

Master's Degree in Dentistry and Dental Prosthetics 2023/2024

Integrated course: Dental materials and prosthetic technologies

Scientific Disciplinary Sector: MED/28

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Number of University Educational Credits (CFU): 17

Module: Dental Materials

Scientific Disciplinary Sector: MED/28

Number of University Educational Credits (CFU): 4

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Module: Prosthetic and Laboratory Technologies

Scientific Disciplinary Sector: MED/28

Number of University Educational Credits (CFU): 5

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Module: Professional Training Activities

Scientific Disciplinary Sector: MED/28

Number of University Educational Credits (CFU): 8

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PREREQUISITES

It is a fundamental requirement that students have acquired basic knowledge of biology, physics, biochemistry and chemistry. There are no prerequisites for the teaching of Dental Materials and Prosthetic and Laboratory Technologies.

LEARNING OBJECTIVES

The purpose of the course is to provide the student with the basic knowledge of dental materials in chemical, physical and biological terms, to know the manufacturing procedures, indications for use, the constituent components of the individual dental materials, their use in Dentistry and in Dental Technology and to orientate in the choice of materials in relation to the optimal clinical and laboratory use. Furthermore, the purpose of the course is to acquire knowledge of prosthetic and laboratory technologies, validated by correct dental practice, at the basis of the production procedures of custom-made devices and made with indirect methods and aimed at prophylaxis, restoration, prosthesis.

LEARNING OUTCOMES

The course has the general objective of providing the student with a basic training on materials, capable of synergistically combining scientific aspects with technological aspects, providing guidelines for the translation of basic knowledge into tools that can be exploited in the choice and use of materials /implantable devices. Furthermore, the teaching has the general objective of

providing the student with a basic training on prosthetic technologies in their possibilities and limits as well as the correct use of the materials available in order to make it possible for the professional to objectively evaluate the artifacts produced in the laboratory dental technician and correct application. The professional fields of activity of the dental technician and the correct collaboration relationships with the dentist must also be clear.

Knowledge and understanding

- At the end of the course, the student will have to demonstrate:
 - Knowledge and understanding of Dental Materials such as:
 - physical, chemical and biological properties; componenti che costituiscono i singoli materiali;
 - correct indications of use and clinical use;
 - dental procedures of their use;
 - industrial manufacturing procedures;
 - indications in the handling and use of biomaterials;
 - protection systems in relation to the use of materials (PPE) and disinfection methods.
- Acquisition of the guiding concepts useful for quickly orienting oneself in the choice of materials and biomaterials among the enormous number of products and technologies available in the dental field in order to choose the best performing materials for clinical use.
- Acquire sufficient knowledge of biomaterials for dental use to rationally elaborate selection criteria in procedures for the prevention and therapy of pathologies and for morpho-functional restoration in the pertinent odontostomatological area.
- Acquire knowledge of prosthetic and laboratory technologies, validated by correct dental practice, at the basis of the production procedures of custom-made devices and made with indirect methods and aimed at prophylaxis, restoration, prosthesis or use in the orthodontic field.
- Knowledge and skills, regarding prosthetic and laboratory technologies, such as:
 - it is necessary to know how to proceed with the development of the impressions;
 - know how to assemble the models in the articulator;
 - knowing how to use self- and light-curing resins;
 - correct indications of use and clinical use.
- Knowledge of digital flow and CAD-CAM technologies to improve the design and manufacturing of dental rehabilitations.
- Understanding of the clinical aspects of dental occlusion, masticatory function and the pathophysiology of the stomatognathic system.
- Basic knowledge on the functions of the masticatory system: Horizontal intermaxillary relationships; Vertical intermaxillary relationships. Curves and occlusal planes.
- Knowledge of the procedures for manufacturing medical devices in compliance with current legislation.

- Knowledge of the correlations between limits and advantages of digital methods complementary to the dental profession.
- Knowledge of the main research methods and the tools most used in the science of materials for dental use.

Applying knowledge and understanding

Students must develop analytical methodological skills. They must know the principles of evidence based medicine, put them in relation to each specific clinical situation. To this end, they will have to develop the capacity for continuous updating and research through the major in-depth Web systems.

Communication skills

Students must have learned an adequate technical-scientific language; they will also have to develop communication skills with the patient starting from the collection of the anamnesis up to the communication of the diagnosis and relative prognosis and therapy.

Making judgements

- Recognize the importance of a thorough knowledge of the subjects consistent with adequate dental education.
- Identify the importance of theoretical knowledge of the subject for the dental profession.

Learning skills

At the end of the course each student will have knowledge of all the dental materials used in modern dentistry. He will be able to recognize their particular indications of use and choose between the different chemical, physical and biological properties that these materials present. Based on the properties of the materials, the student will be able to critically consider their clinical impact and will be able to predict their therapeutic success over time.

COURSE SYLLABUS

Dental Materials

COURSE PRESENTATION (aims, objectives and goals)

- Properties and biocompatibility of dental materials

IMPRESSION MATERIALS

- Impression materials
- Classification of impression materials (Alginate, Silicone, Hydrocolloid)
- Wax
- Pouring of the plaster impression - Materials for prevention and whitening

MATERIALS FOR PREVENTION AND DENTAL WHITENING

- Material products and molecules for prevention for the treatment of hard tissue (so enamel: prevention of caries, whitening, erosion, dentin: sensitivity)
- Molecules for the treatment of soft tissues (therefore Chlorhexidine and other active ingredients)

MATERIALS FOR PROSTHETIC THERAPY

- Materials commonly used in the creation and finalization of a fixed and mobile prosthetic rehabilitation
- Materials in Implantology

ADVANCED IMPRESSION TECHNOLOGIES

- Intraoral scanning and digital workflows

MATERIALS FOR CONSERVATIVE THERAPY

- Principles of enamel-dentine adhesion and chemical-physical characteristics of adhesives and composite materials and their polymerization
- Merchandise and physical, chemical and mechanical characteristics of the latest generation composites used in restorative and prosthetic treatments

MATERIALS FOR ENDODONTIC THERAPY

- Merchandise and physical, chemical and mechanical characteristics of the products used in orthograde and retrograde endodontic treatments

MATERIALS FOR ORTHODONTIC THERAPY

- Macro and microstructure analysis of the orthodontic material
- How an orthodontic material factory is born

MATERIALS FOR IMPLANT THERAPY

- Macro and microstructure analysis of the implant material and interaction of the materials that compose it with the bone tissue

DIGITAL SCANNING

LASER AND LASER ASSISTED DENTISTRY

Prosthetic and Laboratory Technologies

- Prosthetic and Laboratory Technologies Module
- Models: removable abutments, model trays, plinths.
- Colorimetric recordings and color scales.
- Interocclusal registrations.
- Preparation of models in fixed, removable and combined prostheses.
- The duplication of models.
- Set-up and diagnostic wax-ups.
- Individual impression trays.
- Fixed digital prosthesis
- Intra and extra oral digital scans
- Models in augmented reality (integration of scans with CBTC DICOM files)
- Chairside and laboratory CAD/CAM systems
- Laser melting and laser sintering
- 3D printers
- Limits and advantages of digital systems

- Prosthesis on implants
- Transfer, analog, scan abutment
- Digital guided implantology
- Overdenture: laboratory procedures
- Surgical templates: laboratory procedures
- Total prosthesis
- Development of the definitive model
- Creation of the bases of the occlusal valleys
- Choice of teeth: shape, color and size
- Assembly of the teeth
- Finishing and polishing of the prosthesis
- Total digital prosthesis
- Removable partial denture
- Components of a skeleton
- Assembly of the teeth
- Digital removable partial denture
- Criteria for choosing and manipulating materials for CAD/CAM
- Fixed Prosthesis: devices made using alloys, devices made exclusively of materials of a resinous nature and devices made solely of material of a ceramic nature.
- Teeth set-up and waxing. Muffle. Resin finish.
- Partial removable prosthesis: the solidification of the prosthesis to the dental situation and reinforcement structures of the base plates.
- Notes on implantological devices.

COURSE STRUCTURE

The teaching includes:

- 90 hours of lectures during which the concepts necessary for knowledge of the subject will be provided
- 100 hours of practical exercises in the manikin classroom in which the students will have the opportunity to assist and subsequently, under the supervision of the tutors, to directly use the dental materials,
- 100 hours of laboratory lessons at affiliated facilities in which students will acquire knowledge of the dental materials used in the various dental disciplines by displaying their use in the laboratory in detail.

COURSE GRADE DETERMINATION

The exam program coincides with the teaching programme. The vote will be expressed in thirtieths. The verification of learning takes place through a written and oral exam.

The written test consists of about 30 multiple choice questions. Each correct answer corresponds to a score of +1, each wrong answer corresponds to a score of -0.5 and each missing answer

corresponds to 0. The oral exam is accessed if 60% of the questions are answered correctly (18 questions).

The written test lasts 60 minutes.

If the grade of the written exam is 25/30, the student can decide to keep the grade or take the oral exam; for votes, in the written exam, lower than 25/30, the oral exam must be taken.

Each exam is aimed at verifying the degree of knowledge of the notions of the subjects being studied and the ability to relate and interpret the acquired concepts. In particular, the written test aims to verify the level of knowledge of both basic and more in-depth notions and the ability to logically connect the concepts. The oral test is aimed at verifying what the student demonstrated in the previous test, as well as ascertaining his ability to understand and explain concepts with language properties.

Overall, the exam will be evaluated according to the following criteria:

Unsuitable: Poor or lacking knowledge and understanding of the topics; limited capacity for analysis and synthesis, frequent generalizations of the required contents; inability to use technical language.

18-20: Just enough knowledge and understanding of topics, with obvious imperfections; just sufficient capacity for analysis, synthesis and independent judgement; poor ability to use technical language.

21-23: Sufficient knowledge and understanding of topics; sufficient capacity for analysis and synthesis with the ability to logically and coherently argue the required contents; sufficient ability to use technical language.

24-26: Fair knowledge and understanding of the topics; discrete capacity for analysis and synthesis with the ability to rigorously argue the required contents; Good ability to use technical language.

27-29: Good knowledge and understanding of required content; good capacity for analysis and synthesis with the ability to rigorously argue the required contents; good ability to use technical language.

30-30L: Excellent level of knowledge and understanding of the requested contents with an excellent capacity for analysis and synthesis with the ability to argue the requested contents in a rigorous, innovative and original way; Excellent ability to use technical language.

RECOMMENDED TEXTS AND BIBLIOGRAPHY

- **“Odontostomatological Materials and Technologies” – 2019** Author: Professors of Dental Materials and Prosthetic and Laboratory Technologies of Italian Universities. Curator: Giuseppe Spoto. Publisher: Ariesdue
- **“Science of Dental Materials” – 2018** Author: Francesco Simionato. Publisher: Piccin