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Информация о владельце:
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Должность: Ректор
Дата подписания: 07.06.2023 17:43:25
Уникальный программный ключ:
ca953a0120d891083f939673078ef1a989dae18a

**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
RUDN University**

Institute of Medicine

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

Normal Physiology

course title

Recommended by the Didactic Council for the Education Field of:

31.05.01 General Medicine

field of studies / speciality code and title

The course instruction is implemented within the professional education programme of higher education:

General Medicine

higher education programme profile/specialisation title

2022-2023

1. COURSE GOAL(s)

The goal of the course “Normal Physiology” is to equip students with knowledge about the functioning of the human body, student's acquisition of knowledge about the development of structures and functions of various systems of the body on the basis of modern achievements of physiological science, necessary for the formation of a natural scientific worldview and practical activities of a doctor.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the course (module) “Normal Physiology” is aimed at the development of the following competences /competences in part: General Professional Competences- (GPC)-5.

Table 2.1. List of competences that students acquire through the course study

Competence code	Competence descriptor	Competence formation indicators (within this course)
GPC-5	Able to assess morpho-functional, physiological states and pathological processes in the human body to solve professional problems	GPC-5.1. Mastering the algorithm of clinical, laboratory and functional diagnosis when dealing with professional tasks.
		GPC-5.2. Being able to evaluate the results of clinical, laboratory and functional diagnosis when dealing with professional tasks.
		GPC-5.3. Being able to determine morphofunctional, physiological states and pathological processes of the human body.

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course refers to the core/variable/elective* component of (B1) block of the higher educational programme curriculum.

* - Underline whatever applicable.

Within the higher education programme students also master other (modules) and / or internships that contribute to the achievement of the expected learning outcomes as results of the course study.

Table 3.1. The list of the higher education programme components/disciplines that contribute to the achievement of the expected learning outcomes as the course study results

Competence code	Competence descriptor	Previous courses/modules*	Subsequent courses/modules*
GPC-5	Able to assess morphofunctional, physiological conditions and pathological processes in the human body to solve professional problems	Biology Molecular genetics in practical biology and medicine Medical elementology	Pathophysiology, clinical pathophysiology Propedeutics of Internal Medicine general surgery Topographic anatomy and operative surgery Dermatovenereology Neurology, medical genetics, neurosurgery Ophthalmology Forensic Medicine Faculty therapy Faculty surgery Occupational diseases Hospital therapy Anesthesiology, resuscitation, intensive care Hospital surgery, pediatric surgery Oncology, radiation therapy Maxillofacial Surgery

* To be filled in regarding the higher education programme correspondence training mode.

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total workload of the course "Normal Physiology" is 8 credits (288 academic hours).

Table 4.1. Types of academic activities during the periods of higher education programme mastering (**full-time training**)*

Type of academic activities	Total academic hours	Semesters/training modules	
		2	3
Classroom learning , <i>ac.h.</i>	210	102	108
Including:			
Lectures (LC)	70	34	36
Lab work (LW)	140	68	72
Seminars (workshops/tutorials) (S)	-	-	-
<i>Self-studies</i>	33	24	9

Type of academic activities		Total academic hours	Semesters/training modules	
			2	3
<i>Evaluation and assessment (exam/passing/failing grade)</i>		45	18	27
Course workload	Academic hours	288	144	144
	credits	8	4	4

* To be filled in regarding the higher education programme correspondence training mode.

5. COURSE CONTENTS

Table 5.1. Course contents and academic activities types

Course module title	Course module contents (topics)	Academic activities types
Module 1. Introduction to physiology.	Topic 1.1. Introduction to physiology. History of development, main stages. Methods of physiological science.	LC
Module 2. Physiology of blood.	Topic 2.1. Function and composition of blood. blood plasma. Formed elements of blood. Leukocytes. Functions of erythrocytes and hemoglobin. Blood groups. Rh factor. «Erythrocyte Counting». «Leukocyte count». «Determination of hemoglobin content by the Saly method». «Calculation of the color index of blood». Determination of blood group and Rh factor.	LC, LC
	Topic 2.2. The system of regulation of the aggregate state of blood. biophysical mechanisms. Coagulation phases. Buffer systems of the blood. The constancy of the internal environment (homeostasis). blood constants. «Determination of bleeding time». «Determination of clotting time». «Fibrinolysis». «Study of different types of hemolysis». «Study of osmotic resistance of erythrocytes».	Lec, Lab
Module 3. Physiology of excitable tissues.	Topic 3.1. Excitability and its parameters. membrane potential. action potential. «Experiments of Galvani». «Determination of nerve and muscle stimulation thresholds». Analysis and solution of problems on the topic of classes.	Lec, Lab
	Topic 3.2 Physiology of the synapse. Physiology of the nerve fiber, nerve. «Effect of myorelaxin (curare) on the	Lec, Lab

	neuromuscular synapse». Analysis and solution of problems on the topic of classes.	
	Topic 3.3. Muscle physiology. Types of muscle contractions. Work and fatigue. Muscle strength. «Dynamometry». «A Study of Maximal Voluntary Strength and Power Endurance of Muscles». Analysis and solution of problems on the topic of classes.	Lec, Lab
Module 4. Physiology of the central nervous system.	Topic 4.1. Physiology of the central nervous system. Nervous regulation of physiological functions. Reflex and its characteristics. Types of reflexes. Excitation and inhibition in the central nervous system. Basic properties of nerve centers. Reflex regulation of visceral and somatic functions. Coordination and integration of intracentral processes. «Study of unconditioned human reflexes». «Investigation of the cerebellar control of skeletal muscle motor activity». «The receptive field of the spinal reflex». «Determination of reflex time according to Turk». «Analysis of the reflex arc». «Sechenov`s inhibition». «Reflexes of the spinal cord and cranial nerves». «Turk's Study of Reflex Time».	Lec, Lab
	Topic 4.2. Private physiology of the central nervous system. blood-brain barrier. Methods for studying the functions of the central nervous system .	Lec, Lab
	Topic 4.3. Physiology of the autonomic nervous system. Sympathetic, parasympathetic, metasymphathetic nervous system. Synapses of the autonomic nervous system. The role of the autonomic nervous system in the development of adaptive responses . «Tentative assessment of the autonomic tone of a person by the method of questioning.» «Assessment of vegetative tone according to the Kerdo`s index». «Determination of the reactivity of the sympathetic division of the autonomic nervous system (orthostatic test)». «Respiratory-cardiac Hering reflex». Solving problems on the topic of the lesson.	Lec, Lab
Module 5. Physiology of sensory systems.	Topic 5.1. General physiology of analyzers. The role of receptors and higher divisions of	Lec

	the central nervous system in the perception of the external world .	
	Topic 5.2. Private physiology of sensory systems.	Lec
	Topic 5.3. Skin analyzer. « Determining the Spatial Threshold of Sensitivity «.	Lab
	Topic 5.4. Physiology of vision. «Determination of visual acuity», «Determination of the visual field (perimetry)».	Lec, Lab
	Topic 5.5 Physiology of hearing and vestibular apparatus. «Audiometry». «Comparison of air and bone conduction (Rinne 's test)».	Lec, Lab
	Topic 5.6. Physiology of taste and smell. «Determination of thresholds of taste sensitivity». «Determination of the role of smell in the occurrence of taste sensations».	Lec, Lab
	Topic 5.7. Pain. The problem of pain in medicine. Mechanisms of perception of painful stimuli and anesthesia.	Lec
Module 6. Physiology of digestion.	Topic 6.1. General ideas about digestion. Functions of the digestive tract. Methods for studying digestive functions. Physiological basis of hunger and satiety. General principles of regulation of digestion processes.	Lec
	Topic 6.2. Motility of the digestive tract. Secretory function and digestion in the mouth and stomach. Methods for studying digestive functions. «Determination of the active reaction of saliva (pH) using universal indicator paper».	Lec, Lab
	Topic 6.3. secretion in the gastrointestinal tract. Digestion in the small and large intestine. The role of the liver in digestion. Absorption of nutrients in the gastrointestinal tract. «Investigation of the enzymatic properties of gastric juice». «The effect of bile on fats». Solving problems on the topics of the section «Physiology of digestion».	Lec, Lab
Module 7. Isolation, physiology of the kidneys.	Topic 7.1. excretory system. Formation of urine in the kidneys. Kidney as an organ of homeostasis. «The study of some components of urine using diagnostic strips».	Lec, Lab

	Topic 7.2. Non-urinary functions of the kidneys. The role of the kidneys in the development of adaptive reactions of the body. Bladder and urination. Methods for studying kidney function. Solving problems on the topic of the lesson. Analysis of the RAAS scheme. Solving problems on the topics of the «Isolation» section.	Lec, Lab
Module 8. Physiology of the cardiovascular system.	Topic 8.1. Physiology of the cardiovascular system. Cardiac cycle. Spread of excitation through the myocardium. conduction system of the heart. «The Cardiac Cycle in a Frog». «Analysis of the conduction system of the heart by ligatures (Stannius ligatures)».	Lec, Lab
	Topic 8.2. properties of the heart muscle. phases of excitability. Extrasystole. Mechanisms of contractile activity of the myocardium. «Reproduction of extrasystoles».	Lec, Lab
	Topic 8.3. Nervous and humoral regulation of the heart. Methods for the study of the heart. Electrical phenomena in the heart. Electrocardiography. «Registering an electrocardiogram. Interpretation of a normal electrocardiogram.	Lec, Lab
	Topic 8.4. Physiology of blood vessels. Basic laws of hemodynamics. Microcirculation and lymph flow. coronary blood flow. Methods for studying blood circulation. Blood flow velocity, blood pressure. Pulse. Mechanisms of juxta- and transcapillary blood flow. Mechanisms of lymph formation and exchange in interstitial spaces. «Blood pressure measurement». «Assessment of cardiovascular parameters at rest and during exercise» .	Lec, Lab
	Topic 8.5. Regulation of blood circulation. Vasomotor nerves. Hierarchy of vasomotor centers. Redistribution of blood.	Lec
Module 9. Physiology of respiration.	Topic 9.1. Physiology of respiration. External respiration. The role of the respiratory muscles. Change in pressure in the pleural cavity. Air volumes characterizing respiration and capacities. «Spirometry».	Lec, Lab

	Topic 9.2. Biophysics of gas exchange. The difference in partial pressures of gas in the alveolar air, blood, tissues. Carrying gases in the blood. oxygen transport mechanism. Hemoglobin dissociation curve. Transfer of carbon dioxide.	Lec
	Topic 9.3. Breathing regulation. Breathing in the changed conditions of the gaseous environment. Features of breathing in the mountains. Breathing while diving. Hypoxia and their manifestations. «Conducting hypoxemic tests of Stange and Genchi».	Lec, Lab
Module 10. Physiology of endocrine glands.	Topic 10.1. Endocrine regulation of physiological functions. General properties of hormones, hierarchy in the activity of endocrine glands. Private physiology of the endocrine glands.	Lec
	Topic 10.2. Humoral regulation of physiological functions. Physiology of endocrine glands. «Determination of the concentration of glucose in human blood», «Construction of the glycemic curve».	Lab
	Topic 10.3. Particular physiology of the endocrine glands - thyroid and parathyroid glands, adrenal glands, pancreas, gonads.	Lec
Module 11. Metabolism and energy. Thermoregulation.	Topic 11.1. human metabolism. Energy exchange. Determination of the level of metabolism. Basal metabolism, daily energy expenditure. Arrival and consumption of substances in the body. Metabolism of proteins, fats, carbohydrates and trace elements. «Determining the value of the proper basal metabolic rate in various ways». «Determination of the percentage deviation of the basal metabolic rate from the norm by the Reed method.»	Lec, Lab
	Topic 11.2. Neurohumoral regulation of metabolism in the body. Physiological basis of nutrition. Basic principles of food rations. «Assessment of a person's metabolic state by analyzing body mass (calculations of body mass index and ideal body weight)». «Assessment of human body fat distribution by waist/hip index». «Assessment of human body fat mass by caliperometry». «Compilation and evaluation of dietary rations».	Lec, Lab

	Topic 11.3. Thermoregulation. Body temperature and thermoreception. «Temperature Sensitivity Study (Thermoesthesiometry)».	Lec, Lab
Module 12. Physiology of higher nervous activity.	Topic 12.1. Physiology of GND. Conditioned reflex, types, mechanisms of formation. I and II signal systems. dynamic stereotype. Excitation and inhibition in the cerebral cortex. Sleep, its mechanisms, phases. «Electroencephalography».	Lec
	Topic 12.2. Memory. Types of VND. memory mechanisms. The doctrine of the functional system of behavior (P.K. Anokhin). «Determination of the type of GNI according to Pavlov». «Determination of the psychological characteristics of a person using the EPI personality questionnaire (method of G. Eysenck)». «Attention Switching Research». «Dependence of the amount of memory on the degree of meaningfulness of the material.»	Lec, Lab
	Topic 12.3. Motivations and emotions, social role. Motivation as the basis of personality. The sphere of consciousness, subconsciousness, superconsciousness.	Lec
Module 13. Mechanisms for the integration of physiological functions.	Topic 13.1. Mechanisms of integration of physiological functions.	Lec

* - to be filled in only for **full** -time training: *LC* - lectures; *LW* - lab work; *S* - seminars.

6. CLASSROOM EQUIPMENT AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Classroom equipment and technology support requirements

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
Lecture	An auditorium for lecture-type classes, equipped with a set of specialized furniture; board (screen) and technical means of multimedia presentations.	
Seminar	Audience for conducting seminar-type classes, group and	

Type of academic activities	Classroom equipment	Specialised educational / laboratory equipment, software, and materials for course study (if necessary)
	individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations (126, 127)	
Lab work	An auditorium for laboratory work, individual consultations, current control and intermediate certification , equipped with a set of specialized furniture and equipment (114, 116, 126, 127)	<p>A set of specialized furniture; technical means: multimedia projectors «Optoma», «View Sonic» columns «Genius», «Dialog» nettops Lenovo, PVEM «SM» electric wall screens «Digis» .</p> <p>Educational computer programs used in practical classes: testing program «Mytest».</p> <p>Technical means: a complex for laboratory work, training films, a universal stand, a set of tables, universal indicator paper (pH), test strips for determining urine components, a neurological hammer, a set of tuning forks, a hand dynamometer, a multimedia installation, anti- A, Anti-B and anti-AB for determining blood groups according to the ABO system, anti-D coliclone for determining the Rh factor according to the Rhesus system, EK1T-O7 and Axion electrocardiographs, sphygmomanometer, phonendoscope, air spirometer, stopwatch, Forster`s perimeter, Sivtsev`s tables, portable glucometer, electroencephalograph.</p>
Self-studies	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to EIOS (127)	A set of specialized furniture; technical means: multimedia projector «Optoma» «Genius» speakers _ «Lenovo» nettop electric wall screen

7. RESOURCES RECOMMENDED FOR COURSE STUDY

a) *Main readings:*

Fundamentals of human physiology : textbook in 2 volumes. T. 1 / N.A. Aghajanyan, I. G. Vlasova, N.V. Ermakova [and others]; Ed. by Torshin. - 5 th ed. Rev . and add. ; Electronic text data. - M.: Publishing house of RUDN University, 2017 .-- 524 p. : ill. - ISBN 978-5-209-06817-4. - ISBN 978-5-209-06816-7: 138.36. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=460159&idb=0 ,

Fundamentals of human physiology : textbook. In 2 volumes.Vol. 2 / N.A. Aghajanyan, I. G. Vlasova, N.V. Ermakova [and others]; Ed. by Torshina . - 5 th ed. Rev . and add. ; Electronic text data. - M.: Publishing house of RUDN, 2017 .-- 456 p. : ill. - ISBN 978-5-209-06817-4. - ISBN 978-5-209-07434-2: 138.36. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=460012&idb=0

b) *Additional readings:*

Collection of control tasks in physiology for testing and independent work of a student: a textbook for practical exercises and independent work of students / V.I. Torshin, N.V. Ermakova, Z. V. Bakaeva, O. V. Mankaeva; Under total. ed. by V.I. Torshin , N.V. Ermakova . - Electronic text data. - M.: Publishing house of RUDN University, 2017 .-- 533 p. - ISBN 978-5-209-08013-8 : 450.00. http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=461714&idb=0

Brin V.B. Human physiology in diagrams and tables: textbook / V.B. Brin . - SPb . : Publishing house «Lan » , 2017. - 608 p. - (Textbooks for universities. Special literature). - ISBN 978-5-8114-2054-

http://lib.rudn.ru/MegaPro/UserEntry?Action=Rudn_FindDoc&id=465025&idb=0

Shatalova L.S., Torshin V.I. Human physiology : educational terminological dictionary for foreign medical students: In 2 hours. Part 1: AN / L.S. Shatalova, V.I. Torshin . - Electronic text data. - M.: Publishing house of RUDN, 2016 .-- 536 p. : ill. - ISBN 978-5-209-06134-2: 481.71. Electronic version.

Shatalova L.S., Torshin V.I. Human physiology : educational terminological dictionary for foreign medical students: In 2 hours. Part 2: O-Yu / L.S. Shatalova, V.I. Torshin . - Electronic text data. - M.: Publishing house of RUDN, 2017 .-- 456 p. : ill. - ISBN 978-5-209-07581-3: 304.24. Electronic version.

Internet (based) sources

1. Electronic libraries with access for RUDN students:

- Electronic library network of RUDN – ELN RUDN <http://lib.rudn.ru/MegaPro/Web>
- ELN «University Library online» <http://www.biblioclub.ru>
- ELN Urait <http://www.biblio-online.ru>
- ELN «Student Advisor» www.studentlibrary.ru
- ELN «Lan» <http://e.lanbook.com/>

2. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation <http://docs.cntd.ru/>
- search system Yandex <https://www.yandex.ru/>
- search system Google <https://www.google.ru/>
- abstract database SCOPUS <http://www.elsevierscience.ru/products/scopus/>
- **NCBI:** <https://p.360pubmed.com/pubmed/>
- **RUDN University Bulletin:** access mode from the RUDN University territory and remotely <http://journals.rudn.ru/>
- **Library Elibrary.ru:** access on IP-addresses of People's Friendship University of address: [http : //www.elibrary.ru/defaultx.asp](http://www.elibrary.ru/defaultx.asp)
- **ScienceDirect (ESD), «FreedomCollection», «Cell Press» ID Elsevier».** There is remote access to the database, access by IP-addresses of RUDN University (or remotely by individual login and password).
- **Google Academy (eng. Google Scholar)** - a free search engine for full texts of scientific publications of all formats and disciplines. Indexes full texts of scientific publications. Access mode: <https://scholar.google.ru/>
- **Web of Science .** There is remote access to the database. Access to the platform is carried out by IP-addresses of the RUDN University or remotely. Remote access to WOS is activated without administrator intervention after registering on the platform from RUDN University <http://login.webofknowledge.com/>

*Training toolkit for self- studies to master the course *:*

The set of lectures on the course «Normal physiology».The laboratory workshop (if any).on the course «Normal physiology».

The guidelines for writing a course paper / project (if any) on the course «Normal physiology».

8. ASSESSMENT TOOLKIT AND GRADING SYSTEM* FOR EVALUATION OF STUDENTS' COMPETENCES LEVEL UPON COURSE COMPLETION

The assessment toolkit and the grading system* to evaluate the competences formation level (GPC-5) upon the course study completion are specified in the Appendix to the course syllabus.

* The assessment toolkit and the grading system* are formed on the basis of the requirements of the relevant local normative act of RUDN University (regulations / order).

DEVELOPERS:

Associate Professor
of the Department
of Normal Physiology

position, department

E.B. Yakunina

signature

name and surname

Professor of the Department of
Normal Physiology

position, department

D.S. Sveshnikov

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HEAD OF EDUCATIONAL DEPARTMENT:

of Normal Physiology

Name of the department

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V.I. Torshin

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**HEAD
OF HIGHER EDUCATION
PROGRAMME:**

First Deputy Director of Medical
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