

**DLT 114**  
**DENTAL MATERIALS**

**COURSE DESCRIPTION:**

Prerequisites: Enrollment in the Dental Laboratory Technology program

Corequisites:

This course provides a study of the composition, properties, and uses of non-metal materials as well as the physical and mechanical properties of metal alloys. Topics include gypsums, waxes, acrylics, metals, and policies related to health, safety, and infection control. Upon completion, students should be able to identify gypsums, waxes, acrylics, and metal materials and know the proper procedures for health, safety, and infection control. Course Hours Per Week: Class, 1. Lab, 6. Semester Hours Credit, 3.

**LEARNING OUTCOMES:**

The student will:

- a. Practice proper infection control procedures.
- b. Adhere to all institutional health and safety policies.
- c. Identify the various gypsum products, describe their physical and chemical reactions, and demonstrate their proper usage.
- d. Identify the various impression materials, describe their physical application, and demonstrate their proper usage.
- e. Identify the various dental waxes, describe their physical application, and demonstrate their proper usage.
- f. Describe the purpose for separating materials and demonstrate their proper usage.
- g. Describe the various types of acrylic resins, their physical and chemical properties, and demonstrate their proper usage.
- h. Describe the various dental burs and abrasives, and demonstrate their proper usage.
- i. Utilize all equipment needed to meet the course objectives observing all safety precautions.
- j. Use appropriate terminology with respect to dental materials.
- k. Strive to complete all laboratory projects as scheduled.
- l. Identify alloys used in dentistry.
- m. Define metal structures.
- n. Identify precious metal casting alloys.
- o. Identify precious wrought alloys.
- p. Identify base metal casting alloys.
- q. Identify base metal wrought alloys.
- r. Define dental solders.
- s. Identify dental casting investments.
- t. Identify dental soldering investments.

- u. Define flux.
- v. Describe soldering and welding.
- w. Explain combustion, burners, and blow pipes.
- x. Troubleshoot casting defects.
- y. Fabricate impressions utilizing alginate, rubber base and hydrocolloid impression materials.
- z. Pour and trim master casts form alginate, rubber base and hydrocolloid impressions.
- aa. Fabricate stabilized base plates.
- bb. Fabricate vacuum formed custom impression trays.
- cc. Fabricate a clear acrylic denture base.
- dd. Fabricate a denture base repair.

## OUTLINE OF INSTRUCTION:

- I. Overview of institutional policies
  - A. Emergency management
  - B. Hazard control communication
  - C. Reference: handouts/institution policies
  
- II. Introduction to the science of dental materials
  - A. One hour classroom lecture
    - 1) Presentation
      - (a) Historical background
      - (b) ADA specifications
      - (c) Federal regulations and standards
      - (d) Dental laboratory technology
      - (e) Introduction to infection control in the dental laboratory
      - (f) Terminology
    - 2) Application
  - B. References
    - 1) Laboratory and Clinical Dental Materials, pages 3-9
    - 2) Science of Dental Materials, chapter 1
    - 3) Dental Laboratory Technology, AFM, Volume I, glossary, pages 185-205
    - 4) Infection Control In The Dental Laboratory – RR Runnels
    - 5) NADL – Infection Control Program
  
- III. Gypsum products: chemistry of setting, I
  - A. One hour classroom lecture
    - 1) Presentation
      - (a) Gypsum identification
      - (b) Dental plaster and stone
      - (c) Setting reactions of gypsum products
      - (d) Water/powder ratio
      - (e) Setting time

- (f) Calcining and reversal reactions
    - 2) Application
  - B. One hour laboratory demonstration--lab exercise #1A
    - 1) Measuring the water and powder (plaster)
    - 2) Mixing technique
    - 3) Using the Gilmore needles
    - 4) Determining setting times for B-hemihydrate
  - C. References
    - 1) Laboratory and Clinical Dental Materials, pages 56-71
    - 2) Dental Laboratory Technology, AFM, Volume I, Chapter 3, pages 18-24
- IV. Structure of metals, I
- A. Presentation
    - 1) Crystallization
    - 2) Grain size
    - 3) Crystal structure
    - 4) Phase diagrams
  - B. Application
  - C. References
    - 1) Laboratory and Clinical Dental Materials, UNC, pages 115-122
    - 2) Dental Laboratory Technology, USAF, pages 36-39
- V. Gypsum products: chemistry of setting, II
- A. One hour classroom lecture
    - 1) Presentation
      - (a) Setting expansion
      - (b) Control of setting expansion
      - (c) Accelerators and retarders
      - (d) Hygroscopic setting expansion
      - (e) Strength
    - 2) Application
  - B. One hour laboratory demonstration--lab exercise #1B & 1C
    - 1) Measuring and mixing technique for hydrocal
    - 2) Using chemical modifiers
    - 3) Determining the effects of chemical modifiers on a-hemihydrate
  - C. References
    - 1) Laboratory and Clinical Dental Materials, pages 56-71
    - 2) Dental Laboratory Technology, AFM, Volume I, Chapter 3, pages 18-24
- VI. Gypsum products: technical considerations
- A. One hour classroom lecture
    - 1) Presentation
      - (a) Classification of dental stone

- (b) Model and die materials
    - (c) Dies
    - (d) Technique
  - 2) Application
- B. One-half hour laboratory demonstration--lab exercise #1D
- C. References
  - 1) Laboratory and Clinical Dental Materials, pages 69-78
  - 2) Dental Laboratory Technology, AFM, Volume I, Chapter 3, pages 18-24

VII. Impression materials, I

- A. One hour classroom lecture
  - 1) Presentation
    - (a) Characteristics
    - (b) Types and uses
    - (c) Alginate technique
  - 2) Application
- B. One hour laboratory demonstration -- lab exercise #2
  - 1) Proportioning
  - 2) Mixing
  - 3) Making an impression of a cast
  - 4) Pouring the stone cast
  - 5) Trimming the stone cast
- C. References:
  - 1) Laboratory and Clinical Dental Materials, pages 38-56
  - 2) Dental Laboratory Technology, AFM, Volume I, Chapter 3, pages 26-31

VIII. Structure of metals, II

- A. Presentation
  - 1) Properties of metal
  - 2) Mechanical working
  - 3) Deformation of metal
  - 4) Methods of testing
- B. Application
- C. Reference
  - 1) Laboratory and Clinical Dental Materials, UNC, pages 122-125

IX. Impression materials, II

- A. One-half hour classroom lecture
  - 1) Presentation
    - (a) Agar base
    - (b) Compounds
  - 2) Application
- B. One hour laboratory demonstration--lab exercise #3
  - 1) Liquefaction/gelation

- 2) Duplicating technique
- 3) Care of the agar

C. References:

- 1) Laboratory and Clinical Dental Materials, pages 38-56
- 2) Dental Laboratory Technology, AFM, Volume I, Chapter 3, pages 26-31

X. Waxes, separating materials, and debubblizers

A. One hour classroom lecture

- 1) Presentation
  - (a) Waxes
    - (1) Origins
    - (2) Common Properties
    - (3) Types of dental waxes
    - (4) Properties effected by technique
  - (b) Separating materials
    - (1) Uses
    - (2) Types
  - (c) Debubblizers

2) Application

B. Two hour laboratory demonstration - lab exercise #4

- 1) Forming the wax pattern for a clear acrylic denture base
- 2) Flasking the wax pattern

C. References:

- 1) Laboratory and Clinical Dental Materials, pages 79-87
- 2) Removable Prosthodontic Techniques, pages 87-90
- 3) Dental Laboratory Technology, AFM, Volume I, Chapter 3, pages

- B. Application
- C. References:
  - 1) Laboratory and Clinical Dental Materials, UNC, pages 115-141
  - 2) Dental Laboratory Technology, USAF, pages 36-47

XII. Denture base acrylic resin: basic technique

- A. One hour classroom lecture
  - 1) Presentation
    - (a) Introduction
    - (b) Composition
    - (c) General technique for handling the resin
      - (1) Cleanliness
      - (2) Mixing the resin
      - (3) Physical reactions
      - (4) Packing the mold
    - (d) Processing the resin
    - (e) Deflasking and recovery
  - 2) Application
- B. Two hours laboratory demonstration - lab exercise #4 (continued)
  - 1) Boil-out procedures
  - 2) Applying separating media (tin foil and liquid)
  - 3) Mixing the acrylic resin
  - 4) Packing the resin (compression molding)
  - 5) Processing
  - 6) Deflasking and recovery
  - 7) Finishing and polishing
  - 8) Removing polishing materials
- C. References:
  - 1) Laboratory and Clinical Dental Materials, pages 88-114
  - 2) Removable Prosthodontic Techniques, pages 91-97, 106-109
  - 3) 5 Td(ooP0aI)6.2(ontiologyterials)TjEMC 293.1 148.88 182.64 0.6 refBT/P 70MC



B.



2) Dental Laboratory Technology, USAF, pages 23-24

XIX. Final impressions

A. One hour classroom lecture

1) Presentation

(a) Impression plaster

(1) Rigid when set

(2) Uses

(a) Edentulous patients

(b) Matrices

(3) Low strength

(4) Generates considerable heat on setting

(5) Composition

(a) Plaster of Paris

(b) Starch

(6) Separating medium required

(7) Dissolves in boiling water

(b) Metallic oxide impression paste; ZOE

(1) Rigid when set

(2) Two paste system

(a)

- B. Two hours of laboratory demonstration - lab exercises #6 and #7
  - 1) Prepare casts for impressions
  - 2) Using casts for impressions
  - 3) Trimming the tray material
  - 4) Mixing the impression material
  - 5) Making the impression
- C. References:
  - 1) Laboratory and Clinical Dental Materials, pages 39-43, 53-56
  - 2) Removable Prosthodontic Techniques, pages 16, 17
  - 3) Dental Laboratory Technology, AFM, Volume I, Chapter 3, page 28

XX. Dental amalgam

- A. Presentation
  - 1) Description of amalgam
  - 2) Composition
  - 3) Amalgamation
  - 4) Trituration
  - 5) Condensation
- B. Application
- C. References
  - 1) Laboratory and Clinical Dental Materials, UNC, pages 191-198
  - 2) Dental Laboratory Technology, USAF, page 47

XXI. Master casts

- A. One-half hour classroom lecture
  - 1) Presentation
    - (a) Description
    - (b) Infection control factors
    - (c) Need for accuracy
    - (d) Handling the cast
    - (e) How related to the final impression
    - (f) Poured in stone
    - (g) Techniques for making master casts
      - (1) Beading and boxing the impression
      - (2) Inverting the impression
      - (3) Pouring without boxing or inverting
    - (h) Trimming the casts
      - (1) Base thickness
      - (2) Border dimensions
      - (3) Land areas
      - (4) Model trimmer safety
      - (5) Keying casts
  - 2) Application
- B. One hour laboratory demonstration - lab exercise #8
  - 1) Beading, boxing and pouring impression

- 2) Trimming the casts
- 3) Model trimmer safety
- 4) Keying casts
- C. References: Removable Prosthodontic Techniques, pages 23-31

XXII. Soldering and welding

- A. Presentation
  - 1) Description of soldering
  - 2) Fluxes
  - 3) Anti-fluxes
  - 4) General objectives
  - 5) Investment soldering
  - 6) Electric soldering
  - 7) Heat treatment
  - 8) Defects
  - 9) Description of welding
- B. Application
- C. References
  - 1) Laboratory and Clinical Dental Materials, UNC, pages 162-167
  - 2) Dental Laboratory Technology, USAF, pages 44 and 49

XXIII. Practical applications for autopolymerizing acrylic resin

- A. One-half hour classroom lecture
  - 1) Presentation
    - (a) Assembling broken denture segments
    - (b) Reinforcing
    - (c) Pouring and preparing the cast
    - (d) Preparing the broken segments
    - (e) Reassembling the segments on the cast
    - (f) Various techniques for applying resin
    - (g) Curing
    - (h) Finishing and polishing
    - (i) Removing the polishing materials
  - 2) Application
- B. One hour laboratory demonstration - lab exercise #9
  - 1) Assembling and reinforcing broken denture segments
  - 2) Pouring and preparing the cast
  - 3) Rabbeting
  - 4) Applying resin
  - 5) Curing the resin
  - 6) Finishing and polishing
  - 7) Removing the polishing materials
- C. Reference
  - 1) Removable Prosthodontic Techniques, pages 130-133



16. Skinner's Science of Dental Materials, 1973

B. Periodicals:

1. "Journal of Prosthetic Dentistry"
2. "Quintessence of Dental Technology"
3. Journal of Dental Technology
4. Practical Periodontics & Aesthetic Dentistry

**STATEMENT FOR STUDENTS WITH DISABILITIES:**

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