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**MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION OF
THE REPUBLIC OF UZBEKISTAN
TASHKENT STATE MEDICAL UNIVERSITY**



"APPROVED"

Rectory of Tashkent State Medical
University

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2025

**WORKING PROGRAM
FOR THE SUBJECT
"DIGITAL DENTISTRY"**

Field of knowledge: 900000 - Healthcare and Social Security

Field of Education: 910000 - Healthcare and Social Security

Field of study: 60910100 Healthcare and Social Security

Tashkent - 2025

Subject/Module Code RS2503	Academic year 2025-2026	Semester 9-10	Credits 2
Subject/Module Type Mandatory	Language of instruction Uzbek/Russian		Number of hours per week 6-7
Subject name	Classroom hours	Independent study hours	Total workload (hours)
Digital Dentistry	34 (17+17)	38 (19+19)	72 (36+36)

1. Subject essence

The purpose of the module is to develop students' clinical thinking using advanced digital technologies, relying on new pedagogical techniques to analyze diagnostics, features of the clinical course of secondary deformities, orthopedic restoration methods with digital approaches and digital methods of manufacturing orthopedic structures.

Module objectives:

- Step-by-step learning and creation of files for sharing between the doctor and dental laboratories, developing clinical thinking and improving knowledge, and performing step-by-step software operations.

- Provide knowledge on scanning, digital modeling, file export, and additive technologies.

II. Main theoretical part (lecture classes).

III.1. The subject includes the following topics:

9th semester.

Topic 1. Algorithm for obtaining digital data. Working with digital data. Software, diagnostics, and data collection. Creating files in STL and PLY formats. Exporting files to dental laboratory. Computer-aided design (CAD). Computer-aided manufacturing (CAM). Comparative characteristics of analog and digital impressions. Analog impressions. Digital impressions. Merging patient digital datasets. Preparing patients for CBCT. Determining the scanning area. Combining files in DICOM format. Performing facial scans. Application of facial scanners in prosthodontics.

Topic 2. Merging patient digital datasets. Preparing patients for CBCT. Determining the scanning area. Combining files in DICOM format. Performing facial scans. Application of facial scanners in prosthodontics.

Topic 1. Clinical and laboratory stages of implementing digital prosthetic protocols for dental implant-supported restorations. Comparative characteristics of analog and digital restoration stages in immediate prosthetics.

Topic 2. Development and improvement of 3D printers in dentistry and materials for 3D printing. Applications of printers in prosthodontics, principles and operating modes of printers. Advantages and indications for use in prosthodontics.

III. Recommendations and guidelines for practical classes

Thematic plan of theoretical classes:

9th semester

Topic 1. Introduction to digital dentistry. Equipment and instruments of digital dentistry (scanners, milling machines, 3D printers). Software and file types. Exporting files to the dental laboratory and working with them. Analog and digital dentistry. Advantages and disadvantages of digital and analog impressions. Direct and indirect scanning. Selection of material for future prosthetic appliances depending on the impression-taking method. Overview of materials for digital dentistry. Designing the final prosthetic. Virtual working model.

Topic 2. Evolution of facial scanning methods. Operating principles of modern facial scanners. Dynamic facial scanners. Limitations of existing technologies and future developments. Scanning technologies and datasets. CBCT accuracy. Artifacts: beam hardening and scatter radiation. Image registration using anatomical landmarks.

10th semester

Topic 1. Digital protocols for dental rehabilitation of patients with dental implants. Diagnostic stage of the digital protocol, digital protocol, surgical stage of the digital protocol, prosthetic stage of the digital protocol, alternative stages of the digital protocol. Guided surgery. Terminology. Guided surgery systems. Positioning of the surgical guide. Fabrication of restorations before implantation and immediate prosthetic treatment. Disadvantages of guided implant surgery. Future prospects of digital technologies.

Topic 2. Additive technologies in medicine and dentistry. The history and development of 3D printing in dentistry. Possibilities and limitations of 3D printing. Materials used for 3D printing. Overview of 3D printers. Optimal printer models for use in dental and dental laboratory practice. Types of prosthetic structures manufactured using 3D printing.

Practical classes for one academic group must be conducted by a single instructor in classrooms equipped with multimedia equipment. To facilitate learning, interactive methods, approaches, and information technologies should be used to achieve the relevant goals.

IV. Independent Study and Self-directed Work

Recommended thematic plan for independent work:

- 1 Evolution of laboratory, intraoral, and facial scanners
- 2 Guided digital dental implantology and prosthetics
- 3 Cone-beam computed tomography
4. Application of digital surgical guides for immediate loading of dental implants
5. Additive technologies, 3D printers, and 3D printing

Independent work for the "Digital Dentistry" module is conducted during both in-class and out-of-class activities

The following forms are used to organize students' independent work:

- In addition to classroom sessions, practical skills verified on simulators and in simulation rooms/centers are performed under the instructor's supervision in terms of both quantity and quality, and are recorded in practical skills acquisition logbooks

- Performing practical skills during clinical duty organized outside the classroom at medical university clinics and clinical training sites under the guidance of an on-duty physician-instructor, both quantitatively and qualitatively, with entries made in duty logbooks

- Participation in patient care alongside the attending physician or on-duty nurse

- Conducting talks and lectures on sanitation and hygiene practices among the population

- Independent mastery of certain theoretical topics using educational literature

- Preparation of an informational report on a given topic

- Work and lectures based on specialized or scientific literature (monographs, articles) related to sections or topics of the module

- Solving situational problems focused on clinical scenarios and cases

- Solving CASE studies (case studies based on real clinical situations and problems with clinical scenarios)

- creating models, compiling crosswords, making organizers, etc.

V. Educational Outcomes/Professional Competencies

Upon completion of the module

The student must know:

- educational, scientific, and popular science literature for preparing for independent work;
- how to independently perform practical skills, solve case studies and tests;
- occlusion, biomechanics of the dentomaxillary system;
- indications and contraindications for implantation;

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- how to independently perform practical skills, solve case studies and tests;
- occlusion, biomechanics of the dentomaxillary system;
- indications and contraindications for implantation;
- CBCT methods (digital X-ray diagnostics);
- stages of the digital prosthetic protocol;
- principles of digital diagnostics considering aesthetic, phonetic, and functional disorders.

The student must have the following skills:

- analyzing the results of digital examination methods;
- scanning the oral cavity;
- exporting scans of dental arches in various file formats;
- working with a digital modeling system such as exocad;
- reading CBCT in standard format and DICOM format;
- selecting, installing scan markers on dental implants and scanning them;
- completing electronic medical records for orthopedic patients.

The student must master the following skills:

- stages of the digital protocol for manufacturing orthopedic structures, digital planning of dental implantation with subsequent prosthetics.

In each practical session, the student must perform the following practical skills:

- scanning dental arches of the patient's oral cavity or phantom model
- creating files as digital impressions;
- exporting files (digital impressions) to the dental laboratory;
- digital modeling of teeth;
- reading CBCT and correlating it with dental arch scans.

Upon completion of the module, the student should possess the following skills:

1. Scanning of plaster models.
2. Scanning of dental arches
3. Creating files in various formats from digital impressions
4. Exporting files to the dental laboratory
5. Virtual planning of implantation and prosthetics
6. Modeling teeth in the Exocad system.
7. Reading CBCT (cone-beam computed tomography).

VI. Educational technologies and methods:

- Lectures;
- Group work;
- Preparing presentations;

- Individual projects;
- Teamwork and defense projects;
- Role-playing games, discussions.

VII. To receive credit, students must: complete the assignments given as part of ongoing assessment, answer oral questions in the final assessment, and practice practical skills.

VIII. Instructions for Conducting Various Types of Assessment.

ONGOING ASSESSMENT

During ongoing assessment, it is intended to determine and evaluate the student's level of knowledge acquisition, practical skills, and competencies on the module topics. Ongoing assessment for the fixed dental prosthetics module can be conducted in the form of oral examinations, instructor's control tests, work with handouts, case studies, assimilation of information on working with phantom models, working with patients, checking homework, and so on.

When assessing, the following factors are taken into account: the student's level of knowledge, mastery of practical educational materials, level of active participation in discussions of theoretical material and interactive teaching methods, as well as the level of mastery of practical knowledge and skills, and acquisition of competencies (i.e., theoretical, analytical, and practical approaches).

All students must be evaluated at every lesson. The maximum score is 100, with a passing score of 60.

Students will be admitted to the final assessment only after accumulating the specified credits.

A student who scores below the qualifying (passing) score on the current assessment for valid reasons is given a deadline to retake it before the final assessment following the last current assessment.

Student's Independent Work Grade Table

Student Independent Work with Teacher Supervision (SIWTS) (Office hours) is a type of independent study in the credit-based education system conducted in the classroom.

Function of guidance: The instructor is responsible for providing pedagogically significant support for students' independent work in each subject included in the curriculum.

•Helps the student select appropriate methods for mastering the course material. Reviewing explanations of topics that are difficult for the student creates an opportunity to complete practical tasks that reinforce the learning material.

•Helps to study the learning material more deeply. It is usually devoted to a specific topic, for which students should prepare in advance.

• Promotes deeper independent work by students in their preferred scientific field

Management function:

• Ongoing assessment of students' knowledge. During the same session, the student completes control topics outlined in the program and independent work assignments.

• There is a real opportunity to earn the necessary (missing) points to achieve a high grade.

Independent work is conducted during scheduled classes but is not mandatory for students capable of working autonomously. Therefore, one of the teacher's important tasks is to constantly monitor each student's academic progress and provide corrections, ensuring all students can successfully master the lesson and pass the final exam.

In the academic journal, independent work is recorded on a separate page as the student's presence or absence (+ or a/a).

Student Independent Work (SIW) is carried out based on a calendar-thematic plan. The department has identified several types of independent work, as described above in the SIW section. Students can choose up to 12 tasks for each topic. Students can select 1 task per credit. To assist students, the department has developed methodological guidelines for completing each form of SIW. To ensure maximum objectivity in SIW assessment, evaluation criteria described in the curriculum (100 points for each SIW) were developed.

The deadline for submitting independent work (situational tasks, diagnostic algorithms, treatment plans, etc.) is set according to the thematic plan (on the day of the topic analysis). A student who fails to submit the independent work is considered to have not fully passed the competency test.

In the grade book, the assessment score is entered into the independent work section as follows: the denominator contains the score obtained from the image and the number of the presented independent work topic.

Main and supplementary literature, as well as information sources.

Main literature

1. Collection of articles. Digital Protocols in Implantation, Volume 11, 2020. - 299 p.

2. Trezubov, Vladimir Nikolaevich. Orthopedic Dentistry. Propaedeutics and Fundamentals of the Special Course: Textbook for Universities / V. N. Trezubov, A. S. Shcherbakov, L. M. Mishnev. - 3rd ed., revised and expanded. -

Moscow: MEDpress-inform, 2008. - 416 p., 2011. - 416 p.

3. Kopeykin V.N. Dental Prosthetics: Textbook / V.N. Kopeykin, L.M. Demner. - Moscow: Triada-X, 2003. - 416 p.

4. Orthopedic Dentistry: Textbook for Universities / N.G. Abolmasov, N.N. Abolmasov, V.A. Bychkov et al. - 9th ed. - Moscow: MEDpress-inform, 2013. - 512 p.

Supplementary literature

1. Materials and Technologies in Orthopedic Dentistry [Electronic resource]: textbook / Abdurakhmanov A.I., Kurbanov O.R. - 2nd ed. - Moscow: Medicine, 2008. - (Textbook literature for students of dental faculties of medical universities). <http://www.studentlibrary.ru/book/ISBN5225043615.html>

2. Kovalsky, Vladimir Lvovich. Algorithms for organizing and technologies for providing main types of dental care: practical guide / V.L. Kovalsky. - Moscow: Medical Book, 2004. - 180 p.

3. Semenyuk, Vladimir Mikhailovich. Orthopedic Dentistry in Questions and Answers: textbook / V.M. Semenyuk. - Moscow; Nizhny Novgorod: Medical Book: NGMA Publishing House, 2000. - 174 p.

4. Trezubov, Vladimir Nikolaevich. Applied anatomy of the masticatory apparatus: textbook for medical universities / V.N. Trezubov, L.M. Mishnev; ed. V.N. Trezubov. - St. Petersburg: SpecLit, 2001. - 78 p.

5. Materials and technologies in orthopedic dentistry [Electronic resource]: textbook / Abdurakhmanov A.I., Kurbanov O.R. - 2nd ed. - Moscow: Medicine, 2008. - (Textbook literature for students of dental faculties of medical universities). - <http://www.studentlibrary.ru/book/ISBN5225043615.html>

6. Voronov, Anatoly Petrovich. Orthopedic treatment of patients with complete absence of teeth: textbook / A.P. Voronov, I.Yu. Lebedenko, I.A. Voronov. - Moscow: MEDpress-inform, 2006. - 320 p.

7. Vyazmitina, Alexandra Vladimirovna. Materials Science in Dentistry: reference book / A.V. Vyazmitina, T.L. Usevich. - Rostov-on-Don: Phoenix, 2002. - 352 p. - (Textbooks and teaching aids)

8. Zhulev, Evgeny Nikolaevich. Partial removable dentures (theory, clinical and laboratory techniques): guide / E.N. Zhulev. - 2nd ed. - Nizhny Novgorod: NGMA Publishing House, 2005. - 428 p.

Partial removable and overlay dentures [Electronic resource] / Zagorsky V.A. - Moscow: Medicine, 2007. - <http://www.studentlibrary.ru/book/ISBN5225039197.html>

9. Markov B.P. Guide to practical classes in prosthetic dentistry: manual / B.P. Markov, I.Yu. Lebedenko, V.V. Elichev. - Moscow: GOU VUNMTS MZ RF, 2001 - Part 1: for dentistry students. - 662 p. 2001.

11. Chibisova, Marina Anatolyevna. Digital and film radiography in outpatient dentistry: textbook / M.A. Chibisova. - Saint Petersburg: MEDI Publishing House, 2004. - 150 p.

The working program was developed at the Tashkent State Dental Institute.
Protocol of the Central Methodological Council

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