Ministry of Health of Ukraine
Poltava State Medical University

Department of oncology and radiology with radiation medicine

SILABUS

Oncology and _radiation medicine
(the name of the academic discipline)

Normative discipline

Level of higher education	The second (master's) level of higher education
Branch of knowledge	22 «Health care»
specialty	221 «Medcine»
Qualification professional	Doctor
Qualification educational	Daytime
Program form of education	5 course, 10 semester
Course and semester	
Of study	
Of the academic discipline	

Module 2. Radiation medicine

POLTAVA – 2024

DATA ABOUT TEACHERS WHO TEACH THE COURSE

Surname, first name, patronymic of teachers, academic degree, academic title	Pocherniaeva Viktoriya Fedorivna - doctor of medicine, professor Larisa Mykolaivna Vasko - Doctor of Medicine, Associate Professor Marchenko Valery Yuriyovych - Doctor of Medicine, Associate Professor Nestulya Kateryna Igorivna – assistant Tetyana Anatoliivna Dudnyk - Doctor of Medicine, Associate Professor
Profile of the teacher(s)	https://oncology.pdmu.edu.ua/team
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The page of the department on the website of PSMU	https://oncology.pdmu.edu.ua/team

MAIN CHARACTERISTICS OF THE EDUCATIONAL DISCIPLINE

Scope of the academic discipline

Number of credits / hours – 1,0 / 30, of them:

Lectures (h.) – 4 h.

Practical training (h.) – 14 h.

Independent work (h). – 12 h

Type of control FMC

Signs of academic discipline

Nature of discipline (normative/selective) normative

Year of study 5

Semester 10

Policy of educational discipline

Teaching at the department of oncology and radiology with radiation medicine is determined by the system of requirements that the teacher presents to the student when studying the discipline and is based on the principles of academic integrity:

- independent performance of educational tasks of current control without writing off and using mobile phones;

- independent performance of individual tasks and correct design of references to sources of information.

As well as requirements for attending classes (mandatory attendance at lectures and practical classes, absence of absences, tardiness, etc. is unacceptable); rules of behavior of students in classes (mandatory performance of the required minimum of educational work, active participation in studying the topic in class, turning off mobile phones); missed classes are made up in accordance with the regulations for electronic missed classes.

- Teaching at the department is carried out taking into account the norms of Ukrainian legislation on academic integrity, the Statute, Regulations of the PSMU and other normative documents. When organizing the educational process, teachers and students of education act in accordance with:
- Regulations on the organization of the educational process at the Poltava State Medical University
- Regulations on the academic integrity of higher education applicants and employees of the Poltava State Medical University
- Rules of internal procedure for applicants of the Poltava State Medical University
- Regulations on the organization and methodology of evaluating the educational activities of higher education applicants at the Poltava State Medical University
- Regulations on the organization of independent work of students at the Poltava State Medical University
- -Regulations on making up for missed classes and unsatisfactory grades by students of higher education of the Poltava State Medical University.

-Information about these provisions is available on the website:

https://www.pdmu.edu.ua/n-process/department-npr/two-level/opp/med/osvitno-profesiyna-programa-medicina

Description of the educational discipline (abstract) In connection with the widespread distribution of sources of ionizing radiation, the radiation background is increasing. And the use of sources of ionizing radiation in the national economy for diagnostic purposes, as well as the irradiation of a large number of the population of Ukraine with small doses after the accident at the Chernobyl nuclear power plant, led to an increase in the impact of ionizing radiation on the human body. Therefore, the student needs to know what effect ionizing radiation causes on human tissues and organs, to have an idea of the modern point of view on the effect of small doses of ionizing radiation on the body. A graduate of a higher medical institution is required to be able to evaluate information on the nature of the action of small doses of IV, the conditions for the occurrence of somatic stochastic effects, to evaluate clinical and laboratory data to establish the presence of pathology and its connection with the action of ionizing radiation. In addition, our life passes at a time when we are served by nuclear power plants, scientific laboratories, research institutes, not even taking into

account military technologies. Although acute radiation sickness is a peacetime emergency, it can still occur. This is especially evident on the example of the disaster at the Chernobyl nuclear power plant in 1986. Therefore, the modern doctor needs detailed data on the etiology, course and treatment of acute and chronic radiation sickness.

Prerequisites and postrequisites of the academic discipline (interdisciplinary connections)

Mastering module 2. Radiation medicine is based on the students' study of medical biology; medical and biological physics; biological and bioorganic chemistry; human anatomy; histology, cytology and embryology; physiology and integrates with these disciplines, relies on knowledge of pathomorphology; pathophysiology; hygiene and ecology.

Knowledge of radiation medicine is used in the process of further study of propaedeutics of pediatrics; internal medicine; general surgery; pharmacology; social medicine, public health; oncology; allergology; gynecology; hematology; neurology; cardiology

The purpose and tasks of the educational discipline:

The purpose of studying module . Radiation medicine is to train future doctors in the complex of knowledge, skills and abilities in radiation medicine.

The main tasks of studying module . Radiation medicine are:

- to teach the student to determine etiological, pathogenetic factors and clinical manifestations, to diagnose acute radiation damage and to provide emergency aid to victims, to determine the tactics of managing victims who have been exposed to ionizing radiation;
- to learn to determine the etiological and pathogenetic factors of chronic radiation injuries of people, to determine the tactics of managing victims;
- teach how to use the methods of determining the effect of small doses of radiation on the human body and determine the means of prevention, treatment and minimization of the harmful effects of radiation.

Competences and learning outcomes, the formation of which contributes to the discipline (integral, general, special)

integral:

- the ability to solve typical and complex specialized tasks and practical problems in the learning process, which involves conducting research and/or implementing innovations and characterized by the complexity and uncertainty of conditions and requirements;

general:

- the ability to apply knowledge of "Radiation Medicine" in practical situations;
- knowledge and understanding of the subject area of radiation medicine;
- the ability to choose a communication strategy;
- ability to work in a team;
- ability to interpersonal skills;
- the ability to communicate both in the native language and in a second language orally and in writing;

- ability to abstract thinking, analysis and synthesis;

- the ability to constantly learn and be up-to-date;

- the ability to evaluate and ensure the quality of performed works;

- have skills in using information and communication technologies.

special:

- to be able to operate with knowledge about the biological effect of ionizing radiation on the human body, its impact on various organs and systems;

- learn the issues of etiology, pathogenesis, clinic, course of acute and chronic radiation sickness, local radiation lesions, the combined action of various types of ionizing radiation, modern hypotheses of the influence of small doses of radiation on the human body;

- to be able to determine and analyze diagnostic methods and possible clinical consequences when radionuclides enter the body, the possibility of using curative and preventive measures;

- to be able to carry out differential diagnosis between radiation pathology and pathology of internal organs;

- to analyze possible early and late remote consequences of human exposure: stochastic and non-stochastic effects of radiation, somatic and genetic pathology

- learn the main social, sanitary, hygienic, ecological and psychological aspects of accidents at nuclear plants (according to the model of the accident at the Chernobyl NPP);

- master the medical sorting of victims of ionizing radiation at the pre-hospital and hospital stages;

- to be able to provide emergency aid to victims of ionizing radiation at the pre-hospital and hospital stages;

- to be able to prescribe differentiated treatment for patients with radiation damage depending on the degree of severity and the period of the clinical course;

- to be able to draw up a plan of organizational measures for the prevention of radiation injuries and conducting preliminary and periodic medical examinations of workers and persons who have been excessively exposed to ionizing radiation;

- master the skills of using dosimeters and radiometers, determination of radionuclide contamination of water, food products and their suitability for consumption, use of individual and collective means of protection against ionizing radiation.

Learning outcomes for module 2. Radiation medicine: upon completion of the module, students should:

know:

- the nature and properties of ionizing radiation (alpha, beta, gamma, neutrons, X-rays);
- dosimetry of ionizing radiation;
- biological effect of ionizing radiation;
- issues of etiology, pathogenesis, pathomorphology of radiation lesions;
- diagnostic methods in radiation medicine;

- clinical course of acute and chronic radiation lesions: principles of treatment of radiation lesions;
- diagnosis, clinic and principles of treatment with incorporation of radionuclides;
- impact of ionizing radiation on various organs and body systems;
- distant consequences of the action of ionizing radiation;
- the effect of small doses of ionizing radiation on the human body;
- principles of radiation damage prevention and their consequences;
- medical, psychological and social aspects of large-scale accidents at nuclear plants;
- the principles of dispensation of persons who have been exposed to excessive ionizing radiation, about the national register of Ukraine of persons who suffered as a result of the Chernobyl disaster.

be able:

1. To know the structure and functions of individual organs and systems and the human body as a whole in normal conditions, during the development of pathological processes, diseases; to be able to use the acquired knowledge in further education and in the practical activities of a doctor.

2. Collect data on the patient's complaints, life history (professional history in particular) in the conditions of a health care facility and/or at the patient's home, according to a standard survey scheme.

3. Prescribe and analyze additional (mandatory and optional) examination methods (laboratory, X-ray, functional and/or instrumental). Evaluate information for the purpose of differential diagnosis of diseases (according to list 2), using knowledge about a person, his organs and systems, based on the results of laboratory and instrumental research (according to list 4).

4. Establish a preliminary and clinical diagnosis of the disease (according to list 2) on the basis of the leading clinical symptoms or syndromes (according to list 1) by making a reasoned decision and logical analysis, using the most likely or syndromic diagnosis, data from laboratory and instrumental examination of the patient, conclusions of differential diagnosis , knowledge about a person, his organs and systems, observing the relevant ethical and legal norms. 9

5. Determine the necessary regime of work and rest during the treatment of the disease (according to list 2) in the conditions of a health care institution, at the patient's home and at the stages of medical evacuation, including in field conditions, on the basis of a preliminary clinical diagnosis, using knowledge about a person, his organs and systems, observing the relevant ethical and legal norms, by making a reasoned decision according to existing algorithms and standard schemes.

6. Prescribe the necessary medical nutrition during the treatment of the disease (according to list 2), in the conditions of a health care facility, at the patient's home and at the stages of medical evacuation, including in field conditions on the basis of a preliminary clinical diagnosis, using knowledge about a person, his organs and systems, observing relevant ethical and legal norms, by making a reasoned decision according to existing algorithms and standard schemes.

7. Determine the nature of treatment of the disease (conservative, operative) and its principles (according to list 2) in the conditions of a health care facility, at the patient's home and at the stages of medical evacuation, including in field conditions on the basis of a preliminary clinical diagnosis, using knowledge about a person, his organs

and systems, observing relevant ethical and legal norms, by making a reasoned decision according to existing algorithms and standard schemes.

8. Diagnose emergency conditions and establish a diagnosis (according to list 3) by making a reasoned decision and assessing a person's condition under any circumstances (at home, on the street, in a health care facility), including in emergency situations, in field conditions, in conditions of lack of information and limited time, using standard methods of physical examination and possible anamnesis, knowledge about a person, his organs and systems, observing relevant ethical and legal norms.

9. Determine the tactics of providing emergency medical care, under any circumstances, using knowledge about a person, his organs and systems, observing the relevant ethical and legal norms, by making a reasoned decision, based on the established diagnosis (according to list 3) in conditions of limited time using standard schemes.

10. To provide emergency medical aid under any circumstances, using knowledge about a person, his organs and systems, observing the relevant ethical and legal norms, by making a reasoned decision, based on the diagnosis of an emergency condition (according to list 3) in conditions of limited time in accordance with certain tactics, using standard schemes.

11. To organize and carry out medical evacuation measures among the population and military personnel in emergency situations, including in field conditions, during the deployed stages of medical evacuation, taking into account the existing system of medical evacuation support. 12. To perform medical manipulations (according to list 5) in the conditions of a health care institution, at home or at work based on a previous clinical diagnosis and/or indicators of the patient's condition, using knowledge about a person, his organs and systems, observing the relevant ethical and legal norms , by making an informed decision and using standard techniques.

13. Assess the general condition of a pregnant, laboring and parturient woman in the conditions of a health care institution based on anamnestic data, general examination, bimanual, external and internal obstetric examination. Determine the tactics of physiological pregnancy, physiological childbirth and the postpartum period. To conduct consultations on issues of family planning and the selection of a contraceptive method based on anamnestic data, a general examination and a gynecological examination of a woman, using knowledge about the reproductive organs of a woman, observing the relevant 10 ethical and legal norms.

18. To keep medical documentation regarding the patient and the contingent of the population on the basis of regulatory documents, using standard technology. Prepare reports on personal production activity using official accounting documents in a standard form.

26. To comply with the requirements of ethics, bioethics and deontology in their professional activities.

Lecture topics

Name topics	hours				
	Total				
		Lectures	seminars	practical.	independent work

Module 2. Radiation medicine					
Лекція 1. History of radiation medicine development. Natural radiation background. Artificial sources of ionizing radiation. Dosimetry.	2	2			
Тема 1. Biological action of ionizing radiation. Radiosensitivity of body tissues.	3			2	1
Лекція 2. Types of radiation damage. Acute radiation sickness. Radiation reactions and damage.	2	2			
Тема 2. Acute radiation sickness.	5			2	3
Тема 3. Chronic radiation sickness	3			2	1
Тема 4. Long-term effects of ionizing radiation. Means of protection of an organism from action of ionizing radiation.	3			2	1
Тема 5. Poured small doses of ionizing radiation on the human body.	3			2	1
Тема 6. Radiation situation after the Chernobyl accident. Assessment of the degree of contamination by radionuclides in the environment.	5			2	3
Тема 7. Final modul control	4			2	2
Total	**30**	**4**		**14**	**12**

Lecture topics

№ п/п	Name topics	hours
	Module 1. Radiation medicine	
1	History of radiation medicine development. Natural radiation background. Artificial sources of ionizing radiation. Dosimetry. 1. The main stages of development of radiation medicine. 2. The concept of "natural radiation background". 3. Modern views on the natural radiation background. 4. Artificial sources of ionizing radiation. 5. Determination of dose, absorbed and exposed dose. 6. Principles of dosimeters	2
2	Types of radiation damage. Acute radiation sickness. Radiation reactions and damage. 1. What are the causes of acute radiation sickness? 2. Forms of GPC depending on the dose. 3. Classification of ARC by clinical forms. 4. Classification of ARC according to the period of disease development.	2

	5. Identify the main syndromes in the initial and latent periods of ARC. 6. Identify the main syndromes in the midst of ARC 7. Name the main syndromes in the recovery period. 8. The main methods of treatment of ARC depending on the periods.	
3.	Total	4

Topics of seminars - not provided.

Topics of practical classes

№	Name topics	hours
1.	Biological action of ionizing radiation. Radiosensitivity of body tissues. 1. Define the concept of "Radiobiology" 2. How to restore disorders in the cell that occur under the influence of IP? 3. What is the pathogenetic mechanism of the biology of ionizing radiation? 4. Basic theories of biology of ionizing radiation. 5. Radiosensitivity to ionizing radiation, its types. 6. What factors determine the sensitivity of the cell to ionizing radiation? 7. Stages and stages of radiation damage.	2
2.	Acute radiation sickness. 1. Definition of "acute radiation sickness". 2. What are the causes of acute radiation sickness? 3. Classification of ARS depending on the dose and clinical forms. 4. Determine the forms of ARS by the period of disease development. 5. Identify the main syndromes in the initial and latent periods of ARS. 6. Identify the main syndromes in the midst of ARS 7. Name the main syndromes in the recovery period. 8. Name the methods of treatment of ARS depending on the periods.	2
3.	Chronic radiation sickness. 1. Definition of CRS. 2. What stages of CRS.do you know? 3. What are the clinical manifestations of CRS.? 4. Treatment of CRS. by stages of disease development. 5. Principles of CRS. prevention. 6. What dispensary supervision is necessary for patients with CRS..	2
4.	Long-term effects of ionizing radiation. Means of protection of an organism from action of ionizing radiation. 1. What are the consequences of IR in relation to the remote? 2. What are the conditions of somatic stochastic effects. 3. Name the genetic consequences of IR. 4. Explain the nature of the action of small doses of IR. 5. What are the somatic non-stochastic long-term effects of IR exposure? 6. Name the somatic stochastic long-term effects of IR irradiation. 7. Name the teratogenic long-term effects of IR irradiation.	2

5.	Poured small doses of ionizing radiation on the human body. 1. What is meant by small doses of ionizing radiation? 2. What is the pathogenesis of small doses of ionizing radiation? 3. What are the views on the nature of the action of ionizing radiation? 4. What are the radiation-biological effects at low radiation levels? 5. What are the possible effects of ionizing radiation? 6. Positive effect of small doses of ionizing radiation.	2
6.	Radiation situation after the Chernobyl accident. Assessment of the degree of contamination by radionuclides in the environment. 1. Radiation accident at the Chernobyl nuclear power plant: when and from what happened? 2. What is an average laboratory test? 3. How to prepare drugs for radiometric analysis? 4. How to prepare preparations from soil and water samples? 5. How to prepare drugs from food? 6. How to measure the beta activity of drugs, calculate the activity of radionuclides?	2
7.	Final modul control	2
Total		**14**

Independent work (by modules and content modules)

№ п/п	Topic name	hours
	Module 2. Radiation medicine	
1	Preparation for practical classes - theoretical preparation and development of practical skills	6
2.	Elaboration of topics that are not included in the classroom lesson plan: 1. Features of clinical manifestations and treatment of radiation sickness caused by the ingress of radionuclides into the body. 1. Ways and methods of radioactive substances entering the body. 2. Types of division of radioactive elements in the body. 3. Features of internal irradiation of the body. 4. Duration of radionuclide stay in the body depending on the half-life and biological half-life. 5. Methods of objective control of internal radiation levels. 6. Ways of removing radionuclides from the body. 7. Meaning of radio protectors. 1. Organization of work, equipment of radiological department and laboratory for conducting radiometric and dosimetric studies. 1. Types and main tasks of radiological departments. 2. Organization of work and equipment of radiological departments. 3. Groups of radioactive substances according to the degree of radioactive danger. 4. Safety techniques for the staff of radiological departments and radiological laboratories. 5. Devices for dosimetric and radiological control. 6. Devices for individual dosimetric control.	2 2

	7. Types of radiation control.	
3.	Preparation for the final modular control	2
Total		12

Individual tasks are not provided

The list of theoretical questions for preparation of students for final modular control and semester final attestation

1. Nature and properties of ionizing radiation (alpha, beta, gamma, neutrons, X-rays).
2. The concept of dose, dose rate. Exposure, absorbed, equivalent, effective equivalent dose. Units of the International System (SI).
3. Methods of dose determination. Types of dosimeters.
4. Radioactivity (concepts; units, types of radioactive decay), methods for determining radioactivity.
5. Natural and artificial sources of radiation. Their contribution to the formation of the total radiation dose of the population.
6. Radiation situation after the Chernobyl accident.
7. Preventive measures during the period of contamination of the environment with radioactive substances.
8. Determination and assessment of the degree of radionuclide contamination of water and food.
9. The role of free radicals in cell damage due to ionizing radiation.
10. Radiosensitivity of various tissues of the body.
11. The value of hematological research methods to detect pathological changes in human organs and systems after exposure to ionizing radiation.
12. The effect of ionizing radiation on hematopoietic organs.
13. The effect of ionizing radiation on the digestive system.
14. The effect of ionizing radiation on the cardiovascular system.
15. The effect of ionizing radiation on the pulmonary system.
16. The effect of ionizing radiation on the central nervous system.
17. The effect of ionizing radiation on the endocrine system.
18. Clinical and biological criteria for the diagnosis of acute radiation sickness (AHD).
19. General and clinical classification of radiation injuries.
20. Clinical signs of the period of primary GPC reaction.
21. Clinical signs of latent (latent) period of GPC.
22. Clinical signs of the period of disintegration of the disease.
23. Principles of diagnosis of GPC and sorting at the stages of medical evacuation.
24. Treatment of GPC depending on the period of the disease and the experience of treatment of patients affected by the Chernobyl accident.
25. Features of diagnosis and clinic of GPC due to combined irradiation.
26. Features of GPC treatment due to combined irradiation.
27. Principles of medical psycho-social rehabilitation of persons who have undergone GPC.
28. Classification, clinic, treatment of chronic radiation sickness.
29. Classification, diagnosis and clinic of radiation burns.
30. Prevention of radiation damage.

31. Biological effects of low doses of ionizing radiation.
32. Somatic, teratogenic, genetic consequences of radiation exposure.
33. Stochastic and non-stochastic effects of radiation.
34. Organization of medical care in case of radiation accidents.
35. Organization of radiation control in case of accidents at nuclear power plants.
36. Ways of radionuclides entering the body.
37. Distribution of incorporated radionuclides in the body.
38. Preventive and therapeutic measures for the incorporation of I131 (iodine prophylaxis)
39. Medical examination of personnel of nuclear industries.
40. Medical examination of the population exposed to ionizing radiation due to a radiation accident, categories and levels of observation.
41. Medical consequences of large-scale accidents at the nuclear industry.
42. Social protection of people exposed to emergency exposure and psychological aspects of accidents at nuclear power plants.

List of practical skills for final module control and semester final certification
1. Measure contamination with radionuclides: water; food.
2. Determine the radiation dose, dose rate, the amount of radioactivity.
3. To determine safety for the person and admissible time of safe stay in an irradiation zone (according to the existing specifications).
4. Determine the degree of contamination with radionuclides of water and food and their suitability for consumption.
5. Use individual means of protection against ionizing radiation.
6. Use collective means of protection against ionizing radiation.
7. Be able to collect radiation history.
8. Use appropriate tools for the treatment of radiation pathology.
9. Identify the characteristic symptoms at different stages of CPC;
10. Be able to identify hemorrhagic syndrome and infectious processes;
11. Prescribe treatment for CPC and drugs used.
12. Depending on the course of the clinical picture be able to distinguish between forms of GPC.
13. Be able to prescribe treatment based on the dose and form of GPC.
14. Know the incidence of major classes of diseases among liquidators and other populations.
15. Predict the possible long-term effects of radiation
16. Know the clinical aspects of the action of small doses of ionizing radiation.
17. Evaluate the positive effect of small doses of ionizing radiation.

Form of push control of success: - push modular control.
Scheme of accrual and distribution of points received by education seeker

When assessing the mastery of each topic of the module, the student is given a score on a 4-point (traditional) scale. At the same time, all types of works provided for by methodical instructions for studying topics are taken into account. Standardized generalized criteria for evaluating the knowledge of higher education students are used (table 1).

Table 1. Standardized generalized criteria for evaluating the knowledge of students of higher education at PSMU

On a 4-point scale	Assessment in ECTS	Evaluation criteria
5 (exellent)	A	The student of education shows special creative abilities, knows how to acquire knowledge independently, finds and processes the necessary information without the help of a teacher, knows how to use the acquired knowledge and skills to make decisions in non-standard situations, convincingly argues answers, independently reveals his own gifts and inclinations, possesses at least 90 % of knowledge on the topic both during the survey and all types of control.
4 (good)	B	The learner is fluent in the studied amount of material, applies it in practice, freely solves exercises and problems
		in standardized situations, independently corrects errors, the number of which is insignificant, possesses at least 85% knowledge of the topic both during the survey, and all types of control.
	C	The student of education knows how to compare, generalize, systematize information under the guidance of a scientific and pedagogical worker, in general, independently apply it in practice, control his own activity; correct mistakes, including significant ones, choose arguments to support opinions, possess at least 75% of knowledge on the topic both during the survey and all types of control.
3 (satisfactory)	D	The learner reproduces a significant part of the theoretical material, demonstrates knowledge and understanding of the main provisions with the help of a scientific and pedagogical worker, can analyze the educational material, correct errors, among which there are a significant number of significant ones, possesses at least 65% knowledge of the topic as during the survey, and all types of control.
	E	The learner owns educational material at a level higher than the initial one, reproduces a significant part of it at the reproductive level. has at least 60% knowledge on the topic both during the survey and all types of control.
2 (not satisfactory)	FX	The learner owns the material at the level of individual fragments that make up an insignificant part of the material, has less than 60% knowledge of the topic both during the survey and all types of control.
	F	The learner possesses the material at the level of elementary recognition and reproduction of individual facts, elements, possesses less than 60% of knowledge on the topic during the survey, and all types of control.

After studying all topics of the module, the total evaluation of the current success rate for the module is converted from a traditional 4-point scale to a multi-point one (maximum 120 points) according to Table 2.

Table **№2.** Unified table of correspondence of points for current academic performance, points for FNC exam, and traditional four-point evaluation

Average score for current performance (A)	Points for current success in the module (A * 24)	Points for FMC from the module (A*16)	Points for the module and/or exam (A*24 + A*16)	Category ECTS	By 4-point scale
2	48	32	80	F	**2**
2,1	50	34	84	**FX**	not satisfactory
2,15	52	34	86		
2,2	53	35	88		
2,25	54	36	90		
2,3	55	37	92		
2,35	56	38	94		
2,4	58	38	96		
2,45	59	39	98		
2,5	60	40	100		
2,55	61	41	102		
2,6	62	42	104		
2,65	64	42	106		
2,7	65	43	108		
2,75	66	44	110		
2,8	67	45	112		
2,85	68	46	114		
2,9	70	46	116		
2,95	71	47	118		
3	72	50	122	**E**	**3**
3,05	73	50	123		satisfactory
3,1	74	50	124		
3,15	76	50	126		
3,2	77	51	128		
3,25	78	52	130	D	
3,3	79	53	132		
3,35	80	54	134		
3,4	82	54	136		
3,45	83	55	138		
3,5	84	56	140		
3,55	85	57	142		
3,6	86	58	144	**C**	**4 good**
3,65	88	58	146		
3,7	89	59	148		
3,75	90	60	150		
3,8	91	61	152		
3,85	92	62	154		
3,9	94	62	156		
3,95	95	63	158		
4	96	64	160	**B**	
4,05	97	65	162		
4,1	98	66	164		

4,15	100	66	166		
4,2	101	67	168		
4,25	102	68	170		
4,3	103	69	172		
4,35	104	70	174		
4,4	106	70	176		
4,45	107	71	178		
4,5	108	72	180	**A**	**5 Exellent**
4,55	109	73	182		
4,6	110	74	184		
4,65	112	74	186		
4,7	113	75	188		
4,75	114	76	190		
4,8	115	77	192		
4,85	116	78	194		
4,9	118	78	196		
4,95	119	79	198		
5	120	80	200		

The final module control is carried out after the completion of the study of all topics of the module in the last control session of the module.

Applicants who have attended all the classroom training sessions provided for in the curriculum for the discipline and have scored at least the minimum number of points while studying the module are admitted to the final examination. A student who, for good or no good reasons, missed classes, is allowed to work off the academic debt by a certain specified time.

Applicants of higher education who, during the study of the module from which the final control is conducted, had an average current grade of 4.50 to 5.0 are exempted from taking the FMC and automatically (upon consent) receive a final grade in accordance with Table 2, while the presence of the applicant education at FMC is mandatory. In case of disagreement with the assessment, the specified category of higher education applicants makes the FMC according to general rules.

The form of the final module control is standardized and includes control of theoretical and practical training. Tickets, including theoretical and practical tasks, have been prepared for the final modular control at the department. The theoretical part consists of test tasks on two different topics and situational tasks (2). To monitor practical training,

students are provided with images of various radiological research methods (x-rays, CT, MRI, ultrasound), which they must evaluate, describe according to the scheme and draw conclusions.

The result of the final module control is evaluated in points (the traditional 4-point evaluation is not assigned). The maximum number of points for the final modular control at the department is 80 points (20 points for test tasks, two tasks and a practical part). The minimum number of points of the final module control, at which the control is considered passed, is 50 points. The obtained points for the module are submitted by the scientific-pedagogical worker in the "Summary module control report" (and the individual study plan of the applicant.

Teaching methods

- verbal (thematic discussions, problem presentation, trainings, lecture, explanation, story, conversation, brainstorming);

- visual (illustration, film demonstration);

- practical (simulation tasks, presentations, analysis of specific situations, business games, round table, clinical tasks).

Control methods:
- oral control;
- written control;
- test control;
- description of diagnostic X-ray images according to schemes;
- solving clinical problems;
- self-control;
- self-esteem.

Types of control:
- previous (outgoing);
- current;
- final modular control.

Types of control:
- previous (outgoing);
- current;
- final modular control.

Methodological support:
1. Working program of the academic discipline
2. Syllabus
3. Methodical developments of lectures

4. Methodological recommendations for teachers
5. Methodical instructions for independent work of students during preparation for practical classes and during classes
6. Methodical guidelines for independent work of students on the study of topics submitted for independent study
7. Materials for monitoring students' knowledge, abilities and skills:
- tests of different difficulty levels
- situational tasks
- computer control programs
8. Video films
9. Multimedia presentations of lectures.

Recommended Books

Main (basic):

1. Радіаційна медицина : підручник / В.Ф. Почерняєва, Л. М. Васько, Т.О. Жукова та ін. - Львів : «Магнолія 2006», 2021. – 176с.

2. Радіологія : підручник. Т.1 / В. К. Югов, Л. М. Васько, Т. О. Жукова та ін. Львів : Вид-во «Магнолія 2006», 2019. - 279 с.

3. Дудник Т.А., Васько Л.М., Почерняєва В.Ф. Вибрані питання радіаційної медицини в педіатрії. – Полтава : Дивосвіт, 2023. – 132с.

Supporting literature:

1. Л. М. Васько, В.Ф. Почерняєва, В.П. Баштан. Засоби захисту організму від дії іонізуючого випромінювання. - Полтава, 2019. – 130с.

2. Актуальні питання радіаційної медицини у практиці сімейного лікаря: Навчальний посібник для лікарів-інтернів і лікарів-слухачів закладів (факультетів) післядипломної освіти /Вороненко Ю.В., Шекера О.Г., Мечев Д.С., Щербіна О.В. та співав. – К.: Видавець Заславський О.Ю., 2017.–208 с.

3. Норми радіаційної безпеки України. Доповнення: Радіаційний захист від джерел потенційного опромінення (НРБУ-97/Д-2000). Київ, 2000.- 80 с.

4. Екологічно-медичні аспекти наслідків катастрофи на Чорнобильській АЕС / А. Й. Гурський та ін. Пробл. ендокринної патології. - 2019. - С. 76–77.

5. Ярошенко Ж. С. Здоров'я дітей – мешканців радіаційно-забруднених територій, народжених після Чорнобильської катастрофи. - Довкілля та здоров'я. - 2019. -№ 3. - С. 31–37.

6. Радіоімунологічний аналіз в клінічній практиці. /Мечев Д.С., Москалець О.І. та ін. – Київ, Медицина України. – 2014. – 103 с.

7. Промислові радіаційні аварії з джерелами іонізуючого випромінювання, запобігання та порядок їх розслідування. /Мурашко В.О., Костенецький М.І., Рущак Л.В. – Київ, Поліграф. – 2014. – 78 с.

8. Радіаційна медицина: підручник / Д.А. Базика, Г.В. Кулініч, М.І. Пилипенко; за ред. М.І. Пилипенка. – К.: ВСВ «Медицини», 2013. – 232 с.

9. Мурашко В.О., Мечев Д.С. Радіаційна гігієна. /Національний підручник. Вінниця, 2013. – 376 с.

10. Мурашко В.О., Костенецький М.І., Рущак Л.В. Промислові радіаційні аварії з джерелами іонізуючого випромінювання, запобігання та порядок їх розслідування. - Київ, 2014. – 80 с.
11. Норми радіаційної безпеки України. Доповнення: Радіаційний захист від джерел потенційного опромінення (НРБУ-97/Д-2000). Київ, 2000.- 80 с.

Information resources

http://www.sworld.com.ua
www.hotline.ua
https://radiographia.info/
http://nld.by/help.htm
http://learningradiology.com
https://www.sonosite.com

Open access journals (archive of issues, full texts of articles available)

Український Радіологічний Журнал Електронна версія журналу.

Променева діагностика, променева терапія" Електронна версія журналу.

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