

MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY
Department of Radiation diagnostics, Therapy, Radiation medicine and Oncology



APPROVED BY

Acting vice-rector for scientific and pedagogical work

prof. _____ I. P. Shmakova

"01" _____ 09 _____ 2021

PROGRAMME CURRICULUM

«RADIOLOGY»

Level of higher education: second (Master)

Field of knowledge: 22 «Health care»

Specialty: 221 «Dentistry»

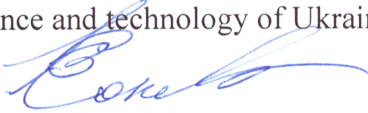
Educational- professional qualification: Dentistry

The programme is based on the educational-professional programme "Medicine", training of specialists of the second (Master) level of higher education in the specialty 222 "Medicine" in the branch of knowledge 22 "Health", approved by ONMedU Academic Council, protocol No. 11 from 04.06.2020.

Developers: Honoured Worker of Science and Technology of Ukraine, professor Sokolov V. M. MD, assistant Doikova K. M., MD.

The program was discussed at a meeting of the Department of Radiation diagnostics, Therapy, Radiation medicine and Oncology.

Protocol No. 1 from 27.08.2021

Head of the Department, Honoured Worker of science and technology of Ukraine,
Doctor of medical sciences, professor  Sokolov V. M.

The programme was approved at the meeting of the Subject cycle methodical Commission on therapeutic disciplines of ONMedU, protocol No. 1 dated 27.08.2021.

Chairman of the Subject Cycle Methodical commission with therapeutic disciplines,
MD, prof.  Matsegora N. A.

The program was approved at the meeting of the Central Coordination and Methodological Council of ONMedU, Protocol No. 1 from 30.08.2021.

1. Description of the discipline:

Name of indicators	Features of the discipline	
	Full-time education	
Total number:	Required	
Credits – 3	Year of education	3
Hours – 90	Semester	VI
Content units – 2	Lectures	10 hours
	Practical lessons	30 hours
	Student's independent work	50 hours
	Including individual tasks	0
	Types of controls	Diff. exam

2. Goals and objectives of the academic discipline.

Goals: To master the knowledge of the student, to form elements of professional competencies in the field of dentistry and health care, to improve the skills and competence acquired in the study of prior disciplines.

Objectives:

1. to acquire skills and abilities to appropriately opt for the optimal method of radiological investigation to detect morphological changes due to the pathology of the teeth and maxillofacial complex.

2. To acquire skills to identify and reasonably analyse the radiological symptoms of the pathology of the teeth and of the maxillofacial complex.

3. Ability to opt for the optimal method of radiotherapy for the treatment of tumour and non-tumour diseases of the teeth and maxillofacial complex.

The process of studying the discipline is aimed at forming elements of the following competencies:

- IC – The ability to solve complex problems and ones in a specific area of professional duty or in the learning process which includes research and / or innovation and is characterised by the complexity and uncertainty of conditions and requirements.
- GC-1 – The ability to abstract thinking, analysis and synthesis.
- GC-2 – The knowledge and understanding of the subject area and of professional activity.
- GC-3 – The ability to apply knowledge in practice.
- GC-4 – The ability to communicate in the state language, both oral and written.
- GC-5 – The ability to communicate in English.
- GC-6 – The skills in the use of information and communication technologies.
- GC-7 – The ability to search, process and analyse information from various sources.
- GC-8 – The ability to adapt and act in a new situation.
- GC-9 – Ability to identify, pose and solve problems.
- GC-10 – The ability to be critical and self-critical.
- GC-11 – The ability to work in a team.
- GC-12 – The desire to preserve the environment.
- GC-13 – The ability to act socially responsibly and consciously.
- GC-14 – The ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.
- GC-15 – The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development

of the subject area, its place in the general system of knowledge about nature and society and in the development of society, techniques and technologies. active recreation and a healthy lifestyle.

- SC-1 – Communication skills and clinical examination of the patient during the diagnosis and treatment.
- SC-2 – The ability to determine the necessary list of clinical, laboratory and instrumental studies and evaluate their results in the diagnosis and treatment.
- SC-3 – The ability to establish a preliminary and clinical diagnosis based on knowledge of the radiological signs of pathological changes of the teeth and maxillofacial complex.
- SC-12 – The ability to determine the tactics of management of person's subject to dispensary supervision.
- SC-13 – The ability to assess the impact of the environment on the health of the population (individual, family, population).
- SC-14 – The ability to maintain regulatory medical records.

Expected learning outcomes. As a result of studying the discipline the student must:

Know: clinic, diagnosis, treatment of the most common diseases in adults and children.

Be able to:

- Select and identify leading clinical symptoms and syndromes (according to the list 1); using preliminary data of the patient's anamnesis, patient examination data, knowledge about the human, his organs and systems, to establish a probable nosological or syndromic preliminary clinical diagnosis of a dental disease according to standard methods (according to the list 2).
- Evaluate information about the diagnosis using a standard procedure, based on the results of laboratory and instrumental studies. Determine the list of necessary clinical, laboratory and instrumental studies and evaluate their results in common diseases of the teeth and maxillofacial region (according to the list 4).
- Prescribe and analyze additional (required and optional) methods of examination (laboratory, radiological, functional and / or instrumental) according to the list 5, for patients with diseases of organs and tissues of the oral cavity and maxillofacial region for the differential diagnosis of diseases (according to the list 2).
- Determine the tactics of emergency medical care during radiological examinations and radiation therapy, using the recommended algorithms, under any circumstances on the basis of a diagnosis of emergency in a limited time (according to the list 4).
- Perform manipulations when providing emergency medical care, if it is necessary during the radiological examination.

Master the skills:

- Communication and clinical examination of the patient.
- Perform medical manipulations during radiation examination and radiation therapy.
- Maintain medical records related to radiation diagnostics and treatment.

3. The content of the discipline

Section 1. Radiation diagnostics.

Topic 1. Basic properties of ionizing radiation. Features of the device of X-ray and radiological departments.

Types of ionizing radiation (corpuseular and photonic). Dependence of ionizing radiation properties on wavelength. Radioactivity. Types and means of protection against ionizing radiation (collective and individual). Peculiarities of the structure of the X-ray and dental office according to the requirements of the Basic Sanitary Rules for Radiation Safety of Ukraine (OSPU) and the Radiation Safety Norms of Ukraine (NRBU). Protect the patient and the doctor during dental examinations.

Topic 2. Physical and technical bases of radio diagnostics in dentistry. Physical and technical bases of X-ray research.

Types of modern methods of diagnostic examination of teeth and maxillofacial region (ionizing and non-ionizing). Indications and contraindications to MRI and ultrasound; advantages and disadvantages. X-ray methods of examination of teeth and maxillofacial area. The rule of orthoradiality. Contact and remote methods. Intraoral radiographs of teeth. Interproximal radiography. Orthopantomographic radiography. Image formation method. Analog and matrix X-ray image receivers.

Topic 3. Cone-beam computed tomography in diagnostics. diseases of the maxillofacial region. Dental subtraction CT in dental practice.

A method of obtaining a three-dimensional image and storing information on digital media. Using the method to study the hard tissues of the tooth and periapical structures. The importance of studying the relationships of adjacent structures. Planning endodontic treatment. Frontal, axial and sagittal plane of the study. DICOM standard of medical research in dental practice. Density windows. Voxel. MPR and MIP reconstruction. Leading symptoms in the study of caries of occlusal and proximal surfaces. Metal artifacts. Metric assessment of the root canal system of the tooth. Estimation of bone density for further treatment planning. Osteoporosis. Diagnosis of temporal bone pathology. Opportunities to assess the surrounding areas.

Topic 4. Radiation research methods and radiation anatomy of the maxillofacial region. Radiation signs of diseases of the teeth and jaws.

Normal image of the tooth (shadow of the enamel cover and dentin of the crown, enlightenment of the tooth cavity and root canal, lateral parts of the periodontal space, the image of the interdental septum). Signs of teeth of the upper and lower jaws. Evaluation of adjacent teeth. Children's dentition. The turn of teeth change is normal. Development of the jaw in the X-ray image. Algorithm of system consideration: 1) to determine the type of radiograph; 2) evaluate the quality of the radiograph on the basis of: contour, structure, separate image and the correct size of the teeth; 3) find out whether the upper or lower jaw is removed; 4) what exactly are the teeth; 5) identify pathological changes in the following sequence: tooth crown, tooth cavity, root canals; root surface, periodontal fissure, compact plate of the hole, the surrounding bone tissue..

Topic 5. Variants and anomalies of development of teeth and maxillofacial region.

Radiation signs of eruption of teeth. Variants of the structure of the jaw (uniform density, multi-mineralized, inhomogeneous density). Exostoses and endostoses.

Disorders of teething (persistent and retained teeth). Violation of the number of teeth (supradentia, adentia). Anomaly of size and shape (macro- and micro-dentia). Anomaly of tooth location: vestibular and mesial dystopia, oral and distal dystopia, supraposition and infraposition, tortoposition, transposition.

Topic 6. Radiation semiotics of diseases of the teeth and jaws. Radiation signs of inflammatory diseases of the teeth and jaws. Radiation diagnosis of periodontitis.

Eclipse and enlightenment. Local change in tooth density and structure. Caries. Periodontitis (classification by radiological signs of manifestation). Radiation signs of chronic fibrous periodontitis. Chronic granulating periodontitis of different localizations. Radiation signs of periodontitis (images of mild, moderate and severe stages). Generalized periodontitis. Periodontitis. Staging by radiological signs.

Topic 7. Radiation signs of traumatic damage of teeth and jaws. Radiation signs of complications of healing of fractures of the maxillofacial region. Radiation diagnosis of osteomyelitis of the maxillofacial region.

Classification of dental injuries (bruise, dislocation, crack, fracture). Fractured tooth. Radiation signs of stabbed tooth dislocation. Radiation image of traumatic injury of the maxillofacial region by Le Fort 1, Le Fort 2, Le Fort 3. Radiation signs of acute and chronic osteomyelitis of the jaws.

Topic 8. Radiation signs of tumor (benign and malignant) lesions of the maxillofacial region.

Mucosal cancer: exophytic (papillary and ulcerative) and endophytic forms. Selective irradiation of areas of regional lymphatic outflow.

Section 2. Radiation therapy.

Topic 9 Biological action of ionizing radiation. Radioactivity and dose. Dosimetry of ionizing radiation. Principles and methods of radiation therapy in dentistry.

Types of ionizing radiation (corpuscular and photonic). Dependence of ionizing radiation properties on wavelength. Types of properties of ionizing radiation: high energy, high penetrating ability, ionizing ability – the ability to form many pairs of ions when interacting with atoms of the environment, photochemical ability to activate molecules of silver bromide or other chemical compounds, luminescent ability to cause glow of some substances thermal action - the ability of the energy of ionizing radiation to be converted into heat, a strong biological effect. Radioactivity. Types of protection against ionizing radiation (time, distance, screen, quantity). Means of protection against ionizing radiation (collective and individual). Radiation hygiene regulations.

Topic 10. Physical and technical bases of radiation therapy.

Carrying out of radiation therapy in an optimum dose in optimum terms. General (irradiation of the tumor in the optimal dose), special (treatment of this disease) and special (development of a plan of radiation therapy individually for each patient) rules. Selection of the optimal dose taking into account the histology of the tumor, the peculiarities of its growth (exophytic, infiltrative), tolerance of adjacent healthy tissues. Radiotherapy interval. Radio modifiers: radioprotectors and radiosensitizers. The course of radiation therapy: before radiation, radiation, after radiation. Types of radiation therapy depending on the purpose: radical, palliative, symptomatic. Indications for each of the species. Methods of radiation therapy: independent, combined, complex, combined-radiation. Independent method programs: radical, palliative, symptomatic. Programs of the combined method: preoperative irradiation, suboperative irradiation, postoperative irradiation. Complex method of treatment: chemotherapy together with irradiation and surgical treatment. Combined radiation treatment: external irradiation with contact radiation therapy. Combined methods of treatment: preoperative, suboperative and postoperative.

Topic 11. Radiotherapy. Long-range gamma therapy. Radiation therapy with high energy sources. Radiotherapy procedures in dental practice.

Goals, objectives, opportunities. Rhythm of irradiation. Types and features of application. Clinical and dosimetric dominance. Topometry. Individual topometric and anatomical map. Sources of ionizing radiation: charged particle accelerator, radionuclides (closed and open). Methods of radiation therapy depending on the distance of radiation sources. External (far remote, close focal, application) and internal radiation sources. Contact methods of radiation therapy: intracavitary, intra tissue, incorporated elements. Long-distance therapy: X-ray therapy, gamma therapy, irradiation with high energy sources. X-ray therapy: superficial, semi-deep, deep. Gamma therapy: static, dynamic. Irradiation with high energy sources: linear accelerators, cyclic accelerators (betatrons, synchrotrons). Dose distribution in space: static and dynamic irradiation.

4. The structure of the discipline

Topic	Number of hours			
	Total	Including		
		L	PW	IW
Section 1. Radiation diagnostics.				
Topic 1. Basic properties of ionizing radiation. Features of the device of X-ray and radiological departments.	2,0		2,0	
Topic 2. Physical and technical bases of radio diagnostics in	4,0	2,0	2,0	

dentistry. Physical and technical bases of X-ray research.				
Topic 3. Cone-beam computed tomography in diagnostics. diseases of the maxillofacial region. Dental subtraction CT in dental practice.	4,0	2,0	2,0	
Topic 4. Radiation research methods and radiation anatomy of the maxillofacial region. Radiation signs of diseases of the teeth and jaws.	13,0	2,0	4,0	7,0
Topic 5. Variants and anomalies of development of teeth and maxillofacial region.	14,0		4,0	10,0
Topic 6. Radiation semiotics of diseases of the teeth and jaws. Radiation signs of inflammatory diseases of the teeth and jaws. Radiation diagnosis of periodontitis.	13,0	1,0	6,0	6,0
Topic 7. Radiation signs of traumatic damage of teeth and jaws. Radiation signs of complications of healing of fractures of the maxillofacial region. Radiation diagnosis of osteomyelitis of the maxillofacial region.	16,0	1,0	4,0	11,0
Topic 8. Radiation signs of tumor (benign and malignant) lesions of the maxillofacial region.	8,0		2,0	6,0
Section 2. Radiation therapy.				
Topic 9. Biological action of ionizing radiation. Radioactivity and dose. Dosimetry of ionizing radiation. Principles and methods of radiation therapy in dentistry.	2,0		2,0	
Topic 10. Physical and technical bases of radiation therapy.	7,0	2,0		5,0
Topic 11. Radiotherapy. Long-range gamma therapy. Radiation therapy with high energy sources. Radiotherapy procedures in dental practice.	5,0			5,0
Final control of mastering the discipline.	2,0		2,0	
Total hours:	90	10	30	50

5. Topics of lectures

№	Topic	Hours
1	Physical and technical bases of radio diagnostics in dentistry.	2,0
2	Cone-beam computed tomography in diagnostics. diseases of the maxillofacial region. Dental subtraction CT in dental practice.	2,0
3	Radiation research methods and radiation signs of diseases of the teeth and jaws.	2,0
4	Physical and technical bases of radio therapy in dentistry.	2,0
5	Radiotherapy procedures in dental practice.	2,0
Total		10,0

6. Topics of practical lessons

№	Topic	Hours
1	Basic properties of ionizing radiation. Features of the device of X-ray and radiological departments.	2,0
2	Physical and technical bases of radio diagnostics in dentistry. Physical and technical bases of X-ray research.	2,0
3	Cone-beam computed tomography in diagnostics. diseases of the maxillofacial region. Dental subtraction CT in dental practice.	2,0
4	Radiation research methods and radiation anatomy of the maxillofacial region. Radiation signs of diseases of the teeth and jaws.	2,0
5	Radiation signs of diseases of the teeth and jaws.	2,0

6	Variants of development of the teeth and maxillofacial region.	2,0
7	Anomalies of development of the teeth.	2,0
8	Radiation semiotics of diseases of the teeth and jaws.	2,0
9	Radiation signs of inflammatory diseases of the teeth and jaws.	2,0
10	Radiation diagnosis of periodontitis.	2,0
11	Radiation signs of traumatic damage of teeth and jaws.	2,0
12	Radiation signs of complications of healing of fractures of the maxillofacial region. Radiation diagnosis of osteomyelitis of the maxillofacial region.	2,0
13	Radiation signs of tumor (benign and malignant) lesions of the maxillofacial region.	2,0
14	Biological action of ionizing radiation. Radioactivity and dose. Dosimetry of ionizing radiation. Principles and methods of radiation therapy in dentistry.	2,0
15	Final control of mastering the discipline.	2,0
	Total hours	30,0

7. Independent work

№	Topic	Number of hours
1.	Radiation research methods and radiation anatomy of the maxillofacial region. Radiation signs of diseases of the teeth and jaws.	7
2.	Variants and anomalies of development of teeth and maxillofacial region.	10
3.	Radiation signs of inflammatory diseases of the teeth and jaws. Radiation diagnosis of periodontitis.	6
4.	Radiation signs of complications of healing of fractures of the maxillofacial region. Radiation diagnosis of osteomyelitis of the maxillofacial region.	11
5.	Radiation signs of tumor (benign and malignant) lesions of the maxillofacial region.	6
6.	Physical and technical bases of radiation therapy.	5
7.	Radiotherapy. Long-range gamma therapy. Radiation therapy with high energy sources. Radiotherapy procedures in dental practice.	5
	Total hours	50,0

8. Individual tasks

Not provide.

9. Teaching methods

Practical training: conversation, presentations on the practical topics, solving clinical scenario problems, exhibition of the X-ray tube, image interpretation practice, instruction and practice of use of DICOM format applications, visiting X-ray, CT and radiotherapy facilities, demonstration and practice of manipulation skills, according to list 5.

Individual work: independent work with the textbook, independent work with the department archive, independent solving of clinical case problems.

10. Control methods and criteria for evaluating learning outcomes

Current control: oral examination, testing, assessment of practical skills, solving situational clinical problems, assessment of classroom activity.

Final control: oral examination, testing.

The structure of the current assessment in the practical lesson:

1. Assessment of theoretical knowledge by the topic of the lesson:
 - methods: survey, solving situational clinical tasks;
 - maximal score – 5, minimal score – 3, unsatisfying score – 2.

2. Assessment of practical skills and manipulations by the topic of the lesson:
 - methods: assessment of the correctness of practical skills
 - maximal score – 5, minimal score – 3, unsatisfying score – 2;
3. Assessment of work with the patient by the topic of the lesson:
 - methods: assessment: а) communication skills of conversation with the patient and his parents, б) the correctness of the appointment and evaluation of laboratory and instrumental studies, в) compliance with the differential diagnosis algorithm, г) reasoning clinical diagnosis, д) assembling treatment plan
 - maximal score – 5, minimal score – 3, unsatisfying score – 2;

Criteria for current assessment in a practical lesson:

«5»	The student is fluent in the material, takes an active part in the discussion and solving situational clinical case problems, with confidence demonstrates practical skills during the examination and interpretation of clinical, laboratory and instrumental studies, expresses their opinion on the topic, demonstrates clinical thinking.
«4»	The student is well versed in the material, participates in the discussion and solution of situational clinical problems, demonstrates practical skills during the examination and interpretation of clinical, laboratory and instrumental studies with some errors, expresses their opinion on the topic, demonstrates clinical thinking.
«3»	The student does not possess enough knowledge, insecurely participates in the discussion and solution of a situational clinical problem, demonstrates practical skills during the examination and interpretation of clinical, laboratory and instrumental studies with significant errors.
«2»	The student does not possess knowledge, participate in the discussion and solution of the situational clinical problem, demonstrate practical skills during the examination and the interpretation of clinical, laboratory and instrumental studies.

The student is admitted to the final control of mastering the discipline (diff. examination) subject to the requirements of the curriculum and if for the current educational activity he received at least 3.00 points, does not have omissions of lectures and practical classes, successfully completed an abstract and presentation on the topics of independent work of students (VTS).

The structure of the final control

The content of the evaluated activity	Quantity
Independent description of two radiological researches of different modality (e. g. a panoramic x-ray and a contact x-ray of a tooth).	3
2 (two) theoretical questions.	2

Criteria for evaluating learning outcomes of students on the exam:

«5»	Awarded to a student who has worked systematically during the semester, at the diff. comprehensive and deep knowledge of the program material, has been able to successfully perform the tasks provided by the program, has mastered the content of basic and additional literature, has realized the relationship of individual sections of the discipline, their importance for the future profession, has showed creativity in understanding and using curriculum, has showed the ability to independently update and replenish knowledge; level of competence — high (creative).
«4»	Awarded to a student who shows full knowledge of the curriculum, successfully performs the tasks provided by the program, mastered the basic literature recommended by the program, showed a sufficient level of knowledge in the discipline

	and is able to independently update and update during further study and professional activities; level of competence — sufficient (constructive-variable).
«3»	Awarded to a student who has shown knowledge of the basic educational and program material in the volume necessary for the further training and the subsequent work on a profession, copes with performance of the tasks provided by the program, has made separate mistakes in answers to diff. knowledge to overcome mistakes under the guidance of a researcher; level of competence — average (reproductive).
«2»	Awarded to a student who did not show sufficient knowledge of the basic curriculum, made fundamental mistakes in performing the tasks provided by the program, can not without the help of the teacher to use the knowledge in further study, failed to master the skills of independent work; level of competence — low (receptive-productive).

Student who has worked systematically and holds an average score of 4.75 and above during the academic year receives 5.00 points without a test at the evaluation. The teacher outlines at the first lesson about the possibility and conditions of obtaining diff. credit "automatically" of all students in the group.

11. Distribution of points awarded to applicants for higher education

The grade for the discipline comprises 50.0% of the grade for the current performance and 50.0% of the grade for the exam.

The average score for the discipline is translated into a national grade and converted into scores on a multi-point scale.

Conversion of the traditional grade for the discipline in the 200-point is carried out by the information and computer centre of the university programme "Contingent".

Conversion table of national assessment into multi-point:

National assessment for the discipline	The sum of points for the discipline
«5»	185 – 200
«4»	151 – 184
«3»	120 – 154

Points from the discipline are independently converted into both the ECTS scale and the four-point scale. ECTS scale scores are not converted to a four-point scale and vice versa. Further accounts are carried out by the information and computer center of the university.

Conversion of the traditional assessment of the discipline and the amount of points on the ECTS scale

Rating ECTS	Statistical indicator
A	The best 10 % of students
B	The following 25 % of students
C	The following 30 % of students
D	The following 25 % of students
E	The last 10 % of students

The ECTS grade is given by the ONMedU educational department or the dean's office after ranking the grades in the discipline among students studying in one course and in one specialty. The ranking of students - citizens of foreign countries is recommended by the decision of the Academic Council to be conducted in one array.

12. List of questions to diff. evaluation

1. Types of ionizing radiation (corpuscular and photonic).
2. The dependence of the properties of ionizing radiation on the wavelength.
3. Radioactivity. Types and means of protection against ionizing radiation (collective and individual).

4. Features of the device of an X-ray and dental office according to requirements of the Basic sanitary rules of ensuring radiation safety of Ukraine (OSPU).
5. Protection of the patient and the doctor during dental examinations.
6. Types of modern methods of diagnostic tests of teeth and maxillofacial area (ionizing and non-ionizing).
7. Indications and contraindications to MRI and ultrasound; advantages and disadvantages.
8. X-ray methods of examination of teeth and maxillofacial area.
9. The rule of orthoradiality. Image formation method.
10. Contact and remote methods.
11. Intraoral radiographs of teeth.
12. Interproximal radiography.
13. Orthopantomographic radiography.
14. Analog and matrix X-ray image receivers.
15. A method of obtaining a three-dimensional image and storing information on digital media.
16. The use of the method for the study of tooth hard tissues and periapical structures. The importance of studying the relationships of adjacent structures.
17. CT in the planning of endodontic treatment.
18. CT. Frontal, axial and sagittal plane of the study.
19. DICOM standard of medical research in dental practice.
20. Density windows in CT. Voxel. MPR and MIP reconstruction.
21. Leading symptoms in the study of caries of occlusal and proximal surfaces.
22. Metal artifacts in the formation of images on CT and ultrasound in dental practice.
23. Metric assessment of the root canal system of the tooth.
24. Estimation of bone density for further treatment planning. Osteoporosis.
25. Diagnosis of pathology of the temporal bones. Opportunities to assess the surrounding areas.
26. Fundamentals of radiological semiotics of pathology of teeth and jaws.
27. Normal image of the tooth (shadow of the enamel cover and dentin of the crown, enlightenment of the tooth cavity and root canal, lateral parts of the periodontal space, the image of the interdental septum).
28. Signs of teeth of the upper and lower jaws. Evaluation of adjacent teeth.
29. Children's dentition. The turn of teeth change is normal.
30. Development of the jaw in the X-ray image.
31. Algorithm of system consideration of the radiograph.
32. Radiation signs of eruption of teeth.
33. Variants of the structure of the jaw (uniform density, multi-mineralized, inhomogeneous density). Exostoses and endostoses.
34. Disorders of teething (persistent and retained teeth).
35. Violation of the number of teeth (supradentia, adentia).
36. Anomaly of size and shape (macro- and micro-dentia).
37. Anomaly of tooth location: vestibular and mesial dystopia, oral and distal dystopia, supraposition and infraposition, tortoposition, transposition.
38. Radiation signs of caries.
39. Radiation signs of periodontitis. Classification by radiological features.
40. Radiation signs of chronic fibrous periodontitis.
41. Chronic granulating periodontitis of different localizations.
42. Radiation signs of periodontitis (images of mild, moderate and severe stages).
43. Radiation signs of generalized periodontitis.
44. Periodontitis. Staging by radiological signs.

45. Classification of dental injuries (bruise, dislocation, crack, fracture).
46. Radiation signs of fracture of the tooth.
47. Radiation signs of stabbed tooth dislocation.
48. Radiation image of traumatic injury of the maxillofacial region.
49. Radiation signs of acute and chronic osteomyelitis of the jaws.
50. Types of ionizing radiation (corpuscular and photonic).
51. Dependence of the properties of ionizing radiation on the wavelength.
52. Types of properties of ionizing radiation.
53. Radioactivity. Types of protection against ionizing radiation.
54. Means of protection against ionizing radiation (collective and individual).
55. Carrying out of radiation therapy in an optimum dose in optimum terms.
56. Factors that influence on the choice of the optimal dose of radiation therapy.
57. Radiotherapy interval.
58. Radiomodifiers: radioprotectors and radiosensitizers.
59. Methods of radiation therapy: independent, combined, complex, combined-radiation.

13. Methodological support:

- Working program of the discipline
- The syllabus of the discipline
- Textbooks:
 1. Essential radiology for medical students, interns and residents // A.Ahuja. – OMF publishing. – 2017. – 518 p.
 2. Kovalsky O. Radiology. Radiotherapy. Diagnostic Imaging: textbook for students of higher med. education establishments of IVth accreditation level / O. Kovalsky, D. Mechev, V. Danylevych. — 2nd ed. — Vinnytsia: Nova Knyha, 2017. — 504 p
 3. Diagnostic Radiology: textbook for medical students, residents, doctors, researches / M.I. Pilipenko, Y.E. Vikman, M.E. Slabodchikov [et al.]. - Kharkiv, 2018. - 260 p.
 4. William Herring MD FACR\ Learning Radiology: Recognizing the Basics 3rd Edition\ May, 2019\451p
 5. Jo-Anne O Shepard MD\Thoracic Imaging The Requisites (Requisites in Radiology) 3rd Edition\ March, 2018 \496 p
 6. MistaR., Planner A., Uthappa M.\ A-Z of Chest Radiology \Cambridge University Press, 2007\224 p.
- Multimedia presentations
- Cathedral archive of radiographs in analog and electronic form.
- Methodical development of practical classes.
- Electronic bank of test tasks by divisions of the discipline.

14. Recommended literature

Basic:

1. Essential radiology for medical students, interns and residents // A. Ahuja. – OMF publishing. – 2017. – 518 p.
2. Kovalsky O. Radiology. Radiotherapy. Diagnostic Imaging: textbook for students of higher med. education establishments of IVth accreditation level / O. Kovalsky, D. Mechev, V. Danylevych. — 2nd ed. — Vinnytsia: Nova Knyha, 2017. — 504 p.
3. Diagnostic Radiology: textbook for medical students, residents, doctors, researches / M.I. Pilipenko, Y.E. Vikman, M.E. Slabodchikov [et al.]. - Kharkiv, 2018. - 260 p.

4. William Herring MD FACR\ Learning Radiology: Recognizing the Basics 3rd Edition\ May, 2019\451 p.
5. Jo-Anne O Shepard MD\Thoracic Imaging The Requisites (Requisites in Radiology) 3rd Edition\ March, 2018 \496 p
6. Mista R., Planner A., Uthappa M. \ A-Z of Chest Radiology \ Cambridge University, 2007\224 p.

Additional literature:

7. Chen M. Basic Radiology / Michael Y. M. Chen, Thomas L. Pope, David J. Ott. — 2nd ed. — McGraw Hill Professional, 2010. — 408 p.
8. Haller J. O., Slovis T. L., Joshi A. Pediatric Radiology 3rd Ed. \ Springer-Verlag Berlin Heidelberg 1995, 2005. Printed in Germany, 298 p.

15. Electronic information resources

1. <https://radiopaedia.org>
2. <http://radiologyassistant.nl>
3. <https://radiographia.info/>
4. <http://nld.by/help.htm>
5. <http://learningradiology.com>
6. <http://www.radiologyeducation.com/>
7. <http://www.radiologyeducation.com/>
8. <https://www.sonosite.com>
9. <https://www.ncbi.nlm.nih.gov/pmc>
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