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FACULTY OF STOMATOLOGY
STUDY PROGRAM 0911.1 STOMATOLOGY
CHAIR OF STOMATOLOGICAL PROPAEDEUTICS "PAVEL GODOROJA"

APPROVED

at the meeting of the Committee for Quality Assurance and Evaluation of the Curriculum Faculty of Stomatology
 Minutes No. 2 of 13.02.2018
 Committee president, PhD, DMS, Associate professor,
 Stepco Elena *E. Stepco*

APPROVED

at the Council meeting of the Faculty of Stomatology
 Minutes No. 6 of 20.02.2018
 Dean of Faculty of Stomatology, PhD, DHMS, Professor,
 Ciobanu Sergiu *S. Ciobanu*

APPROVED

at the meeting of the chair of Stomatological Propaedeutics "Pavel Godoroja"
 Minutes nr. 3 of 20.10.2017
 Head of chair, PhD, DHMS, Associate professor,
 Uncuța Diana *D. Uncuța*



CURRICULUM

DISCIPLINE: **Biomaterials**

Integrated studies

Course type: **Compulsory discipline**

Chișinău, 2017



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I. Introduction

- **General presentation of the disciplines: the place and the importance of discipline in the formation of specific competencies in the professional training program of specialists.**

Biomaterials are an integral part of dentistry being a basic discipline, necessary for training future specialists. Development biomaterials by the students on a preclinical course includes the study of the relationship, composition, structure, properties, production technology and application of materials for various sections of modern dentistry. Thus students get acquainted with laws changing properties of materials under the influence of the physical, mechanical and chemical factors. The results of the investigation of the properties of dental materials have not only theoretical, but also practical value associated with the property management by changing the composition of materials and the development of best practices and technologies use of materials in various fields of dentistry. The basic steps for working with biomaterials, study of their properties, indications and contra-indications for use, are aimed at the development the student's clinical thinking, develop skills for proper preparation, mixing material for future restorations, fixation of dentures, the ability to choose the right material, taking into account the indications and contraindications, compatibility of different chemical composition materials. At the same time, attention is paid to individual biocompatibility of the dental material, the absence of allergic reactions to it. A great attention is paid to the protection of the student while working with biomaterials and later when working with the patient. For this purpose, the students work in special equipment (a disposable robe, gloves, glasses, medical hat and a mask).

The Mission (purpose) of this training plan in specialists' preparation.

The main objective of dental materials science, is to teach future dentist the properties of materials, the technology of preparation, knowledge of field of their application. At the same time, the study of biomaterials that are described within the discipline aimed at developing skills and clinical thinking of students, where future experts on the basis of fundamental knowledge of biomaterials will continue to study and work out the skills while working with these materials at first on phantom, and later on while treating the patients. All this will lead to a right choice of a method of treatment and selection of necessary biomaterials.

- **Discipline teaching languages:** Romanian, Russian and English.
- **Beneficiaries:** students of the first course, Faculty of Stomatology.

II. DISCIPLINE ADMINISTRATION

Discipline code		S.02.O.015	
		Biomaterials in dentistry	
Responsible for discipline		Terehov Alexei, PhD, DMS, Associate professor Uncuța Diana, PhD, DHMS, Associate Professor, head of chair	
Year	I	Semester	II
Number of hours, including			90



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Course	17	Practice	17
Seminars	34	Individual work	22
Evaluation form	CD	Number of credits	3

III. AIMS OF DISCIPLINE

• **At the level of knowledge and concepts a student must:**

- ✓ know the role of biomaterials in dentistry;
- ✓ define biomaterials in dentistry, aims and objectives;
- ✓ know the physicochemical features of biomaterials;
- ✓ know the optical, thermal, electrical and mechanical properties of dental materials;
- ✓ know the notion of biocompatibility of dental materials. Biocompatibility test types;
- ✓ know the classification of biocompatibility: biotolerance, bioinertness, bioreactivity (biological activity);
- ✓ know the metals and metallic alloys, classification; definition.
- ✓ be familiar with the methods of using acrylic resins in dentistry;
- ✓ know the medico-biological material requirements for impression materials;
- ✓ understand the difference between physical and chemical adhesion;
- ✓ know base alloys based on Co-Cr and Ni-Cr. Their properties;
- ✓ know the materials that are used in the development of Endo-bone grafts;
- ✓ know the classification of polymeric materials in accordance with the chemical structure;
- ✓ know the definition of the ceramic mass, chemical composition and their classification;
- ✓ know the composition of the dental waxes, classify according to usage;
- ✓ be familiar with the introduction and use of wax for laying;
- ✓ be familiar with the requirements for dental wax;
- ✓ know the equipment and processing steps of Acrylic polymers;
- ✓ be familiar with the sequence and technique of taking the impression;
- ✓ be familiar with the basic properties of the impression materials;
- ✓ examine the materials used for casting models, and their properties;
- ✓ be familiarized with the requirements for temporary seals and medical layings;
- ✓ know common notions of the permanent filling material
- ✓ know the difference between bandages and temporary fillings;
- ✓ know materials used for dressings;
- ✓ know materials used for temporary fillings;
- ✓ know the characteristic of artificial dentin;
- ✓ to know the purpose of the use of therapeutic layings;
- ✓ know the difference between the baseline and layner layings;
- ✓ understand the reaction of curing glass-ionomer cement;
- ✓ know the factors that influence the adhesion;
- ✓ understand the reaction of curing hybrid glass ionomer cements, properties and indications for use;
- ✓ familiarize yourself with the difference between the basic metal ionomer cements and "kermet";
- ✓ know the structure of the hybrid glass-ionomer cement after polymerisation;
- ✓ familiarize yourself with the chemical composition with silver amalgam;
- ✓ know the working time and to correctly test preparation with silver amalgam;
- ✓ to understand the mechanism of etching the enamel with acid;
- ✓ get acquainted with the classification of adhesive systems;
- ✓ get acquainted with the classification of diacrylic resins after polymerization reaction;



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- ✓ see the basic parts of light curing lamp;
 - ✓ explore temporary root canal filling materials based on calcium hydroxide, their properties and indications for use;
 - ✓ know the materials used for the production of fixed and removable dentures;
 - ✓ know the optimal proportion for the proper kneading of materials
- **At the level of practical work, students must:**
- ✓ be able to explain the use of biomaterials in dentistry;
 - ✓ be able to describe general properties of dental materials;
 - ✓ be able to distinguish between the necessary materials for temporary and permanent sealing;
 - ✓ be able to describe and explain the compatibility of different dental materials;
 - ✓ be able to list the tests of biocompatibility of biomaterials;
 - ✓ to be able to prove need of the use of adhesive systems;
 - ✓ to have the ability to enumerate and characterize the materials necessary for the protection of the dental pulp;
 - ✓ be able to use different methods to determine important tooth shades;
 - ✓ be able to enumerate the factors that affect the choice of colour of a material in the process of restoration;
 - ✓ be able to explain the use of impression trays with different dental materials;
 - ✓ be able to take the impression from the prosthetics field with various impression materials.
 - ✓ be able to knead different types of cements;
 - ✓ be able to knead curative pastes.
- **At the level of integration:**
- ✓ evaluate phases of acrylic polymerization;
 - ✓ evaluate the benefits of using wax as auxiliary material in the denture manufacture;
 - ✓ evaluate the elasticity of composite materials;
 - ✓ evaluate filling material on the scale of "VITA";
 - ✓ sort the instruments for grinding and polishing the materials

IV. PRELIMINARY CONDITIONS AND REQUIREMENTS

Knowledge of and compliance with ethical and professional standards in relation with the patient. Knowledge of the purpose and objectives of biomaterials in dentistry. Knowledge of the chemical composition and physical-chemical properties of different dental materials. Knowledge of indications and contraindications of materials to evaluate the biological compatibility of materials. Knowing the stages of the use of the materials in different dental cases. Knowledge and use of tools for kneading and processing of dental materials. Know the use of working time involved biomaterial. Knowledge of the right sources of information necessary for the work with dental biomaterials.

V. THEMES AND ORIENTATIVE DISTRIBUTION OF HOURS

Nr	THEME	Number of hours
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d/o		Cou r s e s	Semi - n a r s	Pract i c e	Indi v i d u a l
1	<p>Biomaterials. General concept. Classification. Properties of biomaterials.</p> <p>The notion of biomaterials. Properties. Optical properties (reflection and refraction, luminescence, transparency, opacity) dental materials. Color and its methods of definition. Especially the color. Thermal properties of dental materials (thermal conductivity and thermal expansion). Electrical properties (galvanization). Mechanical properties (deformation, elasticity, plasticity) of biomaterials. Occlusal forces. Elasticity. Characteristics of the compressive pressure. Deterioration and hardness. Chemical properties, corrosion. Biocompatibility of dental materials.</p>	1	2	1	1
2	<p>Basic dental materials. Metals and alloys used in dentistry (Au; Ni-Cr; Co-Cr). Composition and properties.</p> <p>Metals and metal alloys. Definition Classification by Siebert (1983). Noble alloys and their properties (melting range, density, hardness). Gold. Platinum. Base alloys based on Co-Cr and Ni-Cr. Their properties. Iron-based alloys based on titanium and copper. Alloys for fixed dentures (noble, base). Alloys for metal-ceramic works. Alloys for skeletal mobilisable partial prostheses. Alloy casting, welding and bonding, alloy recycling. Milling methods. Materials used in making endosseous implants. Compatibility classes: biotolerance, bioinertness, bioreactivity (bioactive).</p>	1	2	1	1
3	<p>Non-metallic materials. Acrylates. Composition and properties. Practical application. Medico-biological requirements.</p> <p>Polymer materials. Chemical composition. Classification of polymeric materials by chemical structure. Classification of polymeric materials for field use. Simple acrylic resins. Release forms. Acrylic plastic with thermal polymerization. Forming a paste. The properties of acrylic plastic with thermal polymerization properties (structure, porosity, volume change, thermal expansion, shrinkage during curing, thermal shrinkage, biological properties).</p> <p>Indications for use of acrylic plastic with thermal polymerization. Self-polymerization acrylic resins. Release forms and their polymerization. Properties of self-polymerization acrylic resins (structure, volume change, thermal properties, optical properties, biological properties). Indications for use of self-polymerization resins.</p>	1	2	1	2
4	<p>Non-metallic materials. Ceramics. Composition and properties. Practical application. Medico-biological requirements. Final.</p> <p>Ceramic masses. Definition. Chemical composition. Classification of ceramic masses depending on: the melting point, the number of layers and the purpose of use. The release form: industrial and laboratory. Stages of baking ceramic body on the metal structure. Characteristics of ceramic masses (volumetric changes, hardness, resistance to pressure, color stability, transparency, biological stability). Notion about new ceramic system: Hi-Ceram-Vita, Ceremony, In-Ceram-Vita, Dicor, Empress Technique. Mechanical copying methods. Computerized grinding methods (CAD-CAM). Final</p>	1	2	1	1
5	<p>Auxiliary materials. Wax. Classification of packaging materials.</p>	1	2	1	2



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Nr d/o	THEME	Number of hours			
		Cou rses	Semi -nars	Pract ice	Indi vidu al
	Dental wax. Composition. Classification by the method of application. Wax properties: fluidity, thermal dilatation, physical properties, and so on. Release form and properties of the base wax. Release form and properties of molded (shaped) waxes. Release form and properties of the sticky wax. Release form and properties between the modeling wax for tabs. Release form and properties of finished wax models. Requirements for dental wax. Classification of packaging materials used in dental laboratory. Properties				
6	<p>Materials for taking impression and casting models. Characteristic. Classification. The materials used. Methods of creating impressions and models.</p> <p>The Definition of Impression. Classification of the impression depending on the method of use and method of taking the impression. The impression tray. Characteristic. Classification. Stages and method of of taking the impression. Classification of impression materials by Gherner, Oksman, Napadov and Postolachi si Bîrsa. Basic properties of the impression material (plasticity, accuracy, elasticity, mechanical durability, volume stability, time of curing). Secondary properties of the impression material (absence of toxic irritation and smel, pleasant taste, long-term storage and easy removal after curing). Short presentation reversible and irreversible solid impression materials. Properties. Characteristic of group of reversible and irreversible elastic impression materials. Medicobiological requirements for the impression materials. Model. Definition. Features. The materials used for the manufacture of models. Their properties and use. Classification of models depending on purpose and method of use. The equipment that is necessary for the manufacture of models. Technique of manufacturing metal models. Their use in practice.</p>	1	2	1	2
7	<p>Materials for sealing cavities. Classification. Requirements for permanent restorative materials.</p> <p>The concept of sealing. Classification of sealing materials. Requirements for temporary sealing materials. Requirements for medical sealing materials. Requirements for the materials for insulating laying. Requirements for the constant filling materials. Definition of crown sealing. Determination of crown restoration. The main characteristics of the sealing materials.</p>	1	2	1	1
8	<p>Temporary filling material. Basic properties. Final.</p> <p>The definition of provisional filling materials. Requirements for temporary restorative materials. The difference between a bandage and other seal. The materials used for bandages. The materials used for the temporal seals. Characteristics of artificial dentin. Property. Chemical composition. The composition of the dentin-paste and paste no eugenol. Chemical properties. Temporary photopolymerization seals. Properties. Methods of kneading and making provisional filling materials. Final test.</p>	1	2	1	1
9	<p>Materials for medical and isolating laying.</p> <p>Definition and classification of medical laying. The purpose of use of medical laying. Water-based calcium hydroxide paste. Properties and</p>	1	2	1	1



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Nr d/o	THEME	Number of hours			
		Cou rses	Semi -nars	Pract ice	Indi vidu al
	indications for use. Calcium hydroxide cements based on resins. Properties and indications for use. Zinc oxide paste. Properties and indications for use. Combined medical pastes. Properties and indications for use. How to prepare medical laying. The mechanism of action of medical laying. Definition and classification of isolating laying. The purpose of the application of isolating laying.				
10	<p>Glass Ionomer Cements. Classification. Indications for use. Contraindications. The advantages and disadvantages.</p> <p>Determination of the chemical composition of glass-ionomer cement. Release form, curing glass-ionomer cement. Properties of glass-ionomer cement. Indications for use directions and technology of mixing glass-ionomer cement. Classification of glass-ionomer cement on Wilson and McLean (1988). Classification by g. j. Mount and W.R. Hume (1998). Characteristics of glass-ionomer cement type I. Characteristics of glass-ionomer cement type II. Characteristics of glass-ionomer cement III type. The way of adhesion of the ionomeric cements to the mineralized dental tissues.</p>	1	2	1	1
11	<p>Hybrid glass ionomer cements. Properties.</p> <p>Definition of hybrid respectively glass ionomer cements. Chemical composition. Types of polymerization. Release form. The curing reaction, properties and indications for use of hybrid glass ionomer cements. Glass ionomer cement with addition of metal particles. Properties. Indications for use. The difference between glass ionomer cement with addition of metal particles and metal ceramic particles (Cermet). Determination of compomers. Indications for use compomers. The curing reaction of hybrid glass ionomer cements. The structure of glass ionomer cements after curing reaction. Definition of ormokers. Properties. Indications for use.</p>	1	2	1	1
12	<p>Dental amalgam. Classification. Definition. Properties. Indications for use, advantages and disadvantages. Final.</p> <p>Definition of amalgams. Classification of amalgam by the number of metals in it's comosition, by the content of copper in the silver alloy, silver sawdust. Chemical composition of amalgam sawdust. The amount of silver in the sawdust. Characteristic. The amount of tin in the sawdust. Characteristic. The amount of copper in the sawdust. Characteristic. The amount of zinc in the sawdust. Characteristic. Characteristics of the liquid mercury. Release form. Equipment and method for kneading the amalgam. Capsules for kneading the amalgams.</p>	1	2	1	2
13	<p>Adhesive systems. General principles of adhesion. Factors influencing the adhesion.</p> <p>Definition. General principles of adhesion. Physical adhesion mechanisms. Chemical adhesion mechanisms. Features of adhesion to solid tissues of the tooth. Adhesion to enamel, morphofunctional features of enamel. Preparation of enamel for the adhesion. Mechanism of etching the enamel with the acid. Adhesion to dentin, morphofunctional features of dentin.</p>	1	2	1	1



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Nr d/o	THEME	Number of hours			
		Cou rses	Semi -nars	Pract ice	Indi vidu al
	Examples of dental tissue. Factors influencing the adhesion (working surface, the adhesive nature, the material used for restorations, skills and a methods of use, depending on the producer).				
14	<p>Classification of dental adhesive systems. Definition. Advantages and disadvantages of different adhesive systems.</p> <p>Classification of adhesive systems in association with (generations, type of polymerization, quantity of stages of imposing, pH, restoration material requiring adhesion). III generation (definition of primer and adhesive). IV the generation, characterization, the procedure of etching, advantages and disadvantages. V generation characteristics, advantages and disadvantages. VI generation characteristics, advantages and disadvantages. VII generation characteristics, advantages and disadvantages.</p>	1	2	1	1
15	<p>Composite filling materials. General characteristics. Classification. Chemical curing composites.</p> <p>Definition of composite materials. Classification of composite materials by Lutz, Phillips and Willems. Organic monomers (BIS-GMA, UDMA, DGMA, TGDMA). Inorganic fillers. Silans, polymerizations initiators, stabilizers, colorants and pigments. Composite macro-filled sealing materials (classical and modern). Composite micro-filled sealing materials. Hybrid composite materials. Release form (powder-liquid, liquid-paste, paste-paste, paste in the syringe). Classification of composites by the method of polymerizations. Chemical curing composites. The technology of kneading.</p>	1	2	1	1
16	<p>Photopolymer composite filling materials. Properties.</p> <p>Composite filling materials photo polymerized under UV radiation. Composite filling materials photo polymerized under the influence of light (halogen lamp). The main parts of photo polymerization lamps (9 parts). Composite filling materials, photo polymerized under the influence of light (laser). Composite filling materials of dual curing. Biocompatibility (the reaction of pulp, microcracks, the irritation caused by the photo polymerization lamp, reaction of mucous of the gums). Water absorption and solubility. Destruction in the oral cavity. Color stability. Polymerization shrinkage. Mechanical properties (hardness, wear, hardness, fracture resistance, ductility, durability). Thermal properties.</p>	1	2	1	1
17	<p>Materials for root canal filling. Classification. The physico-chemical properties. Final.</p> <p>Materials for sealing the root canals. Classification. Temporary sealing materials based on calcium hydroxide. Indications for use. Properties. Release form. The materials for temporary sealing based on iodoform. Indications for use. Release form. The materials on the basis of paraformaldehyde. Indications for use. Their properties and form of release. Materials for permanent sealing. Their characteristics. Materials for permanent sealing based on glass-ionomer cement. Characteristics. Materials for permanent sealing based on material received from the gutta-percha. Characteristics. Materials for permanent sealing based on elastic</p>	1	2	1	2



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Nr d/o	THEME	Number of hours			
		Courses	Seminars	Practice	Individual
	resin. Characteristics. Materials for permanent sealing based on epoxy resins. Characteristics, properties. Primary solid materials for permanent sealing of canals. Gutta-percha pins. Their properties and form of release. Materials including antiseptic properties. Irrigation and intra canal treatment (irrigation solution, solutions and gels for lubricant and chemical expansion of root canals). Final test.				
	Total	17	34	17	22

VI. REFERENT OBJECTIVES AND CONTENT UNITES

Objectives	Content units
Biomaterials. Properties of metals and alloys used in dentistry. Acrylates. Ceramics. Practical application. Medico-biological requirements.	
<ul style="list-style-type: none"> ✓ know the role of biomaterials in dentistry; ✓ define biomaterials in dentistry, their properties; ✓ biocompatibility of dental materials; ✓ know metals and alloys used in dentistry; ✓ know the alloys for metal-ceramic works; ✓ know the classification of polymeric materials; ✓ know simple resins and the acrylic resins with thermal polymerization; ✓ know the concept of ceramic masses; ✓ know the classification of the ceramic masses; 	<p>The role of biomaterials in dentistry. Goals and objectives.</p> <p>Electrical, thermal, mechanical and optical properties.</p> <p>The types of research on biocompatibility (basic and secondary).</p> <p>Precious metals and alloys, their properties (melting point, density, hardness). Gold. Platinum. Non-precious alloys based on Co-Cr and Ni-Cr. Their properties.</p> <p>Iron-based, titanium and copper-based alloys.</p> <p>Metal-ceramic connection.</p> <p>The classification of acrylic resins according to the chemical structure and use.</p> <p>The release form of the ceramic masses. Their properties.</p> <p>The classification of ceramic masses depending on: the melting point, the number of layers and the purpose of use.</p>
Auxiliary materials. Wax. Tools for processing of hard dental tissues. Tools for processing and polishing. Materials for taking the impression and casting models. Methods of creating impressions and models. Materials for sealing cavities. Temporary filling materials.	
<ul style="list-style-type: none"> ✓ define dental wax, it's properties and composition; ✓ list and describe the release forms of dental wax for modeling; ✓ give the definition for "impression", classification of impressions, characteristic classification; ✓ know materials for taking the impression 	<p>Wax properties: fluidity, thermal dilatation, physical properties, etc. The requirements for dental wax.</p> <p>Base wax, molding (profile) wax, modeling wax for laying etc.</p> <p>The classification of the impressions depending on the method of taking the impression. The classification of impression materials based on</p>



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Objectives	Content units
<p>and casting models;</p> <ul style="list-style-type: none"> ✓ the concept of sealing the cavity and the basic characteristics of the filling materials; ✓ the concept of the temporary filling materials and the field of their use; ✓ the characteristic of artificial dentin, it's properties and chemical composition; ✓ list the properties of the temporary photo polymerization seals; 	<p>Gherner, Oksman, Napadov, și Postolachi Bârsa</p> <p>Properties of the impression materials and their use. The classification models in accordance with the method of use and preparation method.</p> <p>Equipment necessary for the models production.</p> <p>The basic characteristics of the sealing materials: adhesion, retraction, disintegration, hermetic marginal adhering of the seal, abrasion, tensile strength, coefficient of thermal expansion, viability, optimal blending texture.</p> <p>Temporary sealing materials are used for: control seals, fixing of the medical material, in cases when it is impossible to finish the treatment in one visit, as temporal fillings of the tooth, as insulating laying, temporary fixation of orthopedic constructions.</p> <p>Artificial dentin is easy to use, has good adhesion to the cavity, low mechanical resistance to the mechanic impact, easy to place and model.</p> <p>Temporary photo polymerization fillings are elastic, are easily removed, do not affect the adhesion and curing of the material for futher filling.</p>
<p>Materials for medical and insulating layings. Glass ionomer cements. Hybrid Glass-ionomer cements. Dental amalgams. Definition. Classification. Properties. Idications and contraindications for use. Advantages and disadvantages.</p>	
<ul style="list-style-type: none"> ✓ definition and classification of medical layings; ✓ to list and explain the purpose of use of the medical layings; ✓ to know the requirements and properties of insulating layings; ✓ to know the definition and chemical composition of glass-ionomer cement. The release form; ✓ to learn glass-ionomer cement classifications; ✓ to know the properties of glass-ionomer cement; ✓ to know and understand the mechanism of adhesion of glass-ionomer cement to the dental tissues; ✓ to explain the difference between glass-ionomer cement with the addition of metal particles and metal-ceramics (Cermet); ✓ to study the properties of glass ionomer 	<p>Materials for therapeutic layings are classified according to their chemical composition and method of polymerization.</p> <p>Stopping the inflammation process in the pulp, influencing the microflora, providing anesthetic action, the stimulation of the formation of substitutional dentin, normalization of metabolic processes in the pulp of a tooth.</p> <p>To requirements for insulating layings: not to be toxic, to be mechanically strong, to be impenetrable, to have low thermal conductivity, to have good adhesion, to be X-ray contrast, to have thermal expansion coefficient close to solid tissues.</p> <p>Glass-ionomer cement is presented as a two-component system of powder-liquid in bottles or as UNI-dose capsules, acid can be added to the powder or solution.</p> <p>Glass ionomer cement can be classified in 3 types: (I)-fixing, II-restorative III-lining.</p> <p>Glass-ionomer cement has a good chemical</p>



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<ul style="list-style-type: none"> ✓ cement with adding of metal particles; ✓ to know the definition of amalgams. Classification of amalgam; ✓ to know how to identify if the amalgam mass was prepared correctly; ✓ to know and explain the properties of mercury amalgam and it's release form; ✓ to know the working time of the amalgam; 	<p>adhesion, biocompatibility, shrinkage, mechanical strength, color and transparency options that correspond to the solid tooth tissues.</p> <p>has binding with mineralized tissues, binding with collagen, good conditioning with the tooth surface.</p> <p>Difference between cements in the chemical composition of powder.</p> <p>Has high abrasion resistance comparing to ionomer cements and has high X-ray contrast that can be compared to the amalgam X-ray contrast.</p> <p>Classification of amalgam by: the number of metals in composition, the content of copper in the silver alloy, silver sawdust.</p> <p>Test for the correct amalgam kneading.</p> <p>Mercury is the only metal that has liquid state in normal temperature conditions.</p> <p>Period when the amalgam retains its properties, necessary for sealing</p>
<p>Adhesive systems. General principles of adhesion. Classification of dental adhesive systems. Definition. General characteristics. Indications for use. Advantages and disadvantages. Composite filling materials. Chemical curing composites. Photopolymer curing composite filling materials. Root canals filling materials</p>	
<ul style="list-style-type: none"> ✓ to explain the definition of adhesion, and the technique of adhesion; ✓ to explain physical and chemical mechanisms of adhesion; ✓ to explain the difference between physical and chemical adhesion; ✓ to study factors that influence the adhesion. ✓ to explain the IIIrd generation of adhesive systems; ✓ define composite materials, classification of composite materials; ✓ to know the release form of hybrid composite materials; ✓ the main parts of the photo polymerization lamp; ✓ to know the purpose of the root channels sealing; ✓ to know the classification of the root channels sealing materials by consistency at the moment of placing; 	<p>The implementation of different adhesion techniques in practice</p> <p>Physical adhesion occurs at the expense of the micromechanical adhesion material with the tissues of the tooth. Chemical adhesion occurs at the expense of the formation of chemical bonding of adhesive with solid mineralized tissues of dentin and enamel.</p> <p>The main element that differs chemical adhesion from physical is the formation of chemical bondings with the emergence of conglomerates on both surfaces.</p> <p>The level of participation of the working surface in the process of adhesion depends on the nature of the adhesive, material used for restorations, method of use and on the manufacturer.</p> <p>Content and history, the definition of the primer and adhesive.</p> <p>Classification of composite materials by Lutz, Phillips and Willems.</p> <p>Powder-liquid, paste-liquid, paste-paste, paste in the syringe.</p> <p>List and describe the main parts of photo polymerization lamp.</p> <p>The purpose of root sealing, as well as the basic</p>



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Objectives	Content units
	requirements for filling material. Determining Sealer and Filler. The difference between them.

VII. PROFESSIONAL COMPETENCE (SPECIFIK (UK) ANF TRAVERSAL (TC)) AND THE RESULTS OF TRAINING.

Professional competence (specific) (SC)

SC1: Knowledge of basic groups of biomaterials used in different branches of dentistry. Knowledge of basic physical and chemical properties of different groups of biomaterials. General principles for the use of biomaterials. Knowing what properties are important for use in different areas of dentistry. Biocompatibility of the material with the tissues of the oral cavity.

SC2: For manufacturing of fixed and removable dentures. Knowledge of additional materials, which are not included in the construction of the denture, but necessary for its production. The materials used for fixing removable dentures temporarily and permanently. Materials required for direct and indirect restorations in the destruction of the crown part of the tooth.

SC3: The materials necessary for temporal root canal filling for impact on periapical focus of chronic infection and the regeneration of periapical bone tissue, as well as materials for permanent hermetic obturation of the whole gap of the root canal with its branches.

SC4: Permanent materials needed for the protection of the pulp from various toxic substances providing protection of dentin and pulp from thermal affection when amalgams are used. The use of adhesive systems for better fixation of restoration materials.

SC5: Knowledge of the compatibility of different materials, the ability to compensate for the shortcomings of one by combining several. Ability to mix materials for work. To know the order of their use. Indications and contraindications in each specific situation.

SC6: Ability to select the appropriate color of filling materials and orthopedic construction. Factors influencing the choice of colors when working with Vita scale

Transversal competence (TC):

TK1: Using professional standards of evaluation, respecting professional ethics, as well as legislation. The advance of logic, practice, evaluation and self-evaluation in decision-making related to the choice of treatment for patients

TK2: Performing actions and specific role playing in the team work in the phantom class at the Department of propeudeutics dental disease named "P. Godoroja." The promotion of dialogue, cooperation, initiative, positive attitude and respect for others, sympathy, altruism and continuing work on a personal and professional development.

TK3: Systematic verification of knowledge and skills, personal role and personal expectations, self-evaluation of knowledge and professional skills, efficient use of linguistic abilities, expertise in information technology, the use of skills in research and communication in view of providing quality services and adapt to the dynamic development of political demands in health and for personal and professional growth.

Learning Outcomes.

At the end of this discipline, the student should:

- know the basic principles, the structure of biomaterials used in different areas of dentistry;



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- know the basic properties of materials to improve the skills of the correct selection of biomaterials in each specific case;
- know that biomaterials first of all should be compatible with tissues of the oral cavity, Hypo-allergenic, and not be carcinogenic or toxic;

VIII. INDEPEND WORK OF STUDENT

Nr.	Theme plan	Implementation strategies	Criteria for evaluation	Period of execution
1	Working with information sources	Reading a course or an appropriate topic from the textbook. Discussion of the topic. Knowledge and selection of additional sources of information on the topic. Attentive reading of the text and a description of the key points. Formulation of general conclusions related to the importance of the topic.	Ability to highlight the main points. Interpretative abilities. Ability to analyze and explain information obtained independently.	Throughout the semester
2.	Assesment of basic knowledge on biomaterials Each student makes a table in which he fills the name of the biomaterials, the chemical composition, positive and negative properties, indications and contraindications to this material the technique of mixing the material			
3.	Practical work	The student mixes different materials depending on the subject of the seminar.	Evaluating properly the mixed material according to the proportion taken for mixing and the consistency of the material.	Throughout the semester

IX. METHODOCAL PROPOSALS FOR TEACHING-LEARNING-ASSESSMENT

✓ Using teaching and learning methods

During teaching this discipline were used different methods to effective understanding and achieving the goals of the training process. Discipline includes teaching courses, seminars, practical work and independent work. This course is conducted on the 1st semester of the first year. During practical work are used the following forms of preparation: independent, brainstorming, group discussion. For the preparation of courses are used the books that are available in the University Library, methodological suggestions of employees, as well as sources of information in electronic format (domestic and international professional websites). Students receive individual tasks, which, later, are subject to group discussion and evaluation of the quality of work performed. For a better assimilation of information and work in groups (team building), throughout the semester, students are evaluated orally and in writing.



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Methods of study include: exploring the information obtained during theoretical courses and information from the textbooks;

Strategies / technologies used in teaching (relating to discipline).

Direct contact, individual, brainstorming, group discussions, comparative analysis.

Evaluation methods (with an explanation of the method for calculating the final mark)

Current: Checking during seminars and practical work, 4 tests in writing and/or the final test. Individual work performed during the semester is assessed and put together with control works. At the end of the semester, based on evaluations received, the annual average is displayed.

Final: The course finalizes with a differentiated colloquy consisting of a oral interview according to the tickets. The final weighted grade, is calculated based on the two positive grades from the totalizers (≥ 5) grades of the annual average, calculated at the end of the discipline study - 50% and the oral interview - 50%. The average annual grade and the grade of the oral interview - are expressed in numbers according to the grading scale (according to the table), and the final grade obtained is expressed in a number with two decimal, which will be entered in the grade card.

The methodology of rounding of estimates evaluation phases

Scale of intermediate assessments (average annual, grades at the exam stages)	National Assessment System	Equivalent ECTS
1,00-3,00	2	F
3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,00	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B
8,51-8,00	9	
9,01-9,50	9,5	A
9,51-10,0	10	

Note: Absence in the exam without any obvious reasons is marked by a pass and is estimated by the number "0". The student has the right to 2 retakes.



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X. RECOMMENDED LITERATURE:

A. Obligatory:

1. Note de curs.
2. Nicolau G., Terehov A., Năstase C., Nicolaiciuc V. Odontologie practică modernă. Iași, 2010, 448 p.
3. Mount G.J., Hume W.R. Conservarea și restaurarea structurilor dentare. București, 1999, 272 p.
4. Boș A., Szekely M., Molnar-Varlam C. Tehnici adezive moderne în medicina dentară. Târgul- Mureș, 2015, 104 p.
5. Manolea H. O. Materiale Dentare. Note de curs pentru studenții Facultății de Medicină Dentară. Craiova, 2001, 186 p.

B. Supplementary:

1. Piescu A., Gafar M. Cariologie și odontoterapie restauratoare. București, 2006, 494 p.
2. McCabe J. F., Angus W.G.Walls. Applied Dental Materials. Singapore, 2008, 303 p.
3. Bonsor S. J., Pearson G. J. Applied Dental Materials. Livingstone, 2013, 454 p.
4. Николау Г.Ю., Терехов А.Б., Настасе К.И. Основы практической Карлесологии. Кишинэу, 2008, 176 стр.
5. Копейкин В.Н., Демнер Л.М. Зубопротезная техника, Москва, 2003. 400 стр.