ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Workforce Development

COURSE: DLA 1201 Dental Materials & Laboratory Procedures

Date: Fall 2020

Credit Hours: 4

Prerequisite(s): Admission to the Dental Assisting Program; successful completion with a "C" or better in DLA 1209.

Delivery Method:		
	☒ **Lecture**	**2 Contact Hours (1 contact = 1 credit hour)**
	☐ **Seminar**	**0 Contact Hours (1 contact = 1 credit hour)**
	☒ **Lab**	**4 Contact Hours (2-3 contact = 1 credit hour)**
	☐ **Clinical**	**0 Contact Hours (3 contact = 1 credit hour)**
	☐ **Online**	
	☐ **Blended**	

Offered: ☒ **Fall** ☐ **Spring** ☐ **Summer**

CATALOG DESCRIPTION:
This course stresses the physical properties, manipulation and applications of gypsum products, dental cements, restorative products, bonding systems, impression materials, and dental waxes currently used in dentistry. Hands-on, laboratory experience is used to ensure proper technique is being followed. CODA standards, CDC and OSHA guidelines and proper aseptic techniques are strictly adhered to.

GENERAL EDUCATION GOALS ADDRESSED

[See last page for Course Competency/Assessment Methods Matrix.]

Upon completion of the course, the student will be able:

[Choose up to three goals that will be formally assessed in this course.]

☒ To apply analytical and problem solving skills to personal, social, and professional issues and situations.
☐ To communicate successfully, both orally and in writing, to a variety of audiences.
☐ To construct a critical awareness of and appreciate diversity.
☐ To understand and use technology effectively and to understand its impact on the individual and society.
☐ To develop interpersonal capacity.
☐ To recognize what it means to act ethically and responsibly as an individual and as a member of society.
☐ To recognize what it means to develop and maintain a healthy lifestyle in terms of mind, body, and spirit.
☐ To connect learning to life.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

[Outcomes related to course specific goals. See last page for more information.]

Upon completion of the course, the student will be able to:

1. Demonstrate a basic understanding of the role of the dental auxiliary in the use of dental materials.
    1.1. Discuss the importance of the study of dental materials for allied oral health practitioner.
    1.2. Discuss why it is necessary that the allied oral health practitioner have an understanding of dental materials for the delivery of dental care.
    1.3. 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
    1.4. Review the historical development of dental materials
    1.5. List and compare the agencies responsible for setting standards and specifications of dental materials.
    1.6. Discuss the requirements necessary for consumer product to qualify for the ADA Seal of Acceptance.
2. Demonstrate a basic understanding of the selection, types, composition, and manipulation of dental cements.
    2.1. Be able to compare the various types of cements and the uses of cements in dentistry (eg. pulpal protection, luting, restorations, surgical restorations)
    2.2. Describe the properties of a cement, and be able to explain how these properties affect selection of a cement for a dental procedure.
    2.3. Identify the components of each dental cement.
    2.4. Describe how these components affect the properties of the cement.
    2.5. Compare the advantages and disadvantages of each cement.
    2.6. Describe and demonstrate the manipulation considerations for mixing cements.
    2.7. Describe demonstrate the procedure for filling a crown with a luting cement.
    2.8. Describe and demonstrate the procedure for removing excess cement after cementation.
    2.9. Apply the mixing technique for each type of cement.

3. Demonstrate a basic understanding of the types, selection, composition, and manipulation of dental impression materials.
    3.1. Describe the purpose of an impression.
    3.2. Describe the three basic types of impressions.
    3.3. Explain the importance of the key properties if impression materials.
    3.4. Define sol and gel and describe these states as they occur with hydrocolloids.
    3.5. Explain why alginate is an irreversible hydrocolloid.
    3.6. List the supplies needed to make an alginate impression and explain how they are used.
    3.7. Select trays for alginate impressions for a patient.
    3.8. Mix alginate, load and seat the tray, and remove the set impression.
    3.9. Evaluate upper and lower alginate impressions, in accordance with the criteria for acceptability.
    3.10. Disinfect alginate impressions and prepare them for transport to the office laboratory.
    3.11. Troubleshoot problems experienced with alginate impressions.
    3.12. Describe the various types of elastomers and explain why they are called elastomers.
    3.13. Compare similarities and differences among the physical and mechanical properties of polyvinyl siloxane (PVS) and polyether impression materials.
    3.14. Discuss the advantages and disadvantages of using polyether impression material for a crown impression
    3.15. Explain why polyvinyl siloxane impression material is so popular.
    3.16. Explain the difference between a hydrophobic and hydrophilic impression material.
    3.17. Evaluate cord placement and gingival retraction for acceptability.
    3.18. Use ferric sulfate astringent to control gingival bleeding before making an impression.
    3.19. Make a registration of a patients bite in centric occlusion.
    3.20. Assemble the cartridge of impression material with mixing tip and load into the dispenser.
    3.21. Explain what a digital impression is
    3.22. Describe the advantages and disadvantages of digital impressions.
    3.23. Disinfect PVS and polyether impressions and prepare them for transport to the dental laboratory.
4. Demonstrate a basic understanding of the properties and manipulation of gypsum products. (ch. 16)
    4.1. Differentiate between negative and positive reproduction.
    4.2. Differentiate among diagnostic casts, working casts, and dies.
    4.3. Describe the chemical and physical nature of gypsum products.
    4.4. Explain the manufacturing process for gypsum products and how this affects their physical characteristics
    4.5. Compare the following properties and behaviors of gypsum products: strength, dimensional accuracy, solubility, and reproduction of detail.
    4.6. List the American Dental Association- recognized gypsum products and their most appropriate uses.
    4.7. Explain initial set and final set of gypsum and the factors that affect the setting time, setting expansion, and strength.
    4.8. Explain the procedure for mixing and handling gypsum products to create diagnostic casts
    4.9. Pour the anatomic portion of maxillary and mandibular diagnostic casts.
    4.10. Pour the base portion of the maxillary and mandibular diagnostic casts.
    4.11. Trim maxillary and mandibular diagnostic casts.
    4.12. Obtain a bite registration using bite registration impression material.

5. Demonstrate a basic understanding of the properties of dental waxes.

5.1. Identify the common components of dental waxes.
5.2. Compare the properties of waxes.
5.3. Differentiate between direct and indirect waxings and identify which property of dental waxes is most important in their difference.
5.4. Describe the usual color, form, and use of inlay, casting, baseplate, boxing, utility, and sticky waxes.
5.5. Obtain a bite registration using utility wax.

6. Demonstrate a basic understanding of the physical and mechanical properties of dental materials.
   6.1. Define primary and secondary bonds and give an example of how each determines the properties of the material.
   6.2. Describe the three forms of matter and give a defining characteristic of each.
   6.3. Define density and explain the relationship of density, volume, and crystalline structure.
   6.4. Define hardness and describe how hardness contributes to abrasion resistance.
   6.5. Define elasticity and give an example of when elasticity is desirable in dental procedures.
   6.6. Relate stiffness and proportional limit, and describe how these properties apply to restorative dental materials.
   6.7. Define ductility and malleability and explain how these characteristics contribute to the edge strength of a gold crown.
   6.8. Differentiate between toughness and resilience.
   6.9. Define brittleness and discuss how this property applies to restorative dental materials.
   6.10. Define viscosity and thixotropic materials and describe the clinical significance of each.
   6.11. Differentiate between therapeutic, preventive, and restorative materials.
   6.12. Discuss the component classifications that may make up a dental material.
   6.13. Describe the reaction stages a material undergoes to acquire its final state.
   6.14. Describe the variables in the manipulation of a material.
7. Demonstrate a basic understanding of the oral environment and its effect on dental materials.
   7.1. Discuss the qualities of the oral environment that make it challenging for long-term clinical performance of dental materials.
   7.2. Describe the long-term clinical requirements of therapeutic and restorative materials.
   7.3. List and give examples of the four types of biting forces and the tooth structures most ideally suited to them.
   7.4. Define stress, strain, and ultimate strength and compare the ultimate strength of restorative materials during each type of stress to tooth structures.
   7.5. Describe the effects of moisture and acidity on dental materials.
   7.6. Describe the clinical significance of galvanism and how it can be prevented.
   7.7. Define thermal conductivity and thermal expansion and contraction and compare the values of thermal expansion and conductivity of restorative materials with those of tooth structures.
   7.8. Describe the process used to achieve mechanical, chemical adhesion, or bonding retention.
   7.9. Describe the factors that determine successful adhesion, including wettability, viscosity, film thickness, and surface characteristics.
   7.10. Describe microleakage and how the results of this process can lead to recurrent decay and postoperative sensitivity.
   7.11. Define biocompatibility and discuss why requirements for biocompatibility may fluctuate.
   7.12. Compare the three visible light wavelengths that are sensed when recognizing color.
   7.13. Describe tooth color in terms of hue, value, and chroma.
   7.14. Explain the importance of detection of restorations and methods for detection.
8. Demonstrate a basic understanding of Dental Amalgam.

8.1. Discuss the safety of amalgam as a restorative material.
8.2. List the main components in dental amalgam.
8.3. Describe the advantages of high-copper amalgams over low-copper amalgams.
8.4. Explain the role of the gamma-2 phase in corrosion of amalgam.
8.5. Describe the particle shapes in lathe-cut, admix, and spherical alloys, and discuss their effects on the condensation resistance of freshly mixed amalgam.
8.6. Define creep, corrosion, and tarnish.
8.7. Compare the strength of amalgam with that of composite resin or glass ionomer cement.
8.8. Discuss the effect of mixing time on the strength and manipulation of amalgam.
8.9. Discuss the advantages and disadvantages of amalgam as a restorative material.
8.10. Perform safe mercury hygiene practices in the dental office.
8.11. Collect and process amalgam scrap for recycling.
8.12. Select an appropriate size of matrix band for a class II amalgam preparation.
8.13. Assemble a Tofflemire band in its retainer.
8.14. Evaluate a class II amalgam matrix setup for meeting proper placement criteria.
8.15. Assist with or place (as allowed by state law) amalgam in a class II cavity preparation.

9. Demonstrate a basic understanding of Composites and Compomers.
9.1. Describe the various types of composite resin restorative materials.
9.2. Discuss the advantages, and disadvantages, of each type of composite resin.
9.3. Discuss the similarities and differences among chemical-cured, light-cured, and dual-cured composite resins.
9.4. Describe how fillers affect the properties of composites.
9.5. Explain why incremental placement of composite resin is recommended.
9.6. Describe the factors that determine how long an increment of composite resin should be light-cured.
9.7. Place a sectional matrix for a class II composite.
9.8. Select an appropriate type of composite for a class II cavity preparation.
9.9. As permitted by state law, place a composite in a class II cavity preparation.
9.10. Light-cure a composite resin restoration following recommended exposure times.
9.11. As permitted by state law, finish and polish a class III composite restoration.
9.12. Discuss the procedural differences between direct and indirect composite restorations.
9.13. Describe the composition of glass ionomer restoratives and their uses, advantages, and disadvantages.
9.14. Explain the effects of fluoride-releasing, resin-modified glass ionomer restorations in the prevention of recurrent caries.
9.15. List the components of compomers.
9.16. Describe the uses of compomers.
9.17. Compare the clinical applications of composite resin restorative materials with glass ionomer cement restorative materials

10. Demonstrate a basic understanding of the principals of bonding, and the different bonding systems.
10.1. Discuss the effects of acid etching on enamel and dentin.
10.2. Describe the basic steps of bonding.
10.3. Explain the differences between bonding to enamel and bonding to dentin.
10.4. Discuss the significance of the smear layer.
10.5. Describe “wet” dentin bonding.
10.6. Compare total-etch and self-etch bonding techniques.
10.7. Explain how the hybrid layer is formed and its importance in bonding to dentin.
10.8. Discuss the factors that interfere with good bonding.
10.9. Discuss the adverse effects of microleakage at restoration margins.

10.10. Describe how to bond ceramic veneers.
10.11. Describe the bonding of orthodontic brackets.
10.12. Describe the bonding of endodontic posts.
10.13. Explain the differences in bonding to enamel, dentin, metal, and ceramic.
10.14. List the factors that contribute to tooth sensitivity after bonding.
10.15. Etch enamel and dentin with phosphoric acid as permitted by state law.
10.16. Apply a bonding system to etched enamel and dentin as permitted by state law

MAPPING LEARNING OUTCOMES TO GENERAL EDUCATION GOALS

[For each of the goals selected above, indicate which outcomes align with the goal.]

Goals	Outcomes
First Goal	
To apply analytical and problem solving skills to personal, social, and professional issues and situations.	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8 2.9

COURSE TOPICS AND CONTENT REQUIREMENTS:

I. Introduction to Dental Materials
   A. The Role of the Dental Auxiliary in the use of Dental Materials
   B. Evidence-Based Dentistry
   C. The Historical Development of Dental Materials
   D. The Agencies Responsible for Standards
   E. Future Developments in Dental Biomaterials

II. Dental Cements
   A. Uses of Dental Cements
   B. Properties of Dental Cements
   C. Manipulation Dental Cements

III. Impression Materials
   A. Overview of Impressions
   B. Impression Trays
   C. Hydrocolloids
   D. Elastomers
   E. Vinyl
   F. Polyether
   G. Silicone
   H. Hybrid
   I. Components of Impression Making for Crown and Bridge Procedures
   J. Digital Impressions
   K. Inelastic Impression Materials
   L. Disinfecting Impressions

IV. Gypsum and Dental Waxes
   A. Uses and Desirable Qualities of Gypsum Products
   B. Properties and Behaviors of Gypsum Products
   C. Classification of Gypsum Products

D. Manipulation of Gypsum Products
E. Composition and Properties of Dental Waxes
F. Classification of Waxes
G. Manipulation of Waxes
H. Lost Wax Technique

V. Physical and mechanical Properties of Dental Materials
A. Physical Structure
B. Application
C. Composition
D. Reaction
E. Manipulation

VI. Oral Environment and Patient Considerations
A. Classification of Dental Materials
B. Biocompatibility
C. Biomechanics
D. Force and Stress
E. Moisture and Acid Levels
F. Galvanism
G. Temperature
H. Retention
I. Microleakage
J. Esthetics
K. Oral Biofilm and Dental Materials
L. Detection of Restorative Materials

VII. Dental Amalgam

VIII. Composites and Compomers
A. Direct-Placement Esthetic Restorative Materials
B. Composite Resin
C. Indirect-Placement Composite Resins
D. Glass Ionomer Cements
E. Hybrid (Resin-Modified) Ionomers
F. Compomers
G. Giomers

IX. Bonding Systems
A. Basic Principles of Bonding
B. Bonding Systems
C. Clinical Applications of Bonding

INSTRUCTIONAL METHODS:

- Lecture
- Class discussions
- Visual aids – videos, models
- Demonstrations
- Laboratory projects
- Hands-on practice using dental materials and equipment
- Computers- Patterson Eaglesoft
- Exams and quizzes

INSTRUCTIONAL MATERIALS:

Text: *Dental Materials*: *Clinical Application for Dental Assistants and Dental Hygienists*, third edition, Hatrick/Eakle, Elsevier 2016.
Computer Software: Patterson Eaglesoft, Patterson Dental
YouTube Videos
Elsevier Textbook Student Resources
Laboratory Materials
Blackboard

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:

- Lecture: Reading assigned materials, note taking and participation in classroom discussion is expected
- Written quizzes and tests are used to evaluate student progress for each unit. A comprehensive final exam will be given at the end of the semester. Homework and quizzes will also be given throughout the semester.
- Laboratory: Students are required to complete all assigned projects.
- Students are required to mix the various dental materials for evaluation by an instructor.
- Students are responsible for the cleanliness of the laboratory and must follow the posted laboratory rules.
- Projects are assessed and given a point value accordingly based on the total points indicated by the material lab manual.
- Final Grade: **A grade of "C" is required in the lecture portion and in the laboratory portion** of this course for graduation from the Dental Assisting Program.
- The student's final grade will be calculated: 50% lecture 50% laboratory grade

The following grading scale will be used as a guide in determining the grade for this course:

A= 90-100
B= 80-89
C= 70-79
D= 60-69
F= 0-59

Course Competency/Assessment Methods Matrix

DLA 1201	**Assessment Options**																															
For each competency/outcome place an "X" below the method of assessment to be used.	**Assessment of Student Learning**	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment
Assessment Measures – Are direct or indirect as indicated. List competencies/outcomes below.	**Direct/ Indirect**	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D						
Demonstrate a basic understanding of the role of the dental auxiliary in the use of dental materials.			X	X	X			X	X			X	X		X					X					X		X				X
Demonstrate a basic understanding of Dental Cements.			X	X	X			X	X			X	X		X					X					X		X				X
Demonstrate a basic understanding of Impression Materials.			X	X	X			X	X			X	X		X					X					X		X				X
Demonstrate a basic understanding of Gypsum.			X	X	X			X	X			X	X		X					X					X		X				X
Demonstrate a basic understanding of Wax Products.			X	X	X			X	X			X	X		X					X					X		X				X

Demonstrate a basic understanding of the Physical and Mechanical Properties of Dental Materials.			X	X	X			X	X			X	X		X					X						X		X			X
Demonstrate a basic understanding of the Oral Environment and Patient Considerations.			X	X	X			X	X			X	X		X					X						X		X			X
Demonstrate a basic understanding of Dental Amalgam.			X	X	X			X	X			X	X		X					X						X		X			X
Demonstrate a basic understanding of Composites and Compomers.			X	X	X			X	X			X	X		X					X						X		X			X
Demonstrate a basic understanding of the Principals of Bonding.			X	X	X			X	X			X	X		X					X						X		X			X