MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS
Educational Institution
BELARUSIAN STATE MEDICAL UNIVERSITY

APPROVED
by Rector of the Educational Institution «Belarusian State Medical University»
_____ S.P.Rubnikovich
20.11.2024
Reg. # UD-091-099/2425/edu.

RADIATION MEDICINE AND ECOLOGY

Curriculum of the educational institution in the academic discipline for the specialty

7-07-0911-03 «Dentistry»

2024

Curriculum is based on the educational program «Radiation Medicine and Ecology», approved 20.11.2024, registration # УД-091-099/2425/уч.; on the educational plan in the specialty 7-07-0911-03 «Dentistry», approved 30.04.2024, registration # 7-07-0911-03/2425/mf.

COMPILERS:

A.R.Avetisov, Head of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Associate Professor;

A.N.Stojarov, Professor of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Professor;

G.D.Keis, Associate Professor of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Associate Professor;

L.M.Sheuchuk, Associate Professor of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Associate Professor;

V.A.Stahouskaya, Senior Teacher of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University»

RECOMMENDED FOR APPROVAL:

by the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University»
(protocol # 2 of 10.09.2024);

by the Scientific and Methodological Council of the Educational Institution «Belarusian State Medical University»
(protocol # 3 of 20.11.2024)

EXPLANATORY NOTE

«Radiation Medicine and Ecology» – the educational discipline of the Medical-Prophylactic Module containing systemized scientific knowledge in all aspects of the environmental impacts, ionizing radiation included, on human health, radiation-induced and environmental illnesses rise.

The aim of the discipline «Radiation Medicine and Ecology» is the formation of basic professional competencies for environmental and radiation safety ensuring.

The objectives of the discipline «Radiation Medicine and Ecology» are to form students' scientific knowledge about the patterns of the impact of environmental factors on human health, the risks of development and pathogenetic mechanisms of the origin of radiation- and environmentally conditioned health abnormalities, methods for individual and population prevention of diseases and abnormal conditions, caused by chronic low-dose exposure to physical, chemical and biological factors; skills needed to reduce the impact of environmental factors and prevent environmentally conditioned illness.

The knowledge, skills and abilities acquired during the study of the academic discipline «Radiation Medicine and Ecology» are necessary for the successful study of the following disciplines: «Radiodiagnosis and Radiotherapy», «Internal Diseases», «Professional Diseases», «Pediatrics».

A student who has mastered the content of the educational material of the discipline «Radiation Medicine and Ecology» should ensure the formation of basic professional competencies:

use knowledge about the laws of the environmental factors impact on human health, apply methods of hygienic assessment of the human environment to develop basic preventive health-preserving measures;

use knowledge about the risks of radiation and environmentally caused pathology, apply methods to reduce radiation and environmental loads on the population.

As a result of studying the discipline «Radiation Medicine and Ecology» the student should

know:

mechanisms of influence of natural and anthropogenic environmental factors on human health;

etiology, pathogenesis, clinical manifestations of radiation and environmentally conditioned pathology;

principles of origin and diminution of radiation exposure to the population due to the impact of natural and man-made sources of ionizing radiation;

a set of measures to protect the population in case of radiation accidents;

principles of adhering the healthy lifestyle and rational behavior in the relevant radiation and environmental situation;

rules of medical ethics and deontology;

be able to:

to promote a lifestyle adequate to the environmental situation among the population;

to assess the dose loads on different categories of exposed individuals under conditions of normal operation of ionizing radiation sources and in the event of a radiation accident and to interpret its results;

master:

methodology of assessment of health risks from the exposure to environmental factors;

methods for reducing dose burden on the population exposed to radiation;

methodology for conducting activities to promote a healthy lifestyle and rational behavior in the relevant radiation and environmental situation.

Total number of hours for the study of the discipline is 58 academic hours, of which 36 classroom hours and 22 hours of student independent work. Classroom hours according to the types of studies: lectures – 18 hours (including 6 hours of supervised student independent work (SSIW)), practical classes – 18 hours.

Intermediate assessment for the Medical-Prophylactic Module (academic disciplines «General Hygiene» and «Radiation Medicine and Ecology») is carried out according to the syllabus of the specialty in the form of a credit (4th semester).

Form of higher education – full-time.

ALLOCATION OF ACADEMIC TIME ACCORDING TO SEMESTERS OF STUDY

Code, name of the specialty	semester	Number of academic hours						Form of intermediate assessment
		total	in-class	including			out-of-class self-studies	
				lectures	supervised student independent work	practical classes		
7-07-0911-03 «Dentistry»	4	58	36	12	6	18	22	credit

THEMATIC PLAN

Section (topic) name	Number of class hours	
	lectures (incl. SSIW)	practical
1. Ecological Medicine	**7,5**	**8**
1.1. Fundamentals of environmental medicine	3	2
1.2. Environmental and medical consequences of biosphere pollution	3	4
1.3. Monitoring of the environment and the health status of the population	1,5	2
2. Radiation Medicine	**10,5**	**10**
2.1. Effects of ionizing radiation	3	2
2.2. Public exposure of humans	3	2
2.3. Biomedical consequences of irradiation	3	2
2.4. Radiation safety	1,5	2
2.5. Reduction in radiation burden on population		2
Total hours	**18**	**18**

CONTENT OF THE EDUCATIONAL DISCIPLINE

1. Ecological Medicine

1.1. Fundamentals of environmental medicine

Environmental medicine: concept, goals, objectives. Heredity, nutritional status and free radical stress as the prominent triggering moments in the environmental diseases evolving. Role and place of Environmental Medicine in the up-to-day system of medical professionals' tuition.

Factors: basic concepts, classification. Characteristics of abiotic and biotic environmental factors. Mechanisms of influence of environmental factors human population. Human adaptation to ecological factors. Specific and nonspecific mechanisms of protection against the adverse effects of environmental factors. Human adaptation to environmental factors. Ecological factors and human health.

Effect of physical factors on the human body and health

Influence of the visible portion of the solar spectrum and illuminance on the human being. Biological rhythms. Calculation of the daily rhythm of human temperature and pulse. Prevention and treatment of «winter depression» («seasonal affective disorder»). Influence of ultraviolet radiation (UVR) on the human, mechanisms of natural protection from the damaging effect of UV-B, UV-C effects on the human. Evaluation of the type of skin sensitivity to UV radiation. Assessment of risk for skin malignancy.

Geomagnetic factors: characteristics, human reaction to the action of geomagnetic factors, prevention of their adverse effects. Meteosensitivity: concept,

classification according to severity of clinical manifestations and types of meteopathical reactions.

Effect of chemical factors on the human body and health. Pathogenetic mechanisms of action of chemical factors on the human body. Foreign chemicals (xenobiotics): concept, classification, general characteristics. Xenobiotics properties that determine their toxicity. Mechanisms of toxic action.

Effect of biological factors on the human body and health. Mechanisms of unfavorable effects of biological factors on human system.

1.2. Environmental and medical consequences of biosphere pollution

Sources of biosphere pollution, possible chemical transformations of pollutants in the biosphere. The relationship between pollution of the human environment with xenobiotics (carbon dioxide, strontium, lead, other metals) and dental diseases.

Environmental and health consequences of air pollution with carbon, nitrogen and sulfur oxides, and other xenobiotics. Environmental and health consequences of photochemical smog, the "greenhouse" effect, and destruction of the ozone layer. Assessment of the level of pollution in the atmospheric air.

The influence of the main components of tobacco smoke on human health and the occurrence of diseases of the oral mucosa.

Ecological and medical consequences of eutrophication of water bodies. Ecological and medical consequences of water pollution with heavy metals (mercury, lead, cadmium) and their connection with occurrence of dental diseases. Endemic diseases caused by insufficient or excessive fluoride in drinking water.

The concept of essential and non-essential elements and their role in development of disease in humans. Endemic pathology in the World and Republic of Belarus.

Ecological problems of nutrition. The main contaminants of food products (pesticides, mycotoxins, fertilizers, heavy metal salts, radionuclides); possible consequences of their chronic intake into the human body. Characteristics of food: composition; basic xenobiotics, taken with food (pesticides, mycotoxins, fertilizers, heavy metals, carcinogens, radionuclides, etc.); compounds forming the organoleptic quality of products; biologically active substances. Food composition assessment.

Assessment of human health risks under the influence of environmental factors. Prevention of possible adverse effects of xenobiotics entering the human body with food.

Ecological characteristics of the environment of residential and public buildings. Physical, chemical, biological factors of indoor environment affecting human health.

Characteristics of non-ionizing electromagnetic radiation (NIEMR). International Classification of electromagnetic waves in frequencies. Use of non-ionizing electromagnetic radiation in medicine. Mechanisms of interaction of non-ionizing electromagnetic radiation and biological structures. Medical aspects of impact of non-ionizing electromagnetic radiation on the human body. Electro-sensitivity: concept prevalence among the population, clinical manifestations. Consequences of NIEM actions on the nervous, endocrine, immune and reproductive systems. Electromagnetic fields (electro smog): concept, sources, features, reducing the adverse effects of its impact on the population. Assessment of the electromagnetic environment

in the room. Radiotelephony. Mobile communications: principles, particularies of the influence of pulsating radiation on the human body.

1.3. Monitoring of the environment and the health status of the population

Monitoring: concept, types. Systems of global and local monitoring. National Environmental Monitoring System. Social and hygienic monitoring: concept, goals, objectives, stages. Analysis of monitoring information results, forecasting of possible developments. Study of environmental factor influence on human health: method of modeling on animals, observation population (questionnaire method, processing of statistical data, epidemiological studies), health risk assessment under the influence of environmental factors. Assessment of the environmental cancer risk.

Regulatory legal framework for environmental protection Basic principles of ecological law. Ecological and natural conservation and resource legislation: Constitution of the Republic of Belarus, laws of the Republic of Belarus «On Ecological Protection», «On State Ecological Expertise», etc. The rights of citizens to health protection, healthy environment and compensation for damages caused by the violation of this right. Liability for contempt of the environmental law.

2. Radiation Medicine

2.1. Effects of ionizing radiation

Radiation medicine: concept, goals, objectives, methods. The role of radiation in human life and society. History of radiation medicine development.

Bonds between Radiation Medicine and Nuclear Physics, General Biology, Biochemistry, Cytology, Genetics, Radiobiology, Radiation Hygiene, clinical disciplines.

Ionizing radiation types classification, properties.

Essence of radioactivity phenomenon. Radioactivity units. Types of radioactive transformations of nuclei. The law of radioactive decay. Interaction between charged particles and substance. Calculation of the percentage of radionuclides after an accidental release. Linear energy transfer (LET) concept. Interaction of electromagnetic radiation and substance. Neutrons and substance interaction features. The phenomenon of induced radioactivity.

Stages of radiation damage. Direct and indirect effects ionizing radiation. Types of cell responses to ionizing radiation exposure. Nowadays views on the mechanisms of interphase and mitotic cell death. Post-radiation recovery.

Methods of ionizing radiation registration: physical, chemical, biological, features and employment in radiation medicine and hygiene. Biological dosimetry. Reconstruction of doses incurred by humans.

Dosimetry: concept, essence. Radiological dose quantities: exposure, absorbed, equivalent, effective, ambient dose equivalent; correlation between traditional units and the units International System of Unis. Air Kerma. Collective dose quantities. Radiological physical/basic, protective, operational dose quantities. Calculation of doses incurred from external and internal exposure of humans to radionuclides of Chernobyl Nuclear Power Plant accidental release. Common and individual dosimetry.

Radiometry. Principles of radiometric studies. Measurement of the dose incurred by humans from internal exposure to ionizing radiation. Methods of measurement of incorporated radioactive cesium.

2.2. Public exposure of humans

Radiation background of the Earth, its components. The contribution of various components of the radiation background to the formation of the average annual effective dose in humans. Natural and man-made sources of ionizing radiation.

Natural radiation background, profiles of natural terrestrial and extraterrestrial sources of ionizing radiation. State of the environmental radiation in the Republic of Belarus prior to the Chernobyl Nuclear Plant (NPP) Accident. Importance of the optimization of the dose burden from radiation background for the Republic of Belarus residents.

Man-made (artificial) radiation background, its components contributing to the human dose burden from exposure to ionizing radiation. Global fallout of radionuclides owing to nuclear weapons testing and regular operation of nuclear reactors. Contribution of ionizing radiation sources used for medical purposes to the radiation burden on patients in the Republic of Belarus.

Achievements of the nuclear energetics worldwide and in the Republic of Belarus. Stages of the nuclear fuel cycle; radionuclides generated during the nuclear reactor operation; dose values incurred in humans from the Nuclear Power Plant regular operation. Belarusian Nuclear Power Plant, radiation safety ensuring for the members of the public in planned exposure situation. Evaluation of the ambient dose equivalent rate of roentgen and gamma radiation.

Chernobyl Accident. Radiation accidents: concept, stages of evolving. Formation of population radiation doses during and after a radiation accident. The Chernobyl Nuclear Plant Accident, radionuclides emission temporal and spatial aspects. Effect on humans of radionuclides of Chernobyl release in the Republic of Belarus. Migration of radionuclides in the biosphere: profiles of deposition of radionuclides in the lithosphere and hydrosphere, progressing accumulation of radionuclides moving up the food chain. Principal pathways for radionuclides entry into the body, types of distribution in the body. The Law of the Republic of Belarus «On the legal status of the territories contaminated as a result of the Chernobyl Nuclear Plant Accident». Radiation background in the Republic of Belarus nowadays. Medical consequences of the Chernobyl accident. Principles of protective measures. Radiation monitoring. Calculation and assessment of the annual effective dose of external human exposure to radionuclides due to the Chernobyl accident.

2.3. Biomedical consequences of irradiation

Radiosensitivity issue – the central problem of radiobiology and radiation medicine. Molecular basis of radiosensitivity. Radiosensitivity of cells, organs and tissues. The effect of ionizing radiation on organs and systems. Individual and age variations in radiosensitivity. The effect of radiation on the embryo and fetus.

Radiation injuries to humans. Factors causing ionizing radiation injuries to human body. The concept of «critical organ». Deterministic effects of radiation: concept, dose dependence, characteristics of the effects. Comparative profile of deterministic and stochastic effects of exposure.

Expected health effects of the particular individual and overall human population under long-term low-dose exposure.

Possible changes in the health of an individual and the human population as a whole with chronic low-dose irradiation.

The health status of the population of the Republic of Belarus after the Chernobyl accident.

2.4. Radiation safety

Radiation safety: concept, guiding principles and ways of implementation. International organizations involved in the upgrade of the radiation safety provision. State administration and regulation in the field of radiation safety. Generic profile of the cornerstone legal acts regulating work with the sources of ionizing radiation: the Law of the Republic of Belarus «On radiation safety», sanitary standards and regulations «Requirements for radiation safety», hygienic standard «Criteria for radiation exposure assessment», sanitary standards and regulations «Requirements for provision of radiation safety of personnel and members of the public under execution of activities involving the employment of atomic energy and sources of ionizing radiation». Categories and situations of exposure, categories of exposed individuals and corresponding approaches to dose limitations. Evaluation of the external radiation exposure of population living in a territory contaminated with radionuclides. Evaluation of the long-term radiation exposure of the population due to entry of radionuclides into the human body by oral and inhalation routes.

Sealed and unsealed sources concept. Measures for protecting against ionizing radiation: measures based on time, distance, shielding, quantity-based protective approach. Radiation safety of the personnel and the members of the public in existing exposure situations.

Radiation accident concept. Decision making criteria for protecting members of the public in radiation accidents. Provision of radiation safety in emergency exposure situation. Criteria for transition to existing exposure situation.

2.5. Reduction in radiation burden on population

The state unified system for monitoring and recording the individual doses.

Exposure to ionizing radiation for medical purposes. Reducing exposure of patients and members of the public to the sources of ionizing radiation employed for medical purposes: legal acts regulating exposure incurred by patients; referral to X-ray and radiodiagnostic examination justification; reference levels for patients in X-ray and radiodiagnostic examinations; organizational, methodological and technical measures to diminish the dose received by the patient.

Principles of reduction of the annual effective dose incurred within the early, interim and recovery phases of the post-accidental period. Reduction of the annual effective dose from external exposure: decontamination of the terrain and the environmental objects; evacuation, resettlement and relocation of people, other measures. Reduction of the annual effective dose from internal exposure: limiting the intake of radionuclides, limiting the absorption of radionuclides in the gastrointestinal tract, exercising rational and healthy dietary habits, facilitating the excretion of radionuclides from the body, reducing the detrimental effects of radionuclides, enhancing the adaptive-compensatory potency of the human body.

Principles of habitation on the terrains contaminated with radionuclides. A set of measures to diminish the annual effective dose from external and internal exposure.

ACADEMIC DISCIPLINE CURRICULAR CHART

Section, topic #	Section (topic) name	Number of hours		Supervised student independent work	Literature	Practical skills	Form of control	
		lectures	practical				of practical skills	of current / intermediate assessment
	Lectures	**12**	**-**	**6**				
1.1.	Fundamentals of environmental medicine	1,5	-	1,5	7			Interviews, preparation and presentation of abstracts
1.2.	Environmental and medical consequences biosphere pollution	1,5	-	-	7			
1.2.	Environmental and medical consequences biosphere pollution	1,5	-	-	7			
1.3.	Monitoring the environment and public health	1,5	-	-	7			
2.1.	Effects of ionizing radiation	1,5	-	1,5	7			Interviews, preparation and presentation of abstracts
2.2.	Public exposure of humans	1,5	-	1,5	7			Interviews, preparation and presentation of abstracts
2.3.	Biomedical consequences of irradiation	1,5	-	1,5	7			Interviews, preparation and presentation of abstracts
2.4. 2.5.	Radiation safety. Reduction in radiation burden on population	1,5	-	-	7			
	Practical classes	**-**	**18**	**-**				
1.1.	Fundamentals of environmental medicine.	-	2	-	2, 3,	Assessment of the risk	Account on	Express-interview,

	Environmental factors. Pract.w.: Assessment of the risk of seasonal emotional disease» «Evaluation of the type of skin sensitivity to UV radiation. Assessment of risk for skin malignancy»				4, 7	of seasonal emotional disease. Evaluation of the type of skin sensitivity to UV radiation. Assessment of risk for skin malignancy	laboratory work Solving situational problems*	electronic tests, reporting and defense of the essays
1.2.	Environmental and medical consequences of biosphere pollution: consequences of air pollution, consequences of hydrosphere pollution. Pract.w.: «Assessment of ozone level in ambient air»	-	2	-	4, 7	Assessment of the level of pollution in the atmospheric air	Account on laboratory work	Express-interview, electronic tests, reporting and defense of the essays
1.2.	Environmental and medical consequences of biosphere pollution. Effect of the state of the lithosphere and the quality of food on population health. Pract.w.: «Food composition assessment»	-	2	-	4, 7	Food composition assessment	Account on laboratory work	Express-interview, electronic tests, reporting and defense of the essays
1.3.	Monitoring of the environment and the health status of the population. Pract.w.: «Assessment of the environmental cancer risk»	-	2	-	4, 5, 7	Assessment of the environmental cancer risk	Solving situational problems*	Express-interview, electronic tests, reporting and defense of the essays
2.1.	Effects of ionizing radiation. Physical basis of the action of ionizing radiation. Methods of ionizing radiation registration. Introduction to dosimetry Pract.w.: «Calculation of the percentage of radionuclides after an accidental release»	-	2	-	1, 7	Calculation of the percentage of radionuclides after an accidental release	Solving situational problems	Express-interview, electronic tests, reporting and defense of the essays
2.2.	Public exposure of humans. Background radiation levels. Natural background radiation. Chernobyl accident. Pract.w.: «Evaluation of the ambient dose equivalent rate of roentgen and gamma radiation by the MKC-6130A dosimeter-radiometer»	-	2	-	1, 7	Evaluation of the ambient dose equivalent rate of roentgen and gamma radiation	Account on laboratory work	Express-interview, electronic tests, reporting and defense of the essays

2.3.	Biomedical consequences of irradiation. Pract.w.: «Evaluation of the external radiation exposure of population living in a territory contaminated with radionuclides»	-	2	-	1, 7	Evaluation of the external radiation exposure of population living in a territory contaminated with radionuclides	Solving situational problems*	Express-interview, electronic tests, reporting and defense of the essays
2.4.	Radiation safety. Laboratory work: «Evaluation of the long-term radiation exposure of the population due to entry of radionuclides into the human body by oral and inhalation routes»	-	2	-	1, 7	Evaluation of the long-term radiation exposure of the population due to entry of radionuclides into the human body by oral and inhalation routes	Solving situational problems*	Express-interview, electronic tests, reporting and defense of the essays
2.5.	Reduction in radiation burden on population. Medical exposure. Reduction of medical exposure of patients and members of the public from the sources of ionizing radiation used for medical purposes. Pract.w.: «A set of measures to diminish the annual effective dose from external and internal exposure»	-	2	-	1, 6, 7	A set of measures to diminish the annual effective dose from external and internal exposure	Solving situational problems*	Express-interview, electronic tests, reporting and defense of the essays. Credit
	Total hours	**12**	**18**	**6**				

*This is a mandatory form of current certification.

INFORMATION AND INSTRUCTIONAL UNIT

LITERATURE

Basic (relevant):

1. Radiation medicine : textbook for foreign students of higher education institutions in medical specialties / A. N. Stozharov [et al.]; edited by A. N. Stozharov. – Minsk : Novoe znanie, 2020. – 205 p.

Additional:

2. Setting global research priorities for urban health. Geneva : World Health Organization; 2022. – Electronic resource https://iris.who.int/bitstream/handle/10665/363443/9789240041820-eng.pdf

3. Review of indicator frameworks supporting urban planning for resilience and health: third report on protecting environments and health by building urban resilience. Copenhagen : WHO Regional Office for Europe; 2022. – Electronic resource https://iris.who.int/bitstream/handle/10665/355760/WHO-EURO-2022-5650-45415-64990-eng.pdf

4. Compendium of WHO and other UN guidance in health and environment, 2024 update. Geneva : World Health Organization; 2024. : – Electronic resource https://iris.who.int/bitstream/handle/10665/378095/9789240095380-eng.pdf

5. ICRP publication 115. Lung Cancer Risk from Radon and Progeny and Statement on Radon. – Electronic resource https://journals.sagepub.com/toc/anib/40/1

6. ICRP publication 117. Radiological Protection in Fluoroscopically Guided Procedures Performed Outside the Imaging Department. – Electronic resource https://journals.sagepub.com/toc/anib/40/6

Electronic courseware for the academic discipline «Radiation Medicine and Ecology»

7. https://etest.bsmu.by/course/view.php?id=221.

METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

The time allocated for independent work can be used by students for:
preparing for lectures and practical classes;
preparing for credit in the academic discipline;
studying the topics (issues) designed for independent work;
problem solving;
performing research and creative tasks;
preparing thematic reports, abstracts, presentations;
taking notes of educational literature;
compilation of a thematic selection of literature sources, Internet sources.

METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND PERFORMANCE OF SUPERVISED STUDENT INDEPENDENT WORK IN THE ACADEMIC DISCIPLINE

APPROXIMATE LIST OF TASKS FOR SUPERVISED STUDENT INDEPENDENT WORK:

preparation and presentation of abstracts;
presentation of reports;
studying topics and problems that have not been discussed at the lectures;
computer testing.

FORMS OF CONTROL OF SUPERVISED STUDENT INDEPENDENT WORK:

interview;
preparation and presentation of abstracts.

LIST OF AVAILABLE DIAGNOSTIC TOOLS

The following forms are used for competence assessment:
reporting and defense of the essays;
express-interview;
interview;
electronic tests.

LIST OF AVAILABLE TEACHING METHODS

Traditional method;
active (interactive) methods:
Problem-Based Learning (PBL);
Research-Based Learning (RBL).

LIST OF PRACTICAL SKILLS

Name of practical skills	Form of practical skills control
1. Assessment of the risk of seasonal emotional disease	Account on laboratory work
2. Evaluation of the type of skin sensitivity to UV radiation. Assessment of risk for skin malignancy	Solving situational problems
3. Assessment of the level of pollution in the atmospheric air	Account on laboratory work
4. Food composition assessment	Account on laboratory work
5. Assessment of the environmental cancer risk	Solving situational problems
6. Calculation of the percentage of radionuclides after an accidental release	Solving situational problems
7. Evaluation of the ambient dose equivalent rate of roentgen and gamma radiation	Account on laboratory work
8. Evaluation of the external radiation exposure of population living in a territory contaminated with radionuclides	Solving situational problems
9. Evaluation of the long-term radiation exposure	Solving situational problems

Name of practical skills	Form of practical skills control
of the population due to entry of radionuclides into the human body by oral and inhalation routes	
10. A set of measures to diminish the annual effective dose from external and internal exposure	Solving situational problems

**PROTOCOL OF THE CURRICULUM APPROVAL
BY OTHER DEPARTMENTS**

Title of the discipline requiring approval	Department	Amendments to the curriculum in the academic discipline	Decision of the department, which designed the curriculum (date, protocol #)
1. Radiodiagnosis and Radiotherapy	Radiodiagnosis and Radiotherapy	No comments or suggestions	Protocol # 2 of 10.09.2024
2. Internal Diseases	Internal Medicine, Gastroenterology and Nutrition with a course of advanced training and retraining	No comments or suggestions	Protocol # 2 of 10.09.2024

COMPILERS/AUTHORS:

Head of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Associate Professor _____ A.R.Avetisov

Professor of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Professor _____ A.N.Stojarov

Associate Professor of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Associate Professor _____ G.D.Keis

Associate Professor of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University», PhD, Associate Professor _____ L.M.Sheuchuk

Senior teacher of the Department of Radiation Medicine and Ecology of the Educational Institution «Belarusian State Medical University» _____ V.A.Stahouskaya

Curriculum content, composition and the accompanying documents comply with the established requirements.

Head of the Office of Educational Activities of the Educational Institution «Belarusian State Medical University» _____ I.L.Kotovich
18.11.2024

Methodologist of the Educational and Methodological department of the Office of Educational Activities of the Educational Institution «Belarusian State Medical University» _____ S.V.Zaturanova
18.11.2024