Course Title – Dental Materials
Course Prefix and Number – DHYG 1319
Department – Dental Hygiene
Division – Allied Health
Course Type: (check one)
☐ Academic General Education Course (from ACGM – but not in WCJC Core)
☐ Academic WCJC Core Course
☒ WECM course (This course is a Special Topics or Unique Needs Course: Y ☐ or ☒)

Semester Credit Hours # : Lecture hours# : Lab/other hours #  3:2:2
Equated Pay hours for course - 3

Course Catalog Description - Study of dental materials including the physical and chemical properties and application of the various materials used in dentistry. Student experiences include manipulation of dental materials in the lab setting.

Prerequisites/Corequisites - DHYG 1339, 1304, 1261, 1227, and 1307 with a grade of C or better.

Approvals – the contents of this document have been reviewed and are found to be accurate.

Prepared by Brenda Bode
Department Head Leigh Ann Collins
Division Chair Leigh Ann Collins
Vice President Dr. Ty Pate

Signature
Signature
Signature

Date 9-11-07
Date
Date 9-26-07
I. Topical Outline – Each offering of this course must include the following topics (be sure to include information regarding lab, practicum, clinical or other non lecture instruction):

DHYG 1319 DENTAL MATERIALS

COURSE OUTLINE

I. Introduction
A. History of Dental Materials
B. ADA Evaluation Programs
1. Council on Dental Therapeutics
2. Council on Dental Materials, Instruments, and Equipment

II. Properties of Dental Materials
A. Physical Considerations
B. Biological Considerations
C. Terminology and Concepts
1. Dimensional Change: shrinkage or expansion
2. Coefficient of Thermal Expansion
3. Microleakage & Percolation
4. Thermal Conductivity
5. Galvanism
6. Corrosion & Tarnish
7. Absorption & Adsorption
8. Wettability, Hydrophilic, Hydrophobic
9. Biting Forces
10. Stress
   a) tensile, shear, compressive
11. Strain
12. Stress-Strain Curve = above equals deformation; below equals elasticity
13. Elastic Modulus = stiffness
   a) Elastic
   b) Plastic
14. Proportional Limit & Ultimate Strength
15. Ductility, Malleability, Resilience, Toughness
16. Hardness (Knoop, Rockwell, Moh’s, Vickers, Brinell)
17. Strain-Time (Viscoelastic strain & Viscous flow)
18. Dynamic Modulus & Dynamic Resilience
19. Flow & Creep
D. Application to Dentistry

III. Preventive Dental Materials
A. Fluoride Gels and Rinses
   1. Composition
      a) APF
      b) Neutral Sodium
      c) Stannous
   2. Properties
      a) thixotropic
      3. Manipulation
B. Pit and Fissure Sealants
   1. Indication
   2. Composition and Reaction
a) Bisphenol A-Glycidyl Methacrylate (BIS-GMA) or Urethane Dimethacrylate
b) Polymerized by light (one component system)
c) Polymerized by organic amine (two component system)
3. Properties
a) Mechanical bonding
b) Periodic re-evaluation for retention
c) Contraindications:
4. Manipulation
C. Mouth Protectors
1. Indications
2. Types and Composition
a) Stock
b) Mouth-formed
c) Custom-made
d) Thermoplastic polymers
   (1) Polyvinylacetate-polyethylene polymer
   (2) polyurethane
   (3) rubber latex
   (4) vinyl plastisol
3. Properties
a) Custom-made
b) Mouth-formed
5. Care
IV. Direct Esthetic Restorative Materials
A. Historical Perspective
B. Composite Restoratives
1. Composition and Reaction
a) Filler Size & Composition
b) Coupling Agents, Organic Matrix, Pigments
c) Initiators and Accelerators
2. Composite Systems
a) Two-Paste
b) Single-Paste
3. Properties
a) Polymerization Shrinkage
b) Thermal Conductivity
c) Water Sorption
d) Radiopacity
e) Compressive and Tensile Strength
f) Elastic Modulus
g) Hardness, Penetration Resistance, Wear
h) Bond Strength
4. Clinical Qualities
5. Manipulation
a) Two-paste system
b) Single-paste system
c) Bonding Agents
d) Restoration of incisals
e) Core build-up
f) Temporary bridge construction
g) Repair of porcelain or composite
C. Ionomer Restoratives
V. Dental Amalgams
A. Definition
B. Mercury
C. Silver Alloys
D. Amalgamation
E. Properties
1. Dimensional Change
2. Strength
3. Creep
4. Tarnish and Corrosion
F. Manipulation
1. Selection of product
2. Mixing Methods
3. Factors In Mixing
a) Trituration
b) Undermix, normal mix, overmix
4. Condensation
5. Finishing
G. Bonding Amalgam to Tooth Structure
VI. Finishing, Polishing, and Cleansing Materials
A. Definitions
B. Abrasion
1. Rate
2. Types
3. Finishing and Polishing Techniques
a) Gold alloy
b) Denture base
c) Composite restorative materials
d) Hybrid ionomers
C. Prophylactic Pastes
1. Composition
2. Properties
D. Dentifrices
1. Composition and role of ingredients
2. Selection of toothbrush and dentifrice
E. Denture Cleansers
1. Requirements
2. Types
3. Effectiveness
4. Recommended techniques and precautions
F. Bleaching
1. Composition
2. Properties
3. Techniques
VII. Cements
A. Definitions
B. Cementation Composition & Reaction, Properties, Manipulation
1. Zinc Phosphate Cement
2. Zinc Oxide-Eugenol Cements
3. Zinc Polycarboxylate Cements
4. Glass Ionomer Cements
5. Hybrid Ionomer Cement
6. Composite & Adhesive Resin Cements
7. Compomer Cement
C. High-Strength Bases
1. Properties
2. Manipulation
D. Temporary Fillings
E. Low-Strength Bases Composition & Reaction, Properties, Manipulation
1. Calcium Hydroxide Cement
2. Resin Cement
3. Zinc Oxide-Eugenol Cement
F. Cavity Liners and Varnishes
G. Special Applications of Cement
VIII. Impression Materials
A. Definitions
B. Rigid
  1. Dental Impression Compound
  2. Impression Plaster
  3. Zinc Oxide-Eugenol Impression Material
C. Hydrocolloids
  1. Alginate Impression Material
  2. Agar Hydrocolloid Impression Material
  3. Agar-Alginate Impression Material
D. Elastomeric Impression Materials
  1. Polysulfide Rubber Impression Materials
  2. Silicone Rubber Impression Materials
    a) Condensation type
    b) Addition type
  3. Polyether Rubber Impression Materials
E. Disinfection of Rubber Impressions
F. Rubber Materials for Bite Registration
IX. Model and Die Materials
  A. Definitions
  B. Types and Selection, Manipulation, Properties
     1. Gypsum products
        a) Model plaster (type II)
        b) Dental Stone (type III)
        c) Dental stone, high strength (type IV)
  2. Metal
     a) Electroplated copper
     b) Electroplated silver
  3. Resin
     a) Epoxy
X. Waxes
  A. Properties, Composition
  B. Types
     1. Pattern Wax
     2. Processing Wax
        a) Boxing Wax
        b) Utility Wax
        c) Sticky Wax
        d) Corrective Impression Wax
        e) Bite Registration Wax
XI. Gold and Nonprecious Alloys
  A. Definitions & Gold Content
  B. Gold Alloys
     1. Porcelain-fused-to-metal
     2. White gold alloys
     3. Cobalt-Chromium
     4. Titanium
  C. Biocompatibility of Alloys
  D. Solders
  1. Brazing
  2. Fluxes
XII. Dental Casting of Metals
  A. Definitions
  B. Wax Pattern
  C. Spruing
  D. Investing
  E. Investment Expansion
  F. Wax Elimination
G. Casting the Alloy
XIII. Plastics in Prosthetics
A. Polymerization Process
B. Vinyl Plastics
C. Acrylic Plastics as Denture Bases
   1. Composition
   2. Properties
      a) Room temperature-processed acrylic dentures
   3. Care of dentures
D. Plastics as Soft Liners
   1. Home reliners
E. Plastics as Prosthetic Teeth
F. Plastic-Metal Combinations
G. Light-Cured Dimethacrylates
H. Other Uses of Plastics in Dentistry
   1. Maxilofacial materials
   2. Temporary crown and bridge materials
   3. Tray materials
XIV. Dental Porcelain
A. Composition
B. Classification
C. Properties
   1. Denture Teeth
   2. Porcelain Crowns, Veneers, Inlays
      a) Fabrication Involving Hand Condensation
   3. Porcelain-Metal Bonding
XV. Dental Implants
A. Natural Dentition Versus Implant Dentition
B. Titanium Types
   1. Endosseous
   2. subperiosteal
   3. Transosteal
C. Materials
   1. Metals
   2. Ceramics
   3. Polymers & Composites
   4. Coated Metals
D. Patient Selection
E. Professional Care
XVI. Miscellaneous Materials
A. Suture Removal
B. Rubber Dam
   1. Rationale
   2. Manipulation

II. Course Learning Outcomes
### Course Learning Outcome

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
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</thead>
<tbody>
<tr>
<td>1. Identify, describe, and recognize the classification, properties, composition, utilization, and manipulation of materials commonly used in dentistry for restorative and laboratory procedures.</td>
</tr>
<tr>
<td>2. Properly mix/prepare the following materials—dental stone, irreversible hydrocolloid, and dental cements.</td>
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<tr>
<td>3. Apply pit and fissure sealants.</td>
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<tr>
<td>4. List proper oral hygiene techniques for care of dentures, partials, implants, and other dental restorative materials.</td>
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<tr>
<td>5. Explain to the average dental patient some of the factors to be considered in choosing materials for treatment purposes.</td>
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<tr>
<td>6. Discuss the indications and contraindications for bleaching.</td>
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<tr>
<td>7. Place and remove a rubber dam.</td>
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<tr>
<td>8. Remove dental sutures.</td>
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</tbody>
</table>

### Method of Assessment

<table>
<thead>
<tr>
<th>Method of Assessment</th>
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</thead>
<tbody>
<tr>
<td>1. Lecture, lab, and exam</td>
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<tr>
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<tr>
<td>7. Lecture and lab</td>
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<tr>
<td>8. Lecture and lab</td>
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</tbody>
</table>

### III. Required Text(s), Optional Text(s) and/or Materials to be Supplied by Student.


### IV. Suggested Course Maximum - 28

### V. List any specific spatial or physical requirements beyond a typical classroom required to teach the course. (classroom & lab space, special equipment or workstations, etc.): J203 lecture and J130 dental hygiene clinic and dental materials lab

### VI. Course Requirements/Grading System – Describe any course specific requirements such as research papers or reading assignments and the generalized grading format for the course

- A = 93-100
- B = 84-92
- C = 83-75
- D = 70-74
- F = 69 & below

Minimum grade of “75” required to pass course

### VII. Curriculum Checklist

- **- Academic General Education Course** (from ACGM – but not in WCJC Core)
  No additional documentation needed
- **- Academic WCJC Core Course**
  Attach the Core Curriculum Checklist, including the following:
  - Basic Intellectual Competencies
  - Perspectives
  - Exemplary Educational Objectives
- **WECM Courses**
  Attach the following:
  - Program SCANS Matrix
  - Course SCANS Competencies Checklist
### SCANS COMPETENCIES FOR THIS COURSE

<table>
<thead>
<tr>
<th>Competency</th>
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</tr>
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<tbody>
<tr>
<td><strong>1 READING</strong> Locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules.</td>
<td>Unit Exams &amp; Final Exam</td>
</tr>
<tr>
<td><strong>2 WRITING</strong> Communicate thoughts, ideas, information, and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flow charts.</td>
<td></td>
</tr>
<tr>
<td><strong>3 ARITHMETIC OR MATHEMATICS</strong> Perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.</td>
<td>Lab exercises with alginate, stone</td>
</tr>
<tr>
<td><strong>4 SPEAKING AND LISTENING</strong> Organize ideas and communicate orally; receive, attend to, interpret, and respond to verbal messages and other cues.</td>
<td>Lab exercises with impressions, sealants</td>
</tr>
<tr>
<td><strong>5 THINKING SKILLS</strong> A worker must think creatively, make decisions, solve problems, visualize, know how to learn, and reason effectively.</td>
<td>Lab proficiencies, exams</td>
</tr>
<tr>
<td><strong>6 PERSON QUALITIES</strong> A worker must display responsibility, self-esteem, sociability, self-management, integrity, and honesty.</td>
<td>Lab exercises</td>
</tr>
<tr>
<td><strong>7 WORKPLACE COMPETENCIES</strong> resources; interpersonal skills; information; systems; and technology</td>
<td>Lab proficiencies</td>
</tr>
<tr>
<td><strong>8 BASIC USE OF COMPUTERS</strong></td>
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</tbody>
</table>
## SCANS Matrix

### Program: Dental Hygiene
### CIP: 51.0602

**List All Courses Required and Identified Competencies**

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Course Number</th>
<th>Course Title</th>
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<tbody>
<tr>
<td></td>
<td>2401</td>
<td>Anatomy &amp; Physiology I</td>
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<tr>
<td></td>
<td>2402</td>
<td>Anatomy &amp; Physiology 2</td>
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<tr>
<td></td>
<td>2420</td>
<td>Microbiology</td>
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<tr>
<td></td>
<td>ENGL 1301</td>
<td>English Composition</td>
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<td></td>
<td>SPCH 1315 (or 1318 or 1321)</td>
<td>Fundamentals of Speech</td>
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<td></td>
<td>1301</td>
<td>Intro to Sociology</td>
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<td></td>
<td>PSYC 2301</td>
<td>Intro to General Psychology</td>
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<td></td>
<td>HUMA</td>
<td>Humanities</td>
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<td></td>
<td>1223</td>
<td>Dental Hygiene Practice</td>
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<td></td>
<td>1227</td>
<td>Preventive DH Care</td>
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<td></td>
<td>1235</td>
<td>Pharmacology for the DH</td>
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<td></td>
<td>1261</td>
<td>Clinical DH 1</td>
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<td></td>
<td>1271</td>
<td>Service-Learning for Local Need</td>
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<tr>
<td></td>
<td>1301</td>
<td>Oral-Facial Anatomy, Histology, Embryology</td>
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<td></td>
<td>1304</td>
<td>Dental Radiology</td>
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<td></td>
<td>1307</td>
<td>General &amp; Dental Nutrition</td>
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<td></td>
<td>1311</td>
<td>Periodontology</td>
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<td></td>
<td>1315</td>
<td>Community Dentistry</td>
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<td></td>
<td>1319</td>
<td>Dental Materials</td>
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<tr>
<td></td>
<td>1339</td>
<td>General &amp; Oral Pathology</td>
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<tr>
<td></td>
<td>1431</td>
<td>Pre-clinical DH</td>
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<tr>
<td></td>
<td>2201</td>
<td>Contemporary DH Care 1</td>
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<td></td>
<td>2231</td>
<td>Contemporary DH Care 2</td>
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<tr>
<td></td>
<td>2362</td>
<td>Clinical DH 2</td>
</tr>
<tr>
<td></td>
<td>2363</td>
<td>Clinical DH 3</td>
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**Competency References**

1. **Reading:** Locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules.

2. **Writing:** Communicate thoughts, ideas, information, and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flow charts.

3. **Arithmetic or Mathematics:** Perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.

4. **Speaking and Listening:** Organize ideas and communicate orally; receive, attend to, interpret, and respond to verbal messages and other cues.

5. **Thinking Skills:** A worker must think creatively, make decisions, solve problems, visualize, know how to learn, and reason effectively.

6. **Personal Qualities:** A worker must display responsibility, self-esteem, sociability, self-management, integrity, and honesty.

7. **Workplace Competencies:** resources; interpersonal skills; information; systems; and technology.

8. **Basic use of computers**