FACULTY OF STOMATOLOGY

STUDY PROGRAM 0911.1 STOMATOLOGY

DEPARTMENT OF RADIOLOGY AND IMAGING

APPROVED
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum faculty of Stomatology
Minutes No. 1 of 26.09.2023
Chairman, MD, PhD, Associate Professor
Stepco Elena

APPROVED
at the Council meeting of the Faculty of Stomatology
Minutes No. 02 of 09.11.2023
Dean of the Faculty of Stomatology,
MD, PhD, Associate Professor
Solomon Oleg

APPROVED
at the meeting of the Chair of Radiology and Imaging
Minutes No. 20 of 27.06.2023

Head of Chair Ph.D., Associate Professor
Malîga Oxana

SILLABUS

DISCIPLINE **DENTAL RADIOLOGY**

Integrated higher studies

Type of course: **Compulsory discipline**

Curriculum developed by the team of authors:

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Malîga Oxana, PhD of med., associate professor

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I. PRELIMINARY

- **General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional / specialty training program.**
  The discipline "Dental radiology" is welcome for students of the Faculty of Dentistry. It is at the same time a fundamental and a clinical discipline in the process of preparing the future specialist. The discipline material is based on students' knowledge obtained by studying physics, anatomy, physiology, and is closely related to the courses of morphopathology, pathophysiology, semiology and dental surgery. The discipline presents aspects of the physical bases of radioimaging methods and radiological anatomy, especially for teeth and the oro-maxilo-facial region. Only a very good knowledge of the possibilities of radioimaging methods, indications, contraindications, radioimaging iconographic semiology enables the student to integrate in the preparation of the future dentist.

- **Mission of the curriculum (aim) in professional training:**
  Students' training both in theoretical and practical aspects, often encountered in the work of future dental practitioners; presentation of the "classic" (conventional) dental radiodiagnostic aspects as well as the present and future possibilities of imaging diagnosis in dentistry and oro-maxilo-facial pathology.
- Language (s) of the course: Romanian Russian, English;
- Beneficiaries: 3rd year students, Faculty of Stomatology.

II. MANAGEMENT OF THE DISCIPLINE

Code of the discipline		**S.05.O.049**	
Name of the discipline		**Dental radiology**	
Person(s) in charge of the discipline		dr. în medicină, conf. univ. **Vasile Zagnat**	
Year	**III**	Semester	**V**
Total number of hours: **90**, including:			
Curs	**15**	Practical work	**15**
Seminars	**15**	Self-training	**45**
Clinical internship			-
Form of assessment	**E**	Number of credits	**3**

III. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the discipline study the student will be able to:

- ✓ ***at the level of knowledge and understanding:***
- to know the notions of radiological physics,

- to know the construction and working principle of the X-ray tube,
- to understand the basic physical principles of imaging methods of investigation,
- to know the indications and contraindications of the radiological examination of the oro-maxilo-facial region,
- to know the radiological anatomy: dental and this of the oro-maxilo-facial region,
- to know the radiological semiology of dental pathology,
- to know the radiological semiology of diseases of the oro-maxilo-facial region.

✓ ***at the application level:***

- to appreciate the quality of the radiological image,
- to be able to appreciate the examination method,
- to recognize the anatomical features of the examined region,
- to perform the radiological diagnosis of pathologies: caries, pulpitis, periodontitis, cysts, osteomyelitis, bone destruction, trauma to teeth, jaws, skull.

✓ ***at the integration level:***

- to appreciate the importance of Radiology for Stomatologists in the context of Stomatology.
- to approach creatively the diagnostic problems at the syndrome level.
- to have skills to implement and integrate the accumulated knowledge into fundamental and clinical disciplines.

IV. PROVISIONAL TERMS AND CONDITIONS

- knowing the basics of medical physics,
- knowledge of the anatomy, physiology, and age-specificities of the teeth and the structures of the oro-maxillo-facial region.

V. THEMES AND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

Nr. d/o	THEME	Number of hours			
		Courses	Seminars	Practical work	Self-training
1.	Medical imaging and its branches. Ionizing radiation. Radioprotection.	1	1	1	3
2.	Radiological methods of investigation.	1	1	1	3
3.	Imaging examination methods: computed tomography, magnetic resonance imaging, ultrasonography, nuclear medicine.	1	1	1	3
4.	Radiodiagnosis of locomotion apparatus pathology.	1	1	1	3
5.	Imaging methods of examination in stomatology.	1	1	1	3
6.	Normal radiological anatomy of teeth, maxillofacial area and temporo-mandibular joint. Age particularities. Developmental anomalies of maxillofacial area.	1	1	1	3
7.	Radio-imaging diagnosis of cranial and maxillofacial area trauma.	1	1	1	3

Nr. d/o	THEME	Number of hours			
		Courses	Seminars	Practical work	Self-training
8.	Radio-imaging diagnosis of caries.	1	1	1	3
9.	Radio-imaging diagnosis of complications of caries.	1	1	1	3
10.	Teleradiography of the maxillofacial area. Imaging methods for diagnosis of maxillofacial area and temporo-mandibular joint pathology.	1	1	1	3
11.	Radiodiagnosis in implantology and parodontology. Radiodiagnosis in stomatololgical treatment.	1	1	1	3
12.	Radiodiagnosis of inflammatory diseases of the maxillofacial area. Radiodiagnosis of osteomyelitis.	1	1	1	3
13.	Radiodiagnosis of diseases of paranasal sinuses.	1	1	1	3
14.	Radiodiagnosis of cysts of the maxillofacial area. Radio-imaging diagnosis of salivary gland pathology.	1	1	1	3
15.	Radiodiagnosis of tumors of the maxillofacial area.	1	1	1	3
Total		**15**	**15**	**15**	**45**

VI. PRACTICAL SKILLS PURCHASED AT THE END OF THE COURSE

Mandatory essential practical skills are:

- To be able to apply the patient's radiation protection equipment and measures in dental radiology.
- To be able to apply the equipment and radiation protection measures of the medical staff in dental radiology.
- To appreciate the quality of the radiographic image,
- To be able to appreciate the method of examination,
- Recognize the anatomical elements of the oro-maxillo-facial region
- To be able to perform the radiological diagnosis of pathologies: caries, pulpitis, periodontitis, cysts, osteomyelitis, elements of bone destruction, traumas of teeth, jaws, skull.

Interpretation of the radiographic image:

- Contact radiography: Dieck variant (retroalveolar).
- Contact radiography: Raper variant (interproximal).
- Retroalveolar radiography. Chronic fibrous apical periodontitis.
- Retroalveolar radiography. Chronic granulomatous apical periodontitis.
- Retroalveolar radiography. Chronic granular apical periodontitis.
- Bitewing radiography (interproximal). Caries.
- Bitewing radiography (interproximal). Incipient marginal periodontitis.
- Radiography of the mandible in the oblique lateral projection
- Occlusal film radiography: Belot variant, Simpson variant
- Contrast-enhanced radiographs (sialography, fistulography, radiography of maxillary sinus, carotid arteriography).

- Panoramic radiography.
- Radiography of the temporomandibular joint.

VII. REFERENCE OBJECTIVES AND CONTENTS UNITS

Objective	Content units
Theme (Chapter) 1. Medical imaging and its branches. Imaging methods of investigation. Radiography. Ionizing radiation. Radioprotection.	
• to define: radiology, medical imaging, radiography, dosimetry, radioprotection • to define: radionuclide, the radiopharmaceutical preparation • to know the properties of X-rays, gamma rays, ultrasound • to know the laws of forming of radiographic image and quality criteria • to demonstrate the ability to properly assess the imaging investigation method • to correctly apply the specific terminology of different imaging investigations • to know and to be able to apply radiation protection measures • to integrate the gained knowledge in clinical disciplines	1. Medical imaging. Definition. Component parts of medical imaging.
	2. Radiology. Definition. The construction and working principle of the X-ray tube. Nature of Rontgen radiation. X-ray properties. Properties of radiolographic image.
	3. Dosimetry. Units for ionizing radiation. International system of units. Absorbed dose. Biological dose.
	4. Radiological protection of the patient. Radiological protection of personnel involved with ionizing radiation.
	5. Radiography. Definition. Forming of radiographic image. Advantages and disadvantages of radiography.
	6. The laws of forming of radiographic image. Radiographic image quality criteria. Special radiological methods.
	7. Radiological contrast agents. Classification.
	8. Tomographic radiological methods: conventional tomography, tomosynthesis, computed tomography. Principles. Advantages, disadvantages, indications, contraindications.
	9. Cone-beam computed tomography.
	10. Magnetic resonance imaging. Physical basics. Advantages, disadvantages, indications, contraindications.
	11. The nature and properties of ultrasound. Methodology, ultrasonographic semiology. Advantages, disadvantages, indications, contraindications.
	12. Basics of nuclear physics. Radionuclide, the radiopharmaceutical preparation. Radionuclide Investigations: methodology, modalities, interpretation of results. Advantages, disadvantages, indications, contraindications.
Theme (Chapter) 2. Radiodiagnosis of locomotion apparatus pathology.	
•to know the basic radiological methods used in the diagnosis of the pathology of the osteo-articular apparatus •to know the radiological anatomy of bones and joints •to demonstrate the ability to recognize anatomical structures on a radiograph •to apply elements of intersindromic radiological differential diagnostics •to integrate the gained knowledge in clinical disciplines	1. Imaging methods for osteo-articular system examination.
	2. Radiological semiology of fractures: fracture line, displacement of fragments. Types of fractures, evolution, complications.
	3. Imaging semiology of changes in bone shape and dimensions (bone atrophy, oedostosis, bone deformities, bone hypertrophy).
	4. Imaging semiology of bone structure changes (osteoporosis, osteosclerosis, osteodestruction, osteonecrosis, osteolysis).
	5. Changes in periosteum (periostosis, periostitis: linear, acciform, Codman's triangle).
	6. Changes of soft tissues (volume and structure).
	7. Imaging semiology of pathology of joints: luxations, subluxations, changes of inflammatory origin.
Theme (Chapter) 3. Imaging methods of examination in stomatology. Normal radiological anatomy of teeth, maxillofacial area and temporo-mandibular joint.	
	1. Radiological methods of investigation in dentistry. Classification.

Objective	Content units
• to know basic radioimaging methods used in dentistry • to know the radiological anatomy of teeth, maxillofacial area and temporo-mandibular joint • to demonstrate the ability to recognize anatomical structures on a radiograph • to integrate the gained knowledge in clinical disciplines	2. Intra-oral radiographic methods. Classification. Contact radiography: by Dieck (retroalveolar), by Raper (interproximal). Indications. Radiography with occlusal film: by Belot, by Simpson. General execution technique according to the examined teeth. Indications.
	3. Extra-oral radiographic methods. Dental radiography in children. Radiography of jaws (maxilla, mandible). Radiographs with contrast substance (sialography, fistulography, carotid arteriography).
	4. Ortopantotomography. Principles and general execution technique. Advantages and disadvantages. Performing defects.
	5. Computed tomography. Cone beam computed tomography.
	6. Ultrasonography. Magnetic resonance imaging. Nuclear medicine. Indications in dentistry.
	7. Radiological image of the permanent tooth. Radiological anatomy of teeth (on tooth groups). Radiological image of the temporary tooth.
	8. Radiological anatomy of jaws. Regional and individual features. Radiological aspects in normal tooth relations with various anatomical elements of the jaws.
	9. Radiological anatomy of temporo-mandibular joint. Radiological anatomy of salivary glands.
Theme (Chapter) 4. Developmental anomalies of maxillofacial area. Radio-imaging diagnosis of cranial and maxillofacial area trauma.	
• to know the age-specificities of teeth in children and the elderly • to know the anomalies of teeth development • to demonstrate the ability to recognize pathological structures on a radiograph • to apply elements of radiological differential diagnostics in dental and maxillo-facial trauma • to integrate the gained knowledge in clinical disciplines	1. Notions of dental embryology. Particularities in children.
	2. Development abnormalities. Number abnormalities. Size abnormalities: macrodontia, microdontia. Eruption abnormalities: transposition. Structure abnormalities: synodontia, concrescencia, germination, taurodontism, dilaceration, tooth in the tooth, invagination, imperfect amelogenesis, imperfect dentinogenesis, imperfect osteogenesis, dental dysplasia, regional odontodispasia, enameloma (enamel pearls).
	3. Age characteristics in the elderly. Abrasion, atrition, erosion, dental resorption.
	4. Classification of fractures of facial massif. Fractures of maxilla: involving and not involving the teeth.
	5. Classification of fractures by Le Fort: I, II, III.
	6. Fractures of mandible: variations, particularities, radiographic signs.
	7. Fractures of teeth. Dislocation of a tooth. Radiological diagnosis.
	8. Evolution of fractures. Radiological signs in uncomplicated evolution. Fracture complications. Radiological diagnosis.
Theme (Chapter) 5. Radio-imaging diagnosis of caries and its complications.	
• to know the basic radiological methods used in the diagnosis of dental caries • to define caries, periodontitis, paradontosis • to demonstrate the ability to recognize pathological structures on a radiograph • to apply elements of radiological differential diagnostics of dental caries and its complications • to integrate the gained knowledge in clinical disciplines	1. Radiological methods used in the diagnosis of dental caries.
	2. Radiological evolution of caries lesions. Clinical and radiological classifications of caries. Radiological signs.
	3. Classification of dental caries complications.
	4. Local complications - pulpitis and pulp necrosis, apical periodontitis. Radiological signs. Periapical granuloma. Radiological signs.
	5. Radicular changes - resorption, hypercementosis.
	6. Acute apical periodontitis. Chronic apical periodontitis. Clinical variants and radiological signs. Diagnostic error sources.
	7. Paradontosis. Definition. Grades. Radiological signs.

Objective	Content units
Theme (Chapter) 6. Teleradiography of the maxillofacial area. Imaging methods for diagnosis of maxillofacial area and temporo-mandibular joint (TMJ) pathology.	
• to know methods, general moments and technique of teleradiography • to know techniques of radioimaging exploration of the TMJ • to demonstrate the ability to recognize anatomical structures on a radiograph • to apply elements of radiological differential diagnostics of TMJ pathology • to integrate the gained knowledge in clinical disciplines	1. Teleradiography. General notions. Indications and areas of application. 2. Technique of teleradiography. Lateral teleradiography. Cranio-facial teleradiography, bone markings, skin markings, lines and plans of reference. 3. Techniques of radio-imaging exploration of TMJ. Parma incidence. The normal and pathological radiological anatomy of TMJ. 4. The imaging diagnosis of temporomandibular joint arthritis. 5. The imaging diagnosis of temporomandibular joint luxations. 6. The imaging diagnosis of temporomandibular joint contracture.
Theme (Chapter) 7. Radiodiagnosis of inflammatory diseases of the maxillofacial area.	
• to know basic radiological methods used in the diagnosis of inflammatory pathology of the oro-maxilo-facial region • to demonstrate the ability to recognize signs of inflammatory pathology of the oro-maxillofacial region on a radiograph • to apply elements of intersindromic radiological differential diagnostics • to integrate the gained knowledge in clinical disciplines	1. Methods of examination in the case of inflammatory diseases of the maxillofacial area. 2. Infections of the maxillary bones: osteoperiostitis, alveolar osteitis, osteomyelitis. Abscesses of the jaws. 3. Radiological classification of osteomyelitis. Odontogenic osteomyelitis. Complications of osteomyelitis. 4. Radio-imaging methods for examination of paranasal sinuses. Radiological anatomy of paranasal sinuses. 5. Sinusitis. Notion. Maxillary sinusitis and radiographic examination of the teeth - odontogenic maxillary sinusitis (acute, chronic), oro-sinusal communication, tooth root pushed into the maxillary sinus.
Theme (Chapter) 8. Radiodiagnosis of cysts and tumors of the maxillofacial area. Radio-imaging diagnosis of salivary gland pathology.	
• to know basic radiological methods used in the diagnosis of masses of the oro-maxilo-facial region • to define: syst, pseudosyst • to demonstrate the ability to recognize signs of a mass of the oro-maxillo-facial region on a radiograph • to apply elements of radiologic differential diagnostics between benign and malignant tumors • to integrate the gained knowledge in clinical disciplines	1. Radio-imaging investigation. Classification of dento-maxillary cysts. Odontogenic cysts (developmental origin, inflammatory origin). 2. Disembriopathic cysts. Non-odontogenic cysts: nazo-palatin cyst, naso-labial cyst, globulo-maxillary cyst. Pseudocysts. 3. Radiological classification of dento-maxillary tumors. Benign tumors. General radiologic semiology. Classification. 4. Benign odontogenic tumors. Ameloblastoma. Odontoma. Cementoma. Benign non-odontogenic tumors. Pseudotumors. 5. General characters of malignant bone tumors. Radiological semiology. Classification. 6. Malignant odontogenic tumors. Malignant non-odontogenic tumors. Secondary malignant tumors. Radio-imaging investigative methods. 7. Salivary gland pathology. Salivary lithiasis. Radio-imaging signs. Tumors of salivary glands. Benign tumors. Malignant tumors. Chronic sialadenitis. Lymphatic lesions. Sialosis.

VIII. PROFESSIONAL (SPECIFIC (SC)) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

✓ **Professional (specific) (SC) competences**

- **PC1.** Strong knowledge of the particularities of structure, development and functioning of the human body in various physiological and pathological conditions.
- **PC2.** Carrying out various practical maneuvers and procedures for carrying out professional activities specific to the specialty of dentistry based on knowledge in fundamental sciences.
- **PC3.** Elaboration of the diagnosis, treatment and rehabilitation plan in various pathological situations and selection of appropriate therapeutic procedures for them, including the provision of emergency medical assistance.
- **PC4.** Use of medical techniques, instrumental and laboratory investigations, digital technologies to solve the specific tasks of the patient's therapeutic conduct.
- **PC5.** Planning, coordinating and carrying out health promotion activities and prophylactic measures to improve health at individual and community level, establishing and implementing complex dispensary plans, applicable in school and preschool communities.
- **PC6.** Application of professional standards for the evaluation and assurance of the quality of dental services in relation to the associated maneuvers, procedures and treatments.

✓ **Transversal competences (TC)**

- **TC1.** Application of professional standards of assessment, acting according to professional ethics, as well as the provisions of the legislation in force. Promotion of logical reasoning, practical applicability, assessment and self-assessment in decision-making.
- **TC2.** Performing of activities and exercising of roles specific to team work in various medical institutions. Promotion of the spirit of initiative, dialogue, cooperation, positive attitude and respect for others, empathy, altruism and continuous improvement of their own activity.
- **TC3.** Systematic assessment of personal competencies, role and expectations, application of self-assessment on the learned processes, acquired skills and professionalism needs, efficient use of language skills, knowledge in information technologies, research and communication skills, for the purpose of provision of qualified services and adaptation to the dynamics of health policy requirements and for personal and professional development.

✓ **Study outcomes**

Upon completion of the study, the student will be able to:

- to know the working principle of the X-ray tube, the properties of ionizing radiation, principles and methods of radioprotection,
- to understand the basic physical principles of imaging methods of investigation,
- to set indications and contraindications to radio-imaging examinations in stomatology,
- to know the radiological anatomy of the teeth and oro-maxillo-facial region,
- to recognize the anatomical features of the examined region,
- to perform radiological diagnosis in the case of dental caries, pulpitis, periodontitis, cysts, osteomyelitis, bone destruction, trauma to the teeth and oro-maxillo-facial region.

IX. STUDENT'S SELF-TRAINING

No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms

1.	Problem report	Oral communication, Power Point Presentation,	Knowing and mastering the theme, The completeness of the elucidation of the question raised for the referral, Ability to highlight the essence of the theme, The representativeness of the images used to illustrate the theme, Answer questions, Compliance with the prescribed regulation	For practical lesson
2.	Homework	Written work in the workbook depending on the question or problem formulated.	The correctness of solving the problem	To be ready for practical lesson
3.	Working with information sources	Read the lecture and the material in the manual to the theme carefully. To get acquainted with the list of additional information sources on the topic. Select the source of additional information for that theme. Wording of generalizations and conclusions related to the theme of the lesson.	The ability to extract the essential, Interpretative ability, The volume of work	During the semester

X. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

- ***Teaching and learning methods used:***
- Course
  - introductive
  - current
  - synthesis
  - theoretical and practical
  - debates
- Practical lessons
  - synthesis
  - repetitive
  - debates
- Traditional methods
  - case study
  - role playing
  - interactive
  - tests

- ***Applied didactic strategies / technologies*** *(discipline specific)*

Analysis of normal and pathological intra-oral, extra-oral and panoramic radiographs.

- ***Evaluation methods*** *(including an indication of how the final note is calculated)*
  - ✓ **Current evaluation**: each student's knowledge will be evaluated at each practical lesson in one or several ways: oral, test, control work, image interpretation, clinical case resolution. 20% of the mark is assigned to the individual work of the student.
  - ✓ **Final evaluation**: semester V - exam. The students, having the average annual mark under the grade "5" or having not recovered absences from practical lessons by the end of the semester, are not admitted to the exam. The exam consists of testing by the Test Editor in the specialized room for this type of evaluation. The final grade for the discipline is composed of 0.5 of the average annual mark on year V and 0.5 of the one obtained by the test.

How to round up the grades at the evaluation steps

Intermediate note grid (annual average, grades from the exam stages)	National scoring system	Equivalent ECTS
1,00-3,00	**2**	**F**
3,01-4,99	**4**	**FX**
5,00	**5**	**E**
5,01-5,50	**5,5**	
5,51-6,0	**6**	
6,01-6,50	**6,5**	**D**
6,51-7,00	**7**	
7,01-7,50	**7,5**	**C**
7,51-8,00	**8**	
8,01-8,50	**8,5**	**B**
8,51-9,00	**9**	
9,01-9,50	**9,5**	**A**
9,51-10,0	**10**	

The average annual mark and the scores of all the final examination (computer assisted, test, oral) - all will be expressed in numbers according to the scoring scale (according to the table), and the final grade obtained will be expressed in two decimal digits will be transferred to the notes book.

Failure to attend the examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student is entitled to 2 repeated claims of the unsuccessful exam.

XI. RECOMMENDED LITERATURE:

A. *Compulsory:*

1. Materials of the Course of Dental Radiology, Department of Radiology and Medical Imaging.
2. Malîga O., Rotaru N., Obadă A. Medical imaging in tables and algorithms. Guidelines. Chișinău, 2015.
3. Whaites Eric. Essentials of Dental Radiography and Radiology. Textbook. Churchill Livingstone, 2002.

B. Additional(available in electronic form at the chair):

1. Stuart C. White, Michael J. Pharoah. Oral Radiology. Principles and intrepretation. Mosby, 2000.
2. Holger Petterson. A Global Text Book of Radiology. Sweden, 2010.