fifth edition. Elsevier. – 2016. Pp. 356.https://www.elsevier.com/books/medical-genetics/jorde/978-0-323-18835-7* *7.Friedberg E. C. et al.DNArepairand mutagenesis. ASMPress.WASHINGTON,D.C.2006. –1161p. https://www.amazon.com/DNA-Repair-Mutagenesis-Errol-Friedberg/dp/1555813194* *8.HartwellL.etal.Genetics:fromgenestogenomes//NewYork,NY:McGraw-HillEducation.–2017.–849pp.https://www.amazon.com/Genetics-Genes-Genomes-9.Hartwell/dp/007352526X* *Sithole-NiangI. GeneticEngineering// PublishedbyInTech,Rijeka,Croatia.–2013.– 137pp.http://library.um.edu.mo/ebooks/b28055287.pdf*

Module 49

Module designation	BIOL22015Medical genetics
Semester(s) in which themoduleis taught	7
Person responsible for the module	Almira Akparova
Language	Russian,Kazakh
Relationto curriculum	Compulsory/elective
Teaching methods	Lecture(interactivemethod,communicativemethod,seminar(casestudy,communicativemethod)
Workload(incl.contacthours,self-study hours)	Totalworkload:150 Contacthours:Lectures-15,Seminars-30StudentsIndividualWork:105
Credit points	5ECTS
Requiredandrecommendedprerequisites for joining the module	Genetics,CytologyandHistology;Biochemistry;Molecular biology
Module objectives/intendedlearning outcomes	Asaresultofstudyingthemodule,thestudentmustknow: The structure of the human genome, the mechanisms of geneticprocessesunderlyinghereditarydiseases;theroleofthegeneticalfactorsintheoccurrenceofpathologicalsymptoms;mechanismsofhereditarydiseasestransmission;methodsofdiagnosis,treatment,andpreventionofgeneticdisorders,includingdiseaseswiththegeneticpredisposition. As a result of studying the module, the student should be ableto: explain the mechanisms of inheritance of hereditary diseases;modern achievementsandproblemsofmedicalgenetics,itsrelationshipwithothersciences. As a result of studying the module, the student must have theskills:beabletosolvegenetictasks;toapplycytogenetic,molecularlygeneticandmoleculargeneticmethods.
Content	Ashorthistoryofmedicalgenetics.Genomicsandclinicalmedicine. Characterization of the human genome. Heredity and pathology. Classification of hereditary pathology. Semiotics andclinicaldiagnostics.Methodsforthediagnosisofhereditarydiseases.Genediseases.Chromosomalabnormalitiesandchromosomalsyndromes.Geneticsofcommondiseases.Environmentalgeneticsandpharmacogenetics.Immunogenetics. Moleculargeneticbasisofcarcinogenesis.
Examsandassessment formats	Twooralrating(20minutesearch)andonefinaloralexam(40minutes)
Studyandexamination-requirements	The final score,consists of theresultsof the rating control and the exam, with 60% being the rating control, 40% - the result of-the exam. Students must have a final grade of 50% or higher to-pass
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg
Readinglist	1. LynnB.Jorde,JohnC.Carey,MichaelJ.Bamshad.MedicalGenetics. Fifthedition.Elsevier.–2016.Pp.356. (inEnglish) 2. P.S. Verma, V. K. Agarwal. Cell biology, genetics, molecularbiology, evolution and ecology, 2006, India. (in English)https://www.amazon.in/Biology-Genetics-Molecular-Evolution-Ecology/dp/8121924421 3. Ruban, E. D. Human genetics with the basics of medicalgenetics: a textbook for students / Eleonora DmitrievnaRuban. -Rostov-on-Don:Phoenix,2015.--319p.(inRussian) 4. Chernoshei, D.A. Immunology // BSMU. – 2018. – 66 p. (inEnglish) http://www.ncbi.nlm.nih.gov/pubmed

Module 50	
Module designation	*BIOL22015Bioinformatics*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*AssiyaKussainova*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures-15, Seminars-30StudentsIndividualWork:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Molecular biology*
Module objectives/intended learning outcomes	*The student must develop the skill of working with databases of biological sequences and structures. Work with different bioinformatics formats for presenting biological data. Be able to use online tools for sequence analysis. Able to solve some problems of molecular biology and genetic engineering.*
Content	*Working with NCBI bioinformatics portal. Working with literary databases (PubMed, PMC), databases of nucleotide (Gene) and amino acid (UniProtKB)sequences, databases of structures (PubChem, RCSB). Study of different bioinformatics data formats (FASTA,GenBank,mol,sdf,PDB).Alignment of biological sequences. Working with programs of the BLAST series. Vector design.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*HogewegP.The Roots Of Bioinformatics And Theoretical Biology.PLoSComput Biol. 2011 Mar;7(3):e1002021.https://pubmed.ncbi.nlm.nih.gov/21483479/* *JohnsonM,ZaretskayaI,RaytselisY,MerezhukY,McGinnisS,MaddenTL.NCBIBLAST:abetterwebinterface.NucleicAcidsRes. 2008 Jul 1;36(Web Server issue):W5-9.https://pubmed.ncbi.nlm.nih.gov/18440982/* *Notre Dame C, Higgins DG, Heringa J. T-Coffee: A novel method for fast and accurate multiple sequence alignment. J Mol Biol.2000Sep8;302(1):205-17. https://pubmed.ncbi.nlm.nih.gov/10964570/* *Burley SK, Berman HM, Kleywegt GJ, Markley JL, Nakamura H,VelankarS.ProteinDataBank(PDB):TheSingleGlobalMacromolecular StructureArchive.MethodsMolBiol.2017;1607:627-641. https://pubmed.ncbi.nlm.nih.gov/28573592/* *Lesk, Arthur. Introduction to Bioinformatics. - 2nd ed. - Moscow:BINOM.Lab.znaniye,2013*

Module 51

Module designation	*BIOL22015Mathematical methods in biology*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*AkanovaK.*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures- 30Seminars – 1StudentsIndividualWork:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*mathematics,genetics,molecular biology*
Module objectives/intended learning outcomes	*The purpose of the training course is to study the methods and methods of statistical analysis of various systems, the formationofskillsandpracticalskills to identify statistical patterns or possible statisticalmodels.* *As result of studying the module, the specialist must:* *know: the basic concepts and terms of mathematical modeling; the main methods of constructing mathematical models; basic concepts and terms of statistical analysis.* *be able to: use computer technology in solving applied problems; use computer technology in solving applied problems.* *have skills: in using Microsoft Excel tools to solve optimization problems; infusing Statistics and Stat plus packages for data processing, in organizing and using data; create a database and use in statistical analysis; empirical study of relationships and dependencies in statistical data.*
Content	*The main components of mathematical modeling methods treatments results molecular-genetic research. Correlation And Regression Analysis. Analysis of variance and specification variables.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*1. Brandt Z. Data analysis. Statistical and Computational Methods"MIR",2012* *2. ArtyukhovV.G., Pantyavin Mathematical methods in biology. VoronezhStateUniversity,2007* *3 Brandt Z. Static methods of observation analysis"MIR",2012* *4 KoldaevV.D. Numerical methods and programming, ForumPublishingHouse»-INFRA-M,2009* *5.BorovkovV.P., Ivchenko Forecasting in the STATISTIKA system in the WINDOWS environment. "Finance and Statistics",2009* *6 ErmakovS. M. Statistical modeling "Nauka",2013* *7 Dubrova T. A.: Statistical methods of forecasting. - M.: Unity,2010* *8 Dzhaychibekov N. Zh., Pekker Ya. S., Fokin V. A. Methods of data transformation and analysis. Izdatservis,2008* *9 Zhumanova L. K. Statistical analysis and its applications."Kazakuniversiteti",2005*

Module 52

Module designation	*BIOL22015Genetics of development*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*AlmiraAkparova*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures-15Seminars- 30Students* *Individual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Cell biology, Genetics, Molecular biology*
Module objectives/intended learning outcomes	*As result of studying the module, the student must know:* *The main issues of developmental genetics: differential expression of genes and their interaction in ontogenesis; the role of exogenous and endogenous factors in the regulation of genes that control the organism s structure and development; developmental genetics of Drosophila and mammals.* *As a result of studying the module, the student should be able to: explain the fundamental foundations, directions, and prospects of using the achievements of developmental genetics.* *As a result of studying the module, the student must have the skills be able to solve genetic tasks; to apply the modern research methods to study the genes involved in the development* *of the organism.*
Content	*Development genetics: a brief history and stages of the formation. The leading role of the nucleus in the regulation of morpho genesis. Regulation of gene expression. Regulation of gene activity during the development of the organism. Homeotic genes, their role in ontogenesis. Embryonic induction. Genes that control embryonic induction. Some genetic aspects of* *determination and trans determination. Determination of sex and its molecular genetic basis.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*

Reading list	*1.SallyA.Moody. Principles of Developmental Genetics//Elsevier. - 2014. – 734 pp. (In English)https://www.elsevier.com/books/principles-of-developmental-genetics/moody/978-0-12-405945-0* *2FraschM.T-boxGenesinDevelopmentandDisease//Academic Press. – 2017. – 444 pp. (In English)https://www.elsevier.com/books/t-box-genes-in-development-and-disease/frasch/978-0-12-801380-9* *3.KarvitaB.AhLuwalia. Genetics. New Age International Publishers,2009(In English) https://www.amazon.com/Genetics-Karvita-B-Ahluwalia/dp/8122423906* *4Basicsofgenetics: textbook. Volume2/William S. Klag, Michael R. Cummings, Charlotte A. Spencer, Michael A. Palladino; translated from English by B.O. Bekmanov; Ministry of Education and Science of the Republic of Kazakhstan. -Bass11. - Almaty: Daur, 2017. (In Kazakh)http://www.ncbi.nlm.nih.gov/ pubmed*

Module 53	
Module designation	*BIOL22015Cytogenetics*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*AlmiraAkparova*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures-15Seminars- 30Students* *Individual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Cell biology, Genetics, Cytology and Histology; Biochemistry; Molecular biology*
Module objectives/intended learning outcomes	*As result of studying the module, the student must know:* *The cellular level of the organization of life; chromosomal basis of the transmission and implementation of genetic information; chromosome changes during cell division; the role of chromosomal abnormalities in the development of pathological conditions.* *As a result of studying the module, the student should be able to: explain the fundamental foundations of cytogenetics, current achievements, and problems; explain the essence of cytogenetic processes and their mechanisms; analyze information about modern achievements of cytogenetics and its applied use.* *As a result of studying the module, the student must have the skills be able to solve cytogenetic tasks; to apply cytogenetic, and molecular cytogenetic methods.*
Content	*Structural and functional organization of chromosomes; principles of cell division; normal and abnormal cell division, its features, and consequences; compilation of genetic maps of chromosomes, determination of the karyotype; chromosomal abnormalities and diseases.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*1.GersenS.L., KeagleM.B. The Principles of Clinical Cytogenetics//Springer New York Heidelberg Dordrecht London. –2014.–560pp.* *http://extras.springer.com/2005/978-1-58829-300-8/1-59259-833-1.pdf* *2 Arsham M. S., Barch M. J., Lawce H. J. The AGT Cytogenetics Laboratory Manual // John Wiley & Sons. Inc., Hoboken, New Jersey. –2017.–1199pp.* *https://www.amazon.com/AGT-Cytogenetics-Laboratory-Manual/dp/1119061229* *3.SinghR.J. Practical Manual on Plant Cytogenetics//Taylor & Francis Group. –2018.–347pp.https://www.routledge.com/Practical-Manual-onPlantCytogenetics/Singh/p/book/9781498742979.* *4BaranovV.S., KuznetsovaT.V. Cytogenetics of human embryonic development. M .: N-L, 2007.658 p. (in Russian).http://www.ncbi.nlm.nih.gov/pubmed*

Module 54	
Module designation	*BIOL22015Methods of Molecular biology and biochemistry*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*Olga Bulgakova*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures-15Seminars- 30Students* *Individual Work:105*
Credit points	*6ECTS*
Required and recommended prerequisites for joining the module	*Biochemistry;Genetics;Molecular biology*
Module objectives/intended learning outcomes	*As a result of studying the module, the student must know: levels and features of the structural organization of proteins and nucleic acids; general principles of isolation and purification, methods for determining the primary structure of protein* *As a result of studying the module, the student should be able to: use modern material and technical and methodological basisforthephysicochemicalandbiochemicalcharacteristicsofproteins and nucleic acids; use in practice modern methods of studying proteins and nucleic acids (PCR, PCR-RFLP, RT-PCR, qPCR, OT-PCR, Sanger sequencing, NGS, microarray, northernblotting,ELISA,westernblotting,immunoprecipitation,chromatography types, gene knockout, gene knockdown, Trim-away method, gene cloning, transfection in molecular cloning, CRISPR-Cas)* *As a result of studying the module, the student must have the skills: interpretation of the received results*
Content	*Ability to plan, organize and conduct an experiment, present experimental data, and use the knowledge gained in scientific and industrial activities; to demonstrate ideas about modern advances in molecular biology and apply the knowledge gained in me search Work*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*Methods in Molecular Biology. Series Ed.: Walker,JohnM.2015-2019SpringerProtocolDatabaseISSN:1064-3745((includes5,000publications on research methods in molecular biology for the latest publishing platform Springer)https://www.springer.com/series/7651* *AlikulovZA, Bersimbay RI Modern methods of biochemistry and molecular biology. // Textbook, Astana. L.N. LN Gumilyov ENU,2013,192p.(in Kazakh)* *https://www.enu.kz/gilimy-basilimdary/euu-khabarshysy-zhurnalynyn-arkhivi/*

Module 55

Module designation	*BIOL22015Cytological and histological methods*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*ZhannatBazarbayeva*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures-15Seminars- 30Students* *Individual Work:105*
Credit points	*6ECTS*
Required and recommended prerequisites for joining the module	*Cytology and histology*
Module objectives/intended learning outcomes	*As a result of studying the module, the student must know:* *light, electron microscopy, digital cytochemical, autoradiographic, methods; structure and function of cells; basic principles of cell theory; the methods of studying the cells and tissues of living organisms* *the student should be able work with the main types of light microscopes; microscopy of cytological and histological preparations, cell culture; to prepare histological and cytological preparations and to decorate them with special dyes.* *As a result of studying the module, the student must have the skills: conducting experimental research at the tissue, cellular and subcellular levels; apply and analyze the knowledge gained in the study of cells in normal and pathological conditions.*
Content	*Know the basic laws and cytological and histological methods, demonstrates knowledge in the field of modern methods for the study of cells. Understands modern problems of biology and uses fundamental biological concepts to solve research problems.*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*1.Myrzagalieva, A Cytology: textbook/A.B.Myrzagaliyeva; Ministry of Education and Science of the Republic of Kazakhstan.* *-Almaty: Dauir,2013.–214(in Kazakh)* *2.. BazarbaevaZh.M. Cytology and histology. textbookAlmaty,2011,208. (in Kazakh)* *3 Borkhunova E. Cytology and general histology. Methodology forstudyingdrugs.M,2017. --144p.4.NurtazinST Generalhistology.textbookAlmaty,2010inRussian)* *4. Sarkisov D.S., PerovYu.L. Microscopic technique. Moscow,2016.,535b. (in Russian)* *5. MyadeletsOD Human histology, cytology, and embryology. Part 1. Cytology, embryology, and general histology: textbook. -Vitebsk: VSMU,2014-439p.(in Russian)* *6. Polonskaya I.V. Yurasova PolonskayaN.Yu. Cytological examination of cervical smears-Pap-test M., 2016. --168p. (in Russian)*

Module 56

Module designation	*BIOL22015 Bioethics with elements of biosafety and biosecurity*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*AigulDinmukhamedova*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures-15Seminars- 30* *Students Individual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Microbiology, Virology, Molecular biology, Genetics, Fundamentalsofmolecularmedicine*
Module objectives/intended learning outcomes	*The purpose of the module: the formation of knowledge in thefield of bioethics, the expansion of ideas about biological safety and protection of objects for use in scientific and practical activities.* *Asa resultofmasteringthemodule,* *thestudentmust:haveanideaofhistoryofthedevelopmentofbioethics,* *ontheprinciplesofbiosafetyandbioethicswhenworkingwithbacteriaandviruses;* *knowthebasicprinciplesofensuringbiologicalsafetyinmodernbiotechnologicalprocessesandtechnologiesforcreatingand the use of genetically transformed biological objects* *forintensificationofproductionorobtainingnewtypesofproductsofvariousdestination; beabletoapplytheknowledgegainedin* *practice*
Content	*Definition of the concept of bioethics. Ethical theories Bioethics as a social necessity. History and theoretical foundations of modern bioethics. Subject and structure of bioethics. Ethics committeesandethicalcounseling. Problemsofbioethics. Biosecurity concept. Biologicalprotection(bio conservation)*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg

Reading list	*1. Laboratory Biosafety Manual, WHO, 3rd Edition, Geneva,2004.https://www.who.int/csr/resources/publications/biosafety/WHO_CDS_CSR_LYO_2004_11w.pdf?ua=1* *2. ZhumadinaSh.M. Problems of modern biology: textbook. - Almaty:Evero,2016.-239p.(in Kazakh)* *3. MedeuovaG.Zh. Ecotoxicology: a textbook in higher education / G.Zh. Medeuova, KN Uncomfortable. - Almaty: Epigraph, 2019. - 2094. (in Kazakh)* *4. Ushakov E.V. Bioethics. Textbook for universities. Moscow, Yurayt,2016,307p. https://static.my-shop.ru/product/pdf/222/2214012.pdf(inRussian)* *5. Peter A. Singer, A. M. Viens. The Cambridge Textbook of Bioethics, Cambridge University Press, 2008, 555p.https://vulms.vu.edu.pk/Courses/BIF402/Downloads/The-cambridge-textbook-of-bioethics.pdf* *6. KhushfG.HandbookofBioethics,2004https://link.springer.com/* *7. OntheratificationoftheConventionontheProhibitionoftheDevelopment, Production and Stockpiling of Bacteriological(Biological) and Toxin Weapons and on Their Destructionhttp://adilet.zan.kz/rus/docs/Z070000245_pdf(in Russian, in Kazakh)* *8.https://www.un.org/ru/documents/decl_conv/conventions/bacweap.shtml* *9. http://www.armscontrol.ru/start/rus/* *10. http://www.cbsafety.ru/rus/autors.asp*

Module 57	
Model designation	*BIOL22015Geobotany*
Semester(s) in which the modules taught	*7*
Person responsible for the module	*AsyaDukenbayeva*
Language	*Russian, Kazakh*
Relation to curriculum	*Compulsory/elective*
Teaching methods	*Lecture (interactive method, communicative method, seminar (case study, communicative method)*
Workload (incl. contact hours, self-study hours)	*Totalworkload:150* *Contact hours: Lectures-15Seminars- 30* *Students Individual Work:105*
Credit points	*5ECTS*
Required and recommended prerequisites for joining the module	*Introduction to biology,Botany*
Module objectives/intended learning outcomes	*The main goal of teaching the "Geobotany" is the study of vegetation, the patterns of its distribution over the territory, knowledge of the structure and dynamics of plant communities, rational use of plant resources.* *Objectives of studying the academic module:* *1. Knowledge of research methods of plant communities.* *2. Study of the composition and structure of phylogeneses.* *3. Elucidation of the dependence of the phytocoenological composition of the vegetation cover, the floristic composition of phytocenoses and their structure, distribution and spatial relationships on climatic and topographic conditions, abiotic environmental factors and in connection with human activities.* *4. study of the formation, variability, and changes of phytocenosesin time, depending on external and internal factors.* *5. Study of interactions between plants in the phytocenosis, depending on the conditions of existence, on the biological and ecological characteristics of plants and.* *6. study of interactions and interdependence of phytocenoses and the environment.* *7. clarification of the state of vegetation in the geological and historical past and the reflection of the past in modern vegetation.* *8. classification of vegetation.*
Content	*The content of the module covers the whole range of problems as: Geobotany - the science of plant communities; The role of plants in nature and human life; The diversity of the plant world is the result of a long evolution of the types of structures of plant organisms; The concept of flora and vegetation. Phytocenosis. Formationofphytocenosis; Ecologyofphytocenoses. Theconceptofenvironmentalfactors. Light, heat, water, air, soilfactors. Reliefasanindirectlyactingecologicalfactor; Phytocenosis structure; Vertical and horizontal structure of the phytocenosis. Dynamicsofplantcommunities; Seasonalandseasonal changes in phytocenoses. Succession; Phytocenosesclassification; Ecologicalandbiologicalcompositionofthecenosis flora as an indicator of connection with the environment. Plantsareindicators; Dynamicsofphytocenoses. Variability, shifts, theircauses,and classification; Regularitiesof the territorial Distributionofvegetationcover;*
Exams and assessment formats	*Two oral ratings (20 minutes each) and one final oral exam (40 minutes)*
Study and examination requirements	*The final score consists of the results of the rating control and the exam, with 60% being the rating control, 40% - the result of the exam. Students must have a final grade of 50% or higher to pass*
Technical, multimedia tools and software	https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg

Reading list	*1. Botany. Morphology and anatomy of plants. Moscow."Enlightenment",2018–-488p.* *2. DukenbayevaA.D. Plant systematics: a textbook/A.D.Dukenbayeva.- Almaty: Epigraph, 2019.-193,[1]b.* *3. Botany: textbook/S.K. Imankulova, L.B.Seilova, K.I.Shalabaev, D. M. Amanbekova, A.ShShokanova ; Ministry of education and science of the Republic of Kazakhstan. - Almaty: Association of higher educational institutions of Kazakhstan,2016.-280,[1] with* *4.KaripbaevaN .Sh .Illustrated determinant of flowering plants/ N. Sh. Karipbaeva, V. V. Polevik, B. M. Silybaeva.- Almaty :Evero,2019.-246,[1]p.* *5. Berkinbay O. B. Bioresources of Kazakhstan. Volume 1 (Fish, amphibians,reptiles).Almaty,2013* *6. Botany. Textbook for universities: in 4 volumes / P. Zitte, E. V. Weiler, J.V. Kaderait,A.Brechinsky,K.Kerner.- Moscow:Akademiya,2007–-256p.* *7. Wildlife reforms. Materials of the conf. OnproblemsofLandscapeandbiologicaldiversityconservation.Karkaralinsk.,2003.,6/p.* *8. "Memlekettiktabigi-korykkorynynproblemalarymendamuperspectivalary" maselesiboyynshaParliamenttiktyndau.Astana.,2004.223bet.* *9. Ecology and sustainable development, No.6, Astana,2001* *10. SapargalievG.S., BaitulinT.I. Biological safety of Kazakhstan. Report. Almaty.,2005.* *11. Geobotany with the basics of agrophytocenology: a textbook/ Saidova N. V., Pakhomova V. M.; M-vo sel. khoz-va Ros. Federation, Federal State Educational Institution. institution of higher Prof. education "Kazan State Agrarian University. un-t". Yoshkar-Ola: String,2011.-182p.*

Module 58	
Module designation	*INEX 42060Industrialpractice*
Semester(s) in which the module is taught	*8*
Person responsible for the module	*NurmukhambetovaGaziza,MeruertSalkymbaeva*
Language	*Russian, Kazakh*
Relation to curriculum	*Profile/University*
Teaching methods	*PracticalClasses*
Workload (incl. contact hours, self-study hours)	*Totalworkload:180*
Credit points	*6ECTS*
Required and recommended prerequisites for joining the module	*Microbiology,Biochemistry,PlantPhysiology,Humanandanimalphysiology*
Module objectives/intended learning outcomes	*To know:* *- modern research directions and the latest achievements in the field of biology and prospects for their use in various fields ofnationaleconomy, medicine, biotechnology;* *- methodologicaltechniques forsettingupabiologicalexperiment.* *Beableto:* *- developandsetupanexperiment;* *- interprettheresultsoftheexperiment;* *- apply methods of statistical data analysis, including the use of modern information technologies;* *Possess:* *Skillsofworkingwithmodernequipmentinlaboratoryandfieldstudiesofbiological objects*
Content	*Industrial practice is aimed at forming students' ideas about the chosen specialty, provides an opportunity for in-depth practical development of professional activity.* *The objectives of the production practice are: to deepen and consolidate the theoretical knowledge gained in the course of training, to gain skills for the practical use of professional knowledge gained during theoretical training; to get acquaintedwiththespecificsofthebachelor'sprofessionalactivityinaparticularproduction, toformaprofessionalpositionofa specialist, astyle ofbehavior, andtomasterprofessional ethics.*
Exams and assessment formats	*Defenseofpracticereport*
Study and examination requirements	*Fulfillmentofanindividualtask, keepingadiaryonpractice, characteristicsfromtheheadofthepracticebase*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*1. TheLawoftheRepublicofKazakhstan "Onsanitaryandepidemiologicalwelfareofthepopulation" (in Kazakh)* *2. Industrial practice. Curriculum for the specialty "Information systems technologies". I.I.Ignatenko (in Russian)* *3. Reportontheresearchwork. Structure andrulesofregistration: GOST7.32-2011. (in Russian)* *4. Regulations on the procedure for conducting practical trainingofstudentsofeducationalinstitutionsofhigherprofessionaleducation. MinistryofEducationoftheKZ. (in Kazakh)* *5. Regulations on the practice of students of the L. N. Gumilyov Eurasian National University (in Kazakh)*

Module 59	
Module designation	*PWIN 42061Pre–diploma practice*
Semester(s) in which the module is taught	*8*
Person responsible for the module	*Nurmukhambetova Gaziza, Meruert Salkymbaeva*
Language	*Russian, Kazakh*
Relation to curriculum	*Profile/University*
Teaching methods	*Practical Classes*
Workload (incl. contacthours, self-studyhours)	*Totalworkload:180*
Credit points	*6 ECTS*
Required and recommended prerequisites for joining the module	*Biochemistry,Botany,Zoology,MolecularBiology*
Module objectives/intended learning outcomes	*Basedontheresultsoftheinternship,studentsmust know:* *administrative documents, methodological and regulatorymaterialsinthefieldofworkingwithbiological objects;* *Beableto:* *Clearlyformulatetasks, developfieldandlaboratoryresearchprograms; make generalizations and conclusions, formalize the results in theformof scientific reports, articles, etc.* *Possess:* *The skills of conducting field and laboratory research in order to obtain scientific material that allows you to characterize the objectunder study as a whole, its individual components or groups of organisms by appropriate methods.*
Content	*Apply knowledge of the basics of evolutionary theory, modern ideas about structural and functional organization of the genetic program living objects and methods of molecular biology, genetics and developmental biology in professional activities* *Forplanningandconductingbiologicalexperiments, theprinciples of conservation, safety and labor protection are given, skillsofworkingwithmodernscientificequipmentandlivingobjectsareapplied.*
Exams and assessment formats	*Defenseofpracticereport*
Study and examination requirements	*Fulfillmentofanindividualtask, keepingadiaryonpractice, characteristicsfromtheheadofthepracticebase*
Technical, multimedia tools and software	*https://edu.enu.kz/,https://www.microsoft.com/,* *https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*1. Regulationson thethesis: Nur-SultanEnu,2013 (in Kazakh)* *2. Occupational safety and health: A textbook for universities / Edited by O.N.Rusak St.Petersburg: MANEB,2011.(in Russian)* *3. The Law of the Republic of Kazakhstan "On EnvironmentalProtection" (in Kazakh)* *4. How to formalize a scientific work: Burdin K. S., Veselov P. V.-M.: HigherSchool,2013.-152p. (in Russian)* *5. Position on the practice of students of the Eurasian nationalUniversity. L.N.ENU (in Kazakh)*

Module 60

Module designation	MFA 42061Module of final assessment
Semester(s) in which the module is taught	*8*
Person responsible for the module	*Rakhmetkazhy Bersimbay*
Language	*Russian, Kazakh*
Relation to curriculum	
Teaching methods	*Practical Classes*
Workload (incl. contacthours, self-studyhours)	*Total workload: 360*
Credit points	*12 ECTS*
Required and recommended prerequisites for joining the module	*Biochemistry, Botany, Zoology, Molecular Biology*
Module objectives/intended learning outcomes	*The final state certification of students is a procedure carried out in order to determine the degree of assimilation by them of the state obligatory standard of the corresponding level of higher professional education, as a result of which a document on education (diploma) is issued*
Content	*The state exam is held in the modules provided for by the curriculum in the scope of the curriculum.* *Passing the state exam and defending the final work is carried out at an open meeting of the State Attestation Commission with the participation of at least half of its members.* *The duration of the state exam in each module, as well as the defense of one final work, as a rule, should not exceed 45 minutes per student. To defend the final work, the student makes a report to the State Attestation Commission for no more than 20minutes.*
Exams and assessment formats	*state exam or thesis defense*
Study and examination requirements	*Students who have fulfilled all the requirements of the curriculum and curricula are allowed to the final certification.*
Technical, multimedia tools and software	*https://edu.enu.kz/, https://www.microsoft.com/, https://fen.enu.kz/subpage/material-no-tehnicheskaya-baza-kaf-obg*
Reading list	*1 https://adilet.zan.kz/rus/docs/V000001222*

Reviewed and approved at the meeting of the department "_____"
Protocol No. 9 dated "14" 04 2022

Head of Department_____ 14.04.2022
(signature) (full name) (date)