

MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS  
Educational Institution  
BELARUSIAN STATE MEDICAL UNIVERSITY

Контрольный  
экземпляр



APPROVED

by First Vice-Rector, Professor

I.N.Moroz

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Reg. # UD-L. 731/2223/edu.

**MATERIALS SCIENCE AND FUNDAMENTALS OF  
MANUFACTURING DENTURES**

**Curriculum of higher educational institution  
in the academic discipline for the specialty:**

**1-79 01 07 «Dentistry»**

Curriculum is based on the educational program «Materials Science and Fundamentals of Manufacturing Dentures», approved 01.07.2022, registration # УД-Л.731/2223/уч.; on the educational plan in the specialty 1-79 01 07 «Dentistry», approved 18.05.2022, registration # L 79-1-7/2223/mf.

### **COMPILERS:**

N.A.Gres, Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor;

N.M.Poloneichik, Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor;

F.R.Tagiyeva, Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor;

G.G.Chistyakova, Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor;

A.A.Petrouk, Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor;

Yu.M.Kazakova, Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD

### **RECOMMENDED FOR APPROVAL:**

by the Department of General Dentistry of the educational institution «Belarusian State Medical University»  
(protocol # 14 of 13.06.2022);

by the Scientific and Methodological Council of the educational institution «Belarusian State Medical University»  
(protocol # 6 of 29.06.2022)

## EXPLANATORY NOTE

«Materials Science and Fundamentals of Manufacturing Dentures» is the academic discipline of the module «Propaedeutic Dentistry and Materials Science», which contains systematized scientific knowledge about dental materials science, technological processes and methods of working with various materials, laboratory techniques for manufacturing dentures and various orthopedic structures.

The aim of the discipline «Materials Science and Fundamentals of Manufacturing Dentures» is the formation of basic professional competence based on the study of the latest scientific data on the properties and application of structural and auxiliary materials, technological processes used when working with various dental materials, the sequence of clinical and laboratory stages of manufacturing dental prostheses and dentitions to solve the problems of professional activity.

The objectives of the discipline «Materials Science and Fundamentals of Manufacturing Dentures» are to form students' scientific knowledge about:

- the types of prostheses used to eliminate defects in teeth and dentition;
- the composition and properties of structural and auxiliary materials;
- the basics of technological processes and the clinical and laboratory stages of manufacturing prostheses of teeth and dentitions;
- the basics of medical ethics and deontology;
- skills and abilities necessary for orthopedic prosthetics.

The knowledge, skills and abilities acquired during the study of the academic discipline «Materials Science and Fundamentals of Manufacturing Dentures» are necessary for the successful study of the following modules: «Medical Prevention in Dentistry», «Therapeutic Dentistry», «Prosthodontics Module».

Studying the educational discipline «Materials Science and Fundamentals of Manufacturing Dentures» should ensure the formation of students' basic professional competency:

BPC. Use knowledge about the composition and properties of structural and auxiliary dental materials, technological processes used at the clinical and laboratory stages of manufacturing orthopedic structures.

**As a result of studying the discipline «Materials Science and Fundamentals of Manufacturing Dentures», the student should**

**know:**

- structure of dental care in the Republic of Belarus;
- equipment of the main and auxiliary premises of the dental laboratory;
- general characteristics of dental prostheses and orthopedic appliances;
- classification of materials used in the manufacture of dentures and orthopedic appliances;
- requirements for the main and auxiliary materials in the manufacture of dentures and orthopedic appliances;
- compositions, properties and use of structural and auxiliary materials in the manufacture of dentures and orthopedic appliances;
- forms of production of structural and auxiliary materials, the technology of their preparation and use;

main technological processes used when working with the main and auxiliary materials in the manufacture of dentures and orthopedic devices;  
 features and sequence of clinical and laboratory stages in the manufacture of various types of structures that eliminate defects in teeth and dentition;

**be able to:**

select impression materials when taking an impression from a patient;  
 select modeling materials when modeling a wax prototype of a denture;  
 select molding materials when replacing a wax prototype of a denture with a structural material;  
 select abrasive materials and tools when processing, grinding and polishing dentures from various structural materials;  
 model various types inlay;  
 model the wax composition of a cast post-and-core construction;  
 model artificial crowns;  
 model different types of bridges;  
 model bases of removable plastic prostheses;  
 make individual tray;  
 to carry out the arrangement of artificial teeth in removable dentures;  
 edging functional impressions;  
 prepare and apply the ceramic mass on the metal base of the frame;  
 carry out the molding of the wax composition in a cuvette to replace it with plastic;  
 install sprue-system;  
 carry out the molding of the wax composition in the flask to replace it with structural metal alloys;

**master:**

manual skills in the preparation of gypsum;  
 technique of casting a plaster model from an impression;  
 skills of selecting an impression tray;  
 skills of choice of impression material;  
 manual skills in the preparation of various types of impression materials;  
 manual skills of working with modeling materials (scraping and layering);  
 skills in working with krampon forceps for bending orthodontic wire;  
 skills of choosing dental rotary instruments for processing various structural materials and hard tissues of teeth;  
 skills of choosing the types of tips for processing various structural materials and hard tissues of teeth;  
 skills in choosing dental rotary instruments for various types of handpieces;  
 manual skills of fastening rotating tools in various types of tips;  
 manual skills in the preparation of plastic dough;  
 skills in determining the types of prostheses, their structural elements and their features;  
 skills in selecting combinations of various structural materials for the manufacture of various types of prostheses;  
 skills in the selection of auxiliary materials at the stages of manufacturing

various types of prostheses;

skills of determining the color shades of natural teeth;

first aid skills to the victim from exposure to an open flame, aggressive liquids, electric current.

**Total number** of hours for the study of the discipline is 218 academic hours. Classroom hours according to the types of studies: lectures – 24 hours, practical classes – 120 hours, student independent work (self-study) – 74 hours.

Intermediate assessment is carried out according to the syllabus of the specialty in the form of a credit (1 semester) and examination (2 semester).

Form of higher education – full-time.

### ALLOCATION OF ACADEMIC TIME ACCORDING TO SEMESTERS OF STUDY

Code, name of the specialty	semester	Number of academic hours						Form of intermediate assessment
		total	in-class	including			out-of-class self-studies	
				lectures (including supervised independent work)	supervised student independent work	practical classes		
1-79 01 07 «Dentistry»	1	104	69	12	-	57	35	credit
	2	114	75	12	-	63	39	exam

## THEMATIC PLAN

Section (topic) name	Number of class hours	
	lectures	practical classes
<b>1. Introduction to the specialty</b>	<b>2</b>	<b>6</b>
1.1. Definition of the concept «dentistry». Organization and equipment of a dental laboratory	1	3
1.2. Dentures. Stages of making dentures	1	3
<b>2. Dental materials science</b>	<b>10</b>	<b>51</b>
<b>2.1. Auxiliary materials used in dentistry</b>	<b>4</b>	<b>27</b>
2.1.1. Impression materials	1	9
2.1.2. Model materials: $\alpha$ -modification of medical plaster. Other materials used for the manufacture of models	1	3
2.1.3. Modeling materials. Dental waxes and modeling resins	1	3
2.1.4. Dental rotary instruments	-	6
2.1.5. Investment materials. The use of gypsum for the manufacture of molds. Refractory molding materials. Other auxiliary materials	1	6
<b>2.2. Construction materials used in dentistry</b>	<b>6</b>	<b>18</b>
2.2.1. Construction metal alloys used for the manufacture of dentures and orthopedic appliances	2	3
2.2.2. Plastics used in dentistry	2	9
2.2.3. Ceramic materials	2	6
<b>2.3. Color science in dentistry</b>	<b>-</b>	<b>6</b>
<b>3. Technological processes for the manufacture of dental prostheses</b>	<b>5</b>	<b>24,5</b>
3.1. Technological processes for the manufacture of dental prostheses from metal alloys	2	7
3.2. Technological processes used for the manufacture of ceramic dentures	2	7
3.3. Technological processes used in the manufacture of prostheses from polymeric materials	2	10,5
<b>4. Laboratory technique for the manufacture of fixed dentures</b>	<b>3</b>	<b>14</b>
4.1. General characteristics and classification of inlays. Laboratory steps for making inlays	1	3,5
4.2. General characteristics of artificial crowns. Laboratory steps for the manufacture of artificial crowns	1	3,5
4.3. General characteristics of prostheses that eliminate defects in the dentition. Laboratory stages of manufacturing	1	7

Section (topic) name	Number of class hours	
	lectures	practical classes
bridges		
<b>5. Laboratory technique for the manufacture of removable dentures</b>	<b>4</b>	<b>24,5</b>
5.1. General characteristics of plastic prostheses. Laboratory steps for manufacturing partial removable dentures	1	3,5
5.2. General characteristics of bugel (clasp) prostheses. Laboratory stages of manufacturing bugel (clasp) prostheses	2	7
5.3. General characteristics of complete removable dentures. Laboratory stages of manufacturing and repair of complete removable dentures	1	14
<b>Total hours</b>	<b>24</b>	<b>120</b>

## CONTENT OF THE EDUCATIONAL MATERIAL

### 1. Introduction to the specialty

#### 1.1 Definition of the concept «dentistry». Organization and equipment of a dental laboratory

Definition of the term «dentistry». Sections of dentistry. Dental laboratory, general purpose, functional duties of a dental technician. Appointment of the premises of the dental laboratory. The volume and area of the production facility for each workplace of the dental technician. Sanitary standards for industrial premises of a dental laboratory (ventilation, lighting, coatings, etc.). The equipment of the workplace of the dental technician and the main tools used in the work. Equipment for auxiliary premises of the dental laboratory. Safety precautions for the use of dental equipment, instruments and materials. Prevention of occupational diseases: organization of work and compliance with protection measures against industrial hazards.

#### 1.2. Dentures. Stages of making dentures

Definition of dental materials science. Definition of prosthetics and dental prosthetics. Classification of prostheses used in dentistry, depending on the functional purpose and method of fixation.

Definition of fixed and removable dentures. Types of prostheses that eliminate defects in hard tissues of teeth and defects in dentition. Maxillofacial prostheses and implants used in dentistry. Classification of dental materials. Classification of prostheses depending on the structural materials used. General technological scheme for the manufacture of dentures. Mechanical, technological, physical properties of dental materials.

### 2. Dental materials science

#### 2.1. Auxiliary materials used in dentistry

##### 2.1.1. Impression materials

Definition of the concepts of «prosthetic bed», «impression» and «model». Classification of impression materials.

Semi-aqueous gypsum  $\beta$ -modification.

Zinc-oxide-eugenol impression materials: composition, properties, application.

Thermoplastic impression materials: composition, properties, application.

Agar-agar hydrocolloids: composition, properties, application.

Alginate materials: composition, properties, application.

Silicone impression materials of condensed type: composition, properties, application.

Silicone impression materials of the additional type: composition, properties, application.

Polysulfide impression materials: composition, properties, application.

Polyester materials: composition, properties, application.

##### 2.1.2. Model materials: $\alpha$ -modification of medical plaster. Other materials used for the manufacture of models

Definition and purpose of the model. Obtaining  $\alpha$ -modification of semihydrate calcium sulfate. Types of plaster used in dentistry (ISO 6873:1998), compression



resistance characteristic and water-to-powder ratio recommended for mixing.

Application in dentistry of different types of gypsum. Types of plaster models, the formation of the base (base) of the plaster model.

Types of non-separable plaster models and materials used for their manufacture. Production of collapsible plaster models: materials, tools and fixtures, manufacturing sequence.

Production of models from polymeric materials. Compositions and technologies (casting, photopolymerization, selective laser sintering).

### **2.1.3. Modeling materials. Dental waxes and modeling resins**

Modeling and investment model. Classification of modeling materials, requirements for them. Animal waxes: properties, application.

Vegetable waxes: properties and applications.

Mineral waxes: properties and applications.

The composition and properties of the main wax mixtures, the value of the components. The main wax compositions produced by the industry. Methods of working with wax compositions (immersion, layering, scraping).

Modeling plastics (ashless plastics). Devices and tools for modeling work.

### **2.1.4. Dental rotary instruments**

General characteristics of a universal stationary dental unit. Portable drills, dental and grinding motors that provide rotation of tools.

Types of dental handpieces used in dentistry, depending on the principles of their work. Comparative characteristics of rotary systems used in dentistry.

Dental burs. The main parts of hogs. Materials used for the manufacture of bladed tools. Forms of working parts of bladed tools. Classification of burs depending on the number of blades. Varieties of bodies of metal bladed instruments, depending on the accessory to the dental handpiece.

Cutters and their purpose. Materials used for the manufacture of cutters. The difference between cutters and burs.

Metal auxiliary instruments used in dentistry.

Abrasive materials: classification, characteristics. Classification of abrasive tools.

Definition of technological processes of grinding and polishing. ISO marking principles.

### **2.1.5. Investment materials. The use of gypsum for the manufacture of molds. Refractory molding materials. Other auxiliary materials**

Definition of molding as a technological process. The purpose of molding materials and their types depending on the technological processes used. Duplication of a plaster model: materials, equipment and tools.

Acrylic molding technology.

Refractory molding materials: sulfate, silicate, phosphate.

Separating insulating materials: compositions, applications.

Separating compensation materials: compositions, applications.

Other auxiliary materials (coatings, electrolyte for electropolishing, fluxes, bleaches).

## **2.2. Construction materials used in dentistry**

### **2.2.1. Construction metal alloys used for the manufacture of dentures and orthopedic appliances**

Classifications of metals and alloys. Biological, physical and chemical properties of metals and metal alloys. Mechanical properties of metals and metal alloys. Technological properties of metals and metal alloys.

Requirements for metals and metal alloys used in dentistry for the manufacture of dentures and appliances.

Compositions of noble metal alloys with a high gold content (high noble), noble metal alloys with a gold content of 25 to 75 percent, palladium-based noble metal alloys, silver-based noble metal alloys.

Compositions of alloys based on cobalt. Nickel-based alloy compositions.

Steel alloys alloyed stainless.

Forms of release of metals and their alloys for the manufacture of dentures and for auxiliary purposes.

Solders. Compositions of solders used in dentistry.

### **2.2.2. Plastics used in dentistry**

Classification of polymeric materials used in dentistry.

Basic acrylic plastics of hot polymerization: composition and purpose of components.

Basic acrylic plastics are self-hardening. Basic plastics of light polymerization.

Thermoplastic base materials: compositions and physical and mechanical properties.

Polymeric materials used for the manufacture of maxillofacial prostheses.

Polymeric materials used for the manufacture of individual spoons, acrylic plastics and light-curing materials.

Polymeric materials used for the manufacture of mouth guards and their characteristics.

Composite polymer materials: definition, main components (polymer matrix, inorganic filler, binding agent).

Plastic artificial teeth: manufacturing method, properties, forms of industrial production.

### **2.2.3. Ceramic materials**

Definition of ceramics and its application in dentistry. Classification of dental ceramic materials.

Feldspar ceramics: composition and purpose of components.

Leucite-reinforced glass-ceramics: composition, scope.

Glass-ceramic reinforced with lithium disilicate.

Forms of industrial production of glass-ceramic materials used for the manufacture of fixed (non-removable) dentures.

Porcelain artificial teeth for removable dentures.

General characteristics of ceramics infiltrated with glass.

Characteristics of polycrystalline ceramics.

### **2.3. Color science in dentistry**

Evaluation of the objectivity of determining the color of the tooth. Meanings, terms, concepts of color science. Features of the visual analyzer. Aesthetic characteristics of the tooth. Determining the color of the tooth. Selection of construction materials.

## **3. Technological processes for the manufacture of dental prostheses**

### **3.1. Technological processes for the manufacture of dental prostheses from metal alloys**

Definition of the technological process. Metal forming: drawing, knurling, rolling, punching, drawing, bending, twisting, forging and stamping.

Heat treatment of metal alloys: purpose and technique.

Technology of milling dentures.

Technology for the manufacture of dental prostheses using selective laser sintering.

Technology of sintering metals and metal alloys in molds (MIM technology).

Electroerosive methods of processing metal alloys. Principles of electrodischarge processing methods.

Technology of plasma spraying of coatings.

Soldering and welding. Melting and casting of metal alloys.

### **3.2. Technological processes used for the manufacture of ceramic dentures**

Technological processes used in the manufacture of dentures using dental ceramics. Technology of layer-by-layer sintering of ceramics.

Technology of hot pressing of ceramics. CAD/CAM technologies.

Combined technologies for the manufacture of ceramic dentures.

### **3.3. Technological processes used in the manufacture of prostheses from polymeric materials**

Methods for molding plastic prostheses. The sequence of molding plastic dentures by pressing under pressure.

Molding of plastic dentures by injection (molding) pressing. Injection molding equipment and technology sequence.

Equipment and auxiliary materials used for molding dentures by casting.

Polymeric materials used for free molding of plastics. The sequence of laboratory steps for the manufacture of an individual spoon using free molding of self-hardening plastics.

Polymeric materials used for milling technology.

Thermoplastics used in dentistry for thermopressing.

Devices for thermal vacuum pressing and principles of pressing polymeric materials.

Devices for thermopneumatic pressing and principles of pressing polymeric materials.

## **4. Laboratory technique for the manufacture of fixed dentures**

### **4.1. General characteristics and classification of inlays. Laboratory steps for making inlays**

General characteristics of inlay depending on the functional purpose.

Classification of inlays according to G. Black, B. Boyanov and V. Yu. Kurlyandsky, ADA.

Structural materials used for the manufacture of inlays. Technological processes used for the manufacture of inlays from various structural materials.

The sequence of clinical and laboratory stages of manufacturing cast metal inlays (with casting without a model).

#### **4.2. General characteristics of artificial crowns. Laboratory steps for the manufacture of artificial crowns**

General characteristics of artificial crowns depending on the functional purpose: structural materials, technological processes used to manufacture crowns from various structural materials.

Requirements for artificial crowns. The sequence of clinical and laboratory stages of manufacturing stamped metal crowns. The sequence of clinical and laboratory stages in the manufacture of cast metal crowns (with casting without a model). The sequence of clinical and laboratory stages in the manufacture of plastic artificial crowns. The sequence of clinical and laboratory stages of manufacturing metal-ceramic artificial crowns.

#### **4.3. General characteristics of prostheses that eliminate defects in the dentition. Laboratory stages of manufacturing bridges**

General characteristics of defects in the dentition. Classification of prostheses used to restore the integrity of the dentition, according to the methods of fixation in the oral cavity and the principles of transferring the masticatory load to the underlying tissues.

General characteristics of bridge prostheses: main elements. Types of supporting elements of bridge prostheses. Characteristics of the intermediate part of the bridge prosthesis. Comparative characteristics of bridges with bilateral support and cantilever prostheses.

The sequence of clinical and laboratory stages of manufacturing a stamped-brazed bridge prosthesis.

The sequence of clinical and laboratory stages in the manufacture of a one-piece cast bridge prosthesis.

The sequence of clinical and laboratory steps in the manufacture of a plastic bridge.

The sequence of clinical and laboratory stages of manufacturing a metal-ceramic bridge prosthesis.

### **5. Laboratory technique for the manufacture of removable dentures**

#### **5.1. General characteristics of plastic prostheses. Laboratory steps for manufacturing partial removable plastic dentures**

General characteristics of removable plastic dentures used in the partial absence of teeth. The principle of transmission of chewing pressure. The main elements of removable plastic dentures used in the partial absence of teeth. Borders of bases on the upper and lower jaws.

Retaining elements of removable plastic dentures used in the partial absence of teeth. Materials used for the manufacture of holding clasps. Types of clasp fixings depending on the number and topography of retaining elements, the direction of clasp

lines. The location of the bent wire holding clasp on the abutment tooth and the main elements of the clasp.

The sequence of clinical and laboratory stages in the manufacture of removable plastic dentures in the partial absence of teeth. Materials used for the manufacture of wax bases with bite ridges.

### **5.2. General characteristics of buigel (clasp) prostheses. Laboratory stages of manufacturing buigel (clasp) prostheses**

General characteristics of supported prostheses used in the partial absence of teeth. The principle of transmission of chewing pressure. Advantages of supported removable dentures in comparison with plastic partial removable dentures.

The main structural elements of the metal frame.

Ney's clasp system. The main parts of the support-holding clasp and their functional purpose. Laboratory stages in the manufacture of cast removable dentures.

Surveying. Equipment, the purpose of surveying.

The sequence of clinical and laboratory stages in the manufacture of supported prostheses.

### **5.3. General characteristics of complete removable dentures. Laboratory stages of manufacturing and repair of complete removable dentures**

General characteristics of complete removable plastic dentures. The principle of transmission of chewing pressure. The main structural elements of complete removable plastic dentures.

The sequence of laboratory steps for the manufacture of removable plastic dentures in case of complete loss of teeth.

Features of the design of artificial dentition in complete removable plastic dentures.

Methods for replacing the wax composition of the base with plastic in the manufacture of removable plastic dentures in the complete absence of teeth.

Possible technical errors in the manufacture of removable dentures by pressing under pressure and hot polymerization. Final processing of prosthesis bases.

Causes of breakdowns of the basis of removable plastic dentures and materials used for repair.

The sequence of repairing removable plastic dentures for fractures of the basis using self-hardening plastics.

## ACADEMIC DISCIPLINE CURRICULAR CHART

Section, topic #	Section name, topic	Number of classroom hours			Self-studies	Forms of control
		lectures	practical classes	supervised student independent work		
<b>1 semester</b>						
<b>1.</b>	<b>Introduction to the specialty</b>	<b>2</b>	<b>6</b>	<b>-</b>	<b>5</b>	
1.1.	Introduction to the specialty. Brief historical outline of the development of dentistry. The modern content of the discipline	1	-	-	2	Interview, written reports on practical work, electronic tests
	Definition of the concept «Dentistry». Organization and equipment of a dental laboratory	-	3			
1.2.	General information about dentures. Stages of manufacturing dentures. General characteristics of constructional and auxiliary materials. Dental materials science	1	-	-	3	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Dentures. Stages of making dentures	-	3			
<b>2.</b>	<b>Dental materials science</b>	<b>10</b>	<b>51</b>	<b>-</b>	<b>30</b>	
2.1.	<b>Auxiliary materials used in dentistry</b>	<b>4</b>	<b>27</b>	<b>-</b>	<b>15</b>	
2.1.1	<b>Impression materials</b>	<b>1</b>	<b>9</b>	<b>-</b>	<b>6</b>	
	Auxiliary materials used at the stages of manufacturing dentures: impression materials. Purpose, classification, compositions and properties	1	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Impression materials: classification, requirements. Zinc oxide eugenol impression materials. $\beta$ -modification of medical plaster	-	3			

	Thermoplastic, agar-agar and alginate impression materials	-	3	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Impression materials: anhydrous elastomers	-	3	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
2.1.2.	Auxiliary materials used at the stages of manufacturing dentures: model materials. Purpose, classification, compositions and properties.	1	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Model materials: $\alpha$ -modification of medical plaster. Other materials used for the manufacture of models	-	3			
2.1.3.	Auxiliary materials used at the stages of manufacturing dentures: modeling materials. Purpose, classification, compositions and properties	1	-	-	1	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Modeling materials. Dental waxes and modeling resins	-	3			
2.1.4.	<b>Dental rotary instruments</b>	-	<b>6</b>	-	<b>3</b>	
	Metal bladed rotating instruments used in dentistry	-	3	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Abrasive materials and tools used in dentistry. ISO marking principles	-	3	-	1	Interviews, tests, written reports on practical work, abstracts, electronic tests
2.1.5.	Auxiliary materials used at the stages of manufacturing dentures: molding and other auxiliary materials. Purpose, classification, compositions and properties	1	-	-	1	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Investment materials. The use of gypsum for the manufacture of molds. Duplication. Refractory investment materials. Other auxiliary materials	-	3			
	Final lesson on the topic «Auxiliary materials used in dentistry»	-	3	-	2	Colloquium

<b>2.2.</b>	<b>Construction materials used in dentistry</b>	<b>6</b>	<b>18</b>	<b>-</b>	<b>15</b>	
2.2.1.	<b>Construction metal alloys used for the manufacture of dentures and orthopedic appliances</b>	<b>2</b>	<b>3</b>	<b>-</b>	<b>2</b>	
	Metals and metal alloys used in dentistry. Classifications, properties	2	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Constructive metal alloys used for the manufacture of dentures and appliances	-	3	-		
2.2.2.	<b>Plastics used in dentistry</b>	<b>2</b>	<b>9</b>	<b>-</b>	<b>5</b>	
	Plastics used in dentistry. Classifications. Properties	2	-	-		Interviews, tests, written reports on practical work, abstracts, electronic tests
	Cold polymerization plastics	-	3	-	3	
	Hot polymerization plastics	-	3	-		
	Composite polymer materials	-	3	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
2.2.3.	<b>Ceramic materials</b>	<b>2</b>	<b>6</b>	<b>-</b>	<b>4</b>	
	Ceramic materials used in dentistry. Classifications. Properties	2	-	-		Interviews, tests, written reports on practical work, abstracts, electronic tests
	Ceramic materials	-	3	-	2	
	Glass ionomer cements, composition, properties, curing process	-	3	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
<b>2.3.</b>	<b>Color science in dentistry</b>	<b>-</b>	<b>3</b>	<b>-</b>	<b>2</b>	
	Final lesson on the topic «Construction materials used in dentistry. Color science in dentistry»	-	3	-	2	Colloquium, Credit



## 2 semester

3.	<b>Technological processes used for the manufacture of dental prostheses from metal alloys</b>	5	24,5	-	15	
3.1.	<b>Technological processes for the manufacture of dental prostheses</b>	1	7	-	5	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Technological processes used for the manufacture of dentures using metal alloys	1	-			
	Technological processes for the manufacture of dental prostheses from metal alloys: metal processing by pressure; CAD/CAM technology, SLS technology, MIM technology. Electroerosive processing methods. Plasma spraying technology. Electroplating. Technologies for connecting metal parts of prostheses	-	3,5	-	3	
	Technological processes for the manufacture of dental prostheses from metal alloys: metal alloy casting	-	3,5	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
3.2.	<b>Technological processes used for the manufacture of ceramic dentures</b>	2	7	-	4	
	Technological processes used for the manufacture of dentures using ceramic materials	2	-			Interviews, tests, written reports on practical work, abstracts, electronic tests
	Technological processes used for the manufacture of ceramic dentures: technology of layer-by-layer sintering of slip. Ceramic hot pressing technology	-	3,5	-	2	
	Technological processes used for the manufacture of ceramic dentures: slip technique with glass infiltration, milling. Combined technologies for the manufacture of ceramic prostheses. Metal-ceramics	-	3,5	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
3.3.	<b>Technological processes used in the manufacture of prostheses from polymeric materials</b>	2	10,5	-	6	
	Technological processes used for the manufacture of dentures using plastics	2	-	-	2	Interviews, tests, written reports on practical work, abstracts,

	Technological processes used in the manufacture of prostheses from polymeric materials: pressure molding, injection molding, casting. Freeform molding of plastics	-	3,5			electronic tests
	Technological processes used in the manufacture of prostheses from polymeric materials: plastic milling, thermal injection pressing, thermal vacuum pressing and pressure thermal pressing	-	3,5	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Final lesson on the topic: «Technological processes for the manufacture of dental prostheses in dentistry»	-	3,5	-	2	Colloquium
<b>4.</b>	<b>Laboratory technique for the manufacture of fixed dentures</b>	<b>3</b>	<b>14</b>	-	<b>8</b>	
4.1.	Prostheses that eliminate defects in hard tissues of teeth: inlays. General characteristics. Inlay technology	1	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	General characteristics and classification of inlays. Laboratory steps for making inlays	-	3,5			
4.2.	Prostheses that eliminate defects in hard tissues of teeth: artificial crowns. General characteristics. Technologies for the manufacture of artificial crowns	1	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	General characteristics of artificial crowns. Laboratory steps for the manufacture of artificial crowns	-	3,5			
<b>4.3.</b>	<b>General characteristics of prostheses that eliminate defects in the dentition. Laboratory steps for the manufacture of bridges</b>	<b>1</b>	<b>7</b>	-	<b>4</b>	
	General characteristics of prostheses that eliminate defects in the dentition: bridges. General characteristics. Technologies for the manufacture of fixed bridge prostheses	1	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	General characteristics of prostheses that eliminate defects in the dentition. Bridges	-	3,5			
	Laboratory steps for the manufacture of bridges	-	3,5	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
<b>5.</b>	<b>Laboratory technique for the manufacture of removable dentures</b>	<b>4</b>	<b>24,5</b>	-	<b>16</b>	
5.1.	Removable partial dentures that replace partial defects in the dentition. General characteristics. Sequence of laboratory steps	1	-	-	3	Interviews, tests, written reports on practical work, abstracts, electronic tests

	General characteristics of removable partial dentures. Laboratory steps for manufacturing partial removable plastic dentures	-	3,5			electronic tests
<b>5.2.</b>	<b>General characteristics of supported prostheses. Laboratory stages of manufacturing clasp prostheses</b>	<b>2</b>	<b>7</b>	-	<b>4</b>	
	Supported prostheses. General characteristics. Prosthesis planning. Sequence of laboratory steps	2	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	General characteristics of supporting prostheses. Laboratory stages of manufacturing clasp prostheses	-	3,5			
	Surveying. Ney's clasp system. Manufacturing of the frame of an removable prosthesis with casting on a refractory model	-	3,5	-	2	Interviews, tests, written reports on practical work, abstracts
<b>5.3.</b>	<b>General characteristics of complete removable dentures. Laboratory stages of manufacturing and repair of complete removable dentures</b>	<b>1</b>	<b>14</b>	-	<b>9</b>	
	Removable removable dentures that replace complete defects in the dentition. General characteristics. Sequence of laboratory steps	1	-	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	General characteristics of complete removable lamellar dentures. Laboratory steps	-	3,5			
	Construction of artificial dentition in complete removable dentures	-	3,5	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Breakdowns of removable dentures. Laboratory technique for repairing removable dentures	-	3,5	-	2	Interviews, tests, written reports on practical work, abstracts, electronic tests
	Final lesson on the topics «Technological processes for the manufacture of dental prostheses», «Laboratory technique for the manufacture of fixed dentures», «Laboratory technique for the manufacture of removable dentures»	-	3,5	-	3	Colloquium, exam
		<b>24</b>	<b>120</b>	-	<b>74</b>	

## INFORMATION AND INSTRUCTIONAL UNIT

## LITERATURE

**Basic:**

1. Powers, J. M. Dental materials: foundations and applications / J. M. Powers, J. C. Wataha. – 11 th ed. – Elsevier, 2017. – 240 p.

**Additional:**

2. Методы препарирования твердых тканей зубов = Methods of preparation of hard dental tissue : учеб.-метод. пособие / Н. М. Полонейчик и др. – Минск : БГМУ, 2019. – 36 с.

3. Полонейчик, Н. М. Оттисковые материалы = Impression materials : учеб.-метод. пособие. – Минск : БГМУ, 2017, 2018. – 39 с.

4. Полонейчик, Н. М. Методы изготовления гипсовых моделей : учеб.-метод. пособие. – Минск : БГМУ, 2020. – 28 с.

5. Полонейчик, Н. М. Керамические материалы в стоматологии и технологические процессы, используемые при изготовлении керамических зубных протезов = Ceramic materials in dentistry and technological processes used in the fabrication of ceramic dental prostheses : учеб.-метод. пособие. – Минск : БГМУ, 2017, 2018. – 40 с.

6. Полонейчик, Н. М. Металлы и сплавы металлов в стоматологии. Технологические процессы, применяемые при изготовлении зубных протезов из сплавов металлов. = Metals and alloys of metals in dentistry. Technological processes used for production of dental prostheses of metals alloys. – учеб.- метод. пособие. – Минск : БГМУ, 2017, 2018. – 40 с.

7. Полонейчик, Н. М. Моделировочные материалы, применяемые в стоматологии = Modelling materials used in dentistry: учеб.-метод. пособие. – Минск : БГМУ, 2018. – 20 с.

8. Полонейчик, Н. М. Полимерные материалы в стоматологии и технологические процессы, используемые при изготовлении полимерных зубных протезов = Polymer materials in dentistry and technological processes used in the fabrication of polymer dental prostheses : учеб.- метод. пособие. – Минск : БГМУ, 2018. – 44 с.

9. Полонейчик, Н. М. Формовочные материалы, применяемые в стоматологии = Investment materials applied in dentistry : учеб.- метод. пособие. – Минск : БГМУ, 2018. – 19 с.

10. Полонейчик, Н. М. Методы изготовления гипсовых моделей = Methods of working casts and die systems production : учеб.- метод. пособие. – Минск : БГМУ, 2020. – 24 с.

11. Материалы, технологические процессы и устройства, используемые для изготовления индивидуальных оттисковых ложек = Materials, technological processes and devices used for custom impression trays fabrication : учеб.-метод. пособие / Н. М. Полонейчик [и др.]. – Минск : БГМУ, 2020. – 16 с.

**METHODOLOGICAL RECOMMENDATIONS FOR THE ORGANIZATION AND  
PERFORMANCE OF INDEPENDENT WORK OF STUDENTS IN ACADEMIC  
DISCIPLINE**

The time allotted for independent work can be used by students for:  
preparation for lectures and practical exercises;  
preparation for colloquium, tests and exams in the academic discipline;  
preparation of thematic reports, abstracts, presentations;  
implementation of practical tasks;  
note-taking of educational literature.

**LIST OF AVAILABLE DIAGNOSTIC TOOLS**

The following forms are used for competences assessment:

**Oral form:**

interview;  
colloquium.

**Written form:**

tests;  
abstracts;  
written reports on practical work.

**Oral-written form:**

credits;  
exam.

**Technical form:**

electronic tests.

**LIST OF AVAILABLE TEACHING METHODS**

Traditional method (lecture, laboratory practicals);

Active (interactive) methods:

training based on simulation technologies;  
Problem-Based Learning (PBL).

**LIST OF PRACTICAL SKILLS**

1. Preparation of plaster.
2. Casting a plaster model from an impression.
3. Selection of an impression tray.
4. Choice of impression material.
5. Preparation of various types of impression materials.
6. Work with modeling materials (scraping and layering).
7. Working with krampon forceps to bend the orthodontic wire.
8. The choice of dental rotary instruments for processing various structural materials and hard tissues of teeth.
9. Selection of types of handpieces for processing various structural materials and hard tissues of teeth.
10. Choice of dental rotary instruments for different types of handpieces.

11. Fastening of rotating tools in various types of handpieces.
12. Preparation of plastic dough.
13. Determination of types of prostheses, their structural elements and their features.
14. Selection of combinations of various structural materials for the manufacture of various types of prostheses.
15. Selection of auxiliary materials at the stages of manufacturing various types of prostheses.
16. Providing first aid to the victim from exposure to an open flame, aggressive liquids, electric current.

### LIST OF EQUIPMENT USED

1. Equipment of the main premises of the dental laboratory: dental table. Dental table, burner, grinding motor, plaster knife, dental hammer, spatulas, scalpel (eye), tweezers, jigsaw and file set, metal scissors, tongs, files, rubber cups, articulators and occluders. Sets of abrasive materials for processing plastics, metal alloys, ceramics.

2. Polymerization equipment. Polymerizer, collapsible cuvettes, hydraulic press,  $\lambda$ -form of gypsum and  $\beta$ -form of gypsum, 3% NaCl solution, vibrating table, vacuum mixer for plaster mixing, trimmer, pins for making collapsible models, jigsaw and files for separating models, retention rings, insulating materials (isokol, petroleum jelly), a polishing motor for polishing, a set of brushes and puffs, polishing pastes, a sandblaster, a steam jet, a muffle furnace, scales, a casting and melting machine, a grinder with vulcanite discs for trimming the gating system, a milling cutter, various metals for casting, molding materials for surveying, scales.

3. Plaster equipment. Impression trays. Impression materials: ZOE material, spatula for cement, paper pad for preparation of ZOE material. Silicone mold, test blocks for evaluating the reproduction of impression materials of surface topography and changes in linear dimensions. Test block and ring mold for evaluating the reproduction of the surface relief by the impression material, changes in linear dimensions. Thermoplastic impression material, agar-agar and silicone material for duplicating plaster models (Gelin), alginate impression material, measuring cups for water and powder. Impression materials: polyester, condensed silicone, connecting type silicone (0, 1, 2 and 3 viscosities). Notebook with scale and spatula for manual mixing of materials, hand mixer for cartridges, Pentamix electric mixer, measuring cups for anhydrous elastomers of 0 and 1 viscosity types. Anhydrous elastomer casting samples to demonstrate compression deformation, impression material disk samples characterizing the degree of viscosity;

4. Polishing equipment. One-piece and dismantled models, dismantled models for demonstrating the modeling of inlays and the framework of MK crowns, one-piece models, various types of waxes (dipping waxes, lavax, base wax, modevax, wax, formodent, clasp wax 02, sticky wax, bridge wax, sets standard wax profiles), spirit lamps, alcohol, spatula (dental), modeling tool kits, wax melter, insulating varnish. Ashless plastics (standard blanks, polymer composition), silicone flasks for

making plastics, a brush for working with plastics.

5. Soldering equipment. Dental handpieces, sets of dental rotary instruments, magnifying glass, vernier caliper, a set of abrasive tools, dental handpieces, measuring devices, materials for duplicating plaster models, cuvette for duplicating models, cuvette for molding plastics, fusible alloy, spoon for melting fusible alloy, spirit lamp, matches, separating (insulating) materials, separating compensating materials, covering materials.

6. Foundry equipment. Dental prostheses made of metal alloys (inlays, artificial crowns, bridges, frames of cast removable dentures, implants). Removable dentures. Forms of industrial production of base plastics: hot polymerization acrylic plastics, self-hardening acrylic plastics. Fixed plastic dentures. Forms of industrial production of composite materials of chemical and light curing. Polymeric materials used for the manufacture of individual trays and mouthguards. Composite artificial teeth. Dental prostheses made using ceramic materials. Forms of industrial production of ceramic materials: ceramic powders for layer-by-layer sintering, ceramic pastes for layer-by-layer sintering, blocks for CAD / CAM technologies, blocks for casting ceramic dentures, ceramic artificial teeth. Forms of industrial production of glass ionomer cement (GIC), notebooks and spatulas for mixing GIC, tooth coloring kits, gray card, fixed dentures, tooth shape charts.

## LIST OF LECTURES

### 1 semester

1. Introduction to the specialty. Brief historical outline of the development of dentistry. The modern content of the discipline.
2. General information about dentures. Stages of manufacturing dentures. General characteristics of structural and auxiliary materials. Dental materials science.
3. Auxiliary materials used at the stages of manufacturing dentures: impression materials. Purpose, classification, compositions and properties.
4. Auxiliary materials used at the stages of manufacturing dentures: model materials. Purpose, classification, compositions and properties.
5. Auxiliary materials used at the stages of manufacturing dentures: modeling materials. Purpose, classification, compositions and properties
6. Auxiliary materials used at the stages of manufacturing dentures: molding and other auxiliary materials. Purpose, classification, compositions and properties
7. Metals and metal alloys used in dentistry. Classifications. Properties
8. Plastics used in dentistry. Classifications. Properties.
9. Ceramic materials used in dentistry. Classifications. Properties.

### 2 semester

1. Technological processes used for the manufacture of dental prostheses using metal alloys.
2. Technological processes used for the manufacture of dental prostheses using ceramic materials.
3. Technological processes used for the manufacture of dentures using plastics.
4. Prostheses that eliminate defects in hard tissues of teeth: inlays. General

characteristics. Inlay technology.

5. Prostheses that eliminate defects in hard tissues of teeth: artificial crowns. General characteristics. Technologies for the manufacture of artificial crowns.

6. General characteristics of prostheses that eliminate defects in the dentition: bridges. General characteristics. Technologies for the manufacture of fixed bridge prostheses.

7. Removable lamellar dentures that replace partial defects in the dentition. General characteristics. Sequence of laboratory steps.

8. Supported prostheses. General characteristics. Prosthesis planning. Sequence of laboratory steps.

9. Removable lamellar dentures that replace complete defects in the dentition. General characteristics. Sequence of laboratory steps.

### LIST OF PRACTICAL CLASSES

#### 1 semester

1. Definition of the concept «Dentistry». Organization and equipment of a dental laboratory.

2. Dentures. Stages of making dentures.

3. Impression materials: classification, requirements. Zinc oxide eugenol impression materials.  $\beta$ -modification of medical plaster.

4. Thermoplastic, agar-agar and alginate impression materials.

5. Impression materials: anhydrous elastomers.

6. Model materials:  $\alpha$ -modification of medical plaster. Other materials used for the manufacture of models.

7. Modeling materials. Dental waxes and modeling resins.

8. Metal bladed rotating instruments used in dentistry.

9. Abrasive materials and tools used in dentistry. ISO marking principles.

10. Investment materials. The use of gypsum for the manufacture of molds. Duplication. Refractory investment materials. Other auxiliary materials.

11. Final lesson on the topic «Auxiliary materials used in dentistry».

12. Construction metal alloys used for the manufacture of dentures and appliances.

13. Cold polymerization plastics.

14. Hot polymerization plastics.

15. Composite polymer materials.

16. Ceramic materials.

17. Glass ionomer cements, composition, properties, curing process.

18. Color science in dentistry.

19. Final lesson on the topics «Construction materials used in dentistry. Color science in dentistry».

#### 2 semester

1. Technological processes for the manufacture of dental prostheses from metal alloys: metal processing by pressure; CAD/CAM technology, SLS technology, MIM technology. Electroerosive processing methods. Plasma spraying technology.



Electroplating. Technologies for connecting metal parts of prostheses.

2. Technological processes for the manufacture of dentures from metal alloys: metal alloy casting.

3. Technological processes used for the manufacture of ceramic dentures: technology of layer-by-layer sintering of slip. Ceramic hot pressing technology

4. Technological processes used for the manufacture of ceramic dentures: slip technique with glass infiltration, milling. Combined technologies for the manufacture of ceramic prostheses. Metal- ceramics.

5. Technological processes used in the manufacture of prostheses from polymeric materials: pressure molding, injection molding, casting. Freeform molding of plastics.

6. Technological processes used in the manufacture of prostheses from polymeric materials: plastic milling, thermal injection pressing, thermal vacuum pressing and pressure thermal pressing.

7. Final lesson on the topic: «Technological processes for the manufacture of dental prostheses in dentistry».

8. General characteristics and classification of inlays. Laboratory steps for making inlays.

9. General characteristics of artificial crowns. Laboratory steps for the manufacture of artificial crowns.

10. General characteristics of prostheses that eliminate defects in the dentition. Bridges.

11. Laboratory steps for the manufacture of bridges.

12. General characteristics of removable partial dentures. Laboratory steps for manufacturing partial removable plastic dentures.

13. General characteristics of supporting prostheses. Laboratory stages of manufacturing clasp prostheses.

14. Surveying. Ney's clasp system. Manufacturing of the frame of an removable prosthesis with casting on a refractory model.

15. General characteristics of complete removable lamellar dentures. Laboratory steps.

16. Construction of artificial dentition in complete removable dentures.

17. Breakdowns of removable dentures. Laboratory technique for repairing removable dentures.

18. Final lesson on the topics «Technological processes for the manufacture of dental prostheses», «Laboratory technique for the manufacture of fixed dentures», «Laboratory technique for the manufacture of removable dentures».

**PROTOCOL OF THE CURRICULUM APPROVAL  
BY OTHER DEPARTMENTS**

Title of the discipline requiring approval	Department	Amendments to the curriculum in the academic discipline	Decision of the department, which designed the curriculum (date, protocol #)
1. Prosthetic Dentistry	Prosthetic Dentistry	No offers	protocol # 14 of 13.06.2022
2. Medical and Biological Physics	Medical and biological physics	No offers	protocol # 14 of 13.06.2022
3. Medical Chemistry	General chemistry	No offers	protocol # 14 of 13.06.2022
4. Bioorganic Chemistry	Bioorganic chemistry	No offers	protocol # 14 of 13.06.2022

**COMPILERS:**

Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor



N.A.Gres

Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor



N.M.Poloneichik

Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor



F.R.Tagiyeva

Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor



G.G.Chistyakova

Associate Professor of the Department of General Dentistry of the educational institution «Belarusian State Medical University», PhD, Associate Professor



A.A.Petrouk

Associate Professor of the Department of General Dentistry of the Educational institution «Belarusian State Medical University», PhD



Yu.M.Kazakova

Curriculum content, composition and the accompanying documents comply with the established requirements.

Dean of the Medical Faculty for International Students of the educational institution «Belarusian State Medical University»

28.06.22



O.S.Ishutin







Methodologist of the educational institution «Belarusian State Medical University»

28.06.22



S.V.Zaturanova

**Information about the authors (compilers) of the curriculum**

Name		Gres Nonna Arkadievna
Position, degree, title	scientific	Associate Professor of the Department of General Dentistry of the Educational institution «Belarusian State Medical University», PhD, Associate Professor
 work		
Name		Poloneichik Nikolai Mikhailovich
Position, degree, title	scientific	Associate Professor of the Department of General Dentistry of the Educational institution «Belarusian State Medical University», PhD, Associate Professor
 work		
Name		Tagieva Farida Raufovna
Position, degree, title	scientific	Associate Professor of the Department of General Dentistry of the Educational institution «Belarusian State Medical University», PhD, Associate Professor
 official		
Name		Chistyakova Galina Gennadievna
Position, degree, title	scientific	Associate Professor of the Department of General Dentistry of the Educational institution «Belarusian State Medical University», PhD, Associate Professor
 official		
Name		Petrouk Alla Alexandrovna
Position, degree, title	scientific	Associate Professor of the Department of General Dentistry of the Educational institution «Belarusian State Medical University», PhD, Associate Professor
 official		
Name		Kzakova Yulia Mikhailovna
Position, degree, title	scientific	Associate Professor of the Department of General Dentistry of the Educational institution «Belarusian State Medical University», PhD
 official		