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MINISTRY OF EDUCATION AND SCIENCE OF RUSSIA

**Federal State Budgetary Educational Institution
of higher education**

**«I.N. Ulianov Chuvash State University»
(FSBEI of HE «I.N. Ulianov Chuvash State University»)**

Medical Faculty

Department of Propaedeutics of Dental Diseases and New Technologies

«APPROVE»

Vice-rector for Academic Affairs


I.E. Poverinov

« 13 » 04 2022

**Working programs of the discipline (module)
«Основы материаловедения в стоматологии / Fundamentals of
Materials Science in Dentistry»**

Direction of training / specialty 31.05.03 Стоматология / Dentistry
Graduate's qualification Врач-стоматолог / Dental Practitioner

Direction (profile) / specialization «Dentistry»

Form of training – очная / intramural

Course – 3

Term – 5

Total academic hours/credit points – 72/2

The year of beginning the training – 2022

The fundamental document for compiling the working program of the discipline (module)
Федеральный государственный образовательный стандарт высшего образования -
специалитет по специальности 31.05.03 Стоматология (приказ Минобрнауки России от
12.08.2020 г. № 984)

Approved by:

Head of the department, Candidate of Medical Sciences L.I. Nikitina

Professor, Doctor of Medical Sciences L.R. Mukhamedzhanova

The working program was approved at the meeting of the Department of Propaedeutics of
Dental Diseases and New Technologies,

25.03.2022, protocol № 8

Head of the department L.I. Nikitina

Approved by

Dean of the Medical Faculty V.N. Diomidova

Acting Head of the Educational and Methodological Department E.A. Shirmanova

1. The purpose and objectives of training in the discipline (module)

The purpose of the discipline - acquiring theoretical and practical skills in the field of dental materials science.

The objectives of the discipline - increase knowledge in the field of materials science in dentistry;

be able to navigate the issues of restorative, endodontic materials when choosing the method of restoration of missing teeth, filling the root canals;

learn basic treatment methods and the use of new materials in orthopaedic dentistry.

2. The place of practical training in the structure of the educational program of higher education

The discipline «Основы материаловедения в стоматологии / Fundamentals of Materials Science in Dentistry» относится к обязательной части учебного плана refers to the mandatory part in the curriculum of the educational program of higher education (hereinafter referred to as the EP of HE) in the field of training / specialty 31.05.03 Стоматология, direction (profile) / specialization of the program «Dentistry».

Previous academic disciplines (modules) and (or) practices that form the knowledge, skills and abilities necessary for training in the discipline (module):

Материаловедение в ортопедической практике / Materials Science in Orthopedic Practice

Патофизиология / Pathophysiology

Терапевтическая стоматология / Therapeutic Dentistry

Фармакология / Pharmacology

Хирургическая стоматология / Surgical Dentistry

Биохимия / Biochemistry

Микробиология, вирусология / Microbiology, Virology

Нормальная физиология / Normal Physiology

Производственная практика (клиническая практика по стоматологии общей практики) / On-the-job training (clinical practice in general dentistry)

Пропедевтическая стоматология / Propaedeutic Dentistry

Анатомия / Anatomy

Гистология, эмбриология, цитология / Histology, Embryology, Cytology

Иммунология / Immunology

Профилактическая стоматология / Preventive Dentistry

Медицинская физика / Medical Physics

Knowledge, skills and abilities formed as a result of training in a discipline (module) are necessary when teaching in the following disciplines (modules) and (or) practices:

Материаловедение в ортопедической практике / Materials Science in Orthopedic Practice

Терапевтическая стоматология / Therapeutic Dentistry

Хирургическая стоматология / Surgical Dentistry

Физиотерапия в стоматологии / Physiotherapy in Dentistry

Детская стоматология / Pediatric Dentistry

Ортодонтия и детское протезирование / Orthodontia and Pediatric Prosthetics

Ортопедическая стоматология / Orthopaedic Dentistry

Челюстно-лицевая хирургия / Maxillofacial Surgery

Гнатология в ортодонтии / Gnathology in Orthodontics

Дентальная имплантация в стоматологии / Dental Implantation in Dentistry

3. Planned learning outcomes in the discipline (module), correlated with the planned learning outcomes

Planned learning outcomes in the discipline (module), correlated with the planned learning outcomes

Code and name of the competence	Code and name of the competence achievement	Descriptors for the indicator of competence achievement (learning)
ОПК-6 Способен назначать, осуществлять контроль эффективности и безопасности немедикаментозного и медикаментозного лечения при решении профессиональных задач / He/she is able to prescribe, monitor the effectiveness and safety of non-drug and pharmacological therapy in solving professional problems	ОПК-6.1 Способен определить показания и противопоказания при назначении медикаментозного, немедикаментозного и иных методов лечения / He/she is able to determine the indications and contraindications when prescribing medication, non-drug and other methods of treatment	the features of emergency and urgent dental care. formulate medical indications for the chosen treatment method, taking into account the etiology and pathogenesis of the disease; justify the scheme, plan and tactics of patient management, medical indications and contraindications for surgery. the treatment of dental and facial anomalies in children and adults; principles, techniques and methods of anaesthesia in dentistry; principles of construction and rules of operation of medical devices (dental equipment); modern medical devices (equipment, instruments and materials) used in dentistry.
ОПК-6 Способен назначать, осуществлять контроль эффективности и безопасности немедикаментозного и медикаментозного лечения при решении профессиональных задач / He/she is able to prescribe, monitor the effectiveness and safety of non-drug and pharmacological therapy in solving professional problems	ОПК-6.2 Способен оценить риски связанные с использованием медикаментозного, немедикаментозного и иных методов лечения / He/she is able to assess the risks associated with the use of medicamentous therapy, drug-free modalities and other methods of treatment	possible side effects of medication; morphological changes in the maxillary system during orthopaedic and orthodontic treatment; possible complications resulting from the use of local anaesthesia. evaluate the effectiveness and safety of medical treatments; evaluate the effectiveness and safety of non-pharmacological treatments. skills to provide emergency and urgent medical care for acute dental diseases, conditions, exacerbations of chronic diseases that are life-threatening to the patient or without obvious signs of a life-threatening condition to the patient.
ОПК-6 Способен назначать, осуществлять	ОПК-6.3 Способен оценить эффективность	forming a treatment plan for a patient with dental problems;

<p>контроль эффективности и безопасности немедикаментозного и медикаментозного лечения при решении профессиональных задач / He/she is able to prescribe, monitor the effectiveness and safety of non-drug and pharmacological therapy in solving professional problems</p>	<p>медикаментозного, немедикаментозного и иных методов лечения / He/she is able to assess the effectiveness of pharmacological therapy, non-drug and other methods of treatment</p>	<p>monitoring the progress of the patient's treatment. analyse the effects of medicines based on their combined pharmacological effects; analyse the effects of non-pharmacological treatments on the basis of their combined properties. caring for patients with maxillofacial injuries, people with disabilities at home; counselling the patient on the treatment of dental diseases; surgical care within the scope of tooth extraction (excluding retained and dystopian teeth), opening of sub-bone abscesses in periostitis of the jaw; orthopaedic treatment of persons with dental defects, dentures within the scope of temporary dentures, dentures for single dentures, dentures up to three units (excluding dentures on dental implants).</p>
<p>ОПК-9 Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач / He/she is able to evaluate morphofunctional, physiological states and pathological processes in the human body to solve professional problems</p>	<p>ОПК-9.1 Способен распознавать морфофункциональные, физиологические состояния и патологические процессы в организме человека / He/she is able to recognize morphofunctional, physiological states and pathological processes in the human body</p>	<p>the biological role of the maxillofacial region, the biomechanics of chewing, age-related changes in the maxillofacial region, the peculiarities of external and internal environmental influences on it; topographic anatomy of the head, maxillofacial region, peculiarities of blood supply, innervation and lymphatic system, structure of teeth, embryology of maxillofacial region, main disorders of embryogenesis; the main issues of normal and pathological physiology of the maxillofacial system, its relationship with the functional state of other systems of the body and levels of their regulation. carry out physical examinations and interpret their results; identify the general and specific signs of dental diseases; identify clinical signs of acute and</p>

		chronic craniofacial pain of somatic, neurogenic and psychogenic origin. the skills of carrying out physical examinations and interpreting their results.
ОПК-9 Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач / He/she is able to evaluate morphofunctional, physiological states and pathological processes in the human body to solve professional problems	ОПК-9.2 Способен анализировать морфофункциональные, физиологические состояния и патологические процессы в организме человека / He/she is able to analyze morphofunctional, physiological states and pathological processes in the human body	the normal structure of the teeth, jaws and structural disorders in dento-alveolar, facial anomalies; the normal functioning of the maxillary system and its dysfunction in bite anomalies. analyse the results of the examination; interpret the results of information collection from patients (their relatives/legal representatives). skills in interpreting the results of collecting information from patients (their relatives/legal representatives), initial examination of patients, re- examination of patients, laboratory tests, instrumental examinations, additional examinations of patients, consultations of patients by specialist doctors.
ОПК-9 Способен оценивать морфофункциональные, физиологические состояния и патологические процессы в организме человека для решения профессиональных задач / He/she is able to evaluate morphofunctional, physiological states and pathological processes in the human body to solve professional problems	ОПК-9.3 Способен диагностировать морфофункциональные, физиологические состояния и патологические процессы организма человека / He/she is able to diagnose morphofunctional, physiological states and pathological processes in the human body	International Statistical Classification of Diseases and Related Health Problems; clinical picture, diagnostic methods, classification of diseases of salivary glands, congenital, acquired anomalies of teeth, dental rows, alveolar processes, jaws and face; the importance of special and additional methods of investigation for the differential diagnosis of dental diseases. diagnose caries, pulp and periodontal disease, periodontal disease, oral mucosa; diagnose dental defects, periodontal disease, missing teeth; diagnose dentoalveolar deformities and anomalies of the teeth and jaws; identify risk factors for oncopathology

		(including various background processes, pre-tumoural conditions). an algorithm for provisional and definitive diagnosis.
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4. Structure, scope and content of the discipline (module)

Educational activities in the discipline (module) are carried out:

- in the form of students' face-to-face work with the teaching staff of the organization and (or) persons involved by the organization to implement the educational programs on other terms (hereinafter - contact work);

- in the form of students' independent work.

Face-to-face work can be classroom-based, extramural, as well as it can be conducted in an electronic information and educational environment (EIEE).

Learning sessions in the discipline (module) and interim assessment of students are conducted in the form of face-to-face work and in the form of students' independent work.

During learning sessions in the discipline (module) face-to-face work includes: lecture-type classes, seminar-type classes and (or) group consultations, and (or) individual work of students with the teaching staff of the organization and (or) persons involved by the organization to implement the educational programs on other terms (including individual consultations).

Legend:

Lec – lectures, Lab – laboratory work, Pr – practical classes, ICW – individual face-to-face work, IW – independent work.

4.1. Content of the discipline (module)

Section name	The section's content	Formed competences	Competence achievement indicator
Fundamentals of dental material science	Biomaterials, biocompatibility and biomechanics. Atomic structure of matter.	ОПК-6, ОПК-9	ОПК-6.1, ОПК-6.2, ОПК-6.3, ОПК-9.1, ОПК-9.2, ОПК-9.3
	Structure of ceramics, polymers. Mechanical properties. Physical properties. Chemical properties.		
	Structure of metals and alloys. Mechanical properties. Physical properties. Chemical properties.		
	Principles of adhesion.		
Dental clinic materials	Dental amalgams. Polymer composites.		

Dental clinic materials	Glass ionomer cements.	ОПК-6, ОПК-9	ОПК-6.1, ОПК-6.2, ОПК-6.3, ОПК-9.1, ОПК-9.2, ОПК-9.3
	Intermediate filling materials.		
	Enamel and dentin adhesives.		
	Endodontic materials.		
	Impression materials.		
Personal contact work.	Personal contact work (credit)		

4.2. Scope of the discipline and types of academic work

Forms of control and types of academic work		Labor intensity of the discipline (module)	
		5	total
1. Face-to-face work:		48,2	48,2
In-class learning in total, including:		48	48
Лекционные занятия (Лек)		16	16
Лабораторные занятия (Лаб)		32	32
Индивидуальная контактная работа (ИКР)		0,2	0,2
2. Independent work of the student:		23,8	23,8
3. Intermediate certification (exam) (зачет)		3а	3а
Total:	academic hours	72	72
	credit units	2	2

№ item	The section's (theme's) name	Face-to face work, including in the electronic information and educational environment, academic hours				IW, academic hours	Total, academic hours
		Lect.	Pr.	Lab.	ICW		
	Fundamentals of dental material science						
1	Biomaterials, biocompatibility and biomechanics. Atomic structure of matter.	2		2		2	6
2	Structure of ceramics, polymers. Mechanical properties. Physical properties. Chemical properties.	1		2		2	5
3	Structure of metals and alloys. Mechanical properties. Physical properties. Chemical properties.	1		2		2	5
4	Principles of adhesion.			2		5,8	7,8
	Dental clinic materials						
5	Dental amalgams. Polymer composites.	2		4		2	8
6	Glass ionomer cements.	2		4		2	8
7	Intermediate filling materials.	2		4		2	8
8	Enamel and dentin adhesives.	2		4		2	8
9	Endodontic materials.	2		4		2	8
10	Impression materials.	2		4		2	8
	Personal contact work.						
11	Personal contact work (credit)				0,2		0,2
Total academic hours		16		32	0,2	23,8	72

4.3. Summary of the discipline (module), structured by sections (topics)

Раздел 1. Fundamentals of dental material science

Тема 1. Biomaterials, biocompatibility and biomechanics. Atomic structure of matter.

Лекционное занятие. Biomaterials. Biocompatibility. Biomechanics. Clinical significance. Introduction. Etruscans (1000-6 BC). Middle Ages. The first dentures. Victorian age. Preservation of teeth. Crowns and bridges. Filling materials. Conclusion. Types of connection of atoms. Types of primary bonds (covalent, ionic, metallic). Bond energy. Formation of solids. Structural arrangement of atoms in a solid.

Лабораторное занятие. Biomaterials, biocompatibility and biomechanics. Historical perspective. Atomic structure of matter.

Тема 2. Structure of ceramics, polymers. Mechanical properties. Physical properties. Chemical properties.

Лекционное занятие. Structure of ceramics. Structure of metals and alloys. Structure of polymers. Raw materials for ceramic production. Crystalline and amorphous ceramic materials. Glass formation. Devitrification.

Лабораторное занятие. Structure of ceramics. Structure of metals and alloys. Structure of polymers. Raw materials for ceramic production. Crystalline and amorphous ceramic materials. Glass formation. Devitrification.

Тема 3. Structure of metals and alloys. Mechanical properties. Physical properties. Chemical properties.

Лекционное занятие. The microstructure of metals. Alloys. Solid phases. Phase diagrams. Nonequilibrium states. Introduction. Mechanisms of polymerization (additive and condensative). Structure of polymers. Polymer compositions (plasticizers, composites).

Лабораторное занятие. Structure of metals and alloys. Structure of polymers. Mechanical properties. Physical properties. Chemical properties

Тема 4. Principles of adhesion.

Лабораторное занятие. Principles of adhesion.

Раздел 2. Dental clinic materials

Тема 5. Dental amalgams. Polymer composites.

Лекционное занятие. Dental amalgams. Polymer composites and polyacid modified polymer composites.

Structure of traditional dental amalgams. Properties of conventional amalgams. Amalgams with high copper content. Selection and use of amalgams. Disadvantages of amalgam fillings. Enhancing longevity of amalgam fillings. Directions for development of composites. Classification of composites. Properties. Mechanical properties. Composites for use in dental laboratories. Clinical features of composite restorations. Polyacid modified polymer composites (compomers).

Лабораторное занятие. Dental amalgams.

Лабораторное занятие. Polymer composites and polyacid modified polymer composites.

Тема 6. Glass ionomer cements.

Лекционное занятие. Glass ionomer cements conventional and glass ionomer cements. Chemistry of glass ionomer cements. Properties. Clinical applications. Glass ionomer cements containing silver-silver cermets. Glass ionomer cements modified with polymers.

Лабораторное занятие. Chemistry of glass ionomer cements. Properties. Clinical

applications. Glass ionomer cements containing silver-silver cermets.

Лабораторное занятие. Glass ionomer cements modified with polymers.

Тема 7. Intermediate filling materials.

Лекционное занятие. Intermediate filling materials.

Cavity varnishes, applications, curing mechanism. Zinc oxide cements.

Pulp protection. Varnishes, bases and cavity liners. Selection of intermediate materials.

Fissure sealants. Clinical applications.

Лабораторное занятие. Pulp protection. Varnishes, basecoats and cavity liners. Selection of intermediate materials.

Лабораторное занятие. Fissure sealants. Clinical application.

Тема 8. Enamel and dentin adhesives.

Лекционное занятие. Adhesives for enamel and dentin. The structure of enamel. Acid etching technique. Bonding with enamel. Structure of enamel. Acid etching technique. Clinical aspects. Application of unfilled polymers. Bond or adhesive strength. Adhesion bonding to dentin. Structure of dentin. Components of dentin adhesives. Bonding to wet dentin. Total dressing technique. Dentine adhesion system preparations. Selection of preparation for bonding to dentin.

Лабораторное занятие. The connection to enamel. Structure of enamel. Acid etching technique. Clinical aspects. Application of unfilled polymers. Bond or adhesive strength.

Лабораторное занятие. Adhesive bonding to dentin. Structure of dentin. Components of dentin adhesives. Adhesion of wet dentin. Total dressing technique. Dentine adhesion system preparations. Selection of preparation for bonding to dentin.

Тема 9. Endodontic materials.

Лекционное занятие. Endodontic materials. Cements for root canal sealing. Protective coating of the vital pulp. Direct pulp coating. Materials for pulp coating. Failures after direct pulp coating. Materials for root canal filling. Cements for root canal sealing. Clinical aspects of root canal materials.

Лабораторное занятие. Protective coating of the vital pulp. Direct pulp coating. Materials for pulp coating. Failures after direct pulp coating.

Лабораторное занятие. Root canal filling materials. Cements for root canal sealing. Clinical aspects of root canal materials.

Тема 10. Impression materials.

Лекционное занятие. Impression materials. Requirements for impression materials. Impression techniques. Requirements for impression material. Accuracy of surface detail

reproduction. Dimensional accuracy and stability. Type of impression tray. Shrinkage of impression material. Hard impression materials. Elastic impression materials. Elastomeric impression materials. Comparative characteristics of elastomeric impression materials. Disinfection of impression materials. Faulty impression taking.

Лабораторное занятие. Requirements for impression material. Accuracy of surface detail reproduction. Dimensional accuracy and stability. Type of impression tray. Shrinkage of impression material. Solid impression materials.

Лабораторное занятие. Elastomeric impression materials. Elastomeric impression materials. Comparative characteristics of elastomeric impression materials. Disinfection of impression materials. Error in taking impressions.

5. Educational technologies

To implement the competence-based approach in the study of the discipline (module), extensive use of active and interactive methods of conducting classes in the educational process is provided:

The components of educational technology are the following:

lectures - for the presentation of new material, interactive form of conducting classes is also used;

laboratory classes;

multimedia tools (projectors) - to improve the quality of perception of the studied material;

supervised homework - to encourage students to work independently;

quizzes - for intermediate certification and assessment of the degree of mastering of the studied material by students.

6. Forms of control and types of evaluation materials for the discipline (module)

Intermediate attestation - evaluation of intermediate and final results of training in the discipline (module).

6.1. Sample list of questions for the credit test

1. Give a definition of dental materials science as an applied science. Why is dental materials science a separate field of knowledge?

2. What is the "ideal" dental material? Is there a universal 'ideal' dental material? Explain your answer.

3. How are dental materials classified? Name the classification and explain on what principle they are based.

4. Tell about the classification of dental materials according to their chemical nature. Why are materials of different chemical nature used in dentistry?

5. Tell us about the basic classification of dental materials. What is the principle underlying this classification?

6. What are the properties of the materials which determine the possibility of their use in the different fields of dentistry?

7. What are the characteristics of the physiological properties of dental materials?

8. Methods of physical analysis.

9. What indicators characterize the chemical properties of dental materials? Requirements for structural materials in terms of chemical parameters.

10. What are the indicators that characterize the mechanical properties of dental materials?

11. What are stress concentration and stress concentrator? Describe the relationship between stress concentrator shape and stress magnitude.

12. Compare dental materials of different chemical nature: metals, ceramics,

polymers in general terms of their physical and mechanical properties.

13. What is theoretical and practical strength? Why in practice it is impossible to create materials with strength equal to theoretical strength?

14. Why is it necessary to conduct preclinical (technical, biological) tests and why cannot we limit ourselves to clinical tests (observations)?

15. What types (based on their ability to absorb mechanical loads) are materials divided into?

16. List the properties of the "ideal" (restorative) dental material.

17. List the requirements for dental materials.

18. Name the main characteristics of restorative materials.

19. What are the characteristics of aesthetic properties of dental materials? 20.

20. Compare in general terms dental materials of different chemical nature: metals, ceramics, polymers on their aesthetic properties.

21. Dental cements. Classification.

22. Zinc-phosphate cements. Composition. Properties. Methods for preparation. Application.

23. Silicate cements. Composition. Properties. Preparation methods. Application.

24. Silicophosphate cements. Composition. Properties. Methods for preparation. Application.

25. Polycarboxylate cements. Composition. Properties. Methods for preparation. Applications.

26. Glass ionomer cements. Composition. Properties. Methods for preparation. Applications.

27. Classification of modern glass ionomer cements.

28. Different types of glass ionomer cements according to chemical composition and curing mechanism.

29. Dual-curing hybrid glass ionomer cements. Properties.

30. Triple-curing hybrid glass ionomer cements. Properties.

31. Cements for permanent fixation of fixed dentures.

32. Cements for temporary luting of artificial crowns.

33. Aqueous inorganic dental cements. The powder in a set of zinc phosphate cement by composition is.

34. Increasing the amount of liquid in the mixing of zinc-phosphate cement results in ...

35. The thickness of the cement film in denture luting should be ...

36. The liquid in the silicate cement set is ...

37. The concept of composite materials.

38. The chemical composition of composites.

39. Additional components of composite materials.

40. Classification of composite materials.

41. Macrofilled composite materials. Representatives.

42. Microfilled composite materials. Representatives.

43. Hybrid composite materials. Representatives.

44. Total composites. Representatives.

45. Properties of composite materials.

46. Mechanism of adhesion of composites to enamel and dentin.

47. Physical and chemical properties of chemically cured composites.

48. Preparation of chemically cured composites. Filling.

49. Adhesive systems. Physical and chemical properties.

50. Adhesion to enamel.

51. Adhesion to dentin.

52. Techniques for application of first generation adhesive systems.

53. Techniques for application of II generation adhesive systems.
54. Methods of application of III generation adhesive systems.
55. Methods of application of adhesive systems of IV generation.
56. Methods of application of adhesive systems of V generation.
57. Methods of application of adhesive systems of VI generation.
58. Methods of application of seventh generation adhesive systems.
59. Requirements for materials for root canal filling. 60,
60. Modern classification of materials for root canal filling.
61. Materials for surgical dentistry.
62. General characteristics of materials for restorative facial surgery and dental implants.

6.2. Sample list of questions for the examination

There is no examination.

6.3. Suggested themes of term papers (projects)

There are no courseworks.

6.4. Suggested themes of term projects

There are no coursework projects.

6.5. Suggested topics of calculation and graphic works

There are no calculation and graphic works.

7. Educational, methodological, informational and software support of the discipline (module)

The electronic catalog and electronic information resources provided by the scientific library of the FSBEI of HE "I. N. Ulianov Chuvash State University" are available at the link <http://library.chuvsu.ru/>

7.1. Regulatory documents, standards and rules

7.2. Recommended basic educational and methodological literature

№ item	Name
1	

7.3. Recommended supplementary educational and methodological literature

№ item	Name
1	

7.4. List of resources of the "Internet" information and telecommunication network

№ item	Name	Link to the resource
1	Единое окно к образовательным ресурсам [Электронный ресурс]. – Режим доступа: http://window.edu.ru	http://window.edu.ru
2	Российская государственная библиотека [Электронный ресурс]. – Режим доступа: http://www.rsl.ru	http://www.rsl.ru
3	Российская национальная библиотека [Электронный ресурс]. – Режим доступа: http://www.nlr.ru	http://www.nlr.ru

4	Научная электронная библиотека «Киберленинка» [Электронный ресурс]. – Режим доступа: http://cyberleninka.ru
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7.5. Software, professional databases, information and reference systems, electronic educational resources and electronic library systems

Software, professional databases, information and reference systems provided by the Informatization Department of the FSBEI of HE "I.N. Ulianov Chuvash State University" are available for download at the link <http://ui.chuvsu.ru> //. The Unified Register of Russian programs for electronic computers and databases, including freely distributed ones, is available at the link reestr.minsvyaz.ru/reestr /.

7.5.1. Licensed and freely distributed software

Microsoft Windows operating System and/or Unix-like operating system and/or mobile operating system;

Office software packages:

Microsoft Office and/or LibreOffice
and (or) OpenOffice and (or) analogues;

Browsers, including Yandex.Browser.

List of software:

OpenOffice 3.3.0

7.5.2. Lists of professional databases and (or) information reference systems and (or) electronic library systems and (or) electronic educational resources

Electronic library system IPRbooks

Electronic library system «Lan Publishing House»

Consultant of a Student. Student Electronic Library

8. Material and technical support of the discipline

Classrooms for lecture-type classes in the discipline are equipped with a teacher's automated workplace consisting of: a personal computer/laptop, multimedia equipment with a screen and (or) SMART interactive whiteboard/SMART TV.

The premises for students' independent work are equipped with computer equipment enabling to connect to the Internet and provide access to the electronic information and educational environment of the FSBEI of HE "I.N. Ulianov Chuvash State University".

№ item	Lesson type	Brief description and characteristics of the composition of installations, measuring and diagnostic equipment, computer equipment and experimental automation tools
1	Зачёт	Учебная аудитория для занятий семинарского типа, текущего контроля и промежуточной аттестации. Оборудование: учебная доска, учебная мебель, переносное мультимедийное оборудование (проектор, экран, ПК или ноутбук), лабораторные стенды

2	Лаб	Учебная аудитория для занятий семинарского типа, текущего контроля и промежуточной аттестации. Оборудование: учебная доска, учебная мебель, переносное мультимедийное оборудование (проектор, экран, ПК или ноутбук), лабораторные стенды
3	Лек	Учебная аудитория для занятий семинарского типа, текущего контроля и промежуточной аттестации. Оборудование: учебная доска, учебная мебель, переносное мультимедийное оборудование (проектор, экран, ПК или ноутбук), лабораторные стенды

9. Means of adapting the discipline teaching to the needs of persons with physical conditions

If necessary, persons with physical conditions can be offered one of the following options for perceiving information, taking into account their individual psychophysical characteristics:

- 1) using e-learning and distance learning technologies.
- 2) using special equipment (enginery) and software in accordance with the students' health restrictions in the Training Centers for Persons with Disabilities and Physical Conditions (hereinafter referred to as special needs) available at the university.

In the course of training, if necessary, the following conditions are provided for persons with visual, hearing and musculoskeletal disorders:

- for persons with visual impairments: educational and methodological materials in printed form in enlarged font; in the form of an electronic document; in the form of an audio file (conversion of educational materials into audio format); in printed form in Braille; individual consultations involving a tactile interpreter; individual assignments and consultations.

- for people with hearing impairments: educational and methodological materials in printed form; in the form of an electronic document; video materials with subtitles; individual consultations involving a sign language interpreter; individual assignments and consultations.

- for persons with disorders of the musculoskeletal system: educational and methodological materials in printed form; in the form of an electronic document; in the form of an audio file; individual assignments and consultations.

10. Guidelines for students to perform independent work

The purpose of the student's independent work (IW) is to consolidate the theoretical knowledge gained and to acquire practical skills in using and performing research of algorithms and data structures when designing application software programs. IW includes independent study of educational issues, preparation for laboratory classes, performing calculation and graphic work, preparation for a test and an exam.

The list of questions and tasks for independent work to prepare for laboratory classes is given in the corresponding methodological instructive regulations in the description of each laboratory work.

The list of questions and tasks for independent work to carry out calculation and graphic work is given in the relevant methodological instructive regulations.

Independent work of students is an integral part of the educational process. The purpose of students' independent work is to master fundamental knowledge, professional

skills, experience of creative, research activities.

The main forms of independent work of students are: classroom independent work under the guidance and supervision of a teacher (at lectures, laboratory classes, etc. and consultations); extracurricular independent work under the guidance and supervision of a teacher (at consultations, during the research work), extracurricular independent work - planned training, educational research, research work of students carried out outside class time on the task and with the method

When performing independent work, students should rely mainly on the knowledge and skills acquired during lectures and laboratory classes. This provides the necessary basis for further in-depth study of other disciplines. However, this knowledge needs to be intensified.

The forms of independent work of students, provided by the discipline "Fundamentals of materials science in dentistry", include:

- Preparation for laboratory classes.
- Independent study of educational issues.
- Preparation for credit.

The following sources are recommended for independent preparation for laboratory classes, study of academic issues, preparation for the test:

- lecture notes and materials of practical, laboratory, group and individual classes;
- Academic (scientific) literature in the relevant area;
- internet resources.

At the beginning of the course the teacher informs students about the forms, types and content of independent work, explains the requirements for the results of independent work, as well as forms and methods of control and evaluation criteria.

According to the questions proposed by the teacher learner studies the content of the recommended on the topics of sections, chapters, paragraphs, textbooks, textbooks and monographs; statistical collections; reviews; articles in the periodical press. Forms of control of such individual work are quizzes in laboratory classes, checking notes and conclusions.

Individual creative assignments include:

- preparation of analytical individual work on the topics proposed by the teacher. The assignment is assessed on the basis of the quality of the analysis performed, identification of factors, causes, conditions of changes, trends; substantiating conclusions; proposals made by the author;

- preparation for discussion, business games, etc;
- critical review of articles from the list recommended by the teacher, etc.

Quizzes are a form of current control. They are designed to highlight the main provisions of the discipline, understand the features based on theory, repeat and consolidate the learning material, check knowledge, control residual knowledge.

Topics for independent study, students need to take notes. The abstract shall briefly outline the main essence of the training material, provide the necessary tabular data, charts.

The main stages of independent study of academic issues:

1. Initial familiarisation with the material of the study topic from the textbook.
2. Highlighting the main points in the studied material, making usual brief notes.
3. Selection of reference cues for the text in the form of individual words, pictures.
4. Thinking about a schematic way of coding knowledge, using different fonts, etc.
5. Making a synopsis of the text.

11. Methodological instructive regulations for students studying the discipline (module)

The first thing to do is to familiarise yourself with the content of the programme of work (hereinafter referred to as "the programme of work").

Lectures aim to provide a systematic basis of scientific knowledge.

While studying and working on theoretical material it is necessary to

- repeat the material outlined in the lecture class and supplement it with the

recommended literature on the topic;

- when studying a theoretical topic independently, make an outline, using the recommended literature sources in the RPD.

- while preparing for the current and intermediate control, use the materials of the FSC.

Work with educational-methodical and scientific literature is one of the important forms of work on mastering the discipline and is necessary in preparation for oral questioning in seminar-type classes, for control works, testing, credit. It includes study of the lecture material - study of the recommended sources and literature on the topics of the lectures. The lecture abstract should contain an abstract of the main issues of the lecture, the schemes proposed by the teacher (at their demonstration), the main sources and literature on the topics, conclusions on each issue. The abstract should be made in a separate notebook on the discipline. It must be neat, well readable, not contain irrelevant information or drawings.

The abstracts of scientific literature in preparation for the classes should also be executed neatly, contain answers to each question posed in the topic, have a reference to the source of information with the obligatory indication of the author, title and year of publication of the used scientific literature. The outline can be basic (contain only the main key positions), but at the same time it allows to give a complete answer to the question, can be detailed. It is up to the learner to determine the length of the outline.

While working with academic and scientific literature, a student may:

- make reading notes in the form of a simple or extended plan (create a list of the main issues discussed in the source);

- write abstracts (citing the most important parts of an article or monograph, briefly summarising the author's main ideas);

- write summaries (a short summary of the main issues in a paper);

- write an abstract (a detailed summary of the main points of a paper).

Work with literature should begin with an analysis of the RAP, which lists the main and additional literature, educational and methodological publications necessary for mastering the discipline and work in the seminar-type classes.

After selecting the desired source, find the section of interest by the table of contents or alphabetical index, as well as the same section of the lecture notes or textbook. In case of difficulties in understanding the study material, you should refer to other sources, where the presentation may be more accessible. It should be noted that work with literature is not only useful as a means of deeper study of any discipline (module), but is also an integral part of the professional activities of a future graduate.

11.1. Methodological instructive regulations for preparing for seminar-type classes

Laboratory works represent one of the forms of mastering theoretical material with simultaneous formation of practical skills in the studied discipline.

The purpose of laboratory work is to deepen the study of theoretical material, the formation of practical skills through regular and systematic independent work of students throughout the course. The process of preparation for laboratory work includes the study of legal documents, compulsory and additional literature on the issue under consideration. Direct performance of laboratory work involves:

- studying theoretical material on the topic of laboratory work (on the issues of the studied topic);

- performing the necessary calculations and experiments;

- drawing up a report with the completion of the necessary tables, graphs, preparation of conclusions on the experiments and theoretical calculations;

- for each laboratory work there is a control: checking the content of the report, checking the assimilation of theoretical material. The control of mastering of theoretical material is individual.

11.2. Methodological instructive regulations for preparing for an examination

There is no examination.

11.3. Methodological instructive regulations for preparing for a test

Preparing trainees for the exam includes: reviewing the syllabus; reviewing the syllabus:

- Reviewing the syllabus of the course;
- Identifying the sources required for preparation (textbooks, additional literature, Internet resources, etc.) and studying them;
- Using lecture notes and practical case study materials;
- consulting with the teacher.

Preparation for the credit begins with the first class of the discipline, in which students receive a general instruction of the teacher and a list of basic requirements for current and final reporting. It is important to learn the material systematically from the very beginning, guided primarily by the list of questions for the test, to take notes on important sources for solving academic tasks.

A learner who has completed all the tasks specified in the work programme of the discipline (module) is allowed to take the test. In the case of missing any types of training sessions for valid or unexcused reasons, the learner independently perform and submit for review in writing general or individual assignments, determined by the teacher. The test for the theoretical course is held in oral or written form (determined by the teacher) on the basis of a list of questions that reflect the content of the current working programme of the discipline. The students are recommended to:

- prepare for the test by carefully reading the questions for the test;
- make a plan for answering each question, highlighting the key points of the material;
- having studied several questions, discuss them with classmates.

The answer shall be reasoned. The results of pass-fail assessments shall be assessed with the mark "pass" or "fail".

11.4. Methodological instructive regulations for performing computational and graphical

There are no calculation and graphic works.

11.5. Methodological instructive regulations for performing a control work

There are no control works.

11.6. Methodological instructive regulations for performing a course work (project)

There are no courseworks (coursework projects).

List of additions and changes

The name and details (if any) of the document attached to the Working Program of the discipline (module) containing the text of updates	Department's decision		Full name of department head:
	Date	Protocol №	