

Course Code: DHG 212**Course Title:** Dental Materials**Department:** Allied Health**Effective Date:** Summer 2026**PCS Code:** 1.2 - Occupational/Technical Instruction**CIP Code:** 51.0601**Repeatability:** 0

Credit Hours

Catalog Notation: 2-4-3**Credit Hour Distribution:**

Lecture: 2

Lab: 4

Clinical: 0

Total: 3

General Course Information

Catalog Description

Study of materials utilized in dental office and laboratory. Infection control in the dental laboratory is emphasized.

General Course Objectives

Through lecture and lab/clinic practice, the student will provide knowledge in the science of dental materials including manipulating materials, properties of materials, reasons specific materials are selected, recognition of dental materials, and care for dental materials while applying infection control procedures.

Minimum Placement Levels

English	Reading	Math
Placement out of ENG 099	Placement out of CCS 099	None

Prerequisites

Credit in DHG 115, DHG 116, DHG 117, DHG 118, and DHG 119

Credit or concurrent enrollment in BIO 123 and COM 103

Admission into the Dental Hygiene program

Methods of Evaluation

6-8 quizzes; 1-3 exams, including a comprehensive final; 5-7 practice quizzes and exams; 10-12 assignments; 1 presentation; and 5-7 pass/fail evaluations.

Instructional Materials and Additional Supplies

Dental Materials: Clinical Applications for Dental Assistants and Dental Hygienists by Eakle, Bastin, and Wilkins

Clinical Practice of the Dental Hygienist by Boyde and Mallonee

Course Content

General Learning Outcomes (GLOs)

- Communication: Students will demonstrate the ability to read, write, listen, and speak effectively.
- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.
- Technology: Students will demonstrate the ability to evaluate, select, and appropriately use current and emerging tools.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Introduction to Dental Materials	1. Discuss the importance of the study of dental materials for the allied oral health practitioner. 2. Discuss why it is necessary that the allied oral health practitioner have an understanding of dental materials in the delivery of dental care. 3. Discuss evidence-based decision-making (EBDM) as it relates to dental materials; what questions might you ask yourself or your practice to make sure you are increasing the potential for successful patient care outcomes? 4. Review the historical development of dental materials. 5. List and compare the agencies responsible for setting standards and specifications of dental materials. 6. Discuss the requirements necessary for a consumer product to qualify for the ADA Seal of Acceptance. 7. Review, summarize, and present information from an evidence-based article on a dental material of your choice.	2.5	0	0
Preventive and Desensitizing Materials	1. Describe the applications of fluoride in prevention. 2. Explain how fluoride protects teeth from caries. 3. Discuss the various methods of fluoride delivery. 4. Explain the benefit of using an antibacterial rinse in conjunction with fluoride. 5. Describe the antibacterial effects of chlorhexidine. 6. Apply topical fluoride gel, foam, varnish, or silver diamine fluoride correctly (as permitted by state law). 7. Describe how sealants protect pits and fissures from dental caries. 8. List the components of sealant material. 9. Recite the steps for applying sealants. 10. Apply sealants to teeth (as permitted by state law). 11. Recite causes of tooth sensitivity. 12. Explain how desensitizing agents work. 13. List the types of materials used to treat sensitive teeth. 14. Calibrate and apply desensitizing agents to sensitive teeth (as permitted by state law). 15. Explain the process of remineralization of enamel. 16. Describe how products for remineralization work. 17. Explain how resin infiltration of the early white spot lesion works. 18. Calibrate and apply remineralizing products (as permitted by state law).	1.5	12	0

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Physical and Mechanical Properties of Dental Materials	1. Define primary and secondary bonds and give an example of how each determines the properties of the material. 2. Describe the three forms of matter and give a defining characteristic of each. 3. Define density and explain the relationship of density, volume, and crystalline structure. 4. Define hardness and describe how hardness contributes to abrasion resistance. 5. Define elasticity and give an example of when elasticity is desirable in dental procedures. 6. Relate stiffness and proportional limit and describe how these properties apply to restorative dental materials. 7. Define ductility and malleability and explain how these characteristics contribute to the edge strength of a gold crown. 8. Differentiate between toughness and resilience. 9. Define brittleness and discuss how this property applies to restorative dental materials. 10. Define viscosity and thixotropy and describe the clinical significance of each. 11. Differentiate between therapeutic, preventive, and restorative materials. 12. List and describe the three main types of restorative dental materials. 13. Describe the reaction stages a material undergoes to acquire its final state. 14. Describe the variables in the manipulation of a material.	1.5	0	0
General Handling and Safety of Dental Materials in the Dental Office	1. Identify five job-related health and safety hazards for employees in dental offices, and explain the methods of prevention for each one. 2. Explain the components of the Occupational Safety and Health Administration Hazard Communication Standard. 3. Describe the ways that chemicals can enter the body. 4. Describe the employee and employer responsibility for safety training. 5. Describe the basic infection control methods for the handling of dental materials in the treatment area. 6. Identify the concepts and benefits of going green in the dental practice. 7. Discuss how the ADA Top Ten Initiatives of sustainability can be incorporated into a general dental practice.	1.5	2	0
Oral Environment and Patient Considerations	1. Discuss the qualities of the oral environment that make it challenging for long-term clinical performance of dental materials. 2. Describe the long-term clinical requirements of therapeutic and restorative materials. 3. List and give examples of the four types of biting forces and the tooth structures most ideally suited to them. 4. Define stress, strain, and ultimate strength and compare the ultimate strength of restorative materials during each type of stress to tooth structures. 5. Explain how moisture and acidity in the mouth can affect dental materials. 6. Explain how galvanism can occur in the mouth and how it can be prevented. 7. Discuss thermal conductivity and thermal expansion and contraction and compare the values of thermal expansion and conductivity of restorative materials with those of tooth structures. 8. Explain the mechanical and chemical adhesion, or bonding, work to retain restorations. 9. Describe the factors that determine successful adhesion, including wettability, viscosity, film thickness, and surface characteristics.	1.5	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Oral Environment and Patient Considerations (cont'd)	10. Describe microleakage and how it can lead to recurrent decay and postoperative sensitivity. 11. Define biocompatibility and discuss why requirements for biocompatibility may fluctuate. 12. Describe tooth color in terms of hue, value, and chroma. 13. Discuss the characteristics of oral biofilm and its role in the etiology of dental caries and periodontal disease. 14. Explain the importance of detection of restorations and methods for detection.			
Composites, Glass Ionomers and Compomers	1. Describe the various types of composite resin restorative materials. 2. Discuss the advantages and disadvantages of each type of composite resin. 3. Discuss the similarities and differences among chemical-cured, light-cured, and dual-cured composite resins. 4. Describe how fillers affect the properties of composites. 5. Explain why incremental placement of composite resin is recommended. 6. Describe the factors that determine how long an increment of composite resin should be light-cured. 7. Place a sectional matrix for a class II composite. 8. Select an appropriate type of composite for a class II cavity preparation. 9. As permitted by state law, place a composite in a class II cavity preparation. 10. Follow protocol to light-cure a composite resin restoration following recommended exposure times and use proper precautions for eye/retina protection. 11. As permitted by state law, finish and polish a class III composite restoration. 12. Discuss the procedural differences between direct and indirect composite restorations. 13. Describe the composition of glass ionomer restoratives and their uses, advantages, and disadvantages. 14. Explain the effects of fluoride-releasing, resin-modified glass ionomer restorations in the prevention of recurrent caries. 15. List the components of compomers. 16. Describe the uses of compomers. 17. Compare the clinical applications of composite resin restorative materials with glass ionomer cement restorative materials.	1.5	2	0
Dental Amalgam	1. List the main components in dental amalgam. 2. Describe the advantages of high-copper amalgams over low-copper amalgams. 3. Explain the role of the gamma-2 phase in corrosion of amalgam. 4. Describe the particle shapes in lathe-cut, admix, and spherical alloys, and discuss their effects on the condensation resistance of freshly mixed amalgam. 5. Define creep, corrosion, and tarnish. 6. Compare the strength of amalgam with that of composite resin or glass ionomer cement. 7. Discuss the effect of mixing time on the strength and manipulation of amalgam. 8. Discuss the advantages and disadvantages of amalgam as a restorative material. 9. Assemble a Tofflemire band in its retainer.	1.5	2	0

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Abrasion, Finishing, and Polishing	1. Define abrasion, finishing, polishing, and cleaning. 2. Discuss the purpose of finishing, polishing, and cleaning of dental restorations and tooth surfaces. 3. Identify and discuss the factors that affect the rate and efficiency of abrasion. 4. Compare the relative ranking of abrasives on restorations and tooth structures. 5. Describe methods by which dental abrasives are applied. 6. Discuss the contraindications to the use of abrasives on tooth structure and restorations. 7. Describe the clinical decisions made to determine which abrasive to use when finishing, polishing, or cleaning dental restorations or tooth structures. 8. Describe the abrasives and the procedures used for finishing and polishing metals, composite, and porcelain. 9. Describe the abrasives and the procedures used for polishing and cleaning metals, composite, ceramic, and gold alloys as part of oral prophylaxis. 10. Describe the safety and infection control precautions taken by the operator when using abrasives. 11. Relate the instructions given to patients to prevent and remove stain from tooth surfaces and restorations. 12. Demonstrate polishing a preexisting composite restoration.	1.5	2	0
Principles of Bonding	1. Discuss the effects of acid etching on enamel and dentin. 2. Describe the basic steps of bonding. 3. Explain the differences between bonding to enamel and bonding to dentin. 4. Discuss the significance of the smear layer. 5. Describe "wet" dentin bonding. 6. Compare total-etch and self-etch bonding techniques. 7. Explain how the hybrid layer is formed and its importance in bonding to dentin. 8. Explain how universal adhesives differ from etch-and-rinse and self-etch adhesives. 9. Discuss the factors that interfere with good bonding. 10. Discuss the adverse effects of microleakage at restoration margins. 11. Describe how to bond ceramic veneers. 12. Describe the bonding of orthodontic brackets. 13. Explain the differences in bonding to enamel, dentin, metal, and ceramic. 14. List the factors that contribute to tooth sensitivity after bonding. 15. Demonstrate etching enamel and dentin with phosphoric acid as permitted by state law. 16. Apply a bonding system to etched enamel and dentin as permitted by state law.	1.5	2	0
Dental Cement	1. Compare the various types of cements for: Pulpal protection, Luting, Restorations, Surgical dressing. 2. Describe the properties of cement and explain how these properties affect selection of cement for a dental procedure. 3. Identify the components of various dental cements. 4. Describe how the components of various dental cements affect the properties of the cement. 5. Compare the advantages and disadvantages of each cement. 6. Describe the manipulation considerations for mixing cements. 7. Describe the procedure for filling a crown with luting cement. 8. Describe the procedure for removing excess cement after cementation. 9. Demonstrate applying the mixing technique for each type of cement.	1.5	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Teeth Whitening Materials and Procedures	1. Describe how whitening materials penetrate the tooth. 2. Compare and contrast the whitening materials used for in-office, take home, and OTC home use. 3. Describe the precautions to take to protect the oral tissues when applying in-office power whitening products. 4. List the steps in the procedures for in-office power whitening. 5. List the potential side effects of in-office power whitening. 6. List the potential side effects of home whitening. 7. Describe the methods to whiten nonvital teeth. 8. Discuss the relative effectiveness of whitening products and whitening toothpastes in removing stains from teeth. 9. Demonstrate proper fabrication of home whitening trays. 10. Explain to a patient how home whitening products are used. 11. Identify clinic situations in which enamel microabrasion might be used. 12. Explain how enamel microabrasion works. 13. Describe the mechanism, safety, and efficacy of tooth bleaching agents. 14. Identify specific tooth conditions and staining responses to tooth bleaching. 15. Differentiate reversible and irreversible side effects associated with the tooth bleaching process. 16. Assess appropriate interventions for tooth bleaching side effects.	1.5	6	0
Impression Materials	1. Describe the purpose of an impression. 2. Describe the three basic types of impressions. 3. Explain the importance of the key properties of impression materials. 4. Explain why alginate is an irreversible hydrocolloid. 5. List the supplies needed to make an alginate impression and explain how they are used. 6. Select trays for alginate impressions for a patient. 7. Mix alginate, load and seat the tray, and remove the set impression. 8. Evaluate upper and lower alginate impressions, in accordance with the criteria for acceptability. 9. Disinfect alginate impressions and prepare them for transport to the office laboratory. 10. Alter approach after troubleshooting problems experienced with alginate impressions. 11. Compare similarities and differences among the physical properties of polyvinyl siloxane (PVS) and polyether impression materials. 12. Discuss the advantages and disadvantages of using polyether impression material for a crown impression. 13. Explain the difference between a hydrophobic and a hydrophilic impression material. 14. Evaluate cord placement and gingival retraction for acceptability. 15. Make a registration of a patient's bite in centric occlusion. 16. Assemble the cartridge of impression material with mixing tip and load into the dispenser. 17. Explain what a digital impression is and how it is used. 18. Describe the advantages and disadvantages of digital impressions.	1.5	10	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Dental Ceramics	1. Discuss the attributes and shortcomings of dental porcelains. 2. Compare the clinical applications of restorations made from porcelain with those made from lithium disilicate. 3. Explain why crowns made from zirconia can be used to restore molars. 4. Describe the methods used to process ceramic restorations. 5. Present a rationale for the selection of ceramic materials for restorations used in the anterior and posterior parts of the mouth. 6. Describe how porcelain bonds to metal for porcelain-fused-to-metal (PFM) crowns. 7. Select the appropriate cement for use with glass-based ceramic materials. 8. Describe common causes for failure of ceramic restorations. 9. Finish and polish ceramic restorations without generating too much heat or stress in the material. 10. Compare the relative strengths of feldspathic porcelain, lithium disilicate, and zirconium. 11. Explain how CAD/CAM technology is used to fabricate a ceramic crown. 12. List the clinical applications for all-ceramic restorations. 13. Follow procedures to properly prepare the conditions in the operator for shade taking. 14. Assist the dentist in shade taking. 15. Reflect on a dental lab visit and summarize the experience for peer review.	1.5	3	0
Gypsum and Wax Products	1. Differentiate between negative and positive reproduction. 2. Differentiate among diagnostic cast, working cast, and dies. 3. Describe the chemical and physical nature of gypsum products. 4. Explain the manufacturing process for gypsum products and how this affects their physical characteristics. 5. Compare the following properties and behaviors of gypsum products: strength, dimensional accuracy, solubility, and reproduction of detail. 6. List the American Dental Association-recognized gypsum products and their most appropriate uses. 7. Explain initial and final set of gypsum and the factors that affect the setting time, setting expansion, and strength. 8. Explain the procedure for mixing and handling gypsum products to create diagnostic casts. 9. Identify the common components of dental waxes. 10. Compare the properties of waxes. 11. Describe the clinical/laboratory significance of each of the properties of waxes. 12. Discuss the three classifications of waxes. 13. Differentiate between direct and indirect waxings and identify which property of dental waxes is most important in their difference. 14. Describe the usual color, form, and use of inlay, casting, baseplate, boxing, utility, and sticky waxes. 15. Prepare model plaster or stone for pouring. 16. Pour the anatomic portion of maxillary and mandibular diagnostic casts. 17. Trim maxillary and mandibular diagnostic casts. 18. Obtain a bite registration, using bite registration or utility wax.	1.5	6	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Polymers for Prosthetic Dentistry	1. Describe the formation of long-chain polymers from monomers. 2. Explain the effect that cross-linking has on the physical and mechanical properties of polymers. 3. Describe the stages of addition polymerization. 4. Explain the function of a free radical. 5. List the important properties of acrylic resins. 6. Describe the procedure for heat processing a denture. 7. Compare and contrast the properties of hard and soft lining materials. 8. List the indications for long- and short-term soft liners. 9. Compare the advantages and disadvantages of chairside and laboratory-processed hard liners. 10. Follow procedures to use an ultrasonic cleaner for cleaning complete and partial dentures in the office. 11. Educate patients regarding the home care regimen they should follow for complete and partial dentures. 12. Inform patients of the precautions they should take when cleaning their dentures.	1.5	6	0
Preventive and Corrective Oral Appliances	1. Describe the uses of mouth guards. 2. List the materials for the fabrication of mouth guards. 3. Explain to a patient how to care for a mouth guard. 4. Describe the fabrication of a sports mouth guard. 5. Describe what obstructive sleep apnea is. 6. Describe the use of oral appliances to prevent snoring or obstructive sleep apnea. 7. Explain how preventive orthodontics prevent or eliminate the need for full-orthodontics. 8. Identify how interceptive orthodontics correct malalignments of the dentition. 9. Describe how thermoplastic orthodontic aligners work. 10. Identify how 3-D printing is being utilized in dentistry.	1.5	0	0
Casting Metals, Solders, and Wrought Metal Alloys	1. Describe the differences among the types of gold alloy used for dental restorations. 2. Differentiate between high-noble, noble, and base-metal alloys. 3. Describe the properties needed for porcelain bonding alloys. 4. Describe the properties of metals used for casting partial denture frameworks. 5. Explain the biocompatibility problems associated with some alloys. 6. Explain how solders are used. 7. List metals used for solders. 8. Describe how wrought metal alloys differ from casting alloys. 9. Describe the uses of wrought wire. 10. Explain the use of the different types of metal wire for orthodontic arch wire. 11. Explain the purpose of an endodontic post. 12. Describe the types of materials used for preformed endodontic posts.	1.5	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Provisional Restorations	1. Explain the purpose of provisional coverage. 2. Describe examples of circumstances that may require provisional coverage. 3. Identify the criteria necessary for a high-quality provisional restoration. 4. Describe the properties of provisional materials. 5. Distinguish among properties that are important for coverage in the posterior, anterior, and both areas. 6. Distinguish between intracoronal and extracoronal restorations. 7. Summarize the advantages and disadvantages of preformed and custom crowns. 8. Differentiate among direct and indirect fabrication techniques. 9. Summarize the advantages and disadvantages of acrylic and composite resin provisional materials. 10. Describe the technique for fabrication of preformed metal and polycarbonate crowns, custom crowns, and intracoronal cement provisional restorations. 11. Summarize patient education and home care instructions.	1.5	1	0
Dental Implants	1. Describe the components of an implant used for a crown. 2. Describe the most common materials used for dental implants. 3. Explain osseointegration of an implant. 4. Discuss the indications and contraindications for dental implants. 5. Explain the advantages of image-guided implant surgery. 6. Identify risks to the patient for implant surgery. 7. Describe the sequence of the one-stage surgical procedure. 8. Describe postsurgical instructions. 9. Compare and contrast the one-stage, two-stage, and immediate surgical procedures. 10. Discuss the pros and cons of immediate loading of an implant. 11. Explain the process of taking an implant impression. 12. Compare and contrast the open-tray and closed-tray impression procedures. 13. Identify the uses for mini-implants. 14. Define the types of bone grafting. 15. Describe the purpose of the sinus lift procedure. 16. Identify when sutures would be utilized in a dental procedure. 17. List the different types of sutures. 18. Describe the types of needles used to place sutures. 19. Demonstrate the removal of sutures. 20. Describe the assessments that should be done for dental implants at the hygiene visit. 21. Demonstrate to a patient the use of home care aids for dental implants. 22. Explain the rationale for the selection of instruments for cleaning titanium implants. 23. Perform periodontal maintenance around an implant (hygienists) using appropriate probes, scalers, curettes, and ultrasonic tips. 24. Describe the concepts, technology, and terminology relevant to implant dentistry. 25. Develop a knowledge base related to osseointegration and ancillary procedures in oral implantology. 26. Comprehend patient selection factors and education essentials. 27. Understand maintenance of dental implant in the clinical setting. 28. Recognize and manage dental implant problems, complications, and failures.	1.5	4	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Sutures and Periodontal Dressings	1. State the functions and demonstrate the purposes of sutures and periodontal dressings. 2. Describe the differences between absorbable and non-absorbable sutures. 3. Describe the procedures for sutures removal. 4. Describe the procedures for periodontal dressing placement and periodontal dressing removal. 5. Explain approaches for managing biofilm with the periodontal dressing in place and upon removal.	0.5	2	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
30	64	0