

Disciplines summary
MASTER'S DEGREE IN PROFILE "NEUROBIOLOGY"

Basic disciplines: Philosophic problems of natural science				
Term	Duration	Course type	ECTS credit points	Student workload
1	1 term	compulsory	2	72 hours:28 classroom / 44self-study work

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time	Pass-fail exam	Lectures, seminars	Sitdikova, G.F.

Learning outcomes

GC-1 – ability for abstract thinking, analysis, synthesis
 GPC-3 – willingness to use fundamental biological ideas in professional activities for formulating and solving new problems
 GPC-8 – ability to use philosophical concepts of natural science to form the scientific outlook

Contents

Topic 1. The emergence of science and the main stages of its development. Historical forms of interaction between science and philosophy. 2 lectures / 1 self-study work
 Topic 2. The concept of science. The criteria for scientific knowledge. The structure of scientific knowledge, its levels and forms. Methods of scientific knowledge. The functions of science in society. 2 lectures / 2 self-study works
 Topic 3. Science and morality. Bioethics. 2 lectures / 2 self-study works
 Topic 4. Features of the present stage of scientific development. Deviant science. 2 lectures / 2 self-study work
 Topic 5. The nature of biological knowledge. Place of Biology in the system of sciences and in the modern world. 2 lectures / 1 self-study work
 Topic 6. The nature and the origin of life. 2 lectures / 4 self-study works
 Topic 7. The principle of Biology. The modern synthesis of knowledge in Biology. 2 lectures / 4 self-study works
 Topic 8. The problem of systemic organization and determinism in Biology. 2 lectures / 4 self-study works
 Topic 9. Man and Nature in the socio-cultural dimension. 2 lectures / 4 self-study works
 Topic 10. Subject of ecophilosophy. Ecological bases of economic activity. 2 lectures / 4 self-study works
 Topic 11. Environmental imperatives of modern culture. 2 lectures / 4 self-study works
 Topic 12. Education and upbringing in the light of the environmental problems facing mankind. 2

lectures / 4 self-study works

Topic 13. Biology in the context of contemporary culture. Biophilosophy. Religion and Biology. Biosemiotics. 2 lectures / 4 self-study works

Topic 14. The political potential of modern Biology. "Posthuman" stage of anthroposociogenesis. 2 lectures / 4 self-study works

Literature

Bioethics: textbook. Lopatin, P.V., Kartashova O.V. / Ed. by Lopatin, P.V. 4th ed., Rev. and add. 2011. - 272 p. ELS "Student adviser"
<http://www.studmedlib.ru/ru/book/ISBN9785970417690.html>

History and Philosophy of Science: a training manual. Shishkov, I.Z. 2010. - 768 p. ELS "Student adviser"
<http://www.studmedlib.ru/ru/book/ISBN9785970414477.html>

Philosophy of science and medicine: textbook. Khrustalev Yu.M. 2009. - 784 p. ELS "Student adviser"
<http://www.studmedlib.ru/ru/book/ISBN9785970405543.html>

Bariev, R.Kh., Levin, G.M., Manko, Yu.V. History and Philosophy of Science (general problems of philosophy of science) [Text]: Tutorial (short course) / Ed. by Manko, Yu.V.? SPb.: Publishing house "Petropolis" 2009? 112. ? ISBN 978-5-9676-0217-7. ELS "Bibliorossika"
http://www.bibliorossica.com/book.html?search_query=%D1%84%D0%B8%D0%BB%D0%BE%D1%81%D0%BE%D1%84%D0%B8%D1%8F+%D0%BD%D0%B0%D1%83%D0%BA%D0%B8&currBookId=14604&ln=ru

Kirvel, Ch. S., et al. The philosophy and methodology of science [Text]: study guide / Kirvel, Ch.S. [et al.]; ed. by Kirvel, Ch.S. ? Minsk: High school, 2012.? 639 p. ? ISBN 978-985-06-2119-1. ELS "Bibliorossika"

http://www.bibliorossica.com/book.html?search_query=%D1%84%D0%B8%D0%BB%D0%BE%D1%81%D0%BE%D1%84%D0%B8%D1%8F+%D0%BD%D0%B0%D1%83%D0%BA%D0%B8&currBookId=12950&ln=ru

Zolotukhin, V.E. History and Philosophy of Science for graduate students: Exam candidates 48 hours: Textbook / Zolotukhin, V.E. ? Third ed., add ? Rostov on Don: Fenix, 2014.? 75. ELS "Bibliorossika"

http://www.bibliorossica.com/book.html?search_query=%D0%98%D1%81%D1%82%D0%BE%D1%80%D0%B8%D1%8F+%D0%B8+%D1%84%D0%B8%D0%BB%D0%BE%D1%81%D0%BE%D1%84%D0%B8%D1%8F+%D0%BD%D0%B0%D1%83%D0%BA%D0%B8+%D0%B4%D0%BB%D1%8F+%D0%B0%D1%81%D0%BF%D0%B8%D1%80%D0%B0%D0%BD%D1%82%D0%BE%D0%B2&currBookId=10910&ln=ru

Subjects

Professor	Name	Hours
Eremeev, A.M.	Philosophic problems of natural science	72

Basic disciplines: Psychology of Leadership: Training

Term	Duration	Course type	ECTS credit points	Student workload
2	1 term	compulsory	2	72 hours: 26 classroom, 46 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	Training	Sitdikova, G.F.

Learning outcomes

GC-1 – ability for abstract thinking, analysis, synthesis
 GC-2 – willingness to act in unusual situations, bear the social and ethical responsibility for decisions
 GC-3 – readiness for self-development, self-realization, the use of creativity
 GPC-2 – willingness to lead the team in their professional activities, tolerantly perceiving social, ethnic, religious and cultural differences

Contents

Topic 1. The concept of leadership 2 practical / 4 self-study
 Topic 2. Self-identification of the "I" 2 practical / 6 self-study
 Topic 3. Who is a leader. 2 practical / 6 self-study
 Topic 4. Leader as an effective communicator. 4 practical / 6 self-study
 Topic 5. Experience with partner and group. 4 practical / 6 self-study
 Topic 6. Feedback – a tool to work with a group. 4 practical / 6 self-study
 Topic 7. Mobilization of a group for joint problem solving. 4 practical / 6 self-study
 Topic 8. Solving of problems and conflicts. 4 practical / 6 self-study

Literature

Kravchenko, A.I. Psychology and Pedagogy [electronic resource] / Kravchenko, A.I. - M.: INFRA-M, 2013. - 400 p. Access mode: <http://znanium.com/bookread.php?book=394126>
 Ostrovskiy, E.V. Psychology and Pedagogy [electronic resource] / Ostrovskiy, E.V., Chernyshova, L.I. - M.: University textbook: SIC INFRA-M, 2013. - 381 p. Access mode: <http://znanium.com/bookread.php?book=398710>

Subjects

Professor	Name	Hours
Sidelnikova, T.T.	Psychology of Leadership: Training	72

Basic disciplines: Foreign language in professional competence

Term	Duration	Course type	ECTS credit points	Student workload
1-2	2 terms	compulsory	4	144 hours: 62 classroom, 82 self-

				study
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Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam, exam	Practical lessons	Sitdikova, G.F.

Learning outcomes

GPC-1 – willingness to communicate orally and in writing in Russian and foreign languages to meet the challenges of professional activity

Contents

Topic 1. Introductory English course 18 practical / 27 self-study
 Topic 2. Communicative English 18 practical / 27 self-study
 Topic 3. Reception of the written and oral information in the field of specialty in English 26 practical /28 self-study

Literature

1. Komarov, A.S. Practical Grammar of English for Students. Practical English Grammar for students [electronic resource]: Study guide / Komarov, A.S. - 2nd ed., - M.: Flint, 2012. - 248 p. <http://znanium.com/bookread.php?book=455224>
2. Kolykhalova, O.A., Makhmuryan, K.S. Britain: A manual for students in undergraduate training in the major "Professor education".- M.: Moscow State Pedagogical University, 2012, 78p. <http://www.bibliorossica.com/book.html?currBookId=4362>
3. Ovchinnikova, I.M. BUSINESS COURSE IN ENGLISH FOR THE LINGUISTIC DEPARTMENT: Tutorial / Ovchinnikova, I.M., Lebedeva, V.A.; ed. by PhD Professor Khromov, S.S. - M.: Publishing center EAOI, 2010. - 304p. <http://www.bibliorossica.com/book.html?currBookId=6084>
4. Sipols, O.V. Develop Your Reading Skills: Comprehension and Translation Practice. Teaching reading and translation (English) [electronic resource]: Study guide / Sipols, O.V. - 2nd ed., - M.: Flint: Nauka, 2011. - 376 p. <http://znanium.com/bookread.php?book=409896>

Subjects		
Professor	Name	Hours
Arslanova, G.A.	Foreign language in professional competence	144

Basic disciplines: Academic writing				
Term	Duration	Course type	ECTS credit points	Student workload
1	1 term	compulsory	2	72 hours: 36 classroom, 36 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	Practical lessons	Sitdikova, G.F.

Learning outcomes

GPC-1 – willingness to communicate orally and in writing in Russian and foreign languages to meet the challenges of professional activity

Contents

Topic 1. The development of communicative skills in reading. 6 lectures / 6 practical / 12 self-study
 Topic 2. The development of communicative skills in writing. 6 lectures / 6 practical / 12 self-study
 Topic 3. Development of lexical and grammatical skills. 6 lectures / 6 practical / 12 self-study

Literature

1. Komarov, A.S. Practical Grammar of English for Students. Practical English Grammar for students [electronic resource]: Study guide / Komarov, A.S. - 2nd ed., - M.: Flint, 2012. - 248 p. <http://znanium.com/bookread.php?book=455224>
2. Kolykhalova, O.A., Makhmuryan, K.S. Britain: A manual for students in undergraduate training in the major "Professor education".- M.: Moscow State Pedagogical University, 2012, 78p. <http://www.bibliorossica.com/book.html?currBookId=4362>
3. Ovchinnikova, I.M. BUSINESS COURSE IN ENGLISH FOR THE LINGUISTIC DEPARTMENT: Tutorial / Ovchinnikova, I.M., Lebedeva, V.A.; ed. by PhD Professor Khromov, S.S. - M.: Publishing center EAOI, 2010. - 304p. <http://www.bibliorossica.com/book.html?currBookId=6084>
4. Sipols, O.V. Develop Your Reading Skills: Comprehension and Translation Practice. Teaching reading and translation (English) [electronic resource]: Study guide / Sipols, O.V. - 2nd ed., - M.: Flint: Nauka, 2011. - 376 p. <http://znanium.com/bookread.php?book=409896>

Subjects

Professor	Name	Hours
Arslanova, G.A.	Academic writing (English)	144

Basic disciplines: Organization and management of laboratory				
Term	Duration	Course type	ECTS credit points	Student workload
2	1 term	compulsory	4	144 hours: 38 classroom, 70 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral exam	Lectures, seminars	Sitdikova, G.F.

Learning outcomes

GPC-2 – willingness to lead the team in their professional activities, tolerant perceiving of social, ethnic, religious and cultural differences
 GPC-3 – willingness to use fundamental biological ideas in professional activities for formulating and solving new problems

Contents

Topic 1. Introduction. The concept of a laboratory. 2 lectures / 2 practical / 10 self-study
 Topic 2. Basic principles of layout of laboratory space for different purposes. 4 practical / 10 self-study
 Topic 3. Organization of work in a laboratory. Planning and accounting. 2 lectures / 4 practical / 10 self-study
 Topic 4. Certification of workplaces. Certification of employees. 2 lectures / 4 practical / 10 self-study
 Topic 5. Laboratory accreditation. 2 lectures / 4 practical / 10 self-study
 Topic 6. Apparatus and equipment of a laboratory. 2 lectures / 4 practical / 10 self-study
 Topic 7. Requirements for the organization of laboratories with pathogenic biological agents. 2 lectures / 4 practical / 10 self-study

Literature

Comments of the authorities to the Labour Code of the Russian Federation / Author Verkhovtsev, A.V. – 11th ed., add. - M.: INFRA-M, 2009. - 864 p. <http://znanium.com/bookread.php?Book=174457>
 Reznik, S.D. Introduction to Management: Textbook / Reznik, S.D., Igoshina, I.A.; Ed. prof. Reznik, S.D. – 2nd ed., add. - M.: SIC Infra-M, 2012. - 416 p.: [Http://znanium.com/bookread.php?Book=244308](http://znanium.com/bookread.php?Book=244308)

Subjects		
Professor	Name	Hours
Grigoryan, B.R.	Organization and management of laboratory	144

Basic disciplines: Modern problems of Biology and Ecology				
Term	Duration	Course type	ECTS credit points	Student workload
1	1 term	compulsory	3	108 hours: 28 classroom, 62 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral exam	Lectures, seminars	Sitdikova, G.F.

Learning outcomes

GPC-3 – willingness to use fundamental biological representation in professional activities for formulating and solving new problems

Contents

Topic 1. Philosophical, social and ethical problems of Biology 2 lectures/ 2 seminars / 8 self-study
 Topic 2. Diseases of the century. 2 lectures/ 2 seminars / 8 self-study
 Topic 3. Test system for determining pathological conditions, susceptibility to diseases and sport. 2 lectures/ 2 seminars / 8 self-study
 Topic 4. Cell theory at the present stage of development of Biology 2 lectures/ 2 seminars / 10 self-study
 Topic 5 Global problems of biosphere 2 lectures/ 2 seminars / 10 self-study
 Topic 6 Nanotechnology in Biology and Biomedicine 4 seminars / 10 self-study
 Topic 7. Stem cells. 4 seminars / 8 self-study
 Preparation for exam – 18 hours

Literature

Ruzavin, G.I. Methodology of scientific knowledge [electronic resource]: Study guide for HEIs / Ruzavin, G.I. - Moscow: UNITI-DANA, 2012. - 287 p. - ISBN 978-5-238-00920-9. Access mode: <http://znanium.com/bookread.php?book=392013>

Philosophy of Science. Philosophy of Biology and Medicine: Textbook for Universities / Moiseev, V.I. - M.: GEOTAR Media, 2008. - 560 p. Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785970407240.html>
 Ecological bases of nature: study guide [electronic resource] / Protasov, V.F.. - M.: Alpha-M: INFRA-M, 2010. - 304 p.: ISBN 978-5-98281-202-5. Access mode: <http://znanium.com/bookread.php?book=197844>

Subjects				
Rakhimov, I.I.	Modern problems of Biology and ecology			108
Basic disciplines: History and methodology of Biology				
Term	Duration	Course type	ECTS credit points	Student workload
1	1 term	compulsory	2	72 hours: 28 classroom, 44 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	Lectures, seminars, trainings	Sitdikova, G.F.

Learning outcomes

GPC-5 – ability to apply knowledge of the history and methodology of biological sciences to address fundamental professional goals

Contents

Topic 1. Introduction. An overview of the methodology. The value of the methodology in specific research. 2 lectures / 2 seminars / 6 self-study
 Topic 2. Formation of representations about living nature. 2 lectures / 4 seminars / 8 self-study
 Topic 3. The origin of biological scientific knowledge. 2 lectures / 4 seminars / 10 self-study
 Topic 4. Large biological generalizations in Biology in 19-20 centuries. 2 lectures / 4 seminars / 10 self-study
 Topic 5. The problems of modern Biology. 2 lectures / 4 seminars / 10 self-study

Literature

Ruzavin, G.I. Methodology of scientific knowledge [electronic resource]: Study guide for HEIs / Ruzavin, G.I. - Moscow: UNITI-DANA, 2012. - 287 p. - ISBN 978-5-238-00920-9. Access mode:

<http://znanium.com/bookread.php?book=392013>

Zelenov, L.A. History and philosophy of science [electronic resource]: Study guide for graduate, post-graduate students and applicants / Zelenov, L.A., Vladimirov, A.A., Schurov, V.A. - 2nd ed., A stereotype. - M.: Flint: Nauka, 2011. - 472 p. - Access mode: <http://znanium.com/bookread.php?book=406114>

Mareeva, E.V. Philosophy of Science: Textbook for graduate students and applicants / Mareeva, E.V. Mareev, S.N., Maidanskiy, A.D.; Moscow Academy of Economics and Law. - M.: INFRA-M, 2010. - 333 p. - Access mode: <http://znanium.com/bookread.php?book=190229>

Subjects		
Professor	Name	Hours
Trushin, M.V.	History and methodology of Biology	72

Basic disciplines: Computer technology in Biology				
Term	Duration	Course type	ECTS credit points	Student workload
2	1 term	compulsory	2	72 hours: 24 classroom, 48 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	Practical lessons	Sitdikova, G.F.

Learning outcomes

GPC-7 – willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks

Contents

Topic 1. Programming Languages, characteristic, function, application in Biology. 4 practical / 8 self-study

Topic 2. The programming language Python. 4 practical / 8 self-study

Topic3. Processing data using language R. 4 practical / 8 self-study

Topic 4. From the genome sequence to its function. 4 practical / 8 self-study

Topic 5. Mathematical modeling of metabolic pathways. 4 practical / 8 self-study

Topic 6. Introduction to systems Biology. 4 practical / 8 self-study

Literature		
<p>Hybrid synergy and intelligent systems theory and practice: proceedings of the 1st International Symposium [electronic resource] / edited by .prof. Kolesnikova, A.V. - Kaliningrad: Publishing house BFU named after I. Kant, 2012. – 227p. – Access mode: http://www.bibliorossica.com/book.html?currBookId=6876&ln=ru&search_query=биоинформатика</p> <p>Bratus, A.S. Dynamical systems and models of Biology [electronic resource] / Bratus, A.S., Novozhilov, A.S., Platonov, A.P. - M.: FIZMATLIT, 2010. – Access mode: http://e.lanbook.com/view/book/2119</p> <p>Lesk, A. Introduction to bioinformatics [Text] / Lesko; A. Translation from English under ed. of prof. Mironova, A.A. and prof. Svyadas, V.K. - Moscow: Binom. Knowledge Laboratory, 2009 - 318 p.</p> <p>Letin, A.S., Letina, O.S., Pashkovskiy, I.E. Computer graphics: Textbook [electronic resource] / Letin, A.S., Letina, O.S., Pashkovskiy, I.E.. - M.: Forum, 2007. - 256 p.: ISBN 978-5-91134-143-5. Access mode: http://znanium.com/bookread.php?book=127915</p>		
Subjects		
Professor	Name	Hours
Yakovlev, A.V.	Computer technology in Biology	72

Basic disciplines: Teaching skills: training of professional competencies				
Term	Duration	Course type	ECTS credit points	Student workload
2	1 term	compulsory	2	72 hours: 20 classroom, 52 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	training	Sitdikova, G.F.

Learning outcomes
<p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GC-2 – willingness to act in unusual situations, bear social and ethical responsibility for decisions</p> <p>GC-3 – readiness for self-development, self-realization, use of creativity</p> <p>GPC-1 – willingness to communicate orally and in writing in Russian and foreign languages to meet the challenges of professional activity</p> <p>GPC-2 – willingness to lead the team in their professional activities, tolerant perceiving social,</p>

ethnic, religious and cultural differences

Contents

Topic 1. Self-study: a combination of techniques allowing to determine the level of formation of professionally significant qualities and abilities of a Professor. Methods of study of personality. 4 practical / 12 self-study

Topic 2. Attention, observation, methods of recruitment and retention of students' attention. 4 practical / 10 self-study

Topic 3. Emotions and emotional state. Human behavior in situations of stress, frustration, etc. The emotional and volitional self-regulation. Ways to create the desired emotional states. Emotional and dynamic style of a team. 4 practical / 10 self-study

Topic 4. Elements of theatrical skill in teaching. Mimic and pantomimic expression. Training of perceptual skills. 4 practical / 10 self-study

Topic 5. Culture of speech. Styles of speech. Choose your style of verbal action. Technique of verbal impact. Verbal interaction (conversation, discussion, debate). The skill of pedagogical communication. 4 practical / 10 self-study

Literature

Kravchenko, A.I. Psychology and Pedagogy [electronic resource] / Kravchenko, A.I. - M.: INFRA-M, 2013. - 400 p. Access mode: <http://znanium.com/bookread.php?book=394126>

Ostrovskiy, E.V. Psychology and Pedagogy [electronic resource] / Ostrovskiy, E.V., Chernyshova, L.I. - M.: University textbook: SIC INFRA-M, 2013. - 381 p. Access mode: <http://znanium.com/bookread.php?book=398710>

Subjects

Professor	Name	Hours
Asafova, E.V.	Teaching skills: training of professional competencies	72

The module of professional competencies: Special Workshop: Actual problems of neurophysiology

Term	Duration	Course type	ECTS credit points	Student workload
1 and 2	31 weeks	Main variable	4	62 classroom, 82 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time	Oral pass-fail exam,	Seminars	Lavrov, I.A.

	defense of presentation on the topic		
Learning outcomes			
<p>During the study of discipline / module "Special Workshop: Actual problems of neurophysiology" students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GC-3 – readiness for self-development, self-realization, the use of creativity</p> <p>GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results</p> <p>GPC-5 – ability to apply knowledge of the history and methodology of biological sciences to address the fundamental professional goals</p> <p>PC-2 – ability to plan and implement professional activities (in accordance with the major (profile) of the master's program)</p> <p>PC-9 – ability for proficiency formation of educational material, lecture giving, commitment to teaching in educational institutions of higher education and management of the research work of students, ability to present course material in oral, written and graphic form for various students</p> <p>Special competences: knowledge of basic research in Neurobiology in Russia and world leading centers.</p>			
Contents			
<p>Topic 1. World-leading neurobiological laboratories leading research in key areas of modern neuroscience. Practical lessons – 12 hours, self-study work – 16 hours</p> <p>Topic 2. Research of development and normal functioning of nervous system. Practical lessons – 12 hours, self-study work – 16 hours</p> <p>Topic 3. Recent studies of the nervous system pathology. Workshops – 12 hours, self-study work – 16 hours</p> <p>Topic 4. The creation of artificial neural networks and their modeling. Practical lessons – 12 hours, self-study work – 18 hours</p> <p>Topic 5. Seminar on topics of research of masters students. Practical lessons – 16 hours. Practical lessons – 12 hours, self-study work – 16 hours</p>			
Literature			
<p>Hermann, A. Gasotransmitters: Physiology and Pathophysiology [Text]/A. Herman, G. F. Sitdikova, T. M. Weiger. – Springer, 2012. – 204p. - ISBN: 978-3-642-30337-1 (Print) 978-3-642-30338-8 (Online). Access mode: http://link.springer.com/book/10.1007/978-3-642-30338-8/page/1</p> <p>Minlebaev, M. Cell-attached recordings of responses evoked by photorelease of GABA in the immature cortical neurons [Text]/ M. Minlebaev, G. Valeeva, V. Tcheremiskine, G. Coustillier, R. Khazipov// Front Cell Neurosci. 2013 doi: 10.3389/fncel.2013.00083. Access mode: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3668178/pdf/fncel-07-00083.pdf</p> <p>Yafarova, G.G. Functional state of the motor centers of the spinal cord under its traumatic injury. Monograph. [Text] / Yafarova G.G., Baltina T.V., Pleschinskiy I.N. - Kazan: JSC "New knowledge", 2008. – 68p. - ISBN 978-5-89347-534-0. Access mode: http://kpfu.ru/docs/F344254651/Function_mograpiya.pdf.</p>			

Subjects		
Professor	Name	Hours
Lavrov, I.A.	Special workshop: Actual problems of neurophysiology	144

Variable section

The ontogeny and phylogeny of the nervous system				
Term	Duration	Course type	ECTS credit points	Student workload
1	18 weeks	compulsory	3	108 hours:28 classroom, 62 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time participation	Oral exam	Lectures and practical lessons	Baltina, T.V.

Learning outcomes

During the study of discipline / module "The ontogeny and phylogeny of the nervous system," students acquire the following competencies:

GC-1 - ability for abstract thinking, analysis, synthesis

GC-3 – readiness for self-development, self-realization, the use of creativity

GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

PC-4 - ability to generate new ideas and methodological solutions

Special expertise:

- The ability to creatively use knowledge of fundamental and applied branches of the discipline "The ontogeny and phylogeny of the nervous system" in scientific and technological activities which determine the direction of the graduate program;

- The ability to understand the laws of ontogeny, periodization and performance of critical periods of human molekular aspects of development of the nervous system, the nervous system phylogeny.

Contents

Topic 1. The concept of ontogenesis and age physiology. Theories of ontogeny, the biogenetic law. The periodization of pre- and postnatal ontogenesis. Genetic approaches to understanding of the development process. Antenatal ontogeny. Embryonic period. Fetal period. The physiological changes of functional systems. Development of CNS. Lectures – 2 hours, practical lessons – 3 hours, self-study work – 12 hours

Topic 2. Development in the early period. Formation of neural progenitor cells. The migration of neurons in the CNS. The proteins of the extracellular matrix adhesion. Regional specification of the nervous tissue. Segmentation. Chord and basal plate. The general scheme of regional differentiation. Lectures – 2 hours, practical classes – 4 hours, self-study work – 14 hours

Topic 3. Control of the phenotype of neurons in the PNS. The role of the axon. The innervation of the target cell. Growth factors. Competitive interaction during development. Lectures – 2 hours, practical classes – 4 hours, self-study work – 12 hours

Topic 4. Postnatal ontogenesis. Functional restructuring of early postnatal ontogenesis. Adaptation. Nervous and humoral regulation of functions. The critical periods for the development of higher functions. Lectures – 2 hours, practical classes – 4 hours, self-study work – 12 hours

Topic 5. The development of children and adolescents. Critical periods. Movement. Influence of physical and mental work function. Development of GNI. Features of the EEG in children. Lectures - 2 hours, practical classes - 3: hours, self-study work – 12 hours

Preparation for exams – 18 hours

Literature

Functional and clinical anatomy of the brain: study guide [electronic resource] / Gayvoronskiy I.V., Gayvoronskiy A.I., Baybakov S.E.- St. Petersburg.: SpetsLit, 2010. - 216 p. Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785299004328.html>

Functional anatomy of the central nervous system: the manual [electronic resource] /I.V. Gayvoronskiy, AI Gayvoronskiy. - Publisher: SpetsLit., 2007. - 256 p. Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785299003451.html>

Subjects

Professor	Name	Hours
Baltina, T.V.	The ontogeny and phylogeny of the nervous system	144

Bioethics: problems and prospects

Term	Duration	Course type	ECTS credit points	Student workload
1	1 term	compulsory	2	72 hours:28 classroom, 44 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral pass-fail exam	Lecture Seminar	Eremeev, A.M.

Learning outcomes
<p>During the study of discipline / module "Bioethics: problems and prospects" students acquire the following competencies:</p> <p>GC-3 – readiness for self-development, self-realization, the use of creativity</p> <p>GPC-6 - ability to use basic knowledge of theory of the biosphere, the understanding of modern biospheric processes for systemic assessment of geopolitical events and forecast of the effects of the implementation of social projects</p> <p>PC-5 – willingness to use knowledge of normative documents regulating the organization of the research and production of biological and technological work (according to the major (profile) of the master's program)</p> <p>PC-9 – ability for proficiency formation of educational material, lecture giving, commitment to teaching in educational institutions of higher education and management of the research work of students, ability to present course material in oral, written and graphic form for various students</p> <p>Special competences:</p> <ul style="list-style-type: none"> - Possession of the moral and ethical principles of human interaction with nature and understanding of the legal aspects of bioethics - The ability to use bioethical principles in experimental studies
Contents
<p>Topic 1. Principles of ethical treatment of animals. Lectures – 2 hours, practical classes – 2 hours, self-study work – 4 hours</p> <p>Topic 2. Bioethics in various philosophies. Lectures – 2 hours, practical classes – 2 hours, self-study work - 4 hours</p> <p>Topic 3. Religion and animals. Lectures – 2 hours, practical classes – 2 hours, self-study work – 4 hours</p> <p>Topic 4. Biomedical ethics. Lectures – 2 hours, practical classes – 2 hours, self-study work – 4 hours</p> <p>Topic 5. The main directions of bioethical debate in the medical field. Lectures – 2 hours, practical classes – 2 hours, self-study work – 4 hours</p> <p>Topic 6. Bioethical issues in the context of the rapid development of biotechnology. Practical lessons – 2 hours, self-study work – 4 hours</p> <p>Topic 7. The implementation of bioethical principles in the research activities of Biology: from theory to practice. Practical lessons – 2 hours, self-study work – 4 hours</p> <p>Topic 8. Laboratory experimentation (scientific and educational experiment). Practical lessons – 2 hours, self-study work – 4 hours</p> <p>Topic 9. The legal and socio-cultural issues of bioethics. Practical lessons – 2 hours, self-study work – 4 hours</p> <p>Topic 10. Regulations related to bioethical issues in accordance with the Russian law. Self-study work – 8 hours</p>
Literature
<p>MAIN LITERATURE</p> <p>1. Lopatin, P.V. Bioethics: textbook, 4th ed., Rev. and add. [Text] / P.V. Lopatin, O.V. Kartashova; ed. by P.V. Lopatin. - Moscow: GEOTAR Media, 2011. - 269 p. 30 copies.</p> <p>2. Bioethics: textbook. Lopatin, P.V., Kartashova, O.V. / Ed. by P.V. Lopatin. 4th ed., Rev. and add. 2011. - 272 p. http://www.studmedlib.ru/ru/book/ISBN9785970417690.html ELS 'student adviser "</p>

3. Shamov, I.A. Bioethics. Ethical and legal documents, regulations: study guide on ethical and legal documents and regulations [electronic resource] / I. A. Shamov, S.A. Abusuev. - M.: GEOTAR Media, 2014. – 357p. - Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785970429754.html> EBS "student adviser "

4. Nezhmetdinova, F.T. Bioethical issues in the context of liberalization and humanization of education [electronic resource] / F.T. Nezhmetdinova. Access mode: <http://z3950.ksu.ru/phil/0708132/080-083.pdf>>

ADDITIONAL LITERATURE

1. Lukyanov, A.S. Bioethics with the basics of biolaw. Publishing house Scientific World, 2008, 360 p.

2. Khrustalev, Yu.M. Bioethics. The philosophy of preservation of life and health savings: textbook. Khrustalev Yu.M. 2013. - 400 p. <http://www.studmedlib.ru/ru/book/ISBN9785970426272>

3. Public morality: philosophical, legal, ethical and practical problems / RAS Institute of Philosophy; Ed. by R.G. Apresian. - M.: Alpha-M, 2009. - 494 p.: Access mode: <http://www.znaniium.com/catalog.php?bookinfo=186242> EBS "Znaniium"

4. Workbooks on Bioethics. Vol. 1: Bioethics: anthropological problem: collection of scientific articles / ed. by B.G. Yudin. - M.: Publishing house: University Press, 2006.

Subjects		
Professor	Name	Hours
Eremeev, A.M.	Bioethics – problems and prospects	72

Course name: Psychophysiology				
Term	Duration	Course type	ECTS credit points	Student workload
2	72 hours	Variable section	3	30 hours - classroom, 42 часа - self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral exam	Lecture, seminar, discussion, practical lesson, trainings	Rosental, S.G.

Learning outcomes

During the study of discipline / module "Psychophysiology" students acquire the following competencies:

GK-1 – ability for abstract thinking, analysis, synthesis

GPC-8 – ability to use philosophical concepts of natural science for the formation of scientific outlook

PC-1 – ability to creatively use knowledge of basic and applied sections of disciplines (modules) in scientific and technological activities which determine the major (profile) of the master's program

PC-9 – ability for proficiency formation of educational material, lecture giving, commitment to teaching in educational institutions of higher education and management of the research work of students, ability to present course material in oral, written and graphic form for various students

Special competences:

- Possession of knowledge about main neurophysiological mechanisms of human mental functions
- The ability to apply basic modern methods of investigation of human (EEG, GSR, etc.) and analyze the results of experiments.

Contents

Topic 1. The object and purpose of psychophysiology. Lectures – 2 hours, self-study work – 5 hours

Topic 2. Psychophysiology of functional states. Lectures – 2 hours, practical classes – 2 hours, self-study work – 5 hours

Topic 3. Psychophysiology of emotions and needs. Lectures – 2 hours, practical classes – 2 hours, self-study work – 5 hours

Topic 4. Psychophysiology of perception. Lectures – 2 hours, practical classes – 2 hours, self-study work – 5 hours

Topic 5. Psychophysiology of attention. Lectures – 2 hours, practical classes – 4 hours, self-study work – 5 hours

Topic 6. Psychophysiology of memory. Practical exercises – 4 hours, self-study work – 5 hours

Topic 7. Psychophysiology of speech processes. Practical classes – 2 hours, self-study work – 5 hours

Topic 8. Basic methods of psychophysiological studies. Practical classes – 4 hours, self-study work – 7 hours

Literature

Danilova, N.N. Psychophysiology: textbook for university students in areas and specialties of psychology. - M: Aspect Press, 2004- 367 p.

Alexandrova, Yu.I. Psychophysiology: textbook for university students enrolled in the major 521000 "Psychology" and specialties 020400 "Psychology", 022 700 "Clinical Psychology" / ed. by doctor of psychological sciences, prof. Yu.I. Alexandrova. - 3rd ed., Add. and rev. - St. Petersburg [et al.]: Peter, 2008. - 463 p.

Cherenkova, L.V. Psychophysiology in diagrams and comments, St. Petersburg: Peter, 2006. - 236 p.

Nikolaeva, E.I. Psychophysiology. Psychological physiology with the basics of physiological psychology. Textbook http://www.bibliorossica.com/book.html?search_query=

Subjects

Professor	Name	Hours
Rosental, S.G.	Psychophysiology	72

Course name: Plasticity of the nervous system				
Term	Duration	Course type	ECTS credit points	Student workload
3	1 term	Basic variable	4	48 classroom, 96 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral pass-fail exam, defense of presentation on the topic	Lectures, seminars	Khazipov, R.N.

Learning outcomes

During the study of discipline / module "Plasticity of the nervous system," students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

PC-3 – ability to apply methodological principles of design, implementation of field and laboratory biological and environmental studies, use modern equipment and computer systems (according to the major (profile) of the master's program)

Special competences:

- The ability to creatively use knowledge of fundamental and applied branches of the discipline "The plasticity of the nervous system" in scientific and technological activities

Contents

Topic 1. The concept of brain plasticity, the influence of learning or damage. Lectures – 3 hours, practical classes – 5 hours, self-study work – 16 hours

Topic 2. The mechanisms responsible for the plasticity, regeneration. Lectures – 3 hours, practical classes – 5 hours, self-study work – 16 hours

Topic 3. Plasticity levels: macro and micro level. Lectures – 3 hours, practical classes – 5 hours, self-study work – 16 hours

Topic 4. The network structure of the brain. Lectures - 3 hours, practical classes – 5 hours, self-study work – 16 hours

Topic 5. The molecular changes in neurons and synapses. Lectures – 3 hours, practical classes – 5 hours, self-study work – 16 hours

Topic 6. Prospects for the regeneration of brain research. Lectures – 5 hours, practical classes - 3 hours, self-study work – 16 hours

Literature		
Subjects		
Professor	Name	Hours
Khazipov, R.N., Lavrov, I.A.	The plasticity of the nervous system	144

Course: Neurobiology of learning and memory				
Term	Duration	Course type	ECTS credit points	Student workload
3	1 term	optional	4	42 classroom/84 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time participation	Oral exam	Lectures, seminars, practical lessons	Gaynutdinov, Kh.L.

Learning outcomes
<p>During the study of discipline / module "Neurobiology of learning and memory," students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-7 - willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks</p> <p>PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program</p> <p>Special expertise:</p> <ul style="list-style-type: none"> - Knowledge of the signaling pathways from receptors and mechanisms of amplification of these signals, the types of receptors and receptor conjugation mechanisms with effector molecules producing secondary messengers, types of effector molecules, mechanisms and functions of messenger synthesis. - The ability to apply knowledge of the cellular mechanisms of learning and plasticity, general-professional disciplines to explain the basic ways of adapting to the habitat of animals and the formation of long-term memory - The willingness to use search skills of convenient model for studying the mechanisms of

learning, and in division of sensory, motor and command neurons

Contents

Topic 1. The evolution of storage. Classification of forms of behavior. Natural selection and behavior. Lectures – 3 hours, practical classes – 5 hours, self-study work – 16 hours

Topic 2. Congenital and acquired behavior. Associative behavior change. Cognitive forms of learning. Memory as a process. Types of memory. The consolidation of memory. Reconsolidation in the reactivation of memory and learning. Lectures – 3 hours, practical classes – 5 hours, self-study work – 16 hours

Topic 3. Nervous system and behavior. Objectives of cell approach. Model objects. The neural organization of behavior. Sensory modalities and motor system. Team and modulator elements as a way to control the modulation of defensive behavior. Lectures – 3 hours, practical classes – 6 hours, self-study work – 16 hours

Topic 4. The neural electrophysiological analogues or training. Post-tetanic potentiation and heterosynaptic relief as cellular analogues of learning and memory, the role of calcium and cyclic nucleotides in their formation. Long-term potentiation in hippocampal slices. Sensitization and development of conditioned reflexes. Changes in functional characteristics of the sensory, motor, command and modulatory neurons during training. Long-term depolarization and increased excitability of the neuron – like the initial components of the elaboration of a conditioned reflex. Burst neuron activity and duration of action of potential basic mechanisms of plasticity at the level of neural networks. Lectures – 3 hours, practical classes – 6 hours, self-study work – 18 hours

Topic 5. Short and long-term memory. Declarative and procedural memory. Features of memory in children. Cellular Neurobiology and abnormal behavior. Lectures – 2 hours, practical classes – 6 hours, self-study work – 18 hours

Literature

Gaynutdinov, Kh.L. The mechanisms of learning and memory formation (tutorial) [Text] / Kh.L. Gaynutdinov, T.Kh.Bogodvid. - Kazan LLC "Intayp", 2013. - 113 p.

Shulgovskiy, V.V. Physiology of higher nervous activity with the fundamentals of Neurobiology [Text] / V.V. Shulgovskiy - M: ASADEMA. 2003 - 15 pp

Yakovleva, O.V. Physiology of excitable systems [Text] / O.V. Yakovleva, G.F. Sitdikova, R.N. Khazipov, A.V. Yakovlev. – Kazan: Kazan University. 2011 – 4.5 pp

Gerasimova, E.V. Physiology of the nervous system [Text] / E.V. Gerasimova, R.N. Khazipov, G.F. Sitdikova. – Kazan: Kazan University. 2012 - 4.37 pp

Bogodvid, T.Kh. Membrane mechanisms of associative learning in snail (monograph) [Text] / T.Kh. Bogodvid, V.V. Andrianov, Kh.L. Gaynutdinov. – Kazan LLC "Veda", 2012. - 80 p.

Pleschinskiy, I.N. Zoopsychology and comparative psychology [Text] / I.N. Pleschinskiy, N.V. Zvyozdochkina – Kazan: RRC "School", 2009. - 9 pp

Subjects

Professor	Name	Hours
Gaynutdinov, Kh.L.	Neurobiology of learning and memory	108

Course name: Special workshop: Modern methods of neurophysiology / Module variable section				
Term	Duration	Course type	ECTS credit points	Student workload
3	1 term	compulsory	3	38/70
Participation requirements		Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time		Pass-fail exam	Lectures, laboratory works	Lavrov, I.A.
Learning outcomes				
<p>During the study of discipline / module "Special Workshop: modern methods of neurophysiology / module variable section" students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results</p> <p>GPC-7 - willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks</p> <p>PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program</p> <p>PC-7 – ability to lead a team of workers, ensure production safety measures</p> <p>Special competences:</p> <p>- The ability to formulate new problems arising in the course of the study; selection, study and development of techniques in accordance with the set goal; development of new theories, models, research methods, developing new methodological approaches</p>				
Contents				
<p>Topic 1. Magnetoencephalography (MEG). Lectures – 2 hours, practical classes – 4 hours, self-study work – 12 hours</p> <p>Topic 2. Doppler sonography. Lectures – 2 hours, practical classes – 4 hours, self-study work – 12 hours</p> <p>Topic 3. Computed tomography of the brain (CT). Lectures – 1 hour practical classes – 6 hours, self-study work – 12 hours</p> <p>Topic 4. Positron emission tomography (PET). Lectures – 1 hour, practical classes – 4 hours, self-study work – 12 hours</p> <p>Topic 5. The nuclear – magnetic resonance (NMR) imaging of the brain (scanners based on the effect of nuclear magnetic resonance). Lectures – 2 hours, practical classes – 4 hours, self-study work – 12 hours</p> <p>Topic 6. Functional magnetic resonance scan. Lectures – 2 hours, practical classes – 6 hours, self-study work – 10 hours</p>				

Literature
<p>The Axon Guide / A guide to electrophysiology and biophysics laboratory techniques. Address: www.student.ulb.ac.be/~dgall/Axon_Guide.pdf</p> <p>Physiology of the central nervous system, Smirnov, V.M.; Sveshnikov, D.S.; Yakovlev, V.N., 2006.</p> <p>Jan Bures and Olga Bureshova. Joseph P.Hyuston. Techniques and basic experiments on the brain and behavior. Moscow, "High School", 1991.</p>

Subjects		
Professor	Name	Hours
Lavrov, I.A.	Special Workshop: modern methods of neurophysiology	108

Course name: Methods of electrophysiology / Module: Cellular Neurobiology				
Term	Duration	Course type	ECTS credit points	Student workload
2	1 term	optional	2	22/50
Participation requirements		Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time		Pass-fail exam	Lectures, laboratory works	Sitdikova, G.F.
Learning outcomes				
<p>During the study of discipline / module "Methods of electrophysiology," students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-3 – willingness to use fundamental biological representation in professional activities for formulating and solving new problems</p> <p>GPC-7 - willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks</p> <p>PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program</p> <p>PC-4 - ability to generate new ideas and methodological solutions</p> <p>Special expertise:</p> <ul style="list-style-type: none"> - The ability to carry out the registration of the electrical characteristics of nerve cells to navigate the modern electrophysiological methods, including the method of fixation of potential - The ability of a critical evaluation of the results of research; processing, critical analysis of the data; preparation and publication of reports, patents, articles 				

Contents
<p>Topic 1. Introduction to electrophysiology. Introducing the microelectrode device installation. Lectures. Basics of electrophysiology, basic concepts. Physical principles of electrophysiology. Schematic diagrams. Lectures – 2 hours, practical classes – 2 hours, self-study work – 8 hours</p> <p>Topic 2. The resting potential and action excitable cells. Nerve impulses. Cable properties of the nerve fiber. Methods of registration. Optical method registration of building cells. Processing and analysis of signals in the registration of the single channels. Lectures – 2 hours, practical classes – 2 hours, self-study work – 8 hours</p> <p>Topic 3. Microelectrodes. The properties and the physical basis of registration with the help of microelectrodes. Extracellular recording of neuronal activity. The structure of the hippocampus. Network activity of the hippocampus. Lectures – 2 hours, practical classes – 2 hours, self-study work – 8 hours</p> <p>Topic 4. Chemical and electrical synapses. Classification of synapses. The structure and properties of the receptor. Preparation of brain slices. Thalamic-cortical slices, electrophysiological properties of neurons in the ventral thalamus. The horizontal sections. Lectures – 2 hours, practical classes – 2 hours, self-study work – 8 hours</p> <p>Topic 5. Date of the extracellular activity of the brain. Electrophysiological recordings of single cells. Lectures. Lectures – 2 hours, practical classes – 2 hours, self-study work – 8 hours</p> <p>Topic 6. The method of recording patch clamp (configuration, principles). Registration of single channels. Laboratory work: registration of synaptic activity of hippocampal neurons. Examples of configurations for patch clamp method. Registration of NMDA channels. Processing and analysis of signal detection of single channels. Practical lessons – 2 hours, self-study work – 10 hours</p>
Literature
<p>The Axon Guide/ A guide to electrophysiology and biophysics laboratory techniques. Address: www.student.ulb.ac.be/~dgall/Axon_Guide.pdf</p> <p>Ion channels in excitable cells (structure, function, pathology) / A.L. Zefirov, G.F. Sitdikova; State educational institution of higher prof. education "Kazan State Univ." State educ. Institution of higher prof. education "Kazan State Univ."? Kazan: [Art Cafe], 2010? 271p.: image.; 21.? Bibliogr.: p. 228-271 (541 references.) 500.</p> <p>Physiology and molecular Biology of cell membranes, Kamkin, A.G.; Kiseleva, I.S., 2008.</p> <p>Physiology of the central nervous system, Smirnov, V.M.; Sveshnikov, D.S.; Yakovlev, V.N., 2006.</p>

Subjects		
Professor	Name	Hours
Yakovlev, A.V.	Methods of electrophysiology	72

Course name: Ion channels: structure and function / module Cellular Neurobiology				
Term	Duration	Course type	ECTS credit points	Student workload
2		optional	3	(Hours) classroom - 22, self-study - 50

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time	Oral exam	Lectures, seminars	Sitdikova, G.F.

Learning outcomes

During the study of discipline / module "Ion channels: structure and function," students acquire the following competencies:

OK-3 – readiness for self-development, self-realization, use of creativity

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program

Special competences:

- Understanding of the molecular bases of the structure of ion channels and their roles in the generation of an excitation, abbreviations, intercellular signaling, perception of sensory stimuli,
- Knowledge of the pathophysiological mechanisms associated with disruption of the structure and function of ion channels and leading to human and animal diseases

Contents

Topic 1. General principles of structure and function of ion channels. Classification. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 2. Methods for studying ion channels. Lectures – 2. Practical lessons – 4. Self-study work – 10.

Topic 3. Features of the structure and operation of various ion channels. Ion channels and intercellular signaling. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 4. Ion channels and perception of sensory stimuli. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 5. Disorders of ion channel dysfunction and dysregulation pathology. Channelopathies. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Literature

1. Zefirov, A.L., Sitdikova, G.F. Ion channels of excitable cells (structure, function, pathology) / monograph Kazan: Art Cafe, 2010 270p

Pathophysiology: textbook: in 2 volumes. [Electronic resource] / edited. by V.V. Novitskiy, E.D.

Goldberg, O.I. Urazova. 4th ed., Rev. and add. 2013. - 640 p. Access mode:
 Vol.1: <http://www.studmedlib.ru/ru/book/ISBN9785970426579.html> Vol.2:
<http://www.studentlibrary.ru/doc/ISBN9785970426586-0009.html>
 Basic and clinical physiology // ed by A. Kamkin and A. Kamenskiy, Publishing Academy, 2004
 Nichols J.G., Martin A., Wallace B.J., Fuchs P.A. From neurons to the brain. Moscow: Publishing House of the scientific and academic literature, 2003, 672 p.
 Sitdikova, G.F., Yakovlev, A.V. Ion channels of the nerve ending, Kazan 2005 (Tutorial)
 Modern classical physiology course (selected lectures) with the application on the CD-ROM. [Electronic resource] / Ed. by Yu.V. Natochin, V.A. Tkachuk. - M.: GEOTAR Media. 2007. - 384 p. Access mode:
<http://www.studentlibrary.ru/doc/ISBN9785970404959-0011.html>
 Sitdikova, G.F. Structure and function of ion channels in excitable cells: Textbook [Text] / G.F. Sitdikova, R.N. Khazipov, A. Hermann. – Kazan: Kazan University, 2011. - 95 p. Access mode:
<http://kpfu.ru/docs/F1752605902/Ion%20channel.pdf>
 Zefirov, A.L., Sitdikova, G.F. Channelopathies // Chapter 5 in the book "Disregulation pathology of the nervous system", ed. by acad. of RAMS E.I. Guseva and acad. of RAMN G.N. Kryzhanovsky, M: Medical Information Agency, 2009, pp 275-323.
 5. Physiology and molecular Biology of cell membranes: textbook for medical students [Text] / A.G. Kamkin, I.S. Kiselyov. – Moscow: Academy, 2008. - 584 p.
 Internet resources
<http://www.xumuk.ru/biochem/>
<http://www.biochemistry.ru>
<http://medbiol.ru/medbiol>
http://yanko.lib.ru/books/biolog/nagl_biochem/

Subjects

Professor	Name	Hours
Sitdikova, G.F.	Ion channels: structure and function	72

Course: intracellular signaling / module Cellular Neurobiology

Term	Duration	Course type	ECTS credit points	Student workload
3	1 term	optional	3	38/70

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time participation	Pass-fail exam	Lectures, seminars, practical lessons	Sitdikova, G.F.

Learning outcomes

During the study of discipline / module "intracellular signaling" students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program

Special competences:

- The ability to understand the signaling pathway with receptors and mechanisms of amplification of these signals, the types of receptors and receptor mechanisms conjugation to effector molecules producing secondary messengers, types of effector molecules, mechanisms and functions of messenger synthesis.
- Ability to apply knowledge of mathematical and natural sciences and general-professional disciplines to explain the mechanisms generating membrane potentials
- The ability to operate theoretical knowledge about the molecular mechanisms of cell functioning and practical skills to study the intracellular signaling systems in living tissues

Contents

Topic 1. Extracellular signals, primary messengers that trigger intracellular signaling processes (hormones, cytokines, growth factors, neurotransmitters, pheromones, purines). Lectures – 2. Practical lessons – 4. Self-study work – 14.

Topic 2. Structural and functional organization of membrane receptors. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Topic 3. The effector molecule. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Topic 4. Adenylate cyclase pathway information. System of guanylate cyclase. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Topic 5. Mechanisms of calcium signaling in cells. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Literature

Zefirov, A.L. Ion channels in excitable cells [Text] / A.L. Zefirov, G.F. Sitdikova. – Kazan LLC "IC Art Cafe", 2010. – 272p

Sitdikova, G.F. Structure and function of ion channels in excitable cells: Textbook [Text] / G.F. Sitdikova, R.N. Khazipov, A. Hermann. – Kazan: Kazan University, 2011 – 95p.

Yakovlev, A.V. Adenylate cyclase and guanylate cyclase of intracellular second messengers. Training handbook [Text] / A.V. Yakovlev, O.V. Yakovleva, G.F. Sitdikova. – Kazan: KGU, 2010. – 48p.

Kamkin, A.G. Physiology and molecular Biology of cell membranes: textbook for medical students [Text] / A.G. Kamkin, I.S. Kiselyova. – Moscow: Academy, 2008. - 584 p.

Konichev, A.S. Molecular Biology: textbook for university students enrolled in the specialty 032400 "Biology", 2nd ed., Rev. [Text] / A.S. Konichev, G.A. Sevastyanova. - Moscow: Academy, 2005. - 396 p.

Subjects		
Professor	Name	Hours
Gerasimova, E.V.	Intracellular signaling	108

Course name: Neurobiology of pain / Module: Cellular Neurobiology				
Term	Duration	Course type	ECTS credit points	Student workload
3	1	optional	3	38/70
Participation requirements		Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time		Pass-fail exam	Lectures, seminars, practical lessons	Giniatullin, R.A.

Learning outcomes

During the study of discipline / module "Neurobiology of Pain" students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

GPC-7 – willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program

Special competences:

- Knowledge of the biological significance of pain, the basic mechanisms for the generation of pain (nociceptive), signaling pathways of peripheral neurons in the cortical representation of nociception, pruritus, and the mechanisms for detecting temperature changes

- The ability to navigate the modern methods of research of pain, temperature sensation and itching

Contents

Topic 1. The biological significance of pain, genetic basis. Lectures – 2. Practical lessons 2. - 4. Self-study work - 14.

Topic 2. The basic mechanisms for the generation of pain (nociceptive) in peripheral neurons, and direct algogeny transducing pain signals. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Topic 3. Ways of transmission of signals from peripheral neurons in the cortical representation

of nociception. Lectures – 2. Practical lessons – 6. Self-study work – 14.
 Topic 4. Mechanisms of pruritus. Thermal sensitivity. Chronic pain and migraine. Lectures – 2. Practical lessons – 6. Self-study work – 14.
 Topic 5. Modern analgesia. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Literature

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 Nicholls, J.G., Martin, A. R., Wallace, B.J., Fuchs, P.A. From neurons to the brain. Translated from the fourth English edition, edited by P.M. Balaban and R.A. Giniatullin. Moscow, 2003
 Neurophysiological mechanisms of migraine and new principles of pathogenetic treatment. Giniatullin, R. A. Kazan Medical Journal number 5 / volume 92/2011
 Woolf, C.J., Ma Q. Nociceptors – noxious stimulus detectors. Neuron. 2007 Aug 2; 55 (3): 353-64.

Subjects

Professor	Name	Hours
Giniatullin, R.A.	Neurobiology of pain	108

Elective courses: Neurochemistry / Module Neurobiology cell

Term	Duration	Course type	ECTS credit points	Student workload
2	Term	optional	4	(Hours) classroom – 48, self-study - 78
Participation requirements		Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Full-time		Oral exam	Lectures, seminars	Sitdikova, G.F.

Learning outcomes

During the study of discipline / module "Neurochemistry" students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific

and technological activities of which determine the major (profile) of the master's program
PC-9 – ability for proficiency formation of educational material, lecture giving, commitment to teaching in educational institutions of higher education and management of the research work of students, ability to present course material in oral, written and graphic form for various students

Special competences:

- Knowledge of basic theoretical concepts and methodological procedures that are used in modern neurochemistry
- The ability to use the basic theories, concepts and principles of neurochemistry in the chosen field of activity

Contents

Topic 1. Goals and objectives of neurochemistry. Lectures – 2. Practical lessons – 2. Self-study work – 7.

Topic 2. The structure of the neuron, glia, hematoencephalic barrier. Lectures – 2. Practical lessons – 2. Self-study work – 7.

Topic 3. Features of the structure of neuronal membranes. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 4. The electrical processes in living tissues. Lectures – 2. Practical lessons – 4. Self-study work – 8.

Topic 5. Transportation systems of membranes. Mechanisms of generation of the resting potential and action potential. Lectures – 2. Practical lessons – 4. Self-study work – 8.

Topic 6. Electrical and chemical synapses. Lectures – 2. Practical lessons – 4. Self-study work – 8.

Topic 7. The general scheme of biochemical processes run by neurotransmitters. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 8. Way of synthesis of neurotransmitters. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 9. Neuropeptide. Neuromodulators. Lectures – 2. Practical lessons – 4. Self-study work – 8.

Topic 10. Neurochemical basis of brain pathology. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Literature

1. Pathophysiology: textbook: in 2 volumes. [Electronic resource] / edited by V.V. Novitskiy, E.D. Goldberg, O.I. Urazova. 4th ed., Rev. and add. 2013. - 640 p. Access mode:

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2. Modern classical physiology course (selected lectures) with the application on the CD-ROM. [Electronic resource] / Ed. by Yu.V. Natochin, V.A. Tkachuk. - M.: GEOTAR Media. 2007. - 384 p. Access mode: <http://www.studentlibrary.ru/doc/ISBN9785970404959-0011.html>

3. Sitdikova, G.F. Structure and function of ion channels in excitable cells: Textbook [Text] / G.F. Sitdikova, R.N. Khazipov, A. Hermann. – Kazan: Kazan University, 2011. - 95 p. Access mode: <http://kpfu.ru/docs/F1752605902/Ion%20channel.pdf>

4. Yakovlev, A.V. Adenylate cyclase and guanylate cyclase of intracellular second messengers. Training handbook [Text] / A.V. Yakovlev, O.V. Yakovleva, G.F. Sitdikova. – Kazan: KGU, 2010. – 48p. <http://kpfu.ru/docs/F694373/metodichka.071209.AY.pdf>

5. Physiology and molecular Biology of cell membranes: textbook for medical students [Text] / A.G. Kamkin, I.S. Kiselyova. – Moscow: Academy, 2008. - 584 p.

6. Basic neurochemistry: Molecular, cellular and medical aspects. Ed. by G.J.Siegel. Elsevier Academy press, .2006, 992 p
7. Ashmarin, I.P., Eshchenko, N.D., Karazeeva, E.P. Neurochemistry in tables and diagrams. M.: Examination, 2006, 143 p.
8. Eshchenko, N.D. Biochemistry of mental and nervous diseases. SPbUE Publishing House, 2004, 198 p.
9. Nichols, J.H., Martin A.R., Wallace, B.J., Fuchs, P.A. From neurons to the brain. Moscow: Publishing House of scientific and academic of literature, 2003, 672 p.

Subjects		
Professor	Name	Hours
Sitdikova, G.F.	Neurochemistry	144

Elective courses: Module System Neuroscience

Course: Methods of electrophysiology / Elective courses / Module: System Neuroscience				
Term	Duration	Course type	ECTS credit points	Student workload
2	1 term	(optional)	2	(22) classroom, (50)self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral pass-fail exam	Practical lessons, lectures	Eremeev, A.M.

Learning outcomes
<p>During the study of discipline / module "Methods of electrophysiology," students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results</p> <p>GPC-7 – willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks</p> <p>PC-3 – ability to apply methodological principles of design, implementation of field and</p>

laboratory biological and environmental studies, use modern equipment and computer systems (according to the major (profile) of the master's program)

PC-6 – ability to lead a team of workers, ensure production safety measures

Special expertise:

- Knowledge of the theoretical foundations of various electrophysiological methods (electroneuromyography, electroencephalography, electrocardiography, electroreography) and methods of processing the data obtained using the above methods
- Willingness to use bioethical norms of application of electrophysiological methods in the examination of man and when working with animals

Contents

Topic 1. Safety precautions when working with electrical equipment. Lectures – 2. Self-study work – 10.

Topic 2. Methods of registration of the heart. Lectures – 2. Laboratory work – 4. Self-study work – 12.

Topic 3. Electroneuromyography: global or interference, the needle (the potentials of individual motor units) Stimulation (M and H responses, F-wave). Lectures – 2. Laboratory work – 4. Self-study work – 14.

Topic 4. Electroencephalography, magnetic encephalography. Lectures – 2. Laboratory work – 4. Self-study work – 14.

Literature

BASIC LITERATURE

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Basic and clinical physiology: study guide for university students of higher med. institutions and biol. faculties, students majoring in "Physiology" [Text] / K. Bauer, R. Byrne, D.J. Cook et al. ; ed. by A.G. Kamkin, A.A. Kamenskiy. - M. Academy, 2004.- 1072 p. - ISBN 5-7695-1675-5. 25 copies.

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Kogan, A.B. Technics of physiological experiment / A.B. Kogan, S.I. Schitov. - M.: Higher scgool, 1967.-796p. 1 copy.

Pearson, R.S. Electromyography in studies of human / R.S. Pearson. Moscow: Science, 1969-231p. 4 copies

Spinal muscular contraction mechanisms of control / R.S. Pearson; Ed. by A.I. Shapovalov.- Moscow: Nauka, 1985.- 184 p. 2 copies.

Online resources: http://elibrary.ru/title_about.asp?id=7680

<http://studentam.net/content/view/854/113/>

Subjects		
Professor	Name	Hours
Eremeev, A.M.	Methods of electrophysiology	72

Course name: Motion Control / module – System Neuroscience				
Term	Duration	Course type	ECTS credit points	Student workload
2	1 term	optional	3	22/86

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	Lecture, seminar	Yafarova, G.G.

Learning outcomes
<p>During the study of discipline / module "Motion Control" students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results</p> <p>GPC-7 – willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks</p> <p>PC-3 – ability to apply methodological principles of design, implementation of field and laboratory biological and environmental studies, use modern equipment and computer systems (according to the major (profile) of the master's program)</p> <p>Special competences:</p> <p>- The ability to understand the physiological mechanisms underlying the control of movements,</p>

navigate the current understanding of the construction of the hierarchy in the nervous system
- Know the efferent function of various parts of the nervous system

Contents

Topic 1. The central nervous system and neuronal processes, enabling the movement. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 2. The cellular mechanisms of excitation of neurons and muscle cells. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 3. Transfer of excitation from cell to cell and reduction of mechanisms of muscle cells. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 4. Reflex organization of the nervous system at its various levels with traffic management and control theory of motion. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 5. Methodological approaches to assessment of the central and peripheral structures for the movement. Lectures – 2. Practical lessons – 4. Self-study work – 10.

Literature

Shmidt, Thews. Human and animal physiology in three volumes, 1996 - 10 copies.

Smirnov, V.M. Physiology of the central nervous system [Text] / V.M. Smirnov, D.S. Sveshnikov, V.N. Yakovlev. - M.: Academy, 2006. - 367 S.-ISBN 5-7695-3199-1.

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Subjects

Professor	Name	Hours
Yafarova, G.G.	Motion control	108

Course name: Neuroendocrinology / module – System Neuroscience

Term	Duration	Course type	ECTS credit points	Student workload
3	1 term	optional	3	38/70

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	Lecture, seminar	Eremeev, A.M.

Learning outcomes		
<p>During the study of discipline / module "Neuroendocrinology" students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results</p> <p>PC-3 – ability to apply methodological principles of design, implementation of field and laboratory biological and environmental studies, use modern equipment and computer systems (according to the major (profile) of the master's program)</p> <p>PC-9 – ability for proficiency formation of educational material, lecture giving, commitment to teaching in educational institutions of higher education and management of the research work of students, ability to present course material in oral, written and graphic form for various students</p> <p>Special competences:</p> <ul style="list-style-type: none"> - The ability to understand the biochemical mechanisms underlying the activity of the endocrine glands - The ability to navigate the current understanding of the biochemical mechanisms of action of hormones 		
Contents		
<p>Topic 1. Neuroendocrinology as the science of endocrine glands, hormones and hormonal control. Lectures – 2. Practical lessons – 4. Self-study work – 14.</p> <p>Topic 2. The endocrine glands and their hormones. Lectures – 2. Practical lessons – 4. Self-study work – 14..</p> <p>Topic 3. Hypothalamus and pituitary and their interaction. Lectures – 2. Practical lessons – 4. Self-study work – 14..</p> <p>Topic 4. The hormones of the gastrointestinal tract. Lectures – 2. Practical lessons – 4. Self-study work – 14.</p> <p>Topic 5. Hormonal regulation of carbohydrate and fat metabolism. Lectures – 2. Practical lessons – 4. Self-study work – 14.</p>		
Literature		
<p>Shmidt, Thews. Human and animal physiology in three volumes, 1996 - 10 copies.</p> <p>Tepperen, J, Teppermen, H. Physiology of metabolism and the endocrine system. Introductory course: Moscow World 1989 656p. - 25 copies</p> <p>Rosen, V.B. Fundamentals of endocrinology. Higher school: Moscow. Rk. 1984 336p. - 10 copies</p> <p>Blagosklonnaya, Ya.V. et al. Endocrinology SpetsLit 2004 - 20 copies</p> <p>Endocrinology. University textbook Dedov / Melnichenko / Fadeev 2007 15 pc</p>		
Subjects		
Professor	Name	Hours
Yakovlev, A.V.	Neuroendocrinology	108

Course name Physiology of adaptations / elective / Systems Neurobiology				
Term	Duration	Course type	ECTS credit points	Student workload
3		optional	3	(38) classroom, (70) self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
	Pass-fail exam	lectures, seminars	Zvezdochkina, N.V.

Learning outcomes

During the study of discipline / module "Physiology of adaptations" students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

GPC-6 - ability to use basic knowledge of theory of the biosphere, understanding of modern biospheric processes for systemic assessment of geopolitical events and forecast of the effects of the implementation of social projects

PC-3 – ability to apply methodological principles of design, implementation of field and laboratory biological and environmental studies, use modern equipment and computer systems (according to the major (profile) of the master's program)

PC-8 – ability to plan and carry out activities to assess the status and protection of the environment, organize activities of the environmental management, evaluation and rehabilitation of bioresources

Special competences:

- Know the classification of the main forms of adaptation to the environment and understand the basic adaptation mechanisms for homeostasis in the body

- The ability to explore the functional state of the body in different environments and the development of methods to ensure the effectiveness of adaptation to different influences.

Contents

Topic 1. History of ideas about adaptation to a changing environment. Theory of adaptation. Lectures – 2. Practical lessons – 4. Self-study work – 14.

Topic 2. Adaptogenic factors. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Topic 3. Adaptation to hypomobility, psychological stress. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Topic 4. Environmental aspects of diseases. Lectures – 2. Practical lessons – 6. Self-study work – 14.

Topic 5. Questions of individual and age adaptation to the social environment. Lectures – 2.

Practical lessons – 6. Self-study work – 14.

Literature

1. Zakharov, Yu.M., Brin, V.B., Masing, Yu.A. Normal physiology / ed. by Tkachenko, B.I. / GEOTAR-Media, 2014
 2. Prokhorov, B.B. Human Ecology. Moscow. M: Academia. 2007.
- Additional:
- Alekseeva, T.I. Human adaptation in different ecological niches of the Earth (biological aspects). M: MNEPU. 2008. 278 p.
- Agadzhanian, N.A. The concept of human ecology and survival: textbook for students of medical and pharmaceutical universities. - Moscow: Russian educational, scientific and methodological center for continuous medical and pharmaceutical education, 2001.
3. Belchenko, L.A. Adaptation to the effects of environmental factors: study guide / Novosibirsk State Univ. Novosibirsk, 2009. 228 p.
 4. Deryabina, G.I. Physiological foundations of adaptation of the human body to physical stress: study guide / G.I. Deryabina; Federal Agency for Education, VPO "Tambov State Univ. named after G.R. Derzhavin". Tambov: TSU Publishing House named after G.R. Derzhavin, 2010. – 20p.
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Subjects

Professor	Name	Hours
Zvezdochkina, N.V.	Physiology of adaptations	108

Gravitational Physiology, module - Systemic Neuroscience.

Term	Duration	Course type	ECTS credit points	Student workload
3	term	optional	4	classroom - 48, self-study - 78

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral exam	lectures, seminars	Eremeev, A.A.

Learning outcomes

During the study of discipline / module "Gravitational Physiology" students acquire the following

competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program

Special competences:

- Ability to form coherent theoretical understanding of the basic principles and laws of functioning of the body, its constituent organs and their systems under different gravitational environment

Contents

Topic 1. Gravitational physiology in relation to the life sciences. The main factors of space flight. Lectures – 2. Practical lessons – 2. Self-study work – 6.

Topic 2. Water and electrolyte metabolism, metabolic changes, immune status and condition of the red blood cells during adaptation to microgravity. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 3. Bone tissue under long-term microgravity. Influence of microgravity on the cardiovascular and respiratory system. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 4. The adaptation of the sensory systems to microgravity. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 5. Hypokinetic syndrome. Motion sickness. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 6. The adaptation of the propulsion system to the conditions of space flight. Motor control. Lectures – 2. Practical lessons – 4. Self-study work – 8.

Topic 7. Spinal reflex mechanisms. Lectures – 2. Practical lessons – 2. Self-study work – 8.

Topic 8. Basic laws and mechanisms of muscle transformation in microgravity. Lectures – 2. Practical lessons – 4. Self-study work – 8.

Topic 9. Ground zero gravity model used in the studies. Lectures – 2. Practical lessons – 4. Self-study work – 8.

Topic 10. Radiation safety of space flights. Medical support of space flight. Lectures Lectures – 2. Practical lessons – 2. Self-study work – 8.

Literature

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Subjects		
Professor	Name	Hours
Eremeev, A.A.	Gravitational physiology	126

Elective courses: Module cognitive neuroscience

Course name: "Experimental methods for evaluation of psycho-physiological functions" / module cognitive neuroscience				
Term	Duration	Course type	ECTS credit points	Student workload
3	14 weeks	optional	2	22 classroom, 50 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	Lectures, practical lessons	Zvezdochkina, N.V.

Learning outcomes

During the study of discipline / module "Experimental methods for evaluation of psycho-physiological functions" students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

GPC-7 – willingness to creatively use modern computer technology in the collection, storage, processing, analysis and transmission of biological information for professional tasks

PC-3 – ability to apply methodological principles of design, implementation of field and laboratory biological and environmental studies, use modern equipment and computer systems (according to the major (profile) of the master's program)

Special competences:

- To understand the subject, objectives and methods of the study of psychophysiological functions

- Readiness for development of instructional techniques of psychophysiological experiment; drawing algorithm of experiment with various tasks.

Contents
Topic 1. Review of the methods of modern psychophysiology. Lectures – 2. Self-study work – 6.
Topic 2. Methods of diagnostics of functional states. Lectures – 2. Laboratory works – 2. Self-study work – 6.
Topic 3. The method of electroencephalography. Lectures – 2. Laboratory works – 2. Self-study work – 6.
Topic 4. Methods of influence on the brain and body (biofeedback, sensory, electrical, magnetic and other effects.) Lectures – 2. Laboratory works – 2. Self-study work – 6.
Topic 5. Psychomotor diagnostic methods. Laboratory work – 2. Self-study work – 6.
Topic 6. The study of human motor reactions. Laboratory work – 2. Self-study work – 6.
Topic 7. Methods of investigating the properties of the nervous system. Lectures – 2. Laboratory work – 1. Self-study work – 6.
Topic 8. Psychophysiological methods for assessing attention and memory. Laboratory work – 1. Self-study work – 6.

Literature
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CGR http://tele.med.ru/anest_conf/zaitcev/index.html
Methods of psychophysiology http://www.scorcher.ru/neuro/science/base/methods.php
http://psyfactor/ / file: // localhost Test Procedure for poligrafe. Test control issues.
Method of clinical electroencephalography (technique, history, indications and conduct) // Medical Portal SVS Medical / YE Akchurina. August 2009, Almaty. http://www.cnsinfo.ru/encyclopaedia/diagnostics/eeg/ЭЭГ

Subjects		
Professor	Name	Hours
Zvezdochkina, N.V.	Experimental methods for evaluation of psychophysiological functions	72

Course name / unit / module Lateral organization of the brain / elective courses / cognitive physiology				
Term	Duration	Course type	ECTS credit points	Student workload
2		(optional)	3	(22) classroom, (50)self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	oral	Lecture Seminars	Baltina, T.V.

Learning outcomes

During the study of discipline / module "lateral organization of the brain" students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

GPC-8 – ability to use philosophical concepts of natural science for the formation of scientific outlook

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program

Special competences:

- Understand the role of the structural organization of the brain in the regulation of human behavior, in the processes of learning, functional states, in the individual characteristics of conduct
- Understand the fundamental problems of functional brain asymmetry
- Readiness to be skilled in the use of basic modern methods of investigation of functional asymmetry of the brain and analysis of experimental results

Contents

Topic 1. The modern concept of hemispheric asymmetry of mental processes, functional cerebral hemispheres of specialization. Lectures – 4. Practical lessons – 8. Self-study work – 25.

Topic 2. Methods of diagnosis of functional brain asymmetry. Lectures – 2. Practical lessons – 12. Self-study work – 20.

Topic 3. The functional asymmetry of the hemispheres and the role of the left and right hemispheres in the management of mental functions. Lectures – 4. Practical lessons – 8. Self-study work – 25.

Literature		
<p>Gayvoronskiy, I.V. Functional and clinical anatomy of the brain: tutorial / I.V. Gayvoronskiy, A.I. Gayvoronskiy, S.E. Baybakov. - SpetsLit Petersburg, 2010. - 216 p. Access mode: http://www.studmedlib.ru/ru/book/ISBN9785299004328.html</p> <p>Nikolaeva, E.I. Psychophysiology. Psychological physiology of the basics of physiological psychology. [Electronic resource]: Tutorial / E.I. Nikolaeva. - M.: PerSe, 2008. – 604p. - ISBN 978-5929201790. Access mode: http://www.bibliorossica.com/book.html?currBookId=6600.</p> <p>Psychophysiology in diagrams and comments [Text] / L.V. Cherenkova, E.I. Krasnoshchekova, L.V. Sokolova; under ed. of A.S. Batueva. - St. Petersburg [et al.]: Peter, 2006.- 236 p.-ISBN 5-469-01392-8.</p> <p>The functional asymmetry of the human / N.N. Bragina, T.A. Dobrokhotova.- 2nd ed., Rev. and add. - Moscow: Medicine, 1988.- 240 p.-ISBN 5-225-00102-5.</p> <p>Rebrova, N.P. Functional hemispheric asymmetry of the human brain and psychological processes [Text] / N.P. Rebrova. - M: Rech 2004</p>		
Subjects		
Professor	Name	Hours
Baltina, T.V.	The lateral organization of the brain	72

The name of the course / unit / module Neuropsychology / elective courses / cognitive physiology				
Term	Duration	Course type	ECTS credit points	Student workload
2		(optional)	3	(22) classroom, (50)self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral	Lecture – 10 hours. Seminars – 12 hours.	Eremeev, A.M.

Learning outcomes
<p>During the study of discipline / module "Neuropsychology" students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the</p>

quality of work and the scientific validity of results

GPC-8 – ability to use philosophical concepts of natural science for the formation of scientific outlook

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program

PC-9 – ability for proficiency formation of educational material, lecture giving, commitment to teaching in educational institutions of higher education and management of the research work of students, ability to present course material in oral, written and graphic form for various students

Special competences:

- Knowledge of the basic principles of the structure of the brain

- Have an understanding of neuropsychological symptoms and syndromes in local lesions of various parts of the brain

Contents

Topic 1. Neuropsychology – the science of the brain mechanisms of higher mental functions. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 2. Structural and functional model of the brain as the substrate of mental activity. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 3. Hemispheric asymmetry of the brain and hemispheric interaction. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 4. Neuropsychological analysis of disturbances of higher mental functions in local brain lesions. Lectures – 2. Practical lessons – 2. Self-study work – 10.

Topic 5. Touch and gnostic disorders. Lectures – 2. Practical lessons – 4. Self-study work – 10.

Literature

BASIC LITERATURE

Khomskaya, E.D. Neuropsychology: textbook for students enrolled in the major "Psychology" and specialties "Psychology" and "Clinical psychology" [Text] / E.D. Khomskaya. - St. Petersburg: Peter, 2008. 20 copies.

Kamkin, A. Basic and clinical physiology [Text] / Edited by A. Kamkin and A. Kamenskiy. - Moscow: "Academy", 2004 – 1600 p. 25 copies.

Schmidt, R. Human physiology: [Tutorial]: 3 vol. [Text] / Ed. by R. Schmidt, G. Thews; trans. from English N.N. Alipova [et al.] Ed. by P.G. Kostyuk. - 3rd ed. - Moscow: Mir, 2005. 105 copies.

Batuev, A.S. Physiology of higher nervous activity and sensory systems: textbook for university students enrolled in the major and specialties of psychology [electronic resource] / A.S. Batuev; [Feder. target prog. "Culture of Russia" (subprogram "Support for printing and publishing of Russia")].- 3rd ed., Rev. and add.- St Petersburg [et al.]: Peter, 2009.-316 p. – Access mode: http://z3950.ksu.ru/bcover/0000676935_con.pdf

ADDITIONAL LITERATURE

Kvashuk, V.V. Glossary of terms in clinical neuropsychology [Text] / V.V. Kvashuk. - Taganrog: TIUE, 2004. 1 copy.

Mikadze, Yu.V. Neuropsychology of childhood [Text] / Yu.V. Mikadze. - Publishing house: Peter, 2008.- 288 p.

Luria, A.R. Neuropsychology and problems of education in secondary school. - [Text] / A.R. Luria, L.S. Tsvetkova. Publishing house: SAG, MODEK, 2008. - 64 p.

Sergeev, B.F. Phenomenon of functional asymmetry of the brain. [Text] / B.F. Sergeev, 2010.-

176 p.

Rebrova, N.P. Functional hemispheric asymmetry of the human brain and psychological processes [Text] / N.P. Rebrova. - M: Speech, 2004 - 320 p. 5 copies.

Functional and clinical anatomy of the brain: study guide [electronic resource] / I.V. Gayvoronskiy, A.I. Gayvoronskiy, S.E. Baybakov. - St. Petersburg: SpetsLit, 2010. - 216p. Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785299004328.html> EBS "student adviser"

Subjects		
Professor	Name	Hours
Eremeev, A.M.	Neuropsychology	72

Course: "The age psychophysiology" / Module cognitive neuroscience				
Term	Duration	Course type	ECTS credit points	Student workload
3	14 weeks	optional	3	38 classroom, 70 self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Pass-fail exam	lectures, seminars	Baltina, T.V.

Learning outcomes
<p>During the study of discipline / module "Age Psychophysiology" students acquire the following competencies:</p> <p>GC-1 – ability for abstract thinking, analysis, synthesis</p> <p>GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results</p> <p>GPC-8 – ability to use philosophical concepts of natural science for the formation of scientific outlook</p> <p>PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program</p> <p>Special competences:</p> <ul style="list-style-type: none">- Knowledge of the theoretical foundations of age psychophysiology; methods of producing and processing- Ability to plan and carry out physiological studies in accordance with the specific theoretical and applied problems, including in the framework of various types of expertise and interpret the

experimental data.

Contents

Topic 1. Learning basic neurophysiological mechanisms underlying the formation of cognitive processes and their specificity at various stages of development. Lectures – 2. Practical lessons – 4. Self-study work – 14.

Topic 2. The brain as a dynamic system of hierarchically organized neural networks ensuring the implementation of cognitive activity. Lectures – 2. Practical lessons – 4. Self-study work – 14.

Topic 3. Morphofunctional maturation of brain structures and the dynamic nature of their functional association in the process of perception. Lectures – 2. Practical lessons – 4. Self-study work – 14.

Topic 4. Neurophysiological research (quantitative and qualitative analysis of the electroencephalogram (EEG) recording and analysis of somatosensory potentials (ERPs), printing). Lectures – 2. Practical lessons – 8. Self-study work – 14.

Topic 5. Neuropsychological and psychophysiological testing. Lectures – 2. Practical lessons – 8. Self-study work – 14.

Literature

Nikolaeva, E.I. Psychophysiology. Psychological physiology of the basics of physiological psychology. [Electronic resource]: Tutorial / E.I. Nikolaeva. - M.: PerSe, 2008. – 604p. - ISBN 978-5929201790. Access mode: <http://www.bibliorossica.com/book.html?currBookId=6600>.

Age physiology and psychophysiology: Textbook [electronic resource] / R.I. Aizman, N.F. Lisova. - M.: SIC INFRA-M, 2014. - 352 p. - ISBN 978-5-16-006423-9. Access mode: <http://znanium.com/bookread.php?book=376897>.

Anatomy and physiology: Textbook [electronic resource] / N.F. Lisova, R.I. Aizman. - M.: SIC INFRA-M, 2014. - 352 p. - ISBN 978-5-16-008972-0. Access mode: <http://znanium.com/bookread.php?book=416718>.

Prenatal stress influences and the developing brain: adapt. mechanisms, immediate and delayed effects / V.A. Otellin, L.I. Khozhay, N.E. Ordyan. - St. Petersburg: Desyatka, 2007. - 236, [1] p. : image, col. image; 22. - in English - Bibliography: p. 204-231. - ISBN 978-5-98330-004-0.

Neurophysiology and higher nervous activity of children and adolescents: study guide for students of pedagogical universities / V.M. Smirnov - 2nd ed., Sr. - Moscow: Academy 2004. - 395p. - ISBN 5-7695-1713-1.

Subjects

Professor	Name	Hours
Baltina, T.V.	Age psychophysiology	108

The name of the course / unit / module Differential Psychophysiology				
Term	Duration	Course type	ECTS credit points	Student workload
3	126 hours	Elective courses module cognitive neuroscience	4	48 hours - classroom, 78 hours - self-study

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
full-time	Oral exam	Lecture, seminar, discussion, practical lesson, training	Rosental, S.G.

Learning outcomes
<p>During the study of discipline / module "Age Psychophysiology" students acquire the following competencies:</p> <p>GC-1 - the ability to abstract thinking, analysis, synthesis</p> <p>GPC-4 – ability to self-studyly analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results</p> <p>PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program</p> <p>PC-9 – ability for proficiency formation of educational material, lecture giving, commitment to teaching in educational institutions of higher education and management of the research work of students, ability to present course material in oral, written and graphic form for various students</p> <p>Special competences:</p> <ul style="list-style-type: none"> - Knowledge of the properties of the nervous system and typological features of their manifestation - Understanding of the influence of personality characteristics and properties of the nervous system on the effectiveness of professional activity

Contents
<p>Topic 1. Subject of the psychophysiology of individual differences. Tasks of differential psychophysiology. Lectures – 2. Practical lessons – 2. Self-study work – 9.</p> <p>Topic 2. The main areas of research in modern differential psychophysiology. Lectures – 2. Practical lessons – 4. Self-study work – 9.</p> <p>Topic 3. The concept of Luria, A.R. on energy, information and regulatory of brain blocks. Lectures – 2. Practical lessons – 2. Self-study work – 9.</p>

Topic 4. General and private properties of the nervous system. The study of the natural preconditions of activity and emotion Lectures – 2. Practical lessons – 4. Self-study work – 9.

Topic 5. Typological properties of the nervous system and the problems of identity and individuality in the works and Ananyev, B.G. and Merlin, V.S. Lectures – 2. Practical lessons – 4. Self-study work – 9.

Topic 6. Basic concepts of differential psychophysiology. Lectures – 2. Practical lessons – 4. Self-study work – 9.

Topic 7. The hierarchical structure of the subject of interacting with the world: body, individual, personality, individuality Lectures – 2. Practical lessons – 4. Self-study work – 9..

Topic 8. Temperament. Character. Style. Abilities. Lectures – 2. Practical lessons – 4. Self-study work – 6.

Literature

Alexandrova, Yu.I. Psychophysiology: textbook for university students enrolled in the major 521000 "Psychology" and specialties 020400 "Psychology" and 022 700 "Clinical Psychology" / ed. by PhD, prof. Yu.I. Alexandrova. - 3rd ed., add. and rev. - St. Petersburg [et al.]: Peter, 2008 - 463 p.

Differential psychophysiology and psychology: key ideas: Monograph / T.F. Bazylevich.
<http://znanium.com/bookread.php?book=446651>

Cherenkova, L.V. Psychophysiology in diagrams and comments, St. Petersburg: Peter, 2006. – 236p

Subjects

Professor	Name	Hours
Rosental, S.G.	Differential psychophysiology	144

Course name: Early activity in the developing brain

Term	Duration	Course type	ECTS credit points	Student workload
1	1 term	additional course	2	Classroom 36, self-study 36 hours

Participation requirements	Exam type (oral, written, term paper, etc.)	Training and teaching methods (lectures, seminars, etc.)	Course coordinator
Basic knowledge of physiology, biophysics	Pass-fail exam	Lectures, seminars, laboratory works on registration of	Khazilov, R.N.

		activity of brain on the basis of Neurobiology Research Laboratory and analysis of activity in the Matlab environment	
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Learning outcomes

During the study of discipline / module "Early activity in the developing brain," students acquire the following competencies:

GC-1 – ability for abstract thinking, analysis, synthesis

GPC-4 – ability to self-study analyze available information, identify the fundamental problems, and set the task and carry out field and laboratory biological research in solving specific problems with the use of modern equipment and computing resources, be responsible for the quality of work and the scientific validity of results

PC-1 – ability to creatively use knowledge of basic and applied sections (modules) in scientific and technological activities of which determine the major (profile) of the master's program

Special competences:

- The ability to understand the basics of developing brain neurophysiology
- Mastery of experimental skills for the registration and analysis of neurophysiological data.

Contents

Topic 1. Introduction to the physiology of the developing brain. Lectures – 2. Prakticheskie classes – 2. Self-study work – 4.

Topic 2. Characteristics of the main activity of the brain patterns. Lectures – 2. Practical lessons – 2. Self-study work – 4.

Topic 3. Critical periods of development. Lectures – 2. Practical lessons – 2. Self-study work – 4.

Topic 4. Age-related changes in excitatory and inhibitory synaptic transmission. Lectures – 2. Practical lessons – 2. Self-study work – 4.

Topic 5. The mechanisms of synaptic plasticity. Lectures – 2. Practical lessons – 2. Self-study work – 4.

Topic 6. The pathophysiological bases of pathologies associated with the development (epilepsy and anoxia). Lectures – 2. Practical lessons – 2. Self-study work – 4.

Topic 7. The adaptation of the fetal brain at the time of delivery, the role of oxytocin. Lectures – 2. Practical lessons – 2. Self-study work – 4.

Topic 8. Optogenetic approaches to the study of brain function. Lectures – 2. Practical lessons – 2. Self-study work – 4.

Topic 9. Phenotyping models of congenital neurological diseases. Lectures – 2. Practical lessons – 2. Self-study work – 4.

Laboratory work to conduct the experiment with recording brain activity of newborn rats. Practical lessons – 9 .

Laboratory work to analyze neurophysiological data in Matlab environment. Practical lessons – 9.

Literature

Khazipov, R.N., Sitdikova, G.F. Electrical activity in the sensory areas of the cortex of the developing brain, pp. 42-61, UDC 612.821.6. 612.822 +
Valeeva, G.R., Khazipov, R.N. Excitatory and inhibitory effects of GABA (γ -aminobutyric acid), pp. 62-78, UDK 611.81 + 612.8.02
