

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

Petro Mohyla Black Sea National University

Medical Institute

Department therapeutic and surgical disciplines

"APPROVE "

The first vice-rector
Ishchenko NM

“ ” _____ 2021 p .

CURRICULUM WORK PROGRAM

RADIOLOGY

Industry knowledge 22 "Health Care "
Specialty 222 "Medicine"

Developer

Head of the Department of Developer

Guarantor of the educational program

Director of the Institute

Chief of NMV

Barantseva SA

Zack M. Yu.

Klymenko MO

Grishchenko GV

Shkirchak SI

Description of the discipline

| Characteristic | Characteristics of the discipline | |
|---|--------------------------------------|---------------------|
| Name of discipline | Radiology | |
| Branch of knowledge | 22 "Health care | |
| Specialty | 222 "Medicine" | |
| Specialization (if any) | | |
| Educational program | Medical | |
| Level of higher education | Master | |
| Discipline status | Normative | |
| Curriculum | 3rd | |
| Academic year | 2021 - 2022 | |
| Semester numbers: | Full-time | Correspondence form |
| | 5th - 6th | - |
| Total number of ECTS credits / hours | 3.5 credit / 105 hours | |
| Course structure: - lectures - practical classes - hours of independent work of students | Full-time | Correspondence form |
| | 17.5 (7.5 / 10) | |
| | 35 (15 / 20) 53 (23 / 30) | |
| Percentage of classroom load | 50 % | |
| Language of instruction | | |
| Form of intermediate control (if any) | Certification for the 5th semester | |
| Form of final control | Differentiated credit - 6th semester | |

2. The purpose and objectives of the discipline

The purpose of studying radiology . K intsevi objectives are based on educational and professional program (EPP) preparation of doctor by profession by its units and is the basis for building the content of the discipline. The description of goals is formulated through skills in the form of target tasks (actions). On the basis of the ultimate goals of each block or section , specific goals are formulated in the form of certain skills (actions), target tasks that ensure the achievement of the ultimate goal of studying the discipline.

Objectives of study: the acquisition by the student of competencies, knowledge, skills and abilities in radiology for the implementation of professional activities in the specialty .

Prerequisites for studying the discipline (interdisciplinary links). The discipline "Radiology" is based on the knowledge acquired by students during the study of such fundamental disciplines as medical and biological physics, medical, biological and bioorganic chemistry, anatomy, histology, physiology, patho morphology , pathophysiology, propaedeutics of internal medicine, pharmacology, and to study surgery, therapy, pediatrics, oncology, traumatology and orthopedics, urology, neurosurgery, obstetrics, gynecology and other disciplines that involve the use of radiological methods of diagnosis and treatment.

Expected learning outcomes. As a result of studying the discipline, students have:

- Assimilate the properties of ionizing radiation and their biological action.
 - Acquire skills in determining the means and methods of protection against ionizing radiation.
 - Master the systematic knowledge of radiation diagnosis and radiation therapy of common diseases
 - .
 - To form practical skills and to analyze radial semiotics of functional morphological changes at pathology of various bodies and systems.
 - Master the ability to identify opportunities and choose a method of radiation therapy for tumors and non-neoplastic diseases ;

- know :

- Basic and properties and as ionizing and non-ionizing radiation.
- Physical and technical bases of various methods of radiological diagnostics.
- Indications and contraindications for the use of each of the radiation methods in the diagnosis of diseases of various organs and systems. Their diagnostic capabilities.
- Principles and methods of radiation therapy and their purpose for the treatment of oncological and non-oncological pathology.

- be able to :

- Evaluate information about the diagnosis, using a standard procedure based on the results of laboratory and instrumental studies.
- Identify the leading clinical symptom or syndrome. Establish the most probable or syndromic diagnosis of the disease. Assign laboratory and / or instrumental examination of the patient. Carry out differential diagnosis of diseases. Establish a preliminary and clinical diagnosis.
- To analyze the radiation semiotics of functional and morphological changes in the pathology of various organs and systems.
- Identify opportunities and choose a method of radiation therapy for tumors and non-tumor diseases.
- Choose the optimal method of radiological examination to detect functional and morphological changes in the pathology of various organs and systems ;

- m atm for ompetentnosti, the formation of which contributes discipline. The developed program corresponds to OPP and is focused on formation of **competences**:

- general (GC) - GCI-GC 3 OPP :

- Ability to abstract thinking, analysis and synthesis, the ability to learn and master modern knowledge.
- Ability to apply knowledge in practical situations.
- Knowledge and understanding of the subject area and understanding of professional activity ;

- professional (PC) - PC 2 OPP:

- Ability to determine the required list of laboratory and instrumental studies and evaluate their results.

According to the OPP, the expected **program learning outcomes (PLO)** include the skills :
PLO 11 ; 13 - 18; 22; 25; 28; 30; 32; 33; 35; 41:

| | |
|----------------------|--|
| <p>PLO 11</p> | <p>Collect data on patient complaints, medical history, life history (including professional history), in a health care facility, its unit or at the patient's home, using the results of the interview with the patient, according to the standard scheme of the patient's survey. Under any circumstances (in a health care facility, its unit, at the patient's home , etc.), using knowledge about the person, his organs and systems, according to certain algorithms:</p> <ul style="list-style-type: none"> • collect information about the general condition of the patient (consciousness, constitution) and appearance (examination of the skin, subcutaneous fat layer, palpation of lymph nodes, thyroid and mammary glands); assess the psychomotor and physical development of the child; • examine the state of the cardiovascular system (examination and palpation of the heart and superficial vessels, determination of percussion boundaries of the heart and blood vessels, auscultation of the heart and blood vessels); • examine the condition of the respiratory organs (examination of the chest and upper respiratory tract, palpation of the chest, percussion and auscultation of the lungs); • examine the condition of the abdominal organs (examination of the abdomen, palpation and percussion of the intestines, stomach, liver, spleen, palpation of the pancreas, kidneys, pelvic organs, finger examination of the rectum); examine the condition of the musculoskeletal system (examination and palpation); examine the state of the nervous system; examine the condition of the genitourinary system; • assess the state of fetal development according to the calculation of fetal weight and auscultation of its heartbeat. |
| <p>PLO 13</p> | <p>In the conditions of the health care institution, its subdivision and among the attached population:</p> <ul style="list-style-type: none"> • Be able to identify and record the leading clinical symptom or syndrome (according to list 1) by making an informed decision, using previous patient history, physical examination data , knowledge of the person, his organs and systems, adhering to relevant ethical and legal norms. • Be able to establish the most probable or syndromic diagnosis of the disease (according to list 2) by making an informed decision, by comparing with standards, using previous patient history and examination of the patient, based on the leading clinical symptom or syndrome, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms. |
| <p>PLO 14</p> | <p>In the conditions of a health care institution, its subdivision:</p> <ul style="list-style-type: none"> • Assign a laboratory and / or instrumental examination of the patient (according to list 4) by making an informed decision, based on the most probable or syndromic diagnosis, according to standard schemes, using knowledge about the person, his organs and systems, adhering to relevant ethical and legal norms. |

| | |
|---------------|---|
| | <ul style="list-style-type: none"> • Carry out differential diagnosis of diseases (according to list 2) by making an informed decision, according to a certain algorithm, using the most probable or syndromic diagnosis, laboratory and instrumental examination of the patient, knowledge of the person, his organs and systems, adhering to ethical and legal norms. • Establish a preliminary clinical diagnosis (according to list 2) by making an informed decision and logical analysis, using the most probable or syndromic diagnosis, laboratory and instrumental examination data , conclusions of differential diagnosis, knowledge of the person, his organs and systems, adhering to relevant ethical and legal norms. |
| PLO 15 | Determine the necessary mode of work and rest in the treatment of the disease (according to list 2), in a health care facility, at home of the patient and at the stages of medical evacuation, including in the field, on the basis of preliminary clinical diagnosis, using knowledge of man, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes. |
| PLO 16 | Determine the necessary medical nutrition in the treatment of the disease (according to list 2), in a health care facility, at the patient's home and at the stages of medical evacuation, including in the field on the basis of preliminary clinical diagnosis, using knowledge about the person, his bodies and systems, adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes. |
| PLO 17 | <p>Determine the nature of treatment (conservative, operative) of the disease (according to list 2), in a health care facility, at home of the patient and at the stages of medical evacuation, including in the field on the basis of a previous clinical diagnosis, using knowledge about the person , its bodies and systems, adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes.</p> <p>Determine the principles of treatment of the disease (according to list 2), in a health care facility, at the patient's home and at the stages of medical evacuation, including field conditions, based on a preliminary clinical diagnosis, using knowledge about the person, his organs and systems , adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes.</p> |
| PLO 18 | Establish a diagnosis (according to list 3) by making an informed decision and assessing the human condition, under any circumstances (at home, on the street, health care facility, its units), including in an emergency, in the field , in conditions of lack of information and limited time, using standard methods of physical examination and possible anamnesis, knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms. |
| PLO 22 | Perform medical manipulations (according to list 5) in a medical institution, at home or at work on the basis of previous clinical diagnosis and / or indicators of the patient's condition, using knowledge about the person, his organs and systems, adhering to relevant ethical and legal norms, by making informed decisions and using standard techniques. |
| PLO 25 | To form, in the conditions of a health care institution, its division on production, using the generalized procedure of an estimation of a state of human health, knowledge of the person, its bodies and systems, adhering to the corresponding ethical and legal norms, by acceptance of the reasonable decision, among the fixed contingent of the population. : dispensary groups of patients; groups of healthy people subject to dispensary supervision (newborns, children, adolescents, pregnant women, representatives of professions that must undergo a |

| | |
|---------------|--|
| | mandatory dispensary examination). |
| PLO 28 | Organize secondary and tertiary prevention measures among the assigned population, using a generalized procedure for assessing human health (screening, preventive medical examination, seeking medical care), knowledge about the person, his organs and systems, adhering to relevant ethical and legal norms, by making an informed decision, in a health care facility, in particular: to form groups of dispensary supervision; to organize medical and health-improving measures differentiated from the group of medical examination. |
| PLO 30 | Carry out in the conditions of a health care institution, its subdivision: • detection and early diagnosis of infectious diseases (according to list 2); * primary anti-epidemic measures in the center of an infectious disease. |
| PLO 32 | In the health care facility, or at the patient's home on the basis of the obtained data on the patient's health, using standard schemes, using knowledge about the person, his organs and systems, adhering to relevant ethical and legal norms, by making an informed decision: to determine the tactics of examination and secondary prevention of patients subject to dispensary supervision; • determine the tactics of examination and primary prevention of healthy individuals subject to dispensary supervision; • calculate and prescribe the necessary food for children in the first year of life. |
| PLO 33 | To determine the presence and degree of restrictions on life, type, degree and duration of disability with the issuance of relevant documents in a health care institution on the basis of data on the disease and its course, features of professional activity. |
| PLO 35 | On the territory of service according to standard methods of descriptive, analytical epidemiological and medical-statistical researches: to conduct screening for the most important non-communicable diseases; • evaluate in the dynamics and in comparison with the average static data indicators of morbidity, including chronic non-communicable diseases, disability, mortality, integrated health indicators; identify risk factors for the occurrence and course of diseases; to form risk groups of the population. |
| PLO 41 | In the conditions of a health care institution or its subdivision according to standard methods: • select and use unified clinical protocols for the provision of medical care, developed on the basis of evidence-based medicine; • participate in the development of local protocols for medical care; • control the quality of medical care on the basis of statistical data, expert evaluation and sociological research data using indicators of structure, process and results of activities; • identify factors that hinder the improvement of the quality and safety of medical care. |

3. The program of the discipline

The educational process is organized according to the European Credit Transfer and Accumulation System (ECTS).

The curriculum consists of two blocks , five sections :

Block №1

Section 1 . Radiobiological bases of radiation therapy. Dosimetry

Section 2. Principles and methods of radiation therapy.

Section 3 . Radionuclide diagnostics

Block № 2

Section 4 . Methods of visualization in radiological diagnostics. Algorithms of radiological research of various bodies and systems. Fundamentals of radial semiotics

Section 5 . Comprehensive radiological diagnosis of diseases of organs and systems.

Block № 1

Section 1. Radiobiological bases of radiation therapy. Dosimetry.

Topic 1 . History of radiology. Types of radiology departments. Features of radiology departments for diagnosis and treatment of somatic and oncological diseases. Radiodiagnostic laboratory: its structure and equipment. X-ray departments. Methods and means of protection when working with sources of ionizing radiation (open and closed): time, distance, screen. Basic sanitary rules of work with sources of ionizing radiation (OSPU-200) and norms of radiation safety of Ukraine (NRBU). Permissible radiation doses when working with sources of ionizing radiation. Radio diagnostic categories of patients and permissible radiation doses. Disposal of radioactive waste. Radio toxicity . RFP metabolism in the body.

Topic 2. Types of radiation used in medical practice. Ionizing and non-ionizing radiation. Physics of ionizing radiation. Radiation sources. Penetrating ability of ionizing radiation. Biological action of radiation. The effect of ionizing radiation on the cell. Somatic, genetic and stochastic effects of ionizing radiation. Individual and population radiation dose. Species, individual, tissue differences in radiosensitivity. The mechanism of radiation damage to cell tumors. Radiosensitivity of tumors. Radiotherapy interval and means of its propagation (oxygenation and hypoxia; synchronization of cell division cycles; hyperthermia, etc.). Radio modifying agents (radio sensitizers and radioprotectors). Problems of clinical dosimetry of ionizing radiation. Radioactivity, units of radioactivity and methods of their determination. Determination of radioactivity in the sample - in vitro diagnosis. Dose of ionizing radiation. Units of exposure, absorbed, equivalent, effective doses. Types of dosimeters. Structure and principles of operation of scintillation, ionization, thermo- and photoluminescent dosimeters. Dose distribution in individual organs and tissues. Maximum allowable doses (DMD) for different categories of patients. GDD radiation units. Local and general irradiation.

Section 2. Principles and methods of radiation therapy.

Topic 3 . Principles and methods of radiation therapy. Radiotherapy. Contact methods of radiation therapy.

Topic 4 . Remote gamma therapy. Radiation therapy with high energy sources. Basic principles of radiation therapy. Classification of methods of radiation therapy. Independent radiation therapy. Radical, palliative, symptomatic treatment. Characteristics of combined, complex methods of treatment and combined radiation method. Choice of focal dose, rhythm, irradiation fields. General and local radiation reactions with different methods of radiation therapy. Closed and open sources of ionizing radiation. External and internal irradiation. Yes, far about remote method of irradiation. The main methods of contact radiation therapy: application, intracavitary, intracellular, method of selective accumulation of radionuclides. Use of high energy sources for the treatment of malignant tumors (betatron, linear and cyclic accelerators). Rationale for radiation therapy of non-tumor diseases. Anti-inflammatory, desensitizing action of ionizing radiation. Indications and contraindications to radiation therapy. Methods of external irradiation.

Topic 5 . Radiotherapy. Far-distance and near-distance radiotherapy of non-tumor diseases and malignant tumors. Far remote gamma therapy. Use of high energy sources for the treatment of malignant tumors (betatron, no lines and cyclic accelerators).

Topic 6 . The main methods of contact radiation therapy: application, intracavitary, intra tissue. Apparatus, sources and forms of radiation sources, indications for use. Methods of radiation therapy for the treatment of non-neoplastic diseases and malignant tumors.

Topic 7 . Reactions and complications during radiotherapy. General reactions and local radiation reactions to complications, clinic, treatment, prevention. The structure of gamma-therapeutic and megavolt departments of radiation therapy.

Section 3. Radionuclide diagnostics

Topic 8. Choose the optimal radiation method of study to identify functional and morphological changes. Analyze the radiation semiotics of functional and morphological changes in pathology. Fundamentals of radiological, radionuclide CT and ultrasound and MRI semiotics. Principles of image acquisition (radiation source and detector); natural and artificial contrast; projection and sections of the study.

Topic 9 . X-ray semiotics: localization, quantity, shape, size, structure, contours of pathological cell (cells). The nature of the cell in natural contrast - shadow, enlightenment. Shadow intensity (small, medium, high). The nature of the cell in natural contrast - changes in the size of the shadow (total or limited increase and decrease), changes in the shape and position of the shadow. Computed tomographic semiotics: shadow sensitivity (hypo, -hyper, -iso). The nature of the cell in the ultrasound examination - echogenicity (hypo, -hyper, -iso, -an). The nature of the cell in the radionuclide study, the degree of accumulation of RFP (normal, increased, decreased). The nature of the cell in magnetic resonance imaging - the signal intensity in a magnetic field (hypo, -hyper, -iso, -an).

Block 2 .

Section 4. Methods of visualization in radiological diagnostics. Algorithms of radiological research of various bodies and systems. Fundamentals of radial semiotics.

Topic 10 . Methods of X-ray examination: radiography, radioscopy, planar tomography, fluorography. Advantages and disadvantages of each method. Indications and contraindications to a particular radiological method of research. Principles of image acquisition in X-ray examination methods (radiation source and detector); purpose of methods - study of morphology or (and) function; contraindications to performance; projection and sections of the study. Fundamentals of X-ray schiology.

Topic 11 . Natural and artificial contrast. Contrasting substances. Indications for their use. Construction of clinical and radiological diagnosis. Principles of obtaining images during computed tomography; purpose of the method; contraindications to performance; Natural and artificial contrast. Contrasting substances. Indications for their use. Construction of clinical and radiological diagnosis. Ultrasound (US) - the main techniques. Advantages and disadvantages of each of the ultrasound techniques. Indications and contraindications to their conduct. Dopplerography. Normal ultrasound anatomy. Ultrasound tomography: semiotics of diseases of internal organs. Principles of obtaining images by ultrasonic methods of research (radiation source and detector); natural and artificial contrast; purpose of methods - study of morphology or (and) function; contraindications to performance; sections of the study.

Topic 12 . Choose the optimal method of radiological examination to detect functional and morphological changes. Analyze the radiation semiotics of functional and morphological changes in pathology. Fundamentals of radiological, radionuclide CT and ultrasound and MRI semiotics.

Principles of image acquisition (radiation source and detector); natural and artificial contrast; projection and sections of the study. X-ray semiotics: localization, quantity, shape, size, structure, contours of pathological cell (cells). The nature of the cell in natural contrast - shadow, enlightenment. Shadow intensity (small, medium, high). The nature of the cell in natural contrast - changes in the size of the shadow (total or limited increase and decrease), changes in the shape and position of the shadow. Computed tomographic semiotics: shadow sensitivity (hypo, -hyper, -iso). The nature of the cell in the ultrasound examination - echogenicity (hypo, -hyper, -iso, -an). The nature of the cell in the radionuclide study, the degree of accumulation of RFP (normal, increased, decreased). The nature of the cell in magnetic resonance imaging - the signal intensity in a magnetic field (hypo, -hyper, -iso, -an).

Section 5. *Complex radiological diagnostics of diseases of organs and systems.*

Topic 13 . Radiation anatomy and physiology of the respiratory organs: chest, tracheobronchial tree, lung roots and pulmonary pattern, their morphological substrate. Age features of radiation anatomy and physiology of lungs. Fundamentals of radiation semiotics of pathology of the respiratory system. Radiation anatomy of the mediastinum, heart and main vessels: X-ray, ultrasound and CT - anatomy in standard projections. The main morphometric indications of the unaltered heart and main vessels. Evaluation of the results of radiological examination of cardiac function: M-mode, Doppler echocardiography, dynamic radiocardiography, radionuclide angiocardiology, perfusion scintigraphy. Age features of radial anatomy and physiology of the heart and main vessels. Classification of lymph nodes and physiology of the heart and main vessels. Classification of mediastinal lymph nodes.

Topic 14 . Radiation methods of examination of the heart, vessels and mediastinal organs and their characteristics (radiography, radioscopy, echocardiography, Doppler echocardiography, radiocardiography, radioventriculography, ventriculography, coronary angiography, cavography). Classification of research methods in order of priority (primary, additional), invasiveness (non-invasive, invasive), information obtained (morphological, functional). Radiation anatomy of the mediastinum, heart and main vessels: X-ray, ultrasound and CT - anatomy in standard projections. The main morphometric indications of the unaltered heart and main vessels. Evaluation of the results of radiological examination of cardiac function: M-mode, Doppler echocardiography, dynamic radiocardiography, radionuclide angiocardiology, perfusion scintigraphy. Age features of radial anatomy and physiology of heart and main vessels. Classification of lymph nodes and physiology of the heart and main vessels. Classification of mediastinal lymph nodes . The principle of obtaining images and indications for the use of radiological methods of the heart, mediastinum and blood vessels. Contrast agents and RFP used in radiological examination of the heart and blood vessels. The concept of X-ray endovascular interventions and indications for their use. Age features of application of radiological methods of research. Evaluation of the results of radiological examination of cardiac function: M-mode, Doppler echocardiography, dynamic radiocardiography, radionuclide angiocardiology, perfusion scintigraphy.

Topic 15 . Radiation research plan. Indications and contraindications to a particular method of gastrointestinal examination. Radionuclide methods of research of digestive tract organs: esophagoscintigraphy, gastroscintigraphy, intestinal scintigraphy. The use of radionuclide methods in vitro to diagnose disorders of the digestive tract. Ultrasound, CT, MRI of the digestive tract. Patient preparation. Indications and contraindications to radiological examination. Normal radiation anatomy of the digestive tract: location and anatomical structure of the esophagus, stomach, small and large intestines. Radiation physiology of the digestive tract: sectoral function, tone, peristalsis and evacuation.

Topic 16 . Radiation methods of examination of the kidneys and urinary tract: ultrasound (Vmetod, Doppler, duplex sonography), radiological (review radiography, excretory urography, fictional cystography, ascending (retrograde) pyelography, angiography, radiographs, CT),

radiographs, CT,), MRI. Types of renographic curves. X-ray contrast and radioactive pharmaceuticals. Classification of RFP. Radiation anatomy and physiology of the kidneys and urinary tract. Preparation of patients for the study. Indications and contraindications to radiological examination. 13 Radiation methods of genital examination: ultrasound, X-ray, radionuclide (in vitro and invivo), CT, MRI. Radiation anatomy of the genitals and breast. Possibilities and main indications and contraindications to radiological examination of the genitals. Radiation semiotics of genital diseases. Radiation semiotics of genital tumors. Radiation diagnosis of pregnancy, pregnancy and postpartum diseases.

Topic 17 . X-ray, radionuclide, ultrasound, CT, MRI. X-ray methods of examination of bones and joints: radiography, tomography, fistulography, pneumoarthrography, angiography, densitometry. Normal radiation anatomy and basics of physiology of bones and joints: planar osteoscintigraphy, SPECT - scintigraphy. Basic principles of radionuclide study of the musculoskeletal system, RFP, used for osteoscintigraphy. Radionuclide semiotics of tumor lesions of bones and joints (primary and secondary), general processes, traumatic injury, degenerative-dystrophic changes of the musculoskeletal system. Possibilities of ultrasound, CT, MRI in the study of the musculoskeletal system, indications for their use. The main indications and contraindications to radiological examination of bones and joints.

Topic 18 . Radiation methods of thyroid imaging: ultrasound, radionuclide, X-ray, CT, MRI. Normal radiation anatomy and physiology. Radiation methods of thyroid imaging: ultrasound and radionuclide scintigraphy, CT, MRI. The main RFP. Preparation of patients for radionuclide examination of the thyroid gland. Radiation examination of the functional state of the thyroid gland; accumulation test with ¹³¹I, dynamic thyroscintigraphy with ^{99m}Tc -pertechnetate, RIA hormones T-3, t-4, TSH, TG. Indications and contraindications to one or another radiological method of thyroid examination. Compilation of the algorithm of radiological research. Radiation semiotics of pathology of the endocrine system: hypo-, hyperthyroidism, tumor lesions of the thyroid gland, inflammatory processes, abnormal location of the thyroid gland.

3.1. The structure of the discipline

| № s / n | Title of sections and topics | Number of hours | | | | |
|--|---|-----------------|---------|------------------------|------------------------------|-----|
| | | at this | 1 ekc . | n ract . occupation | with emin . occupation | CPC |
| Block 1. | | | | | | |
| <i>R ozdil 1.</i> | | | | | | |
| <i>Radiobiological bases of radiation therapy. Dosimetry</i> | | | | | | |
| 1. | History of radiology. Types of radiology departments. Features of the device of radiological and radiological departments of OSPU, NRBU. Basic properties of ionizing radiation. Biological action radiation on a healthy and pathologically altered cell | 6 | 2 | 2 | | 2 |
| 2. | Radioactivity and dose. Dosimetry of ionizing radiation: units and methods for determining radioactivity and radiation dose. Structure of radiometers and dosimeters. | 4 | | 2 | | 3 |
| <i>R ozdil 2.</i> | | | | | | |
| <i>Principles and methods of radiation therapy.</i> | | | | | | |
| 3. | Principles and methods of radiation therapy of malignant tumors. | 6 | 2 | 2 | | 2 |
| 4. | Long-range gamma - therapy. Radiation therapy with high energy sources | 5 | | 2 | | 3 |
| 5. | Radiotherapy. Contact methods of radiation therapy | 5 | | 2 | | 3 |
| 6. | Fundamentals of radiation therapy of non-neoplastic diseases. | 6 | 2 | 2 | | 2 |
| 7. | Radiation reactions and complications. | 4.5 | 1.5 | 1 | | 2 |
| | | | | | | |

| R ozdíl 3. | | | | | | |
|---|--|-------------|-------------|-----------|--|-----------|
| Radionuclide diagnostics | | | | | | |
| 8. | The main tasks and methods of radioisotope diagnostic research | 4 | | 1 | | 3 |
| 9. | Radio indication in the assessment of various organs and systems. | 4 | | 1 | | 3 |
| Final control. | | | | | | |
| Total hours Block 1 | | 45.5 | 7.5 | 15 | | 23 |
| Block 2. | | | | | | |
| R ozdíl 4. | | | | | | |
| Methods of visualization in radiological diagnostics. Algorithms of radiological research of various bodies and systems. | | | | | | |
| Fundamentals of radiation semiotics. | | | | | | |
| 10 . | Physical and technical bases of various radiological research methods | 7 | 2 | 2 | | 3 |
| 11 . | X-ray research methods. X-ray photography. Laws of schiology. Ultrasound research methods | 6 | | 2 | | 4 |
| 12 . | Algorithm of radiological research of various organs and systems. Radiation semiotics | 6 | | 2 | | 4 |
| R ozdíl 5. | | | | | | |
| Comprehensive radiological diagnosis of diseases of organs and systems. | | | | | | |
| 13 . | Radiation methods of research of respiratory organs. Radiation anatomy and physiology of the respiratory system. Radiation signs of respiratory diseases. | 8 | 2 | 2 | | 4 |
| 14 . | Radiation methods of research of heart and vessels. Radiation anatomy and physiology of the cardiovascular system. Radiation signs of diseases of the cardiovascular system | 7 | 2 | 2 | | 3 |
| 15 . | Radiation examination of the salivary glands and digestive tract. Normal radiation anatomy and physiology of the digestive tract. Radiation signs of diseases of the digestive tract. Radiation examination of the liver and biliary tract. Normal radiation anatomy and physiology. Radiation signs of liver and biliary tract diseases. | 7 | 2 | 2 | | 3 |
| 16 . | Radiation examination of the urinary system. Normal radiation anatomy and physiology. Radiation signs of certain diseases of the kidneys and urinary tract. Radiation examination of the genital system and breast. Normal radiation anatomy and physiology. Radiation signs of certain diseases of the genital system and breast. | 6 | 1 | 2 | | 3 |
| 17 . | Radiation study of the musculoskeletal system. Radiation anatomy of bones and joints. Radiation diagnostics of diseases of the musculoskeletal system (injuries, inflammatory processes, tumor lesions). | 7 | 1 | 3 | | 3 |
| 18 . | Radiation examination of the thyroid gland. Radiation signs of thyroid disease. Radiation study of the CNS. Radiation signs of CNS diseases and emergencies. | 6 | | 3 | | 3 |
| 20. | Final control | | | | | |
| Total hours Block 2 | | 60 | 10 | 20 | | 30 |
| Total hours | | 105 | 17.5 | 35 | | 53 |

4. The content of the discipline

4.1. Lecture plan

| № s / n | Name topics | Number hours |
|------------|--|-----------------|
| 1. | <p>History of radiology. Types of radiology departments. Methods of protection .</p> <p>1. Features of radiology departments for diagnosis and treatment of somatic and oncological diseases. Radiodiagnostic laboratory: its structure and equipment. X-ray departments.</p> <p>2 . Methods and means of protection when working with sources of ionizing radiation (open and closed): time, distance, screen.</p> <p>3 . Basic sanitary rules of work with sources of ionizing radiation (OSPU-200) and norms of radiation safety of Ukraine (NRBU).</p> | 2 |
| 2. | <p>Principles and methods of radiation therapy of malignant tumors. Radiation therapy of malignant neoplasms.</p> <p>1. X-ray therapy. Dal eco remote and near-distance radiotherapy of non-tumor diseases and malignant tumors.</p> <p>2. Far remote gamma therapy. Use of high energy sources for the treatment of malignant tumors (betatron, linear and cyclic accelerators).</p> <p>3. The main methods of contact radiation therapy: application, intracavitary, intra tissue. Apparatus, sources and forms of radiation sources, indications for use.</p> | 2 |
| 3. | <p>Radiobiological bases of radiation therapy. Tissue radiosensitivity management.</p> <p>1. The main methods of contact radiation therapy: application, intracavitary, intra tissue.</p> <p>2. Apparatus, sources and forms of radiation sources, indications for use. 3. Methods of radiation therapy for the treatment of non-tumor diseases and malignant tumors.</p> | 2 |
| 4. | <p>Radiation therapy of non-neoplastic diseases. Radiation reactions and complications</p> <p>1. Reactions and complications during radiotherapy.</p> <p>2. General reactions and local radiation reactions to complications, clinic, treatment, prevention.</p> <p>3. The structure of gamma-therapeutic and megavolt departments of radiation therapy.</p> <p>Radiation diagnostic methods in modern clinical practice.</p> <p>1. Methods of X-ray examination: radiography, radioscopy, planar tomography, fluorography. Advantages and disadvantages of each method.</p> <p>2. Indications and contraindications to one or another radiological method of research.</p> <p>3. Principles of obtaining images in X-ray methods of research (radiation source and detector); purpose of methods - study of morphology or (and) function; contraindications to performance; projection and sections of the study.</p> | 1.5 |
| 5. | <p>Radiation methods of research of respiratory organs.</p> <p>1. Radiation anatomy and physiology of the respiratory organs: chest, tracheobronchial tree, lung roots and pulmonary pattern, their morphological substrate.</p> <p>2. Age features of radial anatomy and physiology of the lungs.</p> <p>3. Fundamentals of radiation semiotics of pathology of the respiratory system.</p> <p>4. Radiation anatomy of the mediastinum, heart and main vessels: radiological,</p> | 2 |

| | | |
|----|--|-------------|
| | ultrasound and CT - anatomy in standard projections. | |
| 6. | Radiation methods for the study of the heart, blood vessels and mediastinal organs. 1. Classification of research methods in order of priority (primary, additional), invasiveness (non-invasive, invasive), information obtained (morphological, functional). 2. Radiation anatomy of the mediastinum, heart and main vessels: radiological, ultrasound and CT - anatomy in standard projections. 3. Basic morphometric indications of unaltered heart and main vessels. | 2 |
| 7. | Radiation methods of salivary glands: X-ray, radionuclide. Normal radiation anatomy and physiology of salivary glands. 1. Radiation signs of inflammatory and tumor lesions of the salivary glands. Xerostomia. 2. Radiation methods of research of the digestive tract: radiological radionuclide. 3. X-ray methods of examination of the esophagus, stomach, small and large intestines: radioscopy and radiography, artificial contrast of organs using X-ray positive and X-ray negative contrast agents. 4. Oral contrast, irigoscopy, probe contrast, parietography, angiography. | 2 |
| 8. | Radiation examination of the urinary system. 1. Normal radiation anatomy and physiology. Radiation signs of some diseases of the kidneys and urinary tract. 2. Radiation examination of the genital system and breast. 3. Normal radiation anatomy and physiology. 4. Radiation signs of certain diseases of the genital system and breast. | 2 |
| 9. | X-ray methods of examination of bones and joints. 1. Normal radiation anatomy and basics of physiology of bones and joints 2. Basic principles of radionuclide study of the musculoskeletal system, RFP, used for osteoscintigraphy. 3. Radionuclide semiotics of tumor lesions of bones and joints (primary and secondary), general processes, traumatic injury | 2 |
| | Total hours | 17.5 |

4. 2 . Topics of practical classes

| № s / n | Name topics | Number hours |
|----------------|--|---------------------|
| | Thematic plan of practical classes with Block in 1 | |
| 1. | Radioactivity and dose. Dosimetry of ionizing radiation: units and methods for determining radioactivity and radiation dose. Structure of radiometers and dosimeters. | 2 |
| 2 | Principles and methods of radiation therapy of malignant tumors. Long-range gamma - therapy. | 2 |
| 3 | Radiation therapy with high energy sources | 2 |
| 4 | Radiotherapy. Contact methods of radiation therapy | 2 |
| 5 | Fundamentals of radiation therapy are tumors. | 2 |
| 6 | Radiation reactions and complications. | 2 |
| 7 | The main tasks and methods of radioisotope diagnostic research | 1 |
| 8 | Radio indication in the assessment of various organs and systems. | 2 |
| | Together: | 15 |
| | Thematic plan of practical classes from Block 2 | |

| | | |
|----|--|-----------|
| 9 | X-ray research methods. X-ray photography. Laws of schiology. Ultrasound research methods. Radiation semiotics | 2 |
| 10 | Algorithm of radiological research of various organs and systems. | 2 |
| 11 | Radiation methods of research of respiratory organs. Radiation anatomy and physiology of the respiratory system. | 2 |
| 12 | Radiation signs of respiratory diseases. Radiation signs of diseases of the cardiovascular system | 2 |
| 13 | Radiation methods of research of heart and vessels. Radiation anatomy and physiology of the cardiovascular system. | 2 |
| 14 | Radiation examination of the salivary glands and digestive tract. Normal radiation anatomy and physiology of the digestive tract. Radiation signs of diseases of the digestive tract. Radiation examination of the liver and biliary tract. | 2 |
| 15 | Normal radiation anatomy and physiology. Radiation signs of liver and biliary tract diseases. | 2 |
| 16 | Radiation examination of the urinary system. Normal radiation anatomy and physiology. Radiation signs of certain diseases of the kidneys and urinary tract. | 2 |
| 17 | Radiation examination of the genital system and breast. Normal radiation anatomy and physiology. Radiation signs of certain diseases of the genital system and breast. | 2 |
| 18 | Radiation study of the musculoskeletal system. Radiation anatomy of bones and joints. Radiation diagnostics of diseases of the musculoskeletal system (injuries, inflammatory processes, tumor lesions). Radiation study of the musculoskeletal system. Radiation anatomy of bones and joints. Radiation diagnostics of diseases of the musculoskeletal system (injuries, inflammatory processes, tumor lesions). | 2 |
| | <i>Together</i> | 20 |
| | <i>Just two blocks away</i> | 35 |

4.3. Independent work 23 hours / 30 hours

- Review of scientific literature on the proposed topic, presented in the form of a report using illustrative material (videos, presentations, stands) :

1. Features of X-ray service of the Nikolaev area.
2. Comparison of physical and technical basis and diagnostic capabilities of CT and MRI studies.
3. The most common methods of radionuclide research in Ukraine.
4. Modern methods of radionuclide research.
5. Fundamentals of radiological, radionuclide CT and ultrasound and MRI semiotics of pathology of various organs and systems.
6. Radiation research methods and radiation anatomy of the thoracic cavity.
7. Fundamentals of radiation semiotics of pathology of the respiratory and cardiovascular systems.
8. Radiation signs of emergencies.
9. Radiation diagnosis of congenital malformations of the respiratory system
10. Radiation diagnosis of oncological diseases of the respiratory system.
11. Radiation diagnosis of inflammatory diseases of the respiratory system.
12. Radiation signs of heart defects.
13. Radiation signs of kidney and urinary tract diseases. And the algorithm of the survey.
14. Gastroscopy, irigoscopy, ultrasound diagnosis of diseases of the gastrointestinal tract. Their role in modern medicine.
15. Modern methods of diagnosis and radiation signs of liver and biliary tract diseases.

16. Radiation diagnosis of traumatic diseases and congenital malformations of the musculoskeletal system.
17. Radiation diagnosis of osteomyelitis.
18. Radiation diagnosis of tumors of the musculoskeletal system.

- Participation in the work of the scientific circle, presented in the form of a report at the conference.

- Participation in the development of innovative teaching aids and control of information assimilation with the help of modern computer technologies.

- Participation in the development of distance learning projects.

Plan t ypov first problem to solve at workshops

The student is given an X-ray - a picture with the task:

1. Describe and explain what is shown in the picture.
2. Describe the presence or absence of pathology.
3. Describe (if any) the pathological process.
4. Justify the diagnosis .

4. 4 . Ensuring the educational process

1. Multimedia projectors, computers, screens for multimedia presentations, lecture presentations.
2. Demonstration screens, laptops, files in Power Point and Word with tasks "Step-1" for practical and final classes.
3. Examination tickets.
4. Rq - pictures according to the topic of the lesson
5. Negatoscope.

5. Final control

List of final control issues:

1. History of radiology.
2. Features of the device of radiological and radiological departments of OSPU, NRBU.
3. Types of radiology departments. Basic properties of ionizing radiation
4. Biological effect of radiation on a healthy and pathologically altered cell.
5. Radioactivity and dose.
6. Dosimetry of ionizing radiation: units and methods for determining radioactivity and radiation dose.
7. Structure of radiometers and dosimeters.
8. Principles and methods of radiation therapy of malignant tumors.
9. Long-range gamma - therapy. Radiation therapy with high energy sources
10. X-ray therapy. Contact methods of radiation therapy
11. Basics of radiation therapy of non-neoplastic diseases.
12. Radiation reactions and complications.
13. Principles and methods of radiation therapy of malignant tumors.
14. Long-range gamma - therapy. Radiation therapy with high energy sources
15. X-ray therapy. Contact methods of radiation therapy
16. Basics of radiation therapy of non-neoplastic diseases.
17. Radiation reactions and complications.
18. Radiation methods of respiratory research.
19. Radiation anatomy and physiology of the respiratory system
20. Radiation signs of respiratory diseases.
21. Radiation methods of research of heart and vessels.

22. Radiation anatomy and physiology of the cardiovascular system.
23. Radiation signs of diseases of the cardiovascular system
24. Radiation examination of the salivary glands and digestive tract.
25. Normal radiation anatomy and physiology of the digestive tract
26. Radiation signs of diseases of the digestive tract
27. Radiation examination of the liver and biliary tract.
 28. Radiation study of the urinary system.
 29. Normal radiation anatomy and physiology.
 30. Radiation signs of certain diseases of the kidneys and urinary tract
 31. Radiation examination of the genital system and breast.
 32. Normal radiation anatomy and physiology
 33. Radiation signs of certain diseases of the genital system and breast.
 34. Radiation study of the musculoskeletal system.
 35. Radiation anatomy of bones and joints
36. Radiation diagnosis of diseases of the musculoskeletal system (injuries, inflammatory processes, tumor lesions).
37. Radiation examination of the thyroid gland.
38. Radiation signs of thyroid disease
39. Radiation study of the CNS. Radiation signs of CNS diseases and emergencies.
40. Radio indication in the assessment of various organs and systems.
41. Principles and methods of radiation therapy of malignant tumors.
42. Long-range gamma - therapy. Radiation therapy with high energy sources
43. X-ray therapy. Contact methods of radiation therapy
44. Basics of radiation therapy of non-neoplastic diseases.
45. Radiation reactions and complications.
46. The main tasks and methods of radioisotope diagnostic research
 47. X-ray methods of research. X-ray photography.
48. Laws of radiology. Ultrasound research methods
49. X-ray therapy. Contact methods of radiation therapy
50. Modern possibilities of radiological diagnostics in urological clinic; radiological diagnosis of the head and neck.

A variant of the credit card with the indication of the maximum number of points for each completed task

Petro Mohyla Black Sea National University

P Evan higher education - master

Field of knowledge: 22 " Health care "

C specialist : 222 " Medicine "

Course - Radiology

Option № 0

1. History of radiology. (Maximum number of points - 15).
2. Radiation signs of diseases of the digestive tract (Maximum number of points - 15).
3. X-ray therapy. Contact methods of radiation therapy (Maximum number of points - 15).
4. Radiation reactions and complications (Maximum number of points - 15).
5. Solving a practical problem (reading an X-ray) (Maximum number of points - 20).

*Approved at a meeting of therapeutic and surgical disciplines , Protocol № ____ from " __ " _____
2021 p.*

Head of the department: Professor Zak M. Yu.

6. Evaluation criteria and tools for diagnosing learning outcomes

Control methods

- **Survey (testing of theoretical knowledge and practical skills).**
- **Test control.**
- **Writing a review of scientific literature (abstracts), performing individual tasks, their defense.**

Current control. Testing in practical classes of theoretical knowledge and the acquisition of practical skills, as well as the results of independent work of students. Supervised by teachers according to the specific purpose of the curriculum. Evaluation of training students through: Student Survey, and analysis solution for situational cottages and tests, interpretation of the results of radiological studies, control of practical skills.

Intermediate control. Checking the possibility of using students for X-ray diagnostic analysis of theoretical knowledge and practical skills on all topics studied, as well as the results of independent work of students. Carried out in the last lesson by section by passing practical skills, solving situational problems and testing.

The final test (RCC) is carried out upon completion of the study of all topics of the block at the last test session of the semester. Intermediate final control (certification) and final control (exam) are allowed to students who have attended all the lectures, classroom classes, performed full independent work and in the learning process scored the number of points, not less than the **minimum - 70 points in the fall semester and 40 in the spring semester. The maximum number of points for the current educational activity can be 120 and 80, respectively .**

In order to assess the learning outcomes of the entire discipline , the final control is carried out in the form of a differentiated test . Only students are admitted to the test , as they are credited with both PKR (blocks 1 and 2) in the discipline.

Distribution of points received by students

In the autumn semester , a positive assessment for each topic can be from 8 points (70 points: 9 topics = 7.8 points a , for convenience rounded to 8 points) to 13 points (120 points : 9 topics = 13.3 points a, round up to 13 points) . Evaluation below 8 points means "unsatisfactory", the theme is not reckoned as and subject to working out in due course.

At the RCC in block 1, a student can get a maximum of 80 points. PKR is considered credited if the student scored at least 50 points.

In the spring semester, a positive grade for each topic can be from 4 points (40 points: 9 topics = 4 , 4 points, rounded to 4, but the total score for all topics must be at least 40) to 9 points (80 points: 9 topics = 8.9 points, rounded to 9, but the total score should not exceed 120) . Evaluation below 4 point s means "unsatisfactory", the theme is not reckoned as and subject to working out in due course.

At the RCC in block 2, a student can get a maximum of 40 points. PKR is considered credited if the student scored at least 30 points.

On the test, a student can get a maximum of 80 points. The test is considered passed if the student received at least 50 points. The distribution of points on the test, see above in the example of the test ticket.

Assessment of student performance

| Type of activity (task) | Maximum number of points |
|-------------------------|--------------------------|
| Block 1 | |

| | |
|--|------------|
| Topic 1 | 13 |
| Topic 2 | 13 |
| Topic 3 | 13 |
| Topic 4 | 13 |
| Topic 5 | 13 |
| Topic 6 | 13 |
| Topic 7 | 13 |
| Topic 8 | 13 |
| Topic 9 | 13 |
| Together: | 120 |
| Final control work on block 1 | 80 |
| Total: 120 +80 = | 200 |
| Block 2 | |
| Topic 1 | 9 |
| Topic 2 | 9 |
| Topic 3 | 9 |
| Topic 4 | 9 |
| Topic 5 | 9 |
| Topic 6 | 9 |
| Topic 7 | 9 |
| Topic 8 | 9 |
| Topic 9 | 9 |
| Together: | 80 |
| Final control work on block 2 | 40 |
| Total: 80 + 40 + | 120 |
| Diff. test | 80 |
| Together for block 2 and credit | 200 |

Criteria for assessing knowledge

Score 1 2 -1 3 points per topic in the autumn semester, 8-9 points per topic in the spring semester, 71-80 points on the RCC in the fall semester, 3 8 -4 0 points on the RCC in the spring semester and 71-80 points on credit (A on the ECTS scale and 5 on the national scale) the student's answer is evaluated if it demonstrates a deep knowledge of all theoretical principles and the ability to apply theoretical material for practical analysis and has no inaccuracies.

Assessment 10 -11 point s on the topic in the fall semester 6-7 points on the subject in the spring semester, 61-70 points on the PC R in the fall semester , 3 5 -37 Points in e snyanomu semester and 61-70 points in the standings (B and C on the ECTS scale and 4 on the national scale) the answer is evaluated if it shows knowledge of all theoretical provisions, the ability to apply them in practice, but some fundamental inaccuracies are allowed.

Assessment 8-9 mark along for the subject in the autumn semester 4-5 points on the subject in the spring semester, 50-60 points on PKR in the autumn semester , 3 0 - 3 4 grade and on PKR in the spring semester and 50-60 points on the test (D and E on the ECTS scale and 3 on the national scale) the student's answer is evaluated provided that he knows the main theoretical provisions and can use them in practice.

7. Recommended literature

Basic

1. Radiology, ed. M.M. Tkachenko K .: "Book Plus", 2011
2. X-ray diagnostics "edited by VI Milko, TV Topchiy, AP Lazar, etc.," New book ", 2005.

3. Kravchuk S.Yu., Lazar AP "Fundamentals of radiation diagnostics", Chernivtsi, 2005.
4. General guide to radiology. Editor X. Peterson, in 2 volumes. MISEK Anniversary Book 1995 .
5. Handbook of nuclear medicine. Ed. TPSivachenko. K .: "Higher school", 1991.-535p.
6. Radiation diagnostics. For order. Mr. Yu Koval. - Kyiv: "Medicine of Ukraine", vol. I, vol. 2, 2009.-682 p.

Auxiliary

1. A guide for physicians who refer patients for radiological examination. Criteria for selecting the image method. (Adapted by the European Commission and experts representing European Radiology and Nuclear Medicine. Agreed with the European Commission). Ministry of Health of Ukraine 2000. - 104 p.
2. Lazar AP Radiation medicine. -K: Health, 1993. -221 p.
3. OSPU -2000.
4. NRBU 1998.

Information resources

Website of the State Institution "DMA of the Ministry of Health of Ukraine"

<http://www.dsma.dp.ua/en/>

Library of the State Medical Academy of the Ministry of Health of Ukraine

<http://library.dsma.dp.ua/index.php?lang=uk>