# MEDICAL UNIVERSITY

# "PROF. DR. PARASKEV STOYANOV" - VARNA

# FACULTY OF DENTAL MEDICINE

*Approved with a Protocol of №* 07/24.06.20б.

**Approved:**
**DEAN of Faculty of Dental Medicine:**
**/ Prof. Stefan Peev, MD, PhD, DSc/**

## EDUCATIONAL PROGRAMME

## OF

## "ROENTGENOLOGY (GENERAL AND SPECIFIC)"

**Specialty "DENTAL MEDICINE"**
**Educational-qualification degree "MASTER"**
**Professional qualification " PHYSICIAN IN DENTAL MEDICINE"**

| | Semester | Horarium weekly | Total horarium |
|---|---|---|---|
| Lectures | VI, VII | 1/1 | 30 |
| | | | |
| Exercises | VI, VII | 2/2 | 60 |
| | | | |
| Total | | | 90 |
| | | | |
| Monitoring and evaluation forms | Current control | | Exam – VII semester |
| Credits ( ECTS ) | | 2+2 | 4 |
| Extracurricular employment | | | 30 |

**Lecturer:**
**Assoc. Prof. Borislav Georgiev Chaushev, MD, PhD**
**Prof. Stefan Vasilev Peev, DMD, PhD, DSc**
**Prof. Tihomir Dobrinov Georgiev, MD, PhD, DSc**
**Assoc. Prof. Elitsa Encheva-Mitsova, MD, PhD**
**Dr. Ivailo Hristov**
**Dr. Konstantin Kostadinov**

**Varna, 2020**

## Annotation

The Imaging Diagnostics training for dental medicine students is intended to qualify students to achieve a certain level of knowledge of imaging modalities, such as conventional X-ray diagnostics, ultrasound, magnetic resonance imaging, interventional radiology, nuclear medicine. There are two main sections - general imaging and special imaging in dental medicine. Many of the diagnostic techniques use radiation, that is why the beginning of the training course requires the acquisition of basic knowledge about the receipt, nature and properties of radiation, their biological effects on the human body in their medical use, and methods of control and protection.

The study plan is compiled on the basis of nosological groups, in the relevant anatomical areas and systems.

The main activities for which the dental medicine student in Imaging diagnostic is preparing are the following:

**1. Theoretical knowledge of:**

A) etiology, pathogenesis, clinical and pathoanatomical semiotics. They are a prerequisite for the correct interpretation of the images acquired, through various methods and techniques.

B) the physical bases that determine differences in the diversity of imaging modalities.

C) to determine the indications for the application of a specific imaging modality

D) assessment of contraindications for imaging studies

E) the legal aspect

**2. Practical skills for:**

A) selection of the most appropriate imaging studies according to the nosological unit and clinic.

B) interpretation of the findings from all imaging methods.

**3. Motivating** students to research through additional extracurricular activities

**Forms of education, control and assessment**

Test control - once a semester - twice in total.

Examination forms: entrance test, practical examination / reading of several images from different modalities /, theoretical examination on a combination of four questions - one general part imaging, one special part imaging, one nuclear medicine and one radiotherapy

**Evaluation criteria**

Passage level 12 out of a total of 20 test points

## Thematic plan of lectures and classes

Lectures (30 hours)

| № | TOPIC | Time |
|---|---|---|
| | **VI semester** | **15** |
| 1. | **1. Physics**<br>1.1. Composition of matter - structure of matter, ionization<br>1.2. Nature of radiation - radiation, electromagnetic radiation<br>1.3. Radiographic machine - characteristic<br>1.4. X-ray production - characteristic radiation<br>1.5. Factors controlling X-ray exposure, magnitude of current, magnitude of voltage, filtration, collimation<br>1.6. Interaction of X-rays with matter-coherent scattering, photoelectric absorption, comptan-scattering, beam scattering<br>1.7. Dosimetry - exposure, absorbed dose equivalent dose, effective dose, radioactivity<br>**1. Biology**<br>1.1. Radiation chemistry-direct effect, indirect effect, DNA changes<br>1.2. Deterministic and stochastic effect<br>1.3. Deterministic effect on cells - intracellular structure, cell reproduction<br>1.4. Deterministic effect on tissues and organs-short-term, long-term effects, modifying factors<br>1.5. Radiotherapy in oral cavity-rationality, effect on oral tissues<br>1.6. Deterministic effect on whole body radiation-acute radiation | 2 |

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| | syndrome, radiation effect on embryos and fetuses, late effects<br>1.7. Stochastic effects - carcinogenesis, inherited effects | |
| 1. | **1.Savety and protection**<br>1.1. Sources of radiation exposure - natural radiation, medical exposure, other sources<br>1.2. Dose Limitations at Exposure and Risk-Limit Doses, Patient Exposure, Risk Assessment<br>1.3. Dental exposure - patient selection, screening, staff protection, evaluation criteria, postgraduate training<br><br>**2. Digital Imaging**<br>2.1. Analog vs. digital testing<br>2.2. Types of digital image sensors<br>2.3. Features of digital sensors - contrast, spatial resolution, application and sensitivity<br>2.4. Digital Image Viewer - Electronic Monitors Features, Hard Copies, Image Processing, Image Recovery, Image Manipulation<br>2.5. Saving images. Clinical considerations<br><br>**3. Film image**<br>3.1. X-ray film composition, intraoral X-ray film<br>3.2. Amplifying screens<br>3.3. Get a latent image<br>3.4. Processing solutions<br>3.5. Equipment<br>3.6. Manual processing protocol<br>3.7. Automatic processing-action machines<br>3.8. Establishing the correct exposure<br>3.9. Image Characteristic: saturation, contrast, speed, noise sharpness and resolution, quality<br>3.10. Common mistakes in radiography | 2 |
| 3 | **1. Projections and image**<br>1.1. Sharpness and resolution of the image<br>1.2. Sharpness and size deformation<br>1.3. Parallel and bisector technique<br>1.4. Location of the object<br>1.5. Egg shell effect<br><br>**2. Intraoral projections**<br>2.1. Quality criteria<br>2.2. Periapical imaging - X-ray protocol, parallel technique, angle-grafting technique, bitewing projection<br>2.3. Occlusal images<br>2.4. The image in children - behavior towards the patient<br>2.5. Mobile devices<br>2.6. Special Relationships - Patients with Mental Problems, | 2 |

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| | Physical Problems, Vomiting Reflex, Endodontic Imaging, Pregnancy, Toothless Patients<br>**3. Anatomy**<br>3.1. Teeth<br>3.2. Surrounding tissues and structures - laminadura, alveoli, periodontal space, spongiosis<br>3.3. Maxila<br>3.4. Mandibula<br>Recovery materials | |
| 4 | **1. Extraoral projections, anatomy**<br>1.1. Criteria<br>1.2. Techniques<br>1.3. Image evaluation<br>1.4. Conclusions<br><br>**2. Panoramic image**<br>2.1. Panoramic image formation<br>2.2. Positioning the patient<br>2.3. Interpreting the image<br><br>**3. CBCT**<br>3.1. Principles of image formation with a cone beam computed tomography<br>3.2. Clinical considerations<br>3.3. Artifacts<br>3.4. Advantages and disadvantages<br>3.5. Conclude<br>3.6. Software processing<br>3.7. Anatomy | 2 |
| 5 | **1. Other image modalities**<br>1.1. Computer tomographic scanner<br>1.2. MRI<br>1.3. Ultrasound<br>1.4. Nuclear medicine<br>1.5. Conventional tomography | 2 |
| 6 | **1. Radiation treatment of diseases in themaxilo facial surgery**<br><br>**2.Radioisotope diagnosis of maxillofacial surgery** | 2 |
| 7 | **1. Ensuring quality control, Infectious control**<br><br>**2. Appointment of radiographic examinations**<br>2.1. Role of radiographs in pathology and monitoring<br>2.2. Radiographic examinations<br>2.3. Criteria for the appointment of radiographic images and their usefulness, special considerations | 3 |

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| | **1. Principles of interpretation of X-ray images**<br>1.1. Adequate diagnostic imaging<br>1.2. Visual strategy<br>1.3. Diagnostic justification for oral radiology<br>1.4. Analysis of abnormal findings<br>1.5. Analytical or systematic approach<br>Study description, report | |
| | **VII semester** | 15 |
| | **1. Caries**<br>1.1. Pathogenesis<br>1.2. The role of radiology in the detection of carious lesions<br>1.3. Finding in conventional intraoral film<br>1.4. Finding a digital movie<br>1.5. Direction of carious lesion<br>1.6. Post-irradiation therapy<br>1.7. Alternatives to radiographic examination for caries detection<br>**2. Periodontal diseases**<br>2.1. Pathogenesis<br>2.2. Evaluation of periodontal disease<br>2.3. Normal anatomy<br>2.4. Characteristics of the image in periodontitis<br>2.5. Dental conditions related to periodontal disease<br>2.6. Evaluation of periodontal therapy<br>2.7. DD<br>2.8. Conditions related to periodontal disease | 2 |
| 2 | **1. Inflammatory diseases.Periodontitis**<br>1.1. Pathogenesis<br>1.2. General characteristics-clinic<br>1.3. General radiological findings<br>1.4. Periapical inflammatory processes-periodontitis<br>1.5. Osteomyelitis<br>1.6. Osteoradecrosis<br>1.7. Osteonecrosis of the jaws associated with the administration of bisphosphonates<br>1.8. Diagnostic findings in soft tissue infections<br>1.9. Pericoronaritis<br>**2. Cysts**<br>2.1. Odontogenic cysts<br>2.2. Neodontogenic cysts<br>2.3. Soft tissue cysts | 2 |

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| | 2.4. Lesions resembling cysts | |
| 3 | **1. Benign tumors**<br>1.1. Hyperplasia<br>1.2. Epithelial odontogenic tumors<br>1.3. Mixed odontogenic tumors<br>1.4. Mesenchymal tumors<br>1.5. Neodontogenic tumors of neural origin, and mesodermal ones<br><br>**2. Other bone diseases**<br>2.1. Bone dysplasia<br>2.2. Other bone lesions<br><br>**3. Malignant tumors**<br>3.1. Pathogenesis<br>3.2. Clinical characteristics<br>3.3. Imaging of imaging<br>3.4. Cancer<br>3.5. Metastatic tumors<br>3.6. Sarcomas<br>3.7. Malignant diseases of the hematopoietic system<br>3.8. Radiography in cancer survivors | 2 |
| 4 | **1. Systemic diseases**<br>1.1. Pathogenesis<br>1.2. Characteristic of the image<br>1.3. Endocrine diseases<br>1.4. Metabolic bone diseases<br>1.5. Other systemic diseases<br><br>**2. Diseases of the sinuses**<br>2.1. Normal development and variations<br>2.2. Sinus related diseases<br><br>**3. Temporomanidibular joint**<br>3.1. Anatomy of TMJ<br>3.2. Modalities for TMJ<br>3.3. Pathology<br>3.4. Remodeling and joint conditions<br>3.5. Injuries<br>3.6. Ankylosis<br>3.7.Tumors | 2 |
| 5 | **1. Calcification and ossification of soft tissues**<br>1.1. Pathogenesis<br>1.2. Calcifications<br>1.3. Ossification<br>2. Diseases of the salivary glands<br>2.1. Mechanism | 2 |

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| | 2.2. Image studies<br>2.3. Strategy<br>2.4. Obstructive and inflammatory diseases<br>2.5. Non-inflammatory diseases<br>2.6. Cystic lesions<br>2.7. Benign tumors<br>2.8.Malignant tumors | |
| 6 | **1. Injury**<br>1.1. Radiographs of traumatic tooth injuries<br>1.2. Tooth fractures<br>1.3. Fracture of the facial bones<br>1.4. Post-fracture tracking<br><br>2. Dental anomalies<br>2.1. Developmental anomalies<br>2.2. Obtain anomalies | 2 |
| 7 | **1. Craniofacial anomalies**<br>1.1. Cleft lip and palate<br>1.2. Syndrome on Cruzon<br>1.3. Hemifacial microsomia<br>1.4. Tricher-Collins Syndrome<br>1.5. Cladocranial dysplasia<br><br>**2. Implants**<br>2.1. Image studies<br>2.2. Techniques<br>2.3. Planning<br>2.4. Intra - and postoperative evaluation<br><br>**3.Forensic medical aspect** | 3 |
| | **TOTAL** | **30** |

**Classes (60hours):**

| № | TOPIC | TIME |
|---|---|---|
| | **VI semester – 30 акад. часа** | |
| 1. | Production of X-rays. X-ray machine-characteristic. Dosimetry. Ionizing rays-characteristic, biological action. Stochastic, deterministic effect. | 2 |
| 2. | Savety and protection. Digital and analog x-ray image. Saving images. | 2 |
| 3. | Radiographic anatomy in the maxillofacial surgery, teeth and jaws | 2 |

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| 4. | Intraoral imaging, quality and criteria | 2 |
| 5. | Extraora imagingl, cranial center-types. Orthopantomography | 2 |
| 6. | CBCT equipment - advantages and disadvantages of the method. | 2 |
| 7. | CBCT - software processing, interpretation and image analysis, anatomy. | 2 |
| 8. | Quality control of radiographs, infectious control. Assignment and criteria for radiographic examinations | 2 |
| 9. | Other image modalities | 2 |
| 10. | Radiation treatment of diseases in the maxillofacial area | 2 |
| 11. | Radioisotope diagnosis of maxilofacial diseases | 2 |
| 12. | X-ray unit, technique for intraoral, orthopantomography, CBCT and cranial images | 2 |
| 13. | Basic principles and analysis of radiographic images, report. | 2 |
| 14. | Other imaging modalities (MRI, ultrasound, etc.) | 2 |
| 15. | Colloquium | 2 |
| **VII semester – 30hours** | | |
| 1. | Hard dental tissues deseases | 2 |
| 2. | Periodontal Diseases-l radiographic images. Implants | 2 |
| 3. | Periodontal diseases; X-ray findings in treated teeth | 2 |
| 4. | Inflammatory Diseases. Osteomyelitis | 2 |
| 5. | Cysts | 2 |
| 6. | Benign tumors. Other bone diseases. | 2 |
| 7. | Malignant tumors | 2 |
| 8. | Systemic diseases | 2 |
| 9. | Diseases of the paranasal cavities | 2 |

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| 10. | TMJ diseases | 2 |
| 11. | Soft tissue calcification and ossification | 2 |
| 12. | Salivary gland diseases | 2 |
| 13. | Traumatic injuries to the facial bones and teeth. Dental anomalies. | 2 |
| 14. | Craniofacial anomalies. Forensic medical aspect | 2 |
| 15. | Colloquium | 2 |

## Literature


1. Textbook on X-ray and radiology for medical students under the editorship of Prof. Velichkov, Sofia, 1989.
2. Textbook of Radiology and Radiology for Medical Students, edited by Prof. Ivan Ushev, Sofia, 1984.
3. Textbook on X-ray and radiology for medical students - second revised edition by Prof. Ushev, Prof. Burliev, Prof. Peshev, Prof. Popmikhailov, Sofia 1980.
4. Guide to Radiation Treatment for Students - Assoc. Prof. Lena Marinova and Prof. Mariana Yaneva - 2008.
5. Textbook on radiation therapy for students of dental medicine - L. Marinova, K. Yordanov - Colorprint 2010.
6. General Lecture on Radiation Treatment for Students in Dental Medicine - Assoc. Prof. Dr. Encheva
7. Textbook on Nuclear Medicine and Radiation - second revised edition. by I. Kostadinova, T. Hadzhieva. MF, 2011

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**Prepared the program:** _____
**/ Dr. Ivailo Hristov/**

**Head of Department:** _____
**/Assoc. Prof. Borislav Georgiev Chaushev, MD, PhD/**