NON-PROFIT JOINT-STOCK COMPANY
«AL-FARABI KAZAKH NATIONAL UNIVERSITY»

MODULE HANDBOOK

EDUCATION PROGRAMME

7M05113 NEUROSCIENCE

CLUSTER A

CONTENT

Purpose of education programme

To train specialists of masters in the field of neuroscience with professional competencies that meet the requirements of employers carrying out professional activities based on modern methodological approaches of neuroscience, aimed at solving theoretical and applied problems to identify patterns of functioning of the system "brain-environment-behavior", the development and implementation of innovative neurotechnologies in the scientific, socio-economic, medical, educational spheres of society capable of consolidating the world scientific and practical experience in neuroscience guided by moral and ethical norms and principles in professional activity.

Learning outcomes

ON1. Define and integrate interdisciplinary theoretical and methodological concepts in neuroscience, their contradictions and development prospects in order to conduct studies in the relevant research centers and institutes.

ON2. To perform analysis of the validity and effectiveness of methods and technologies in scientific and applied aspects of neuroscience in order to integrate modern approaches to studying the functioning of the nervous system at the molecular, cellular, systemic and behavioral levels.

ON3. Create scripts for automatic processing of group data using modern software packages Phyton, MATLAB for neuroengineering.

ON4. Possess an arsenal of modern approaches for the correct selection of research methods in solving theoretical and applied problems in the context of a multidisciplinary approach in neuroscience.

ON5. Develop assessment criteria and target indicators of the effectiveness of neurotechnologies in practice based on modeling cognitive processes **.**

ON6. Implement technologies of neurocomputer interfaces aimed at solving urgent issues of health care, state security, marketing and business.

ON7. Analyze the phylogenesis and ontogenesis of the nervous system in health and disease from the standpoint of an interdisciplinary approach in neuroscience for research developments in the diagnosis, prognosis, and rehabilitation of diseases of the nervous system.

ON8. Determine applied tasks in neuroscience in conjunction with urgent issues of education, health care, socio-economic sphere and state security.

ON9. Contribute to the implementation of neuroscience specialties in scientific research organizations and higher educational institutions.

ON10. Master scientific communication methods in order to broadcast own data in the field of neuroscience and ideas to the scientific community and other interested communities.

ON11. Adhere to moral and ethical standards and principles in professional activities.

ON12. Present proper research results to leading scientific journals in the field of neuroscience applying academic writing skills.

Learning Objectives-Module Matrix

Module	Learning outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
Module on history and philosophy of science	+	+								+		+
Psychology and Pedagogy Module	+	+							+			
Brain evolution and psychoinformatics		+		+			+					
Mathematical Neuroscience			+	+	+	+				+		
Clinical Neuroscience	+	+		+			+	+		+		
Research of functional systems	+	+	+				+	+			+	
Biological principles in Neuroscience	+	+		+	+	+		+	+		+	+
Cognitive Neuroscience		+	+		+	+		+	+	+	+	
Clinical neuroscience		+	+		+	+	+	+	+	+	+	
Computational neuroscience		+	+	+	+	+		+	+	+	+	

Course structure

RESEARCH	
UNIVERSITY COMPONENT	ELECTIVE COMPONENT
24	

CORE DISCIPLINES	
UNIVERSITY COMPONENT	ELECTIVE COMPONENT
20	15
35	

MAJOR DISCIPLINES	
UNIVERSITY COMPONENT	ELECTIVE COMPONENT
31	18
49	

TERM

1	History and phil. of science & Psychology and Pedagogy 6 ECTS	Brain evolution and psychoinformatics & Mathematical Neuroscience & Clinical Neuroscience **(1 of 3)** 6 ECTS	Research of functional systems 12 ECTS	**RES.** Master's Student Research (MSR), Including Scientifing Internship And Dissertation Writing 3 ECTS	27
2	History and philosophy of science & Psychology and Pedagogy 14 ECTS	Brain evolution and psychoinformatics & Mathematical Neuroscience & Clinical Neuroscience **(1 of 3)** 9 ECTS	Research of functional systems 6 ECTS	**RES.** Master's Student Research (MSR), Including Scientifing Internship And Dissertation Writing 4 ECTS	33
3	Biological principles in Neuroscience	Cognitive Neuroscience Clinical neuroscience Computational neuroscience		Master's	33

	13 ECTS	**(1 of 3)** 18 ECTS	Student Research (MSR), Including Scientifing Internship And Dissertation Writing 2 ECTS	

4	**RESEARCH** Master's Student Research (MSR), Including Scientifing Internship And Dissertation Writing 15 ECTS	FINAL ATTESTATION 12 ECTS	27

List of modules

Workload HPW (Hours per week) according – Teaching methods as lecture, seminar, lab works and others (lesson, project, etc.)

Module/Disciplines	**ECTS**	**Workload HPW** *(Часы в неделю)*				**Term**
		lec.	**sem.**	**lab.**	**other**	
Module of history and philosophy of science						
History and philosophy of science	3	1,5	1,5			1
Foreign Language (professional)	6		6			2
Psychology and Pedagogy Module						
Pedagogy of higher education	3	1,5	1,5			1
Psychology of Management	3	1,5	1,5			2
Teaching Internship	5		5			2
Brain evolution and psychoinformatics						
Evolutionary and Developmental Neurobiology	6	3	3			1
Cognitive Psychology	9	3	6			2
Mathematical Neuroscience						
Phyton and MATLAB Programming	6	3	3			1
Machine Learning	9	3	6			2
Clinical Neuroscience						
Epigenetics and neurogenetics	6	3	3			1
Neuroinformatics	9	3	6			2
Research of functional systems						
Organization and planning of scientific researches	6	1,5	4,5			1
Human Functional Systems	6	3	3			1
Biophysics for Neuroscience	6	3	3			2
Biological principles in Neuroscience						
Fundamentals of Cognitive Neuroscience						
RESEARCH PRACTICE	4			4		3
Cognitive Neuroscience						
Neuromechanism of Decision Making	9	3	6			3
Affective Neuroscience	9	3	6			3
Clinical neuroscience						
Current problems of neurodegenerative deseases	9	3	6			3
Research in Neuropsychopathology	9	3	6			3
Computational neuroscience						
Brain-computer interface	9	3	6			3
DATA Mining and Big DATA in Neuroscience	9	3	6			3
MASTER'S STUDENT RESEARCH (MSR), INCLUDING SCIENTIFING INTERNSHIP AND DISSERTATION WRITING	**24**					
Research Seminar	3	1	1		1	1,2,4
Dissertation Writing	14	2	3	3	7	1-4
Scientific Internship	3				3	4
Publication in the Proceedings of International Conferences	4				4	4
FINAL ATTESTATION	12				12	4

TOTAL	**120**					

CORE DISCIPLINES

University component

M-1 Module on history and philosophy of science

Module Objectives. Students will be able to:

1. to determine the features of science as a special kind of knowledge, activity and social institution;
2. to systematize the main problems and discussions on methods and strategies for conducting scientific research and the laws governing the development of science;
3. choose the methods and strategies of research most relevant to the subject under study and follow them in professional activity;
4. Critically evaluate current scientific achievements and orientate in choosing the most effective strategies for interdisciplinary search;
5. formulate and correctly argue their own ethical position in relation to the current problems of the current stage of development of science.8.

Module designation	***History and philosophy of science***
Credit points	*5*
Semester(s) in which the module is taught	*1-2*
Relation to curriculum	UNIVERSITY COMPONENT M-1 Module on history and philosophy of science
Teaching methods	Lecture, seminar, practice, project Lectures will a selection from the orientation readings and material for classroom discussion based on their own judgment. It is recommended that students used those texts not selected for classroom discussion as background readings which will help them contextualize the texts which will be subject of discussion (lecture-discussions, lectures with case studies, lecture-study, fluent brainstorming, lecture with the use of feedback techniques, lecture-consultation). The seminars are interactive and allow students to practice their new skills and explore different topics.
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hours per week for Seminar, total 30 Contact hours.* *105 self-study hours*
Person responsible for the module	Amrebayeva Zhyldyz PhD, senior-lecturer, Department of Philosophy Faculty of philosophy and political science
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	*Prerequisites:* Philosophy, the complex of natural-science and socio-humanistic studies of bachelor course
Module objectives/intended learning outcomes	***Knowledge base***: The purpose of the discipline is to study the complex of problems of science in philosophical knowledge and philosophical research through the presentation of the main directions, approaches, methodology, methods associated with the phenomenon of science, modern science, epistemology, research of science in culture, etc. ***Analysis***: critically analyze and evaluate the philosophical concepts of science and the "main" approaches to the "problems" of science in philosophy and philosophy of

	science. ***Synthesis:*** can synthesize and transform the philosophical and interdisciplinary knowledge to solve educational and research applications, can use conceptual and methodological apparatus of philosophy and social sciences to solve creative issues of various difficulty levels, using modern computer technologies and interactive teaching methods; ***Evaluation:*** substantiate and reveal the essence of the philosophy of science in the context of the development of philosophical knowledge and the methodology of philosophical cognition and researchs; ***Application:*** argue their own position and point of view regarding the importance of the diversity of scientific research, as well as approaches to the problems of science; ***Application of skills***: can work on educational and research projects to determine the context of the problem, formulate research goals and objectives, substantiate the methodology and methods of the project (using modern computer technology, resources, etc.) ***Autonomy in skill use***: can plan and implement basic and applied research projects, perform science projects using methods of analysis of social and individual reality and methods of research process of its transformation, present ability of design and carring out professional, scientific and scientific pedagogical activity, based on the philosophical understanding of modern educational processes.
Content	1. Introduction to the discipline. The subject of history and philosophy of science. 2. Science as a subject of philosophy, and a variety of "scientific" and "theoretical" research in philosophy, as well as research of science itself in philosophy. 3. Classical and modern philosophy of science in the context of studying the problems of science and its evolution: comparisons and evaluations. 4. Features of science as a social institution. Classical philosophy and philosophy of science: essence, criteria and names. 5. Historical dynamics of science and its features. 6. Foundations and possibilities of internalist and externalist approaches and models of the development of scientific knowledge. 7. Scientific picture of the world and actual problems of science in modern philosophy of science. 8. The problem of scientific rationality in modern philosophy of science. 9. Science and methodological knowledge. Science and methodological culture. 10. The nature and specificity of the scientific revolution. 11. Theoretical knowledge. 12. Disciplinary structure of science: philosophical analysis. 13. Social and humanitarian knowledge and science: evolution, structure, tasks, problems, etc. 14. Scientific discovery. 15. Science as the basis for the development and modernization of modern society.

Examination forms	Standard Written Exam: Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Reading list	***Main:*** *1. Mitroshenkov, OA History and Philosophy of Science: textbook for universities / OA Mitroshenkov. - Moscow: Yurayt Publishing House, 2022. - 267 p. (Russian)* *2. Franz-Peter Griesmaier, Jeffrey A. Lockwood. This is Philosophy of Science: An Introduction, 2022;* *3. Nikiforov, A.L. Philosophy and history of science: Textbook. - Moscow.: Infra-M, 2018. - 384 p. (Russian)* *4. Christopher Donohue and Charles T. Wolfe. Vitalism and Its Legacy in Twentieth Century Life Sciences and Philosophy (History, Philosophy and Theory of the Life Sciences, 29): 2022* ***Recommended:*** *1. Nikiforov, A.L. Philosophy and history of science: Textbook. - Moscow.: Infra-M, 2018. - 384 p. (Russian)* *2. Kuzmenko, G.N. Philosophy and Methodology of Science: Textbook for Masters / - Moscow: Yurayt, 2016. - 450 p. (Russian)* *3. Myrzaly S.K. History and philosophy of science. - Almaty: Bastau, 2014. (Kazakh)* *4. Stepin V.S. History and philosophy of science. – Moscow: Academic Project, 2011. - 423 p. (Russian).* *5. Khasanov M.Sh., Petrova V.F. History and philosophy of science. - Almaty: Kazakh University, 2013. - 150 p. (Russian)* *6. Ostrovsky E.V. (2012) History and Philosophy of Science. UNITY-DANA, 160 p* *7. Cover J.A., Curd M. and Pincock, C. (2012) Philosophy of Science: The Central Issues, 2nd edition. Norton. (English)* *8. Mamchur E.A. The future of fundamental science. Conceptual, philosophical and social aspects (2011) URSS, Moscow (Russian)*

Module designation	Foreign Language (Professional)
Credit points	6
Semester(s) in which the module is taught	Semester 1
Relation to curriculum	UNIVERSITY COMPONENT M-1 Module on history and philosophy of science
Teaching methods	Practical lessons (individual, group, project work, discussion, test)
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hours per week for Seminar, total 30 Contact hours.* *135 self-study hours*
Person responsible for the module	Valeriya Tsyganova
Language	English
Required and recommended prerequisites for joining the module	Prerequisites: intermediate level of English (B1)
Module objectives/intended	Speaking:

learning outcomes	• apply professional vocabulary and terminology necessary for effective communication in a professional environment within the framework of specialty; • think creatively; • be creative in solving new problems and situations; • independently prepare and deliver oral messages on professional topics, including the use of multimedia technologies. Reading: • read and translate authentic texts in the specialty from English into native language using a dictionary; • extract the necessary information from English-language sources created in various sign systems (text, table, graph, diagram, audiovisual series, etc.) in typical situations of professional and business communication; • recognize significant information in oral and written utterances, as well as use the basic grammatical units characteristic of technical speech. Writing: • to compose written texts of an informative nature (message, report, review, scientific and technical documentation); • abstract of texts on the profile of the specialty, reports of master's students on research topics; • correctly and logically formulate own thoughts in writing. Listening: • listen and understand an authentic speech of a general, professional and scientific nature. Prepare presentation material and a project on the topics studied.
Content	UNIT 1 Getting started in research Planning a career in science Applying for research funding Writing up a résumé or CV Preparing for an interview UNIT 2 The scientific community Communicating with scientific communities Writing a critical review Completing a Material Transfer Agreement UNIT 3 Finding a direction for your research Doing a literature review Using evidence in arguing a point Taking part in a meeting UNIT 4 Designing an experiment Describing approaches to data collection Designing an experimental set-up Describing material phenomena and forces Making predictions of experimental results UNIT 5 Describing an experiment Describing a process Evaluating the results of an experiment Describing problems with an experiment Keeping a lab notebook UNIT 6 Writing up research 1: materials and methods

	Describing states and processes Describing data: numbers / numerical values Writing up from lab notes UNIT 7 Writing up research 2: presenting data Analysing data (statistical analysis) Summarising data in visual form Writing captions for figures Describing visual data
Examination forms	Standard Written Exam: Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Reading list	*1. Tamzen Armer. Professional English. Cambridge English for Scientists. Cambridge University Press, 2011* *2. Michael McCarthy, Felicity O'Dell. Academic Vocabulary in Use. Vocabulary reference and practice. Cambridge University Press, 2012* *3. Cathy Cox and David Hill English for academic purposes. Student's book. Pearson Longman. 2004*

M-2 Psychology and Pedagogy Module

Module Objectives. Students will be able to:
1. understand the current state of the theory and practice of management psychology in an amount that is optimal for use in the subsequent professional activity;
2. to analyze the methodological problems of the psychological analysis of management processes and phenomena;
3. apply and describe psychological methods of studying individuals and social groups (communities) in order to improve management efficiency;
4. explain the basic psychological characteristics of the activities of individuals and groups that are the objects of management;
5. systematize the basic psychological characteristics of the activities of the subjects of management; establish the nature and content of the psychological preparation of subjects of management;
6. to characterize the socio-psychological phenomena arising in the management process in the interests of increasing its effectiveness;
7. demonstrate methods and techniques for the development and improvement of the professionally important psychological qualities of the subjects of management;
8. develop business and interpersonal skills in the context of the contact of different managerial cultures;

Moduledesignation	**Pedagogy of higher education**
Credit points	3
Semester(s) in which the module is taught	2
Relation to curriculum	UNIVERSITY COMPONENT M-2 Psychology and Pedagogy Module
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	**15 weeks,** **1 hour per week for Lecture, total 15 Contact hours.** **2 hours per week for Seminar, total 30 Contact hours.** **45 self-study hours**
Person responsible for the module	Kasymova Roza, PhD
Language	Kazakh / Russian
Required and recommended prerequisites for joining the module	Pedagogy Teaching Internship
Module objectives/intended learning outcomes	Students have abilities to analyze of theoretical issues of modern higher school pedagogy; can examine of methodology pedagogy can assess the significance of methodology's approaches, just how people understand and/or learn about pedagogy, given the vast array of ideas, practices, institutions, and communities that lay claim to the category can to apply outcomes of psychological studies in professional and teaching activity
Content	1. The main directions and trends in higher education in the world. Higher Education in the Republic of Kazakhstan.

	2. Teaching science and its place in the human sciences. 3. Higher School of Pedagogy Methodology 4. The nature and structure of educational activities 5. Personality of a high school teacher and current requirements for the competence of its 6. Communicative competence of a high school teacher 7. Traditional methods and forms of training 8. The theory of the pedagogical process 9. Methodological foundations of the learning process in higher education. Managing the learning process 10. Active teaching methods to train future specialists 11. Active teaching methods to train future specialists 12. New educational technologies in higher education 13. Organization of the educational process of higher education on the basis of the credit system 14. Technology pedagogical planning, organization and control in higher education 15. High school as a social institution.
Examinationforms	Standard Written Exam: Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Readinglist	*1. Geoff Petty.Teaching today. A practical Guide.Fourth Edition.United Kingdom, Nelson Thornes Ltd, 2019. -614p.* *2. Mynbaeva A.K., Fundamentalsofthe Higher Schoolof Pedagogy: LearningPSAR. - Almaty, 2021. - 156p.* *3. Peonov,P. Pedagogyof higher education. -Minsk University,2020.* *Pedagogy and psychologyof higher education.-Rostov n/D: Phoenix, 2019. - 544p.*

Module designation	**Psychology of Management**
Credit points	3
Semester(s) in which the module is taught	1
Relation to curriculum	UNIVERSITY COMPONENT M-2 Psychology and Pedagogy Module
Teaching methods	communication technology; problem learning, critical thinking. Active and interactive forms of training, individual creative and analytical tasks, brainstorming, brainstorming, competition, quiz, decision tasks case; SWOT analysis.
Workload (incl. contact hours, self-study hours)	Total workload: 3 - 190 contact hours 15 weeks, 1 hour per week for Lecture, total 15 Contact hours. 1 hours per week for Seminar, total 15 Contact hours. Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lectures in the form of a mini-conference, video presentations, a traditional lecture and a heuristic conversation, the lecture is an INSERT. Seminars in the form of practical, discussion form, debates and other interactive types.

	Private study including examination preparation, specified in hours: independent work of a student and independent work under the guidance of a teacher - 60
Person responsible for the module	Sveta Berdibayeva (Doctor of Psychology, prof. in Kazakh)/ Maira Kabakova (kand.psyc.n, ,Russian), Candidate of Psychological Science)/ Aidana Rizulla (PhD, in eng),
Language	Kazakh / Russian / English
Required and recommended prerequisites for joining the module	**Prerequisite** - Psychology at the Bachelor's degree **Postrequisite** – Foreign Language (professional)
Module objectives/intended learning outcomes	***Analysis***: carry out psychological analysis of management processes and phenomena; analyze and evaluate communication processes and processes of interpersonal perception in the organization through the application of system analysis and cross-cultural management techniques; Critically analyze the management performance of a manager based on a survey of management styles; analyze the professional activities of the manager in terms of ensuring his psychological effectiveness; ***Synthesis:*** factors affecting the effectiveness of the group, psychological methods of resolving conflict situations, psychological support for innovations; ***Evaluation:*** assess life and professional situations from the point of view of management psychology; Assess occupational risks in various management activities; ***Application:*** - interpret the processes of interpersonal perception, interpersonal and intercultural communication in the organization to maintain the corporate culture and psychological climate; - apply psychological technologies to regulation of emotional state, stress tolerance, personal growth, reduction of management conflicts, improvement of psychological climate and corporate culture; - apply skills of psychological selection of personnel, management decisions, methods of motivation of work; managing the organization's emotional environment
Content	Lecture 1. Introduction to management psychology Lecture 2. History of management psychology development Lecture 3. Theoretical and methodological foundations of management psychology. Lecture 4. Research methods in management psychology Lecture 5. Personality in management interaction Lecture 6. The identity of the leader as a subject of organization management. Lecture 7. Psychology of management decisions. Lecture 8. Motivational aspects of management. Lecture 9. Personality and building a business career in the organization. Lecture 10. Psychology of business communication and professional communication. Lecture 11. Psychology of interpersonal perception in the organization.

	Lecture 12. Psychology of intercultural communication. Lecture 13. Emotional management. Lecture 14. Psychology of management conflicts. Lecture 15. Corporate culture of the organization
Examination forms	The form of the exam is written - the solution of cases - grouped by the topic of situational and problematic problems. Case topics: 1. The identity of the manager. 2. Personality and business career 3. Interpersonal and intercultural communication in the organization. 4. Stereotypes of perception in the organization. 5. Employee motivation problems. 6. Management decision-making. 7. Communicative barriers to business communication. 8. Management conflicts.
Reading list	*1. Akhtaeva N.S., Abdizhapparova A.I., Bekbaeva Z.N. Baskaru pshihologiya. - Almaty: Kazakh University, 2018. - 452 p.* *2. Irgebayeva N.M. Baskaru pshihologiya. [Electronic resource]: textbook/Irgebayeva N.M. - Electronic text data. - Almaty: Nur-Print, 2015.- 356 p. - Access mode: http://www.iprbookshop.ru/67021.html.-EBS "IPRbooks"* *3. Korolev L.M. Pshihologiya upravleniya. 5th ed. - M.Dashkov and K., 2016. - 188 p.* *4. Umbitaliyev A.D. Baskaru pshihologiya: textbook/A.D. Umbitaliyev, K.B. Satymbekova, G.E. Kerimbek/Almaty: Economics, 2017. - 464 p.* *5. Gilbreth L.M.The Psychology of Management. Palala Press, 2015 - 360 p.* *6. Voskoboynikov F. The Psychology of Effective Management. Strategies for Relationship Building, Taylor & Francis eBooks, 2016 – 174 p.* *7. Shane Linder. Project Management & Business Psychology: A Guide to Construction Management, 2020.* *8. James P Armatas. Management Practices of Successful CEOs: Memoir of a Psychological Consultant to Management, 2020.*

Module designation	**Teaching Internship**
Credit points	5
Semester(s) in which the module is taught	1
Relation to curriculum	UNIVERSITY COMPONENT M-2 Psychology and Pedagogy Module
Teaching methods	-
Workload (incl. contact hours, self-study hours)	-
Person responsible for the module	Egyzbaeva M.K. docent
Language	Kazakh / Russian
Required and recommended	Before teaching practice, undergraduates study the following disciplines: «Pedagogy of higher education», «Psychology of

prerequisites for joining the module	Management»
Module objectives/intended learning outcomes	The purpose of the pedagogical practice of magistracy studies is to prepare for scientific and pedagogical activities in a higher educational institution, to acquire and consolidate the skills of practical exercises for the implementation of the educational process in higher education, including the teaching of particular disciplines, the organization of educational activities of students, scientific and methodological work on the subject. In addition in the course of teaching practice, a master's student should expand and deepen theoretical knowledge: - basic principles, methods and forms of organization of the pedagogical process; - methods of control and evaluation of professionally significant qualities students; - requirements for a university teacher in modern conditions. - implementation of methodological work on the design and organization of the educational process; - speaking in front of an audience and creating a creative atmosphere in the course of classes; - analysis of difficulties arising in pedagogical activity and the adoption of an action plan to resolve them; - independent conduct of psychological and pedagogical research; - self-control and self-assessment of the process and result of pedagogical activity. - correct diagnosis of the pedagogical phenomenon; - skills are associated not only with the direct presentation of educational information but also with the methods of obtaining and processing it. - independently conduct classes according to the plan of the academic discipline (at least two lessons); - develop lecture notes for individual academic disciplines (at least one abstract); - form a methodological package for the chosen academic discipline; - accessible, taking into account the specifics of the subject, the level of preparedness of students, their life experience and age to present educational material; - using various teaching methods and their combinations, it is logically correct to build the process of teaching and learning information by students; - to formulate questions in an accessible, concise and expressive way; - effectively use technical training aids, visual aids, computer programs; - promptly diagnose the nature and level of learning by students of educational material;
Content	The content of pedagogical practice is focused on the following types of pedagogical activity: 1. Training work: preparation and conduct of training sessions in the discipline, participation in the examination of the exam in the discipline, checking the tests of students. 2. Educational work: development of plans for training

	sessions, educational and methodological support, funds of evaluative means of discipline. 3. Organization of NIRS and extracurricular work of students: counseling students in the preparation of independent work, preparing students to participate in competitions / olympiads / conferences, conducting polls and survey of students. The specific content of practice is planned by the scientific director and is reflected in the individual schedule of the task of pedagogical practice.
Examination forms	The student-trainee draws up the practice results in a written report, which he defends in the commission at the graduating department during the corresponding period of intermediate certification according to the academic calendar. The assessment of the student's internship results is equated to the theoretical training marks, is taken into account when considering the issue of awarding a scholarship, and when calculating the overall GPA and transferring it to the next year of study and entered in the statement of practice. The general results of the practice summarise at the Academic Councils of the faculties with the participation of representatives of the practice bases. The final grade for pedagogical practice gets rated by a commission, which includes teachers in pedagogy and psychology and the head of training from the graduating department.
Reading list	*1. Afonin, I.D. Psychology and Pedagogy of Higher School / I.D. Afonin, A.I. Afonin. - M.: Rusayns, 2018. - 256 p.* *2. Gromkova, M.T. Pedagogy of Higher School: Textbook / M.T. Gromkov. - M.: Unity, 2017. - 80 p.* *3. Mukasheva A.B., Kasen G.A. Pedagogical practice in magistracy: guidelines. - Almaty: Kazakh University, 2011. - 84 p.* *4. Okolelov, O.P. Pedagogy of Higher School: Textbook / O.P. Okolelov. - M.: Infra-M, 2016. - 219 p.* *5. Stolyarenko, L.D. Psychology and Pedagogy of Higher School: Textbook / L.D. Stolyarenko. - Rn / D: Phoenix, 2014. - 336 p.*

Elective component

Brain evolution and psychoinformatics

Module Objectives. Students will be able to:
1. Analyze the methodological, theoretical, and empirical approaches to the study of the psychological mechanisms of cognitive processes;
2. Systematize modern theories of perception, attention, memory, thinking, and language;
3. Understand, critically analyze, and apply professional methodological knowledge, research methods in the interdisciplinary field of cognitive psychology and neuroscience;
4. Analyze the theory of cognitive neuroscience, modern scientific advances in understanding the neuroscientific foundations of the psyche and behavior;
5. Interpret the results of mathematical programming and data analysis of research in neuroscience correctly;
6. Apply to the program in MATLAB, R-statistics;
7. Demonstrate the application of the principles and methods of informatics for the collection, organization, and synthesis of scientific research data in the field of cognitive psychology and neuroscience;
8. Use effective approaches in the application of modern statistical programs in cognitive psychology and neuroscience.

Discipline designation	*Evolutionary and Developmental Neurobiology*
Credit points	6
Semester(s) in which the module is taught	*1*
Relation to curriculum	*ELECTIVE COMPONENT* *Brain evolution and psychoinformatics*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *1 hour per week for Seminar, total 15 Contact hours.* *150 self-study hours*
Person responsible for the module	***Datkhabayeva G.K.*** Candidate of Biological Sciences, Associate Professor of the Department of Biophysics, Biomedicine and Neuroscience ***Bahtybaeva L.K.*** Candidate of Biological Sciences, Associate Professor of the Department of Biophysics, Biomedicine and Neuroscience
Language	Kazakh, Russian, English
Required and recommended prerequisites for joining the module	*History and philosophy of science*
Discipline objectives/intended learning outcomes	The purpose of the discipline is to develop the ability to analyze the evolutionary development of the organic world and ontogenesis based on the formation of ideas about the patterns of phylogenetic and individual development of the nervous system of animals, morphofunctional transformations of the brain in the evolutionary series of animals and in the process of ontogenesis.

	Know: principles and patterns of maturation and age-related changes in the physiological systems of the body at different stages of ontogenesis; Be able: analyze the age-related characteristics of the neurohumoral regulation of the functional systems of the body; offer new and original views and projects. The ability to argue and defend their position in the legal field; illustrate your vision of facts and determine the value of the author's approach Competences: Generalization of the theoretical opinions of the authors and the definition of common and special features. Own: identify the determinants of development and age-related changes in the physiological systems of the body; acquire practical skills: tapply methods for assessing the functional state of the physiological systems of the body from the standpoint of compliance with the age norm; formate a complete picture of the role of age-related changes in the central nervous system in the formation of cognitive, sensory and motor functions of the body
Content	1. The history of the development of young features of the central nervous system. The role of investing in the development process of the history of Greece, Egypt and other states. Modern history of the development of the central nervous system. 2. General characteristics of the embryonic process of development of the central nervous system. Histological studies, laying of ectoderm, migration of neuroblasts and spongioblasts. 3. Age-related development of the peripheral nervous system. The role of peripheral development of the ganglia of the intracranial and extracranial location. Development of nerve plexuses. 4. Age-related development of the spinal cord. The role of the bookmark of ascending, descending, additional neurons, The role of microglia development. Laying of the motor and sensory horns of the spinal cord. 5. Age-related development of the medulla oblongata. Development of XII, XI, IX, X cranial nerves. The bookmark and the role of olives in the development of vestibular and motor functions of animals and humans. 6. Age-related development of the posterior brain: Varolian bridge and cerebellum. Age-related changes in the Varolian bridge and cerebellum with the development of conditioned reflexes and motor functions in humans. 7.The role of the Varoliev bridge in the regulation of respiration. The evolutionary development of the Varolian bridge and cerebellum. Age-related development of IX, VIII, VII, VI cranial nerves. 8. Age-related development of the midbrain. The importance of the development of the red nucleus, gray substance and black substance in the development of motor

	functions. Age-related fixation of reflexes and involution of transmitter reflexes. 9. Age-related development and consolidation of movement stereotypes. Significance for a developing child in norm and pathology. 10. Age-related development of the epithalamus and thalamus. Substantiation of the significance of all varieties of nuclei. The evolutionary development and complication of the functions of the thalamus. The peak of the development of the thalamus in mammals, especially in humans. 11. Age-related development of the hypothalamus. Substantiation of its role as a homeostatic organ. Senile negative changes in the hypothalamus. Substantiation of the evolutionary significance of the hypothalamus for the higher classes of vertebrates: birds and mammals. 12. Age-related development of the extrapyramidal system of the brain. Substantiation of significance for erect animals. 13. The evolutionary development of the extrapyramidal system. The significance of the caudate, lenticular, pale nucleus for the development of complex motor movements. 14. Age-related development of the cerebral cortex. Substantiation of the connection with the development of intelligence in children, adolescents, young people and adults. 15. The evolutionary development of the pyramidal brain system in animals. Meaning for a human.
Examination forms	Written examination: problem solving questions Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Reading list	1. Evolutionary Neuroscience. / Edited by Kaas J.H. Second Edition. New York: Academic Press, 2020. — 923 p. 2. Lynne M. Bianchi. Developmental Neurobiology. 2018 by Garland Science, Taylor & Francis Group, LLC. 360 p. 3. Neural Circuit and Cognitive Development Comprehensive Developmental Neuroscience. / Edited by John Rubenstein and Pasko Rakic. Second Edition. New York: Academic Press, 2020. — 649 p. 4. Dan H. Sanes, Thomas A. Reh, William A. Harris, Matthias Landgraf. Development of the Nervous System. Fourth Edition. 2019. London: Academic Press is an imprint of Elsevier. 374 p. 5. Principles of Neural Science. Sixth Edition. / Edited by Kandel E. R. et al. – New York : McGraw-hill, 2021. 1645 p. 6. Fundamental Neuroscience. Third edition. / Edited by Larry Squire et al. New York: Academic Press is an imprint of Elsevier, 2016. — 1277 p. 7. Frederic H. Martini, Judi L. Nath et al. Fundamentals of Anatomy and Physiology (9th ed.) 2012.

	8. Allen Connie, Harper Valerie. Laboratory Manual for Anatomy and Physiology, 3rd Edition 2009; 9. Anatomy & Physiology Made Incredibly Easy, 3rd Edition Springhouse-2009. Recommended: 10. Krutetskaya Z.I. Mechanisms for intracellular signaling: Monograph. - St. Petersburg .: St. Petersburg State University, 2003 11. Physiology of the endocrine system / Ed. D.Griffina, M: Bean, 2008 12. John F. Basis of Endocrinology / John F. Laycock, Peter G.Vays.- M .: Medicine, 2000 13. Alberts Essen Nelson P. Biological physiology. 5. Shapiro, B.E., et al., MathBioinformatics, 2004. 14. Soderberg U. Cellular Homeostasis, 2007.

Discipline designation	*Cognitive Psychology*
Credit points	9
Semester(s) in which the module is taught	*2*
Relation to curriculum	*ELECTIVE COMPONENT* *Brain evolution and psychoinformatics*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours*
Person responsible for the module	***Kamaznova A.T.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience*
Language	Kazakh, Russian, English
Required and recommended prerequisites for joining the module	*History and philosophy of science*
Discipline objectives/intended learning outcomes	The purpose of the discipline is to analyze theoretical and empirical knowledge about the psychological mechanisms of cognitive processes, current theories of perception, attention, memory, thinking and language. The course forms ideas about models of cognitive processes, modern research in cognitive psychology and its perspective areas. Know: Explain the history of cognitive psychology and its influence on other fields of neuroscience; identifies main theories and the historical and philosophical foundations of cognitive psychology; reasonably and conclusively compare different approaches in research in the field of cognitive psychology. Be able: apply critical thinking skills, methods and principles of cognitive psychology research, and cross-cultural influences on cognitive processes to cases of human behavior; Explain the strengths and weaknesses of methods in cognitive psychology.

	Competence: Analyze principles of cognitive psychology and apply them in neuroscience research; classifies methods and analyze how they are being integrated with neuroscience. Own: Analyze the basic methods used in the empirical analyses of cognitive processes; masters the tools of evaluation cognitive processes; analyzes and interprets data in Cognitive Psychology.
Content	1. Introduction and History of Cognitive Psychology. Historical background of cognitive psychology 2. Cognitive Psychology and Cognitive Neuroscience. Distinct between Cognitive Neuropsychology and Cognitive Psychology 3. Perceptual Processes I: Sensation, Perception. 4. Perceptual Processes II: Attention and Consciousness 5. Mechanisms of Attention 6. Memory Strategies and Metacognition 7. Mental Imagery and Cognitive Maps 8. Language I: Introduction to Language and Language Comprehension 9. Language II: Language Production and Bilingualism 10. Deductive Reasoning and Decision Making. Thinking and reasoning 11. Intelligence: Definition, Theories & Testing 12. Problem Solving and Creativity 13. Emotion and cognition. Individual Differences in Cognition 14. Cognitive Development Throughout the Lifespan 15. Modern research in cognitive psychology and its perspective areas.
Examination forms	Oral examination: problem solving questions Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Reading list	1. Ochsner K.N., Kosslyn S.M. The Oxford Handbook of Cognitive Neuroscience: Volume 1: Core Topics (Oxford Library of Psychology) Reprint Edition. 2016 2. Cognitive Psychology and Cognitive Neuroscience. 2006 3. Michael W. Eysenck And Mark T. Keane Cognitive Psychology A Student's Handbook. 2015 4. The Oxford Handbook of Cognitive Psychology Get access Arrow. Daniel Reisberg (ed.) 2013 5. Foundations of Cognitive Psychology. 2008 6. The Foundations of Cognitive Science. by Michael I. Posner (Editor). 1993 7. Handbook of Cognition. Edited by: K. Lamberts, R.

	Goldstone. 2004

Mathematical Neuroscience

Module Objectives. Students will be able to:
1. Integrate mathematical theories and models with the principles of brain functions for the synthesis of methodological possibilities and approaches in the study of cognitive functions;
2. Navigate in predicting the dynamics of the development of brain functions based on the initial data and in the diagnosis of deviations from the norm;
3. Apply programming technologies in the development of system and application software;
4. Use the MATLAB environment to create simulation models of processes in real-time;
5. Build algorithms for processing arrays and other structured data using Python and Matlab;
6. Carry out the choice of an acceptable machine learning method for solving a specific problem of data analysis in neuroscience;
7. Perform data preprocessing, setting the parameters of the analysis method and interpreting the results obtained in neuroscience;
8. Develop algorithms and write programs for logical, probabilistic, metric machine learning models.

Discipline designation	*Python and MATLAB Programming*
Credit points	*6*
Semester(s) in which the module is taught	*1*
Relation to curriculum	*ELECTIVE COMPONENT* *Mathematical Neuroscience*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *1 hour per week for Seminar, total 15 Contact hours.* *150 self-study hours.*
Person responsible for the module	**Mansurova M.E.** *Candidate of Physic-Mathematical Sciences, Associate Professor*
Language	Kazakh, Russian, English
Required and recommended prerequisites for joining the module	History and philosophy of science
Discipline objectives/intended learning outcomes	The purpose of the discipline is to develop the ability to apply programming technologies in the development of system and application software, to use the MATLAB environment to create simulation models of processes in real time, to build algorithms for processing arrays and other structured data using the Python language and the MATLAB environment. Know and build algorithms for processing arrays and other structured data using Python and MATLAB; To be able: apply the basic constructions of the programming language using the example of Python and the MATLAB environment; Competence: use modern methods and technologies of machine learning for forecasting tasks;

	Own: find, evaluate and use information from various sources necessary for solving scientific and professional problems.
Content	1. Basics of Python Programming. 2. Basics of NumPy and SciPy. 3. Differences Between NumPy Arrays and Python Lists. 4. Math Function in ndarray objects. 5. Using Pandas for Data Analysis. 6. Data Frames and Series. 7. Importing and Exporting Data in Data Frames. 8. MATLAB Programming: Variables and mathematical operationsю 9. Plotting in MATLAB. 10. Data input/output. 11. Control structures. 12. Creating functions. 13. Statistics. 14. Image processing. 15. Analyzing biological data.
Examination forms	Combinated Exam: Project work: desing and explain algorithms for processing arrays and other structured data using the Python language and the MATLAB environment
Reading list	Albert Danial. Python for MATLAB Development: Extend MATLAB with 300,000+ Modules from the Python Package Index. Apress, 2022. Python Programming for Beginners: The #1 Python Programming Crash Course to Learn Python Coding Well and Fast (with Hands-On Exercises). Codeone Publishing. 2022. Stormy Attaway. MATLAB: A Practical Introduction to Programming and Problem Solving. Butterworth-Heinemann; 5th edition. 2018. Tarek A. Atwan. Time Series Analysis with Python Cookbook: Practical recipes for exploratory data analysis, data preparation, forecasting, and model evaluation. Packt Publishing. 2022. Claus Führer, Jan Erik Solem, Olivier Verdier. Scientific Computing with Python: High-performance scientific computing with NumPy, SciPy, and pandas, 2nd Edition. Packt Publishing. 2021. M. S. Goldman and M. S. Fee, “Computational training for the next generation of neuroscientists.,” Curr Opin Neurobiol, vol. 46, pp. 25–30, Jul. 2017, doi: 10.1016/j.conb.2017.06.007. M. A. Kramer and U. T. Eden, Case Studies in Neural Data Analysis. Cambridge, MA: MIT Press, 2016.

Discipline designation	*Machine Learning*
Credit points	*9*
Semester(s) in which the module is taught	*2*
Relation to curriculum	*ELECTIVE COMPONENT* *Mathematical Neuroscience*
Teaching methods	*lecture, seminar*

Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Mansurova M.E.*** *Candidate of Physic-Mathematical Sciences, Associate Professor* ***Amirhanova G.A.*** PhD, Senior Lecturer of the Faculty of Information Technology
Language	Kazakh, Russian, English
Required and recommended prerequisites for joining the module	History and philosophy of science
Discipline objectives/intended learning outcomes	The purpose of the discipline is to develop the ability to select an acceptable machine learning method for solving a specific data analysis problem, perform data preprocessing, configure the analysis method parameters and interpret obtained results, develop algorithms and write programs for logical, probabilistic, metric machine learning models. Know: the basic principles, methods, and tasks of machine learning; To be able: develop algorithms and write programs for logical, probabilistic, metric machine learning models; Competences: ompare and select an acceptable machine learning method for each specific case; Own: solve practical problems of data analysis by methods of intellectual, statistical and visual analysis.
Content	1. Basic definitions: precedent, training sample, features of objects, types of features, matrix of features-objects. 2. Algorithm model, learning method, algorithm quality functional. 3. Basic concepts of machine learning. 4. Bayesian decision theory. 5. Parametric methods. 6. Multivariate methods. Dimension reduction. 7. The task of clustering. Nonparametric methods.. 8. Decision trees. Linear discriminant analysis. 9. Multilayer perceptrons. 10. Prediction using supervised learning methods. 11. Training a perceptron model on a data set. 12. Classification using the support vector machine. 13. Building data sets for training. 14. Data compression using dimension reduction. 15. Model estimation and hyperparametric tuning.
Examination forms	Combined: Project Work: develop algorithms for logical, probabilistic, metric machine learning models
Reading list	1. Aurélien Géron. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems. O'Reilly Media, 2017. 2. Abdrakhmanov M.I. Pandas. Working with data. 2nd ed. Dev Practice Team. 2020. 170 p.

	3. Paul Jones. Python: The Fundamentals of Python Programming. CreateSpace Independent Publishing Platform. 2016. 202 p. 4. Josh Starmer. The StatQuest Illustrated Guide To Machine Learning. 2022. 305 p. 5. Marc Peter Deisenroth. Mathematics for Machine Learning. Cambridge University Press. 2020. 6. Andreas Lindholm, Niklas Wahlström, et al. Machine Learning: A First Course for Engineers and Scientists. Cambridge University Press. 2022. 7. Moritz Hardt and Benjamin Recht. Patterns, Predictions, and Actions: Foundations of Machine Learning. Princeton University Press. 23022.

Clinical Neuroscience

Module Objectives. Students will be able to:
1. Analyze epigenetic and neurogenetic mechanisms of functioning, change, and inheritance of the genome for the formulation and solution of research problems in neuroscience;
2. Differentiate the mechanisms and ways of realization of epigenetic signals in the cell of organisms of different levels of the organization;
3. Identify the role of gene expression in brain development and plasticity of behavior;
4. Apply EEGLab, SPM, MATLAB, and Python for data analysis in clinical neuroscience;
5. Introduce programming approaches to neuroscientific research of brain signals and modeling of neural networks;
6. Plan research in neuroscience based on analyzing the principles and approaches underlying the research of brain pathology;
7. Develop research in neuroscience based on an understanding of brain diseases and their underlying biological mechanisms;
8. Analyze the methodological foundations of research in the field of clinical neuroscience with the possibility of using programming approaches.

Discipline designation	*Epigenetics and neurogenetics*
Credit points	6
Semester(s) in which the module is taught	*1*
Relation to curriculum	*ELECTIVE COMPONENT* *Clinical Neuroscience*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *1 hour per week for Seminar, total 15 Contact hours.* *150 self-study hours.*
Person responsible for the module	**Omirbekova N.Zh.** Professor of Department of Molecular Biology and Genetics, Doctor of Biological Sciences
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*History and philosophy of science*
Discipline objectives/intended learning outcomes	The purpose of the discipline is to form the ability to use theoretical and practical knowledge of epigenetic and neurogenetic mechanisms of functioning, change and inheritance of the genome for the formulation and solution of research problems. The course is devoted to the study of the mechanisms and ways of realizing epigenetic signals in the cell of organisms of different levels of organization, the role of gene expression in the development of the brain and plasticity of behavior. Know and analyze existing concepts of epigenetics and neurogenetics and the role of small RNAs in silencing genes; To be able: reveal the mechanisms and ways of realization of implementing epigenetic signals in the cell; apply basic model systems to study epigenetics and neurogenetics;

	Competences: determine the epigenetic determinants of human diseases, including neurological and mental diseases; Own: analyze the molecular processes and functions of specific proteins for practical purposes in epigenetics and neurogenetics.
Content	1. Objects and methods of epigenetics. 2. Epigenetic and neurogenetic mechanisms of functioning 3. Mechanisms and ways of realization of epigenetic signals in the cell of organisms of different levels of organization. 4. The value of RNA interference, small RNA and chromatin 5. Genomic imprinting. 6. The role of epigenetics in various diseases in humans. 7. Genome evolution and brain evolution. 8. Theoretical and methodological approaches to the analysis of human and animal behavior. 9. Basic molecular genetic mechanisms responsible for the formation of behavioral patterns 10. The role of gene expression in brain development and behavior plasticity. 11. Methods of neurogenetics. 12. Conservativeness of genes involved in brain development and function. 13. Mechanisms of education, use, inheritance, and changes in strategies, patterns, and behaviors in humans and animals. 14. Gene expression in the development of the brain and plasticity of behavior. 15. Epigenetic, neurogenetic and Neuroscience
Examination forms	*Oral examination: problem solving questions.* Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Reading list	1. Epigenetics. / Ed. Ellis S.D., Jenuwein T., Reinberg D. - M.: Technosfera, 2013.- 436 p. 2. Genes. / Ed. Lewin B. – M.: Binom. Knowledge Lab. 2012. - 896 p. 3. Epigenetics. Manage your genes / Ed. Gavrilov M., Maltseva I. - AST, 2021. - 320 p. 4. Carey Nessa. Epigenetics. – Phoenix, 2012. – 349 p. 5. Wilson K., Walker D. Principles and methods of biochemistry and molecular biology, Binom, 2015. 6. Neurogenetics, Part I. / Editors: Daniel H. Geschwind, Henry L. Paulson, Christine Klein. - Elsevier, 2018. -436 p. 7. Neurogenetics, Part II / Ed. by D.H. Geschwind, H.L. Paulson (Editor), Ch. Klein (Editor). - Elsevier; 1st edition, 2018. - 480 p.

Discipline designation	*Neuroinformatics*
Credit points	*9*
Semester(s) in which the module is taught	*2*
Relation to curriculum	*ELECTIVE COMPONENT* *Clinical Neuroscience*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Mansurova M.E.*** *Candidate of Physic-Mathematical Sciences, Associate Professor*
Language	Kazakh, Russian, English
Required and recommended prerequisites for joining the module	History and philosophy of science
Discipline objectives/intended learning outcomes	The purpose of the discipline is to develop programming skills for neuroscientific research, in particular for analyzing brain signals and modeling neural networks. The course is devoted to the practical development of EEGLab, SPM, MATLAB and Python for their application in data analysis in clinical neuroscience. Know and analyze the features of data programming approaches in neuroscience; To be able: determine the effectiveness of computational models for the analysis of databases in neuroscience; Competences: collect and translate research results in neuroscience into a database format using computational models; Own: apply EEGLab, SPM, MATLAB, and Python for data analysis; evaluate the compatibility of databases to facilitate the exchange of information on various aspects of the functioning and structure of the nervous systems.
Content	1. Single Neuron structure. 2. Biophysics of spike generation and action potential propagation. 3. Neural coding and decoding – models of neural response, spike-triggered characterizations of response. 4. Measuring neural information. 5. Adaptation of neural responses. 6. Normative models of function. 7. Neural Populations. 8. Receptive field maps. 9. Parallel Channels. 10. Correlations and interactions. 11. Network structure and computation. 12. Analyzing brain signals and modeling neural

	networks. 13. Higher level functions. 14. Memory – the Hopfield model. 15. Decision making and Bayesian analysis.
Examination forms	Combinated1 Exam: Project work. Make desing of application in data analysis in clinical neuroscience
Reading list	1. Péter Érdi, Basabdatta Sen Bhattacharya, et al. Computational Neurology and Psychiatry (Springer Series in Bio-/Neuroinformatics, 6). Springer. 2018. 815 p. 2. Vinoth Jagaroo. Neuroinformatics for Neuropsychology. Springer. 2009. 3. Nikola K. Kasabov (Ed.), Nikola Kasabov. Springer Handbook of Bio-/Neuro-Informatics (Springer Handbooks). 2014. 4. Neuroinformatics challenges to the structural, connectomic, functional and electrophysiological multimodal imaging of human traumatic brain injury. Amazon. 2015. 5. Adam Liwo. Computational Methods to Study the Structure and Dynamics of Biomolecules and Biomolecular Processes: From Bioinformatics to Molecular Quantum Mechanics (Springer Series in Bio-/Neuroinformatics). 2014.

MAJOR DISCIPLINES
University component

Research of functional systems

Module Objectives. Students will be able to:
1. Use modern natural science knowledge in the field of general and private physiology for the formulation and solution of research problems in neuroscience;
2. Possess practical skills of mathematical methods of processing the results of research of human functional systems in neuroscience;
3. Apply applied techniques of related branches of neuroscience to form approaches in the study of functional systems;
4. Describe, substantiate and present the scientific results of research in neuroscience based on understanding the functions of the whole organism from the standpoint of integral physiology;
5. Analyze critically the importance of the adaptive interaction of the organism with the external environment for research in the field of neuroscience;
6. Solve the problems of neuroscience based on a systemic understanding of the physiological mechanisms of the body's functions;
7. Use modeling methods used in the study of human functional systems;
8. Integrate knowledge about the physiological mechanisms of body functions from the perspective of the concept of functional systems.

Discipline designation	*Organization and planning of scientific researches*
Credit points	6
Semester(s) in which the module is taught	1
Relation to curriculum	*UNIVERSITY COMPONENT* *Research of functional systems*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *3 hour per week for Seminar, total 45 Contact hours.* *120 self-study hours*
Person responsible for the module	***Aitasheva Z.G.*** Professor of the Department of Molecular biology and Genetics
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*History and philosophy of science*
Discipline objectives/intended learning outcomes	The purpose of the discipline is the formation of systemic theoretical ideas about modern methods of researching. Particular attention in the course is paid to the analysis of the general characteristic features of the methods used in the study, the leading role of the modeling method, the experimental nature of applied techniques, a complex combination of related scienctific branches. Know: carry out a methodological analysis of a scientific problem; transform the knowledge in solving scientific problems.

	To be able to: use the relevant research methods for study and the advantages of interdisciplinary research strategies, carry out independent scientific research and be competent in formulating their own scientific conclusions; Competences: apply the conceptual and methodological apparatus in the implementation of various levels of creative ideas; Own: carry out further theoretical and / or applied research at a high level, making a significant contribution to the creation of new ideas, approaches and methods.
Content	1. Introduction. Philosophical backgrounds of scientific reasoning 2. Tasks of scientific reasoning 3. Literature search (Part 1). Library and online search 4. Literature search (Part 2). Implementation of Snowball Principle 5. Abstract compilation 6. Art of designing an abstract 7. Overall types of research publications. Reviews, experimental papers, short communications, letters to the editor, abstracts, synopses, highlights 8. Scientific paper as one of the main grounds for the development of scientific reasoning skills 9. Poster presentations. Advantages and the risk of failure 10. Art of oral presentations 11. Issues of Interviewing 12. Ten Rules principles in scientific reasoning 13. Online learning and commercialization of scientific research 14. Life-long learning. 15. Perspectives and constraints of scientific development
Examination forms	Written examination: Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Reading list	1 Vaughn L. Concise Guide to Critical Thinking. 2-nd Edition, 2020, 368 pp. 2 Morrow D.R., Weston A. A Workbook for Arguments: A Complete Course in Critical Thinking 3-rd Edition, 2019, 563 pp. 3 Golard A. A field guide to thinking errors: Using neuroscience to classify, avoid, and exploit our biases. 2021, 260 pp. 4 Potochnik, A., Colombo M., Wright C. Recipes for Science, Taylor&Francis, 2019, 327 pp. 5 Meltzoff, J. and H. Cooper. Critical Thinking about Research (2-nd editon).APA (Amazon Kindle), 2018, 335 pp. 6 Rurherford, A. Critical thinkers:methods for clear thinking and analysis in everyday situations from the greatest

	thinkers in history. Amazon (Great of Kindle Edition), 2018, 173 pp.

Module designation	*Human Functional Systems*
Credit points	6
Semester(s) in which the module is taught	1
Relation to curriculum	*UNIVERSITY COMPONENT* *Research of functional systems*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *1 hour per week for Seminar, total 15 Contact hours.* *150 self-study hours.*
Person responsible for the module	**Bahtybaeva L.K.** *Candidate of Biological Sciences, Associate professor of the Department of Biophysics, Biomedicine and Neuroscience* **Srailova G.T.** *Candidate of Biological Sciences, Associate professor of the Department of Biophysics, Biomedicine and Neuroscience* **Ablaikhanova N.T.** *Candidate of Biological Sciences, Associate professor of the Department of Biophysics, Biomedicine and Neuroscience*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*History and philosophy of science* *Epigenetics and neurogenetics*
Discipline objectives/intended learning outcomes	The purpose of the discipline is to form the presentation of the vital activity of the human body as an open self-regulating system that ensures the adaptive interaction of the body with the external environment on the basis of modern natural science knowledge in the field of general and private physiology. The course is devoted to the analysis of the functions of an integral organism from the standpoint of integral physiology, the issues of a systemic approach in understanding the physiological mechanisms of body functions from the standpoint of the concept of functional systems are considered. Know: To combine the acquired knowledge of human physiology and build an integrative scheme is functional. To be able to: highlight the role of neurohumoral regulation in the control and management of functional systems in human organisms. Competence: carry out research work on the development of cybernetic schemes of functional systems of the body *Own:* electro physical methods, theoretical basis for operating experimental methods, methods of quantitative and qualitative approaches in experimental physiology; skills in design and realization of physiological experiment be able to choose and realize proper physiological method for research.

Content	1. The functional system that provides respiration. Cortical-hypothalamic-varolic-medullary breathing control. Vegetal-spinal control of respiration. Humoral regulation and concentration of CO2 in the blood. Transrespiratory, transpulmonary and partial pressure of gazes. The scheme of control and management of external and internal breathing. The role of chemo-, mechano-, thermo-, baro-, osmo-, j-receptors in the regulation of respiration. 2. The Functional system that provides blood circulation. Cortical-hypothalamic-limbic-medullary control of automaticity, excitability, conduction and contractility of the heart muscle. 3. The role of ion-humoral regulation in the tetanization and refractoriness of the heart muscle. ECG, as the implementation of the plan of functional activity of the heart. 4. Functional system that provides blood circulation. Cortical-hypothalamic-limbic-medullary vascular tone control. The role of ion-humoral regulation in vasodilatation and vascular contraction. 4. The functional system that provides digestion. Cortical-hypothalamic-limbic-medullary management of secretary and contractile activity of the digestive system. Regulation of appetite. 5. The role of ion-humoral regulation in the secretary activity of the digestive system. 6. The functional system that protects the body from antigens. The dominant role of humoral regulation and the role of cytokines. Provision of innate defense mechanisms and formation of adaptive immunity. 7. The functional system that provides water-salt balance in the body. The role of the kidneys. 8. Supervision of the central nervous system and the autonomic nervous system and regulation of the pelvic organs in ensuring a constant water-electrolyte balance in the body. 9. The functional system that provides supervision and operation of internal endocrine organs. The role of positive and negative feedback in the work of the Master gland. 10. The functional system that ensures the movement of the body in space. Physiology of excitable tissues. Bioelectric phenomena. 11. The laws of irritation. Conducting arousal. Muscle contraction. Nerve impulse conduction and neuromuscular transmission. The role of cerebellum. 12. The functional system that provides supervision and regulation of the work of internal organs. Afferent and efferent innervations. 13. Autonomic sympathetic and parasympathetic nervous system. Types of reflexes. Spinal cord. The medulla oblongata. The role of Varoliev Bridge. 14. The functional system that provides thermoregulation.

	Hypothalamic–medullary regulation. The role of hormones. 15. Anokhin's theory of functional systems of the body. Main provisions of the law.
Examination forms	Written examination: arguing on questions. Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions.
Reading list	1. Frederic H. Martini, Judi L. Nath et al. 2. Fundamentals of Anatomy and Physiology (9th ed.) 2012. 3. - Allen Connie, Harper Valerie 4. Laboratory Manual for Anatomy and Physiology, 3rd Edition 2009; 5. - Anatomy & Physiology Made Incredibly Easy, 3rd Edition Springhouse, 2009. 6. Recommended: 7. Krutetskaya Z.I. Mechanisms for intracellular signaling: Monograph. - St. Petersburg .: St. Petersburg State University, 2003 8. Physiology of the endocrine system / Ed. D.Griffina, M: Bean, 2008 9. John F. Basis of Endocrinology / John F. Laycock, Peter G.Vays.- M .: Medicine, 2000 10. Alberts Essen Nelson P. Biological physiology 11. Shapiro, B.E., et al. MathBioinformatics, 2004. 12. Soderberg U. Cellular Homeostasis, 2007.Janeway C.A., Travers P., Walport M., and Shlomchik M. (2001) Immunobiology / 6th Edition. Garland Publishing, New York, ISBN 0-8153-3642-X 13. Mage RG, Sehgal D, Schiaffella E, Anderson AO. 1999. Gene-conversion in rabbit B-cell ontogeny and during immune responses in splenic germinal centers. Vet Immunol Immunopathol 72:7-15 14. Kuprash, D.V., M.B. Alimzhanov, A.V. Tumanov, A.O. Anderson, K. Pfeffer, and S.A. Nedospasov. 1999. TNF and Lymphotoxin beta Cooperate in the Maintenance of Secondary Lymphoid Tissue Microarchitecture But Not in the Development of Lymph Nodes. J. Immunol 163: 6575-6580. 15. Seghal, D., E. Schiaffella, A.O. Anderson and R.G. Mage. 2000. Generation of heterogeneous rabbit anti-DNP antibodies by gene conversion and hypermutation of rearranged VL and VH genes during clonal expansion of B-cells in splenic germinal centers. Eur. J. Immunol. 30:3634-3644.

Discipline designation	*Biophysics for Neuroscience*
Credit points	6
Semester(s) in which the	2

module is taught	
Relation to curriculum	*UNIVERSITY COMPONENT* *Research of functional systems*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *1 hour per week for Seminar, total 15 Contact hours.* *150 self-study hours*
Person responsible for the module	**Gumarova L.Zh.** *candidate of biological sciences, professor Department of Biophysics, Biomedicine and Neuroscience* **Kulbaeva M.S.** *candidate of biological sciences, Department of Biophysics, Biomedicine and Neuroscience*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*History and philosophy of science* *Epigenetics and neurogenetics*
Discipline objectives/intended learning outcomes	The purpose of the course is to provide understanding of the biophysical aspects of neuroscience. The course is devoted to the biophysical foundations of the functioning of excitable tissues, bioelectrical phenomena in living organisms, biophysical foundations of electrophysiological methods (EEG, ECG, EMG, etc.), applied elements of quantum biophysics (EPR, NMR, etc.), the influence of physical factors on biosystems, the formation of skills of a biophysical approach to experimental research in neurosciences. Know and understand the basic principles of cell biophysics and complex systems; basic physical laws underlying biological processes and phenomena; Be able to explain the essence of the first and second principles of thermodynamics; Hess' law, principles of Prigogine and E. Bauer; analyze the mechanisms of bioelectrical and photobiological processes; Competences: the mechanisms of generation of biological rhythms; principles of electrical conductivity of biosystems ; interpret the basics of radiobiology and the mechanisms of radiation injury; Own: apply the acquired theoretical knowledge and practical skills in the practice of their own research.
Content	1. Introduction. Biophysics is the science of physico-chemical processes in the biological system. 2. Thermodynamics is the science of energy, heat and metabolic processes in the body. Thermodynamic equilibrium, steady state, non-equilibrium thermodynamics. 3. I, II and III beginnings of thermodynamics. Application of the 1st and 2nd laws of thermodynamics for biological systems. 4. Light absorption of biological systems. Basic photobiological processes. The main stages of

	photobiological processes. 5. Application of laser beams in biology and medicine. 6. Luminescence in biological systems. Bioluminescence and biochemiluminescence. 7. Photosynthesis. Primary and initial stages of photocycles of biomolecules. Effect of UV radiation on the body and biopolymers: nucleic acids and proteins, lipids. Mutagenic effect of UV rays. 8. Mambrane biophysics. Molecular organization and biophysical properties of membrane structures. Transport of substances through the biomembrane. Biomembrane potentials. 9. Biopotential. Electric field of biosystems. Electrical activity of tissues and organs. 10. Electrical conductivity of biological systems. Biologically active points on human and animal skin. 11. Radiation biophysics. Nonionizing radiation in human life. Biological effect of ionizing radiation. Radionuclides and their effects on living systems. 12. Radiobiological reactions. Effects of ionizing radiation on the organism level. 13. Actual problems of medical biophysics. Theory of cell damage. Diagnostic methods used in medicine. 14. Biophysics of periodic processes. Biorhythmology. Light and biorhythm. Hierarchy of rhythm in a multicellular organism. Biological clock. Mechanisms of adaptation of biological systems to extreme conditions of the external environment. 15. The 21st century is the century of biology, biotechnology and biomedicine. Mathematical modeling and its significance in biology. Modeling of biotechnological and ecological processes.
Examination forms	Written examination: problem solving questions Written examination: arguing on questions Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions
Reading list	1. Antonov V.F., Chernysh A.M., Kozlova E.K., Korzhuev A.V. Physics and biophysics. Workshop: textbook. Benefit. - M.: GEOTAR-Media, 2012. - 336 p. 2. Jackson M. Molecular and cellular biophysics.-M.: Mir.-2012.-552p. 3. Inyushin V.M., Tuleukhanov S.T., Gumarova L.Zh., Kulbaeva M.S. Shvetsova E.V. Ecological biophysics. Teaching aid. - Almaty: Kazakh University, 2016. - 100 pages. 4. Inyushin V.M., Toleukhanov S.T., Kulbaeva M.S., . Gumarova L.Zh., Shvetsova E.V., Kayrat B.K. Tests in biophysics. Educational and methodological manual. - Almaty: Kazakh University, 2019. - 116 p. 5. Kovaleva L. V. Medical biophysics: textbook. allowance

	/ L. V. Kovaleva; State. honey. University of Semey. - 2nd ed. - Almaty: Aknur, 2019. - 324 p. 6. Orynbaeva Z.S., Tuleukhanov S.T., Gumarova L.Zh., Kulbaeva M.S., Shvetsova E.V. Introduction to the kinetics of biological processes: textbook - Almaty: Kazakh University, 2020. - 89 p. 7. Samoilov V.O. Medical biophysics: A textbook for universities. - St. Petersburg: SpecLit, 2013. - 591 p. 8. Tuleukhanov S.T., Inyushin V.M., Gumarova L.Zh., Kulbaeva M.S., Shvetsova E.V. Methodical guide to laboratory studies in biological physics. - Almaty: Kazakh University, 2015. - 122 p. Internet resources: Electronic library of KazNU - https://elib.kaznu.kz/ Electronic library - http://elibrary.ru/ Website of the Faculty of Biology of Moscow State University - http://www.bio.msu.ru

Biological principles in Neuroscience

Module Objectives. Students will be able to:
1. Analyze the evolutionary development of the organic world based on the formation of ideas about the patterns of phylogenetic and individual development of the nervous system;
2. Establish links between evolutionary and ontogenetic morphological and functional transformations of the brain;
3. Analyze biophysical aspects in neuroscience;
4. Research neuroscience, taking into account the biophysical foundations of the functioning of excitable tissues;
5. Plan the study of the biophysical foundations of the brain using the methods of electrophysiological methods (EEG, ECG, EMG, etc.);
6. Develop neurobiological research using applied elements of quantum biophysics (EPR, NMR, etc.);
7. Carry out analytical work on the application of the biophysical approach in experimental studies of neuroscience;
8. Apply knowledge of the influence of physical factors on biosystems in solving research problems in neuroscience.

Discipline designation	*Fundamentals of Cognitive Neuroscience*
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	*UNIVERSITY COMPONENT* *Biological principles in Neuroscience*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Kustubayeva A.M.*** *PhD, Professor Department of Biophysics, Biomedicine and Neuroscience*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*Biophysics for Neuroscience* *Human Functional Systems*
Discipline objectives/intended learning outcomes	The purpose of the discipline is the formation of an interdisciplinary understanding of the neurophysiological mechanisms of emotional and cognitive processes, as well as the formation of skills in the use of modern scientific research methods, new neurotechnologies to optimize and restore cognitive functions. The course develops the ability to analyze theories of cognitive neuroscience, modern scientific advances in understanding the neuroscientific foundations of the psyche and behavior. Know: explain theoretical approaches in the study of neurophysiological mechanisms of emotional and cognitive

	processes To be able to: analyze the relationship between brain anatomy, cognition, and neurocognitive abnormalities in psychopathological syndromes Competences: apply modern research methods in cognitive neuroscience; compare and apply neurotechnologies for cognitive function recovery Own: create research design in the field of cognitive neuroscience.
Content	1. Introduction to Cognitive Neuroscience. Methods in Cognitive Neuroscience. 2. Brief tour to Brain Anatomy and overview of cognitive functions. From nerve cells to cognition. 3. Functional System (FS) Principles. FS hierarchical organization. 4. Six Senses. Coding of sensory information. Perception theories. 5. Vision. Visual perception theories. Visual illusions. 6. Auditory system. Theries in Hearing. Hallucinations and hearing voices. 7. The Bodily Senses. Touch. Pain. 8. Smell and Taste. 9. Motor function. Involuntary and Voluntary movement. Motor system hierarchical organization. 10. Emotion netwoks. Theories of emotion and emotional intelligence. Emotion regulation mechanism. 11. Motivation and reward netwoks. Learning theries. Habituation. Sensitization. 12. Memory system. Inmplicit and Explicit Memory. Memory theories. 13. Executive control theories and networks. Multiple demanding (MD) brain areas. 14. Language and the Aphasias. Alexia, Dyslexia, Agraphia. 15. Biological Basic of Thought. Brain-computer interfaces. Artificial Intelligence. Disorders of Thought and Volition. Schizophrenia.
Examination forms	Oral examination: problem solving questions. Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam – 2 hours for 2-3 questions.
Reading list	1. Gazzaniga M.&Mangun G. The Cognitive Neurosciences. 2014. 2. Kustubayeva A.M. Cognitive processes and Brain. Qazak University, 2020, -134 p. 3. Kandel E., Schwartz J., Jessell T.M. Principles of neuronal science. Sixth edition, 2021. 4. Posner J, Polanczyk GV, Sonuga-Barke E. Attention-deficit hyperactivity disorder. Lancet. 2020 Feb 8;395(10222):450-462. doi:

10.1016/S0140-6736(19)33004-1. Epub 2020 Jan 23. PMID: 31982036; PMCID: PMC7880081.
5. McRae K, Gross JJ. Emotion regulation. Emotion. 2020 Feb;20(1):1-9. doi: 10.1037/emo0000703. PMID: 31961170.
6. Voss JL, Bridge DJ, Cohen NJ, Walker JA. A Closer Look at the Hippocampus and Memory. Trends Cogn Sci. 2017 Aug;21(8):577-588. doi: 10.1016/j.tics.2017.05.008. Epub 2017 Jun 15. PMID: 28625353; PMCID: PMC5659202.

Elective Component

Cognitive Neuroscience

Module Objectives. Students will be able to:
1. Explain and understand the theoretical concepts of the neurobiological foundations of decision making; 2. Analyze the role of the influence of emotions on the decision-making and risk assessment processes; 3. Demonstrate practical skills in analyzing the relationship of emotional experience and behavior with brain functions; 4. Analyze methodological approaches to research in the field of affective neuroscience; 5. Evaluate approaches in the study of the neurobiological generation of emotional experiences that affect behavior; 6. Explore and systematize the mental processes of generation/perception of speech utterances; 7. Analyze the role and importance of the brain in language acquisition; 8. Independently develop programs aimed at studying the cerebral organization of speech activity.

Module designation	*Neuromechanism of Decision Making*
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	ELECTIVE COMPONENT Cognitive Neuroscience
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Kamaznova A.T.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience* ***Zholdasova M.K.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*Cognitive Psychology*
Module objectives/intended learning outcomes	The purpose of the discipline is to develop the ability to conduct a methodological analysis of the problems of the neurobiological foundations of decision-making, the role of the influence of emotions on the processes of decision-making and risk assessment. The course forms a systemic understanding the functions of the brain in decision-making

	processes in norm and pathology. Know: - describe the basic principles of the neurobiological bases of decision-making; understanding of how the brain makes decisions in real life, and particularly how emotion plays a key role. To be able to: analyze the main types of information involved in the decision-making process; analyze the decision-making and risk assessment processes; Competences: ability to use knowledge from one field (e.g., the neuroscience of decision-making) and apply it to other fields (e.g., understanding consumer, investor, or voter behavior); explain and critically evaluate major concepts and theories across a broad array of topics related to human decision-making Own: effectively develop a well-reasoned research in Neuroscience of Decision Making
Content	1. Introduction to Decision Making and the Brain 2. Methods for measuring decision-making behavior 3. Neural Processes and Mechanisms of Social and Individual Decision Making 4. The value of things: Costs and benefits, risks and rewards 5. Intertemporal choice and self-control. Behavior and Choice 6. Attention, context and expectancy effects 7. Emotions in Decision-Making 8. Social Decisions: Altruism and Morality 9. Social Decisions: Strategy and interaction 10. Risk, economic and cognitive modeling 11. Addiction, and disorders of decision making 12. Decision making under risk and uncertainty 13. Artificial Learning and Decisions 14. Discussions on Decision Making, Psychology and Brain 15. Impact of neuroscience on real-world decision-making
Examination forms	Oral examination: problem solving questions. Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam –2-3 questions, time of preparation for the answer – 10-20 minutes
Reading list	1. Kandel E., Schwartz J., Jessell T.M. Principles of neuronal science. Sixth edition, 2021. 2. Kustubayeva A.M. Cognitive processes and Brain. Qazak University, 2020, -134 p. 3. Purves D., Augustine G., Fitzpatrick D., et al. Neuroscience 6th edition, 2017. 4. Hardman, D. (2009). Judgment and Decision Making. BPS & Blackwell Publishing. 5. Over, D. (2004). Rationality and the normative/descriptive distinction. In D.J. Koehler &

	N. Harvey (Eds.), Blackwell Handbook of Judgment and Decision-Making (pp. 3-18). Oxford, UK: Blackwell Publishing. 6. Baron, J. (2000), Thinking and Decision Making, Cambridge, UK: Cambridge University 7. Plous, S. (1993). The Psychology of Judgment and Decision Making. New York: McGraw-Hill. 8. Kandel E., Schwartz J., Jessell T.M. Principles of neuronal science. International edition, 2000. 9. Understanding Other Minds Perspectives from Developmental Social Neuroscience. Edited by Simon Baron-Cohen Helen Tager-Flusberg, Michael V. Lombardo, Oxford University Press 2013 10. Gazzaniga M.&Mangun G. The Cognitive Neurosciences. 2014

Discipline designation	*Affective Neuroscience*
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	ELECTIVE COMPONENT Cognitive Neuroscience
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Kustubayeva A.M.*** *PhD, Professor Department of Biophysics, Biomedicine and Neuroscience*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*Cognitive Psychology*
Discipline objectives/intended learning outcomes	The purpose of the discipline is to form an idea of the relationship of emotional experience and behavior with brain functions, the ability to analyze the theory of affect, to analyze methodological approaches in conducting research in the field of affective neuroscience. The course reveals the dynamic features of the interaction mechanisms of the brain regions associated with the generation of emotional experience that affects behavior. Know: integrate scientific approaches in the study of affects; To be able to: analyze the main theoretical approaches in affective neuroscience; - compare and determine the neurobiological correlates of emotion; Competences: evaluate the methodological approaches of research in the field of affective neuroscience;

	- identify effective methods of neuroimaging in the study of emotions; Own: carry out scientific research on the neurobiological foundations of emotional states in health and disease.
Content	1. Affective Neuroscience. History in the studies of emotion in human and animals. 2. Emotional network. Emotional Operating system and subjectivity. 3. Basics of motivational and emotional processes. 4. Dynamics of the brain activity. Sleep and arousal. Emotional state. Dynamics of brain activity during emotional states transition. 5. Basic emotions and differentation mechanisms between emotions. 6. Complex emotions and social emotions. 7. FMRI studies of emotional states. 8. EEG studies of emotional states. 9. Emotion and cognition 10. Context and Emotion 11. Reward and control 12. Social Emotions 13. Emotion and Decision Making 14. Understanding Other's Emotions 15. Affective disorders
Examination forms	Oral examination: interpreting cases. Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam –2-3 questions, time of preparation for the answer – 10-20 minutes
Reading list	1. Armony, J. & P. Vuilleumier (Eds.), (2013) The Cambridge Handbook of Human Affective Neuroscience; Cambridge University Press, New York, NY. 2. Kandel (2013): Principles of Neural Science, 5th edition, chapter 48, Emotions and Feelings and chapter 63, Disorders of Mood and Anxiety 3. Power, M. & Tim Dalgleis, T. (2008). Cognition and Emotion: From Order to Disorder. Psychology Press: New York 4. Kohn N., Eickhoff S.B., Scheller M., Laird A.R., Fox P.T. & Habel U., (2014) Neural network of cognitive emotion regulation — An ALE meta-analysis and MACM analysis, NeuroImage, Volume 87, 2, 345-355. 5. Kringelbach, M. L., & Berridge, K. C. (2017). The Affective Core of Emotion: Linking Pleasure, Subjective Well-Being, and Optimal Metastability in the Brain. Emotion Review, 9(3), 191-199. 6. Scollon, C. N., Koh, S., & Au, E. W. (2011). Cultural differences in the subjective experience of emotion: When and why they occur. Social and Personality Psychology Compass, 5(11), 853-

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Clinical neuroscience

Module Objectives. Students will be able to: 1. Analyze the mechanisms of development of neurodegenerative diseases; 2. Study and systematize the processes and factors influencing the occurrence of neurodegenerative diseases; 3. Analyze studies of brain tumors based on modern neuroimaging methods; 4. Analyze and compare various methods of brain research in neurodegenerative diseases; 5. Adapt methodological approaches in research in neuroscience, taking into account modern advances in neuropsychopathology; 6. Determine the advantages of using a multimodal approach in brain research in health and disease; 7. Work with data from the results of functional magnetic resonance imaging with cognitive load; 8. Independently analyze the planning of EEG studies of the brain in neurodegenerative diseases.

Discipline designation	*Current problems of neurodegenerative deseases*
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	ELECTIVE COMPONENT Clinical neuroscience
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	**Karimova A.** *Candidate of Medical Science, Associate Professor*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*Epigenetics and neurogenetics* *Human Functional Systems*
Discipline objectives/intended	The purpose of the course is to form a system of understandings about the mechanisms of development of

learning outcomes	neurodegenerative diseases, their classification, clinical manifestations, diagnostics, risk factors, biological foundations of prevention and treatment. The course reveals current models for the study of neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease. Know: define and analyze the classification of neurodegenerative diseases; To be able to: discover the mechanisms of manifestation of progressive, hereditary and acquired forms of diseases of the nervous system; Competences: evaluate the contribution of various scientific studies in the field of investigation of the mechanisms of complex conditions and rare degenerative disorders of the nervous system; Own: apply modern methods of neurodegenerative diseases studies; carry out scientific research in the field of neurodegeneration.
Content	1. The concept of neurodegenerative diseases. 2. Neurodegenerative diseases. General pathogenetic basis. 3. Pathophysiology of neurodegenerative diseases. 4. Genetic aspects, environmental factors and lifestyle in the development of neurodegenerative diseases. Facts and hypotheses. 5. Biomarkers of neurodegenerative diseases. 6. Parkinson's disease. Problem state. Clinical manifestations. Diagnostics. Principles of drug and non-drug therapy. 7. Alzheimer's disease. Problem state. Clinical manifestations. Diagnostics. Principles of drug and non-drug therapy. 8. Lateral amyotrophic sclerosis. Problem state. Clinical manifestations. Diagnostics. Principles of drug and non-drug therapy. 9. Huntington's disease. Problem state. Clinical manifestations. Diagnostics. Principles of drug and non-drug therapy. 10. Review of other neurodegenerative diseases. Progressive supranuclear palsy. Frontotemporal dementia. Multisystem atrophy. Corticobasal degeneration. Spinal muscular atrophy. Spinocerebellar ataxia. 11. Psychological support, social integration, rehabilitation as ways to maintain the quality of life of patients with neurodegenerative diseases. 12. Effective methods for the prevention of neurodegenerative diseases. 13. The problem of using animal models in the study of neurodegenerative diseases. Solution prospects. 14. Current research in the study of neurodegenerative diseases. 15. Prospects for further scientific research.
Examination forms	Oral examination: discussion. Base question amount 10-30: questions on the application of knowledge regardless of the

	number of students, regardless of loans for any level of education; exam –2-3 questions, time of preparation for the answer – 10-20 minutes.
Reading list	1. Нейродегенеративные заболевания: от генома до целостного организма. Под редакцией М.В.Угрюмова. Научный мир. 2014 год. Том 1. 580 с. 2. Нейродегенеративные заболевания: от генома до целостного организма. Под редакцией М.В.Угрюмова. Научный мир. 2014 год. Том 2. 848 с. 3. В.В.Пономарев. Нейродегенеративные заболевания. Фолиант. 2013 год. 200 с. 4. Anthony Schapira, Zbigniew K. Wszolek, Ted M. Dawson, Nicholas Wood. Neurodegeneration. Wiley-Blackwell. 2017. 344 p. 5. Alexander S. McNeill. Neurodegeneration: Theory, Disorders and Treatments. Neuroscience Research Progress. 2011. 249 p. 6. Principles and Practice of Movement Disorders. 3rd Edition. Elsevier. 2021. 564 p. 7. Memory Loss, Alzheimer's Disease and Dementia. 3rd Edition. Elsevier. 2021. 336 p. Интернет ресурсы: 1. National Institute of Aging https://www.nia.nih.gov/health/alzheimers 2. EU Joint Program - Neurodegenerative Disease Research https://www.neurodegenerationresearch.eu 3. International Parkinson and Movement Disorders Society https://www.movementdisorders.org

Discipline designation	*Research in Neuropsychopathology*
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	ELECTIVE COMPONENT Clinical neuroscience
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Kudaybergenova S.K.*** *PhD, Associate Professor Department of Psychology* ***Zholdassova M.K.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*Epigenetics and neurogenetics* *Human Functional Systems*
Discipline objectives/intended	The purpose of the discipline is to form the ability to methodologically analyze scientific research on the

learning outcomes	neurobiological foundations of psychiatric diseases. The course includes the basics of psychopathology along with modern achievements in neuropsychopathology: FMRI, EEG brain research in neurodegenerative diseases. Know: modern studies of the mechanisms of damage of various parts of the central and peripheral nervous system To be able to: determine effective approaches and research methods in neuropsychopathology; Competences: apply the EEG method in brain research in condition of neurodegenerative diseases; Own: carry out the analysis of scientific research data in the field of neuropsychopathology; apply modern programming techniques to create research models in the field of neuropsychopathology.
Content	1. Introduction to neuropsychology pathology: history and basic assumptions. Neuropsychology and Neuroscience advances 2. Localization in the brain: Principles of functional neuroanatomy 3. Neuropsychological syndromes and their characteristics 4. Assessment using brain activity recording techniques. 5. Neuroimaging techniques: structural and functional magnetic resonance imaging, DTI, PET, EEG 6. Intervention and Neuropsychological Rehabilitation Methods 7. Neuropsychological assessment. Validation and standardisation of neuropsychological assessment tools 8. Diagnosis and treatment of cognitive impairment associated with neurological and/or psychiatric illnesses 9. Neuropsychological disorders in childhood: current research 10. Brain changes associated with cognitive rehabilitation 11. Neuropsychopathology of ageing 12. Neuroanatomical and neurofunctional correlates of neuropsychological deficits 13. The neuropsychopathology of Emotion 14. Current scientific research data in the field of neuropsychopathology 15. Ethical issues of scientific research in Neuropsychopathology
Examination forms	Oral examination: problem solving questions. Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam –2-3 questions, time of preparation for the answer – 10-20 minutes
Reading list	1. Foundations of Human Neuropsychology. Kolb and Wishaw, 2009, Sixth Ed. Worth press.

2. Elias, L. J., & Saucier, D. M. (2006). Neuropsychology: Clinical and experimental foundations. Boston: Allyn & Bacon.
3. Kalat, J. W. (2013). Biological psychology (11th ed.). Singapore: Wadsworth.
4. Pinel, J. P. J. (2011). Biopsychology (8th ed.). Singapore: Pearson.
5. Anderson, V., Northam, E., Hendy, J. & Wrennall, J. (2005). Developmental Neuropsychology: A Clinical Approach (Brain Damage, Behavior and Cognition Series). NY, NY: Psychology Press, Taylor and Francis Group.
6. Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (2013). Arlington, VA.: American Psychiatric Press.
7. Grant, I. & Adams, K. (2009). Neuropsychological Assessment of Neuropsychiatric and Neuromedical Disorders, Third Edition. New York, New York: Oxford University Press.
8. Heilman, K.M. & Valenstein, E. (2003). Clinical Neuropsychology. NY, NY: Oxford University Presss.
9. Lezak, M. D., Howieson, D. B, & Loring, D.W. (2012). Neuropsychological Assessment, 5th ed. NY, NY: Oxford University Press
10. Morgan, J.E. & Ricker, J.E. (2008). Textbook of Clinical Neuropsychology. NY, NY: Taylor and Francis Publishers, Inc.Reynolds
11. C.R.(Editor) & Fletcher-Janzen, E. (Editor) (2008). Handbook of Clinical Child Neuropsychology, Third Edition. NY, NY: Springer Publishers.
12. Strauss, E., Sherman, E.M.S. & Spreen, Otfried (2006). A Compendium of Neuropsychological Tests:,Third Edition Administration, Norms and Commentary. NY, NY: Oxford University Press.
13. Yeates, K.O., Ris, M.D., Taylor, H.G. & Pennington, B.F. (2010). Pediatric Neuropsychology: Research, Theory, and Practice, 2 nd Edition. NY, NY: Guildford Press.
14. American Educational Research Association, American Psychological Association, & National Council on Measurement in Education.(2014). Standards for educational and psychological testing. Washington, DC: American Educational Research Association.

Computational neuroscience

Module Objectives. Students will be able to:
1. Analyze the processes of development and support of the functionality of neurocomputer interfaces; 2. Track and analyze the ways of transmission and processing of information by the brain; 3. Understand the principles and approaches of interaction between the brain and the computer; 4. Adequately apply the methods of mathematical modeling to practical problems of computational neuroscience; 5. Correctly interpret the key parameters in the architecture of the neural network; 6. Evaluate the possibilities of modeling information processes in the human body; 7. Demonstrate an understanding of the major technology trends driving deep learning; 8. Use effective approaches in defining efficient (vectorized) neural networks.

Discipline designation	*Brain-computer interface*
Credit points	9
Semester(s) in which the module is taught	3
Relation to curriculum	ELECTIVE COMPONENT Computational neuroscience
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Kustubayeva A.M.*** *PhD, Professor Department of Biophysics, Biomedicine and Neuroscience* ***Melnikov M.V.*** *Research Institute of Physiology and Fundamental Medicine*
Language	*Kazakh, Russian, English*
Required and recommended prerequisites for joining the module	*Phyton and MATLAB Programming* *Machine Learning* *Biophysics for Neuroscience*
Discipline objectives/intended learning outcomes	The purpose of the discipline is to build the ability to develop and maintain the functionality of neurocomputer interfaces, track and analyze the ways in which information is transmitted and processed by the brain. The course reveals the basic principles and approaches of interaction between the brain and computer, modeling information processes taking into account the peculiarities of encoding, transmitting and decoding sensory information, for correction and recovery in case of disorders, as well as for increasing efficiency. Know: describe the basic principles of the functioning of the human body as an integral information system; To be able to: track and analyze the ways of transmitting information by means of electrical excitation, intercellular signal transmission and its processing by the brain; Competences: analyze the main types of information entering the human body;

	Own: simulate information processes in the human body, taking into account the peculiarities of coding, transmission and decoding of sensory information.
Content	1. The concept of BCI(BMI) 2. Main tasks BCIs are used for. Performance and usability of BCIs 3. Challenges of clinical usage of BCI 4. Non-clinical applications for BCI: entertaining, self-enhancing, etc. 5. ERP-based BCIs 6. Rhythmic EEG-based BCIs 7. fNIRS-based BCIs 8. The concept of biofeedback and neurofeedback 9. Biofeedback on autonomous signals 10. EEG and ERP neurofeedback 11. fNIRS and BOLD fMRI neurofeedback 12. Connectivity-based neurofeedback 13. Machine learning for BCI and neurofeedback 14. Pitfalls and weak points of contemporary BCI and neurofeedback technologies 15. Perspectives and future directions in BCI
Examination forms	Written examination: problem solving questions Written examination: arguing on questions Base question amount 10-30: questions on the application of knowledge regardless of the number of students, regardless of loans for any level of education; exam –2-3 questions, time of preparation for the answer – 10-20 minutes
Reading list	1. Brain-Computer Interfaces Handbook: Technological and Theoretical Advances. C.S. Nam, A. Nijholt, F. Lotte (Eds.). CRC Press, 2019. 2. Brain-Computer Interfaces: Applying our Minds to Human-Computer Interaction. Tan D.S., Nijholt A. (Eds.). Springer-Verlag London Limited, 2010. 3. Kropotov J. Quantitative EEG, Event-Related Potentials and Neurotherapy. Academic Press, 2008. 4. Evidence-based practice in biofeedback and neurofeedback. G. Tan, F. Schaffer, R. Lyle, I. Teo (Eds.). Wheat Ridge, CO: AAPB, 3rd ed., 2016. 5. Vidal J.J. Toward direct brain-computer communication. Annual Review of Biophysics and Bioengineering. 1973. 2(1):157-180. 6. Kaplan A.Y., Shishkin S.L., Ganin I.P., et al. Adapting the P300-based brain-computer interface for gaming: a review. IEEE Transactions on Computational Intelligence and AI in Games (Special Issue on Brain/Neuronal-Computer Games Interfaces and Interaction). 2013. 5(2):141-149. 7. Chaudhary U., Birbaumer N., Ramos-Murguialday A. Brain-computer interfaces in the completely locked-in state and chronic stroke. Progress in Brain Research. 2016. 228:131-161. 8. Khan M.A., Das R., Iversen H.K., Puthusserypady S.

	Review on motor imagery based BCI systems for upper limb post-stroke neurorehabilitation: From designing to application. Computers in Biology and Mediine. 2020. 123:103843. 9. Abiri R., Borhani S., Sellers E.W., et al. A comprehensive review of EEG-based brain-computer interface paradigms. Journal of Neural Engineering. 2019. 16(1):011001. 10. Liberati G., Federici S., Pasqualotto E. Extracting neurophysiological signals reflecting users' emotional and affective responses to BCI use: A systematic literature review. NeuroRehabilitation. 2015. 37(3):341-58. 11. Sorger B., Goebel R. Real-time fMRI for brain-computer interfacing. Handbook of Clinical Neurology. 2020. 168:289-302. 12. Sulzer J., Haller S., Scharnowski F., et al. Real-time fMRI neurofeedback: progress and challenges. Neuroimage. 2013. 76:386-99. 13. Markiewcz R. The use of EEG Biofeedback/ Neurofeedback in psychiatric rehabilitation. Psychiatria Polska. 2017. 51(6):1095-1106. 14. Paret C., Goldway N., Zich C., et al. Current progress in real-time functional magnetic resonance-based neurofeedback: Methodological challenges and achievements. NeuroImage. 2019. 202.

Discipline designation	*DATA Mining and Big DATA in Neuroscience*
Credit points	*9*
Semester(s) in which the module is taught	*3*
Relation to curriculum	*ELECTIVE COMPONENT* *Computational neuroscience*
Teaching methods	*lecture, seminar*
Workload (incl. contact hours, self-study hours)	*15 weeks,* *1 hour per week for Lecture, total 15 Contact hours.* *2 hour per week for Seminar, total 30 Contact hours.* *225 self-study hours.*
Person responsible for the module	***Amirkhanova G.A.*** *PhD, Senior lecturer*
Language	Kazakh, Russian, English
Required and recommended prerequisites for joining the module	Phyton and MATLAB Programming Machine Learning Biophysics for Neuroscience
Module **objectives/intended learning outcomes**	The purpose of the discipline is to develop the ability to apply methods and algorithms of intellectual analysis in solving problems of identifying implicit patterns in large data sets. The course examines neural network classification algorithms, the design features of classification algorithms provided by SQL Server Analysis Services for use in brain

	signal analysis and predictive modeling. Know and reveal implicit patterns in large datasets; To be able determine the size and complexity of information that can cause problems during its processing and storage, searching and analysing innovations in neuroscience; Competences: develop classification algorithms provided by SQL Server Analysis Services for using in predictive modeling; use neural network classification algorithms; Own: detect patterns in databases and use the information obtained to make various kinds of decisions.
Content	1. Introduction to Data Mining in Neuroscience. 2. Computational Neuroscience. 3. Exploratory Data Analysis. 4. Probability Theory and Random Variables. 5. Probabilistic Inference. 6. Performance Evaluation. 7. Feature Subset Selection. 8. Non-probabilistic Classifiers. 9. Probabilistic Classifiers. 10. Metaclassifiers. Multidimensional Classifiers. 11. Non-probabilistic Clustering. 12. Probabilistic Clustering. 13. Probabilistic Graphical Models. 14. Bayesian Networks. Markov Networks. 15. Spatial Statistics.
Examination forms	Combined: Project Work. Design features of classification algorithms provided by SQL Server Analysis Services for use in brain signal analysis and predictive modeling
Reading list	1. Michael N. Jones. Big Data in Cognitive Science (Frontiers of Cognitive Psychology). Psychology Press. 2016. 374 p. 2. Qi Xuan, Zhongyuan Ruan, et al. Graph Data Mining: Algorithm, Security and Application (Big Data Management). Springer. 2021. 3. Prashant Natarajan, John C. Frenzel, et al. Demystifying Big Data and Machine Learning for Healthcare. CRC Press. 2017. 4. Concha Bielza, Pedro Larrañaga. Data-Driven Computational Neuroscience: Machine Learning and Statistical Models. Cambridge University Press. 2020. 708 p. 5. Daniel Durstewitz. Advanced Data Analysis in Neuroscience: Integrating Statistical and Computational Models (Bernstein Series in Computational Neuroscience). Springer. 2017. 317 p.

MODULE RESEARCH PRACTICE

Module Objectives. Students will be able to:
1. to systematize basic principles, methods and forms of organization of research in Neuroscience;
2. critically evaluate the main problems and strategies for conducting scientific research in Neuroscience;
3. analysis of difficulties arising during research activity and planing to solve them;
4. independently conduct research design in Neuroscience;
5. choose research methods and strategies of research most relevant to the subject of a study and follow them in professional activity;
6. possess practical skills of processing research results in Neuroscience;
7. describe, substantiate and present the scientific results of research in Neuroscience.

REASEARCH

Module Objectives. Students will be able to:
1. to organize a plan of a research practice acording to topic of own master degree dissertation;
2. analyze scientific articles according to the master degree dissertation;
3. be able to obtain research data by statistics;
4. possess practical skills of processing research results during scientific internship;
5. describe, substantiate and present the scientific results of own research at an International Conference in Neuroscience.

Discipline designation	**REASEARCH WORK**
Credit points	24
Semester(s) in which the module is taught	1-4
Relation to curriculum	University Component
Teaching methods	l **scientific work, publications, conferences and more**
Workload (incl. contact hours, self-study hours)	**60 weeks,** **scientific work, publications, conferences and more** **Research Seminar** 1-3 **Dissertation Writing** 2-14 **Scientific Internship** 3-3 **Publication in the Proceedings of International Conferences** 4 -4
Person responsible for the module	***Kustubayeva A.M.*** *PhD, Professor Department of Biophysics, Biomedicine and Neuroscience* ***Kamaznova A.T.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience* ***Datkhabayeva G.K.*** *Candidate of Biological Sciences, Associate Professor of the Department of Biophysics, Biomedicine and Neuroscience* ***Zholdassova M.K.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience*
Language	Kazakh, Russian, English
Required and	Organization and planning of scientific researches

recommended prerequisites for joining the module	Fundamentals of Cognitive Neuroscience
Discipline objectives/intended learning outcomes	Publications, conferences and more
Content	The aim of practice: to conduct research using advanced international experience and new technologies. Practice forms the ability to achieve new scientifically based theoretical / experimental research results, to determine the relevance, content, scientific novelty, practical relevance of the study, to correlate research / experimental research methodological, practical) sections with the main defense rules.
Examination forms	Oral examination and publications Practical/laboratory exercises, SIW should be independent, creative. Plagiarism, forgery, the use of cheat sheets, cheating at all stages of control are unacceptable.
Reading list	1. Robert Coe, Michael Waring, Larry V Hedges, Laura Day Ashley. Research Methods and Methodologies in Education. 3rd edition.: Sage , 2021. 480p. 2. Dr. Alok Gupta, Nitin Gupta. Research Methodology by Dr. Alok Gupta, Nitin Gupta. SBPD Publications, 2022. 247p. 3. 3.Chawla, D. & Sodhi, N. (2011) "Research Methodology: Concepts and Cases" Vikas Publishing House PVT Ltd 4. 4. Kumar R. Research Methodology a step-by-step guide for beginners. 3rd edition. 2011. SAGE Publications Ltd 5. Sheehy M., Wray C. Academic writing handbook for learners. FET, 2019. P. 100 6. Newman A. How write a great research paper, and get it accepted by a good journal: Life Sciences Department, Senior Publisher, Elsevier, 2018. P. 487 7. Winkler A.,C., & Metherell, J.R. (2012). Writing the Research Paper: A Handbook, Cengage Learning. the United States of America 8. Hairston, et al. The Scott, Foresman Handbook for Writers (San Francisco: Longman 2010 or latest edition) 9. Bullock R. (2013) The Norton Field Guide to Writing . W.W. Norton

Module Objectives. Students will be able to:

1. critically evaluate strategies for conducting scientific research of own master degree dissertation;
2. independently conduct research of own master degree dissertation;
3. analyze of research results and write thesis;
4. present the scientific results of a thesis in local scientific journal;
5. do public defence the master thesis.

Module designation	**MASTER THESIS WRITING AND DEFENCE**
Credit points	24 ECTS
Semester(s) in which the module is taught	1, 2, 3, 4
Relation to curriculum	Master's student research
Teaching methods	lecture, seminar
Workload (incl. contact hours, self-study hours)	**1 weeks, 12 ECTS**
Person responsible for the module	***Kustubayeva A.M.*** *PhD, Professor Department of Biophysics, Biomedicine and Neuroscience* ***Kamaznova A.T.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience* ***Datkhabayeva G.K.*** *Candidate of Biological Sciences, Associate Professor of the Department of Biophysics, Biomedicine and Neuroscience* ***Zholdassova M.K.*** *PhD, Associate Professor* Department of Biophysics, Biomedicine and Neuroscience*
Language	Kazakh, Russian, English
Required and recommended prerequisites for joining the module	Evolutionary and Developmental Neurobiology Epigenetics and neurogenetics Organization and planning of scientific researches Human Functional Systems Fundamentals of Cognitive Neuroscience
Content	The final certification of master students is carried out in the form of writing and defending a master's thesis. To conduct the final attestation of students, an Attestation Commission (AC) for education is created. Students who have fully completed the educational process in accordance with the requirements of the working and individual curriculum and working curricula, and who have received admission to the defense by the supervisor, are allowed to the final certification. Programmes for a comprehensive exam in educational programmes of higher education are developed by graduating departments and approved by the Academic Council of the Faculty and the Academic Council of the University. The defense of the master's thesis is held at an open meeting of the attestation commission. On the topic of the master's thesis, students must publish at least one scientific publication. Before defending master's theses, they undergo a mandatory check for plagiarism in the UNIVER system. The results of the comprehensive examinations and the defense of final work are announced on the day they are held. Decisions

	on defense assessments, as well as on awarding qualifications, awarding a degree and issuing a state diploma (without distinction, with honors) are made by the certification commission at a closed meeting by open voting by a simple majority of votes of the commission members participating in the meeting. A student who has passed the final certification and confirmed the mastery of the educational programmes is awarded a master's degree by the decision of the attestation commission and is awarded a qualification in the relevant educational programmes and is issued a diploma with an application free of charge. The diploma appendix (transcript) indicates the latest grades according to the point-rating letter system of assessments for all academic disciplines, completed term papers (projects), research or experimental research work, types of professional practices, final certification, indicating their volume in academic credits and hours. Graduates of master's degree programs receive a European Diploma Supplement free of charge in addition to their diploma.
Examination forms	Public defence