

Документ подписан простой электронной подписью
Информация о владельце:
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Должность: Ректор
Дата подписания: 28.05.2026 13:00:44
Уникальный программный ключ:
ca953a0120d891083f939673078ef1a989dae18a

**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
RUDN University
Institute of Medicine**

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

COURSE SYLLABUS

MEDICAL ELEMENTOLOGY

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

1. COURSE GOAL(s)

The course "Medical Elementology" is included in the specialty program "Medical science" in the direction of 31.05.01 "Medical science" and is studied in the 6th semester of the 3rd year. The discipline is implemented by the Department of Medical Elementology. The discipline consists of 4 sections and 11 topics and is aimed at studying the biological role of macro-and microelements and their significance for human health

The purpose of mastering the course is to develop students' competencies in assessing morphofunctional and physiological conditions, as well as pathological processes associated with the elemental status of a person, and apply this knowledge in clinical, laboratory and functional diagnostics, including the use of artificial intelligence technologies, as well as in developing personalized nutrition strategies, therapy and prevention of diseases based on biogeochemical data. and elementological principles.

2. REQUIREMENTS FOR LEARNING OUTCOMES

Mastering the course "Medical Elementology" is aimed at developing the following competencies (parts of competencies) in students:

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

Cipher	Competence	Indicators of achievement of competence (within the given discipline)
GPC-5	is able to assess morphofunctional, physiological states and pathological processes in the human body to solve professional problems	OPK-5.1 Has an algorithm for clinical, laboratory and functional diagnostics in solving professional problems; OPK-5.2 Is able to evaluate the results of clinical, laboratory and functional diagnostics when solving professional tasks, including using artificial intelligence technologies; OPK-5.3 Is able to determine morphofunctional, physiological states and pathological processes in the human body based on knowledge about the structure of the human body, the functioning of organs and systems in normal and pathological conditions;
PC-2	is able to conduct a patient examination in order to establish a diagnosis	PC-2.7 is able to conduct differential diagnostics with other diseases/conditions, including urgent, as well as establish a diagnosis based on the current international statistical classification of diseases and related health problems (ICD);

3. COURSE IN HIGHER EDUCATION PROGRAMME STRUCTURE

The course "Medical Elementology" 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*
OPK-5	is Able to evaluate the morphofunctional, physiological States and pathological processes in the human body for the solution of professional tasks	Biochemistry; Normal physiology; General surgery; Biology; Microbiology, Virology; Pathophysiology, clinical pathophysiology; Propaedeutics of internal diseases; Immunology; Pathological anatomy, clinical pathological anatomy; Chemistry; Pharmacology; Bioorganic chemistry; Anatomy; Histology, embryology, Cytology;	Obstetrics and gynecology; Oncology, radiation therapy; Molecular-genetic methods; Methods of microbiological diagnostics; Phthisiology; Anesthesiology, resuscitation, intensive care, and Ophthalmology; Methods of cell biology and histology; Topographical anatomy and operative surgery; Forensic medicine; Oral and maxillofacial surgery; Medical forensics; Otorhinolaryngology; Pediatrics; Sectional rate;
PK-2	is Capable of carrying out examination of the patient to establish the diagnosis of	General surgery; Propaedeutics of internal diseases; Microbiology, Virology; Immunology; <i>Molecular genetics in practical biology and medicine**</i> ; Pathophysiology, clinical pathophysiology, Pathological anatomy, clinical pathological anatomy;	Practice of surgery: medical assistant surgeon; physician Assistant therapeutic profile: physician assistant physician; General medical Practice profile: assistant physician outpatient clinics; the Practice of obstetrical and gynecological profile: physician assistant midwife; the Practice of obstetrical and gynecological profile: assistant gynecologist; General medical Practice profile: physician assistant pediatrician; Dermatology; Neuroscience, medical genetics, neurosurgery; Ophthalmology; surgery Faculty; occupational diseases; hospital therapy; Endocrinology; Outpatient therapy; hospital surgery, pediatric surgery; Pediatrics; Obstetrics and gynecology; Anesthesiology, resuscitation, intensive care, and

			Oncology, Radiation Therapy; Otorhinolaryngology; Reproductive Health; Traumatology, Orthopedics; Faculty Therapy; Maxillofacial Surgery; General Medical Skills; Emergency Conditions; Urology; Infectious Diseases; Psychiatry, Medical Psychology; Allergology; Phthisiology; Endoscopic Urology; Telemedicine; Clinical Dentistry; <i>Topical Issues of Neonatology**</i> ; <i>Topical Issues of Neonatology Neonatology**</i> ; Cardiology in quests; Molecular genetic methods; Methods of microbiological diagnostics; Evidence- based medicine; Sectional course; Private radiology; Outpatient pulmonology;
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* - filled in in accordance with the matrix of competencies and SUP of the OP HE

** - elective subjects /practices

4. COURSE WORKLOAD AND ACADEMIC ACTIVITIES

The total labor intensity of the discipline "Medical Elementology" is "2" credits.

Table 4.1. Types of academic work by periods of development of the educational program of higher education for full-time education.

Type of academic activities	Total academic hours	Semesters/training modules	
		6	
<i>Contact work, ac.h.</i>	51	51	
Lectures (LC)	0	0	
Lab work (LW)	0	0	
Seminars (workshops/tutorials) (S)	51	51	
<i>Self-studies</i>	18	18	
<i>Evaluation and assessment (exam/passing/failing grade)</i>	3	3	
Course workload	ac.h.	72	72
	cred. unit	2	2

5. COURSE CONTENTS

Table 5.1. Content of the discipline (module) by type of academic work

Course module title	Course module contents (topics)	Academic
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		activities types
Section 1 Introduction to Medical Elementology	1.1 Subject of Medical Elementology. Biological classification of chemical elements. The concept of bioelements. Subject and basic concepts of medical elementology	S
	1.2 Biogeochemistry and factors influencing the elemental status of the population. Biogeochemistry and factors of the elemental status of the population	S
	1.3 A new paradigm of nutrition and therapy. Nutrition and therapy	S
Elementology Section 2 General elementology	2.1 Factors affecting the homeostasis of trace elements. Interaction between trace elements. Homeostasis and interaction	S
	2.2 The elemental status of a person. Personalized assessment of a person's elemental status. Personalized assessment of human elemental status trace elements	S
Section 3 Private Elementology human diseases	3.1 Macronutrients: role, metabolism and clinical aspects Macro elements (potassium, sodium, calcium, magnesium, phosphorus, sulfur, chlorine): role in the body; absorption; excretion; deficiency and excess; toxicity; associated diseases; sources.	S
	3.2 Organogenic elements: role and exchange Organogenic elements (carbon, oxygen, nitrogen, hydrogen): role in the body; absorption; excretion; associated diseases; sources.	S
	3.3 Essential Trace Elements: role, metabolism and clinical aspects Essential trace elements (iron, zinc, copper, manganese, chromium, cobalt, molybdenum, selenium, iodine): role in the body; absorption; excretion; deficiency and toxicity; associated diseases; sources.	S
	3.4 Conditionally essential trace elements: role and exchange Conditionally essential trace elements (lithium, strontium, vanadium, nickel, tin, silicon, fluorine): role in the body; absorption; excretion; deficiency and toxicity; associated diseases; sources.	S
	3.5 Toxic and potentially toxic trace elements: role and toxicology Toxic and potentially toxic trace elements (arsenic; aluminum; lead; cadmium;	S

	mercury): role in the body; absorption; excretion; toxicity; associated diseases; sources.	
Section 4 The role of chemical elements in diagnosis and therapy	4.1 Chemical element imbalance in diseases: clinical manifestations Chemical element imbalances in various diseases: diseases of the skin and its appendages, of the musculoskeletal, bronchopulmonary, immune, endocrine, cardiovascular systems, children's diseases, trace elements in oncology and hematology.	S

* - filled in only for **FULL** -TIME training: *LC-lectures; LW-laboratory work; S – practical/seminar classes.*

k16. 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)
Computer lab	A computer class for conducting classes, group and individual consultations, current control and intermediate certification, equipped with personal computers (in the amount of 20 pcs.), a whiteboard (screen) and technical multimedia presentation tools.	
Seminar	room for conducting seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification, equipped with a set of specialized furniture and technical means for multimedia presentations.	
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 the EIE.	

* - the audience for independent work of students **must be specified!**

7. RESOURCES RECOMMENDED FOR COURSE STUDY

Main readings:

1. Radysh I. V., Skalny A.V. Meditsinskaya elementologiya : uchebnik [Medical elementology: textbook]. - Electronic text data. - Moscow: RUDN University, 2024. - 289 p.: ill. - (Golden Collection of RUDN University). - ISBN 978-5-209-11976-0 : 41.33.

https://mega.rudn.ru:443/MegaPro/UserEntry?Action=Rudn_FindDoc&id=517313&idb=0

2. Bioelementology as an integrative direction of life science : a monograph / A. A. Kirichuk, A. L. Gorbachev, I. Yu. Tarmaeva; ed.by A.V. Skalny. - Electronic text data. - Moscow: RUDN, 2020. - 110 p.: ill.ISBN 978-5-209-10092-8.

https://lib.rudn.ru/MegaPro/UserEntry?Action=Link_FindDoc&id=491216&idb=0

- 3. Medical elementology: Textbook: Recommended for students of medical universities and doctors / A.V. Skalny [et al.]. - Electronic text data. - Moscow: RUDN Publishing House, 2018. - 222 p. : ill. - ISBN 978-5-209-08997-1 : 227.46.

https://lib.rudn.ru/MegaPro/UserEntry?Action=Link_FindDoc&id=474484&idb=0-4

. Chemical elements in ecology, human physiology, and medicine:

textbook / A.V. Skalny, A. A. Kirichuk. - Electronic text data. - Moscow: RUDN University, 2020. - 209 p.: ill. ISBN 978-5-209-10387-5 : 165.90.

https://lib.rudn.ru/MegaPro/UserEntry?Action=Link_FindDoc&id=496075&idb=0

- 5. Skalny A.V., Skalnaya M. G., Kirichuk A. A., Tinkov A. A. Meditsinskaya elementologiya : uchebnoe posobie : dlya studentov meditsinskikh VUZov i vrachikov [Medical elementology: a textbook for students of medical universities and doctors]. - 2nd ed., ispr. and add. - Moscow : Russian University of Peoples ' Friendship, 2021. -198 , [1] p.: ill., tab., color ill.: 22 cm.; ISBN 978-5-209-10832-0.

Additional literature:

1. Osnovy fiziologii cheloveka [Fundamentals of human physiology]. In 2 volumes, Vol. 1 / N. A. Agadzhanian [et al.]; Edited by V. I. Torshin. - 5th ed., reprint. Moscow: RUDN Publishing House, 2017, 524 p. (in Russian). ISBN 978-5-209-06817-4.

2. Vitamins in general medical practice [Electronic resource]: An educational and methodical manual / T. A. Vasina [et al.]. - Electronic text data. - Moscow: RUDN Publishing House , 2017.-26 p. - ISBN 978-5-209-08395-5.

- 3. Medical elementology : questions, exercises, tasks: Educational materials of the Russian Academy of Medical Sciences.- methodical manual / Lobaeva T. A., Skalny A.V., Rylina E. V. et al. - Moscow: Vash format Publishing House, 2025. - 204 p. - ISBN 978-5-00147-715-0-4

- 4 Bioorganic chemistry for Medicine students = Bioorganic chemistry for medical students : lectures / L. G. Voskressensky, A.V. Listratova, A.V. Varlamov. - Electronic text data ; A book in English. - Moscow: RUDN, 2018. - 143 p.

https://lib.rudn.ru / MegaPro / UserEntry?Action=Link_FindDoc&id=466195&idb=0-5

Bioorganic Chemistry with the basics of medical elementology: textbook / Edited by A.V. Skalny, L. M. Shafran, I. V. Radysh. - Moscow: RUDN University, 2019. - 628 p.: ill. ISBN: 978-5-209-08947-6

Resources of the information and telecommunications network "Internet":

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts

- RUDN University Electronic Library System – RUDN University EBS

<https://mega.rudn.ru/MegaPro/Web-EBS> "University Library online"

<http://www.biblioclub.ru-> EBS Urite <http://www.biblio-online.ru-EBS>

"Student's consultant" www.studentlibrary.ru-Znanium EBS <https://znanium.ru/>

2. Databases and search engines

- Sage <https://journals.sagepub.com/>

- Springer Nature Link <https://link.springer.com/>

- Wiley Journal Database <https://onlinelibrary.wiley.com/>

- Scientometric database Lens.org <https://www.lens.org/www.lens.org>

Teaching materials for independent work of students in the development of the discipline / module:*

1. Course of lectures on the discipline "Medical elementology".

* - all teaching materials for independent work of students are placed in accordance with the current procedure on the discipline page **in TUIS!**

DEVELOPERS:

Assistant Professor		Skalny A. A.
_____	_____	_____
position, department	signature	name and surname

HEAD of the Department:

Head of the Department		Skalny A. V.
_____	_____	_____
name of the department	signature	name and surname

HEAD of the Higher Education Program:

Professor		Sturov N. V.
_____	_____	_____
<i>Position, BUP</i>	<i>Signature</i>	<i>Surname Acting</i>