



ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Health Professions

COURSE: DLA 1204 Dental Radiography

Date: Fall 2023

Credit Hours: 3

Complete all that apply or mark "None" where appropriate:

Prerequisite(s): Admission into the Dental Assisting Program. Must be 18 years old to enroll.

Enrollment by assessment or other measure? Yes No
If yes, please describe:

Corequisite(s): None

Pre- or Corequisite(s): None

Consent of Instructor: Yes No

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

Offered: **Fall** **Spring** **Summer**

CATALOG DESCRIPTION and IAI NUMBER (if applicable):

Introduction to radiation physics, radiation protection and the operation of radiographic equipment. Instruction in exposure, processing, mounting of dental radiographs, and study of safety and standard practices. Students will also be introduced to interpretation of radiographs and specialized intraoral and extraoral radiographic techniques.

ACCREDITATION STATEMENTS AND COURSE NOTES:

The curriculum must include content at the in-depth level in dental radiology. Students must demonstrate knowledge and skills to produce diagnostic dental image surveys on manikins. Prior to exposing dental images on patients, students must demonstrate competence in:

- a. Radiation health protection techniques
- b. Processing procedures
- c. Anatomical landmarks and pathologies
- d. Mounting survey of dental images
- e. Placing and exposing dental images on manikins

COURSE TOPICS AND CONTENT REQUIREMENTS:

- I. Explain the history of dental radiation
 - a. Progression of Dental Radiography
 - b. Pioneers and contributions
 - c. Diagnosis
 - d. 5 uses of dental radiographs
- II. Radiation physics and identification of the x-ray unit
 - a. Ionization
 - b. Radiation vs. Radioactivity
 - c. Electromagnetic spectrum
 - d. Characteristics of radiation
 - e. Interactions with matter
 - f. 3 major components of the xray machine
 - g. Control panel
 - h. X-ray tube
 - i. Electrical circuits
 - j. X-ray generation
- III. Dental X-ray Image characteristics
 - a. 3 basic requirements of an acceptable diagnostic radiograph
 - b. radiolucent and radiopaque
 - c. film density and contrast
 - d. sharpness, magnification, and distortion
 - e. millamperage, kilovoltage, distance, and exposure time
 - f. manual, rapid, and automatic processing
- IV. Radiation protection for the radiographer
 - a. Terms to measure radiation
 - b. maintaining radiation safety for the operator and patient
 - c. filtration and collimator used
 - d. radiation monitoring devices
 - e. professional responsibility and concern for radiation safety
- V. Patient education in radiography
 - a. Risks
 - b. Benefits
 - c. Goals of the dental radiographer
- VI. Dental imaging examinations
 - a. basic intraoral procedures
 - i. three basics
 - b. paralleling and bisecting techniques
 - c. shadow casting

- i. 5 principals
 - d. proper horizontal and vertical angulations
 - e. type and number of films/sensors required to make a complete periapical and bitewing survey
 - f. design of image receptor positioners/holders
 - g. systematic and orderly sequence of the exposure procedure
- VII. Infection control in radiography
 - a. benefits and necessity
 - b. cross-contamination
 - c. personal protective equipment
 - d. infection control procedures during exposure and processing of radiograph
- VIII. Patient Management
 - a. Special problems
 - b. Operators' appearance and attitude
 - c. Film/sensor placement issues
 - d. Anatomical variations in the mouth
- IX. Patient Selection
 - a. Guidelines for prescribing radiographs for the following:
 - i. Child
 - ii. Adolescent
 - iii. Adult
 - b. Recall patients
- X. Mounting radiographs
 - a. advantages
 - b. identification dot
 - c. labial and lingual methods
 - d. anatomic generalizations
- XI. Paralleling technique
 - a. Principals
 - b. advantages and disadvantages
 - c. assemble and position image receptor holders
 - d. technique
 - e. horizontal and vertical angulations
 - f. vertical angulation errors
- XII. Bitewing technique
 - a. List the 2 ideal uses for bitewing examination
 - b. Describe the bitewing technique
 - c. Differentiate between horizontal and vertical bitewing radiographs
 - d. Compare methods used for holding the bitewing image receptor in position
 - e. Identify the positions of the film placement and the vertical and horizontal angulations normally used for bitewing radiographs
 - f. Demonstrate mounting bitewing films
- XIII. Exposure and technique errors in dental images
 - a. Identify and correct the types of radiographic errors caused by incorrect radiographic techniques
 - b. Identify and correct the types of radiographic errors caused by incorrect film positioning and angulations of the central ray
 - c. Identify and correct the types of radiographic errors caused by incorrect processing procedures

- d. Identify the conditions that cause radiographs to be fogged
- XIV. Anatomical Landmarks
 - a. Normal landmarks of head and neck
 - b. Radiopaque
 - c. Radiolucent
 - d. Radiographic appearance of all oral structures
- XV. Preliminary interpretations by dental auxiliary
 - a. Cysts
 - b. Anomalies
 - c. Normal and pathological bone resorption
 - d. Dental injuries
 - e. Interpretation vs diagnosis
 - f. Restorative materials
 - g. Dental caries
 - h. Prosthetic appliances
 - i. Buccal-object rule
 - j. Periodontal disease
- XVI. Digital imaging
 - a. fundamentals
 - b. direct and indirect digital imaging
 - c. sensors required to make a complete periapical and bitewing survey for each digital system
 - d. digital image receptors
 - e. digital radiography's effect on radiation exposure
 - f. advantages and limitations
- XVII. Quality assurance
 - a. quality assurance and quality control
 - b. quality control tests
 - c. quality control tests for radiographic viewing equipment
- XVIII. Dental radiography and radiation biology
 - a. biological damage and the possible effects of radiation on cells
 - b. body cells in order of their radio sensitivity
 - c. factors that determine radiation injuries
 - d. short- and long-term effects of irradiation
 - e. effects of oral radiation therapy
 - f. units of measurement used in radiation exposure
 - g. risk versus benefit of dental radiographs
- XIX. Bisecting Technique
 - a. principles of the bisecting technique
 - b. receptor size
 - c. horizontal angulation
 - d. vertical angulation
 - e. basic rules of the bisecting technique
 - f. advantages and disadvantages
- XX. Special radiographic techniques
 - a. Occlusal
 - b. Edentulous
 - c. Pediatric
 - d. Extraoral
 - e. Focal trough
 - f. Panoramic imaging

XXI. Legal Responsibilities of the Dental Auxiliary

- a. Diagnosis
- b. Interpretation
- c. Completion of dental records
- d. Life cycle of a radiographic record

INSTRUCTIONAL METHODS:

- Lecture
- Power Points
- Class discussion
- Demonstration
- Visual aids - videos, models, slides
- Exams and quizzes
- Lab
- Laboratory practice of skills
- Laboratory practical exams
- Problem solving exercises

EVALUATION OF STUDENT ACHIEVEMENT:

Lecture is weighted at 75% of the overall grade, and lab is weighted at 25%. Both lecture and lab must be passed with a C or higher to obtain a passing overall grade. The following scale is used to determine the grade in both lecture and lab portions. All radiographic projects must be passed with an 80% or higher to follow the guidelines set forth by the American Dental Association.

Recommendations for Patient Selection and Limiting Radiation Exposure developed by the ADA and FDA will be taken into consideration when prescribing radiographs. These recommendations are subject to clinical judgment and may not apply to every patient. The supervising dentists will determine exposure frequency only after reviewing the patient's health history and completing a clinical examination. Retakes will be determined by the supervising dentist or clinic dental hygienist while following ALARA concepts. Clinic policies allow for no more than 20% retakes for any radiographic examination.

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

The student must obtain a grade of 85% or better on a DXTTR survey, using the paralleling technique, before he/she is allowed to take a survey on a patient.

Other requirements may be imposed as the instructor deems appropriate to show proficiency in safety, exposure and processing technique, patient management, asepsis, mounting, time management or specific exposure(s). A student may not expose a human subject until all areas are demonstrated on DXTTR to the standard of care set within this course.

The student must follow the “Guidelines for Selecting Patients for Radiographic Survey”, when determining suitable radiographic patients.

INSTRUCTIONAL MATERIALS:

Textbooks

Dental Radiography, Iannucci, Jansen, Howerton, 6th Edition, 2022

Workbook and Laboratory Manual for Dental Radiography, Iannucci, Jansen, Howerton, 6th Edition, 2022

Resources

- Student Resources on Evolve
 - Case studies
 - Interactive exercises
 - Procedure videos
 - Video Q&A
 - Canadian Content Corner
 - Review questions – self-study examination

LEARNING OUTCOMES AND GOALS:

Institutional Learning Outcomes

- 1) Communication – to communicate effectively;
- 2) Inquiry – to apply critical, logical, creative, aesthetic, or quantitative analytical reasoning to formulate a judgement or conclusion;
- 3) Social Consciousness – to understand what it means to be a socially conscious person, locally and globally;
- 4) Responsibility – to recognize how personal choices affect self and society.

Course Outcomes and Competencies

1. Explain the history of dental radiation
 - 1.1. Trace the progress of radiography from its discovery to the present
 - 1.2. Name the pioneers of radiography and identify their contributions
 - 1.3. Discuss x-rays as the basis for diagnostic procedures
 - 1.4. Discuss the 5 uses of dental radiographs
2. Demonstrate an understanding of radiation physics and characteristics and identification of the x-ray unit
 - 2.1. Understand the difference between radiation and radioactivity
 - 2.2. Identify the electromagnetic spectrum
 - 2.3. Identify the 3 major components of the dental x-ray machine
 - 2.4. Identify the functions on the control panel
 - 2.5. Draw and label a typical dental x-ray tube
 - 2.6. Identify the functions of the electrical circuits and the control devices
 - 2.7. Identify factors involved in x-ray generation
 - 2.8. Describe how kilovoltage affects the density and contrast of the image
 - 2.9. Discuss kilovoltage, milliamperage, and exposure time
3. Demonstrate a basic understanding of dental x-ray image characteristics
 - 3.1. Identify the 3 basic requirements of an acceptable diagnostic radiograph

- 3.2. Differentiate between radiolucent and radiopaque areas on a dental radiograph
- 3.3. List the factors and influence film density and contrast
- 3.4. List the factors that influence sharpness, magnification, and distortion
- 3.5. Differentiate between the effect of variations in milliamperage, kilovoltage, distance, and exposure time on the resulting dental radiograph
4. Demonstrate a basic understanding of radiation protection for the radiographer
 - 4.1. Identify the terms used to measure radiation
 - 4.2. Identify the procedures for maintaining radiation safety for the operator and patient
 - 4.3. Discuss different types of filtration and collimator used in dental x-ray machines
 - 4.4. Differentiate among the various radiation monitoring devices
 - 4.5. Identify the areas of professional responsibility and concern for radiation safety
5. Demonstrate basic understanding of patient education related to radiographic procedures.
 - 5.1. Explain the necessity for patient education in radiography.
 - 5.2. Identify the benefits that the patient derives from preventive radiation procedures.
 - 5.3. Describe several methods by which the patient can be educated to appreciate the value of dental radiography.
 - 5.4. Identify the goals of a dental radiographer.
6. Demonstrate a basic understanding of the different dental imaging examinations
 - 6.1. Identify the three basic intraoral procedures
 - 6.2. Compare the principles of the paralleling and bisecting techniques
 - 6.3. Discuss the 5 principles of shadow casting
 - 6.4. Differentiate between the methods used to obtain proper horizontal and vertical angulations
 - 6.5. Select the type and number of films/sensors required to make a complete periapical and bitewing survey
 - 6.6. Explain the basic design of image receptor positioners/holders
 - 6.7. Demonstrate a systematic and orderly sequence of the exposure procedure
7. Explain infection control involved with taking dental radiographs
 - 7.1. Identify the benefits and necessity of infection control during radiographic procedures
 - 7.2. Describe measures to be taken during radiographic procedures to avoid cross-contamination
 - 7.3. List the personal protective equipment recommended for the dental radiographer
 - 7.4. Describe and perform proper infection control procedures during exposure and processing of radiographs
8. Demonstrate a basic understanding of patient management during radiographic procedures.
 - 8.1. Describe how to manage patients with special problems.
 - 8.2. Discuss how the operator's appearance and attitude may affect the patient's cooperation.
 - 8.3. Explain how to handle common problems with film placement caused by anatomical variations in the mouth.
9. Demonstrate a basic understanding of radiographic patient selection criteria.
 - 9.1. Discuss and follow the guidelines for prescribing dental radiographs for the new patient, either child, adolescent or adult.
 - 9.2. Discuss and follow the guidelines for prescribing dental radiographs for the recall patient, either child, adolescent or adult.
10. Demonstrate a basic understanding of mounting radiographs
 - 10.1. List 5 advantages of mounting radiographs

- 10.2. Discuss the use and importance of the identification dot
- 10.3. Compare labial and lingual methods of film mounting
- 10.4. List 5 anatomic generalizations that aid in mounting radiographs
11. Demonstrate a basic understanding of the paralleling technique
 - 11.1. Discuss the principles of the paralleling technique
 - 11.2. List the advantages and disadvantages of the paralleling technique
 - 11.3. Identify and be able to assemble and position image receptor holders for use with the paralleling technique
 - 11.4. Explain the importance of achieving accurate horizontal and vertical angulations
 - 11.5. Identify vertical angulation errors made when using the paralleling technique
12. Demonstrate a basic understanding of the bitewing technique
 - 12.1. List the 2 ideal uses for bitewing examination
 - 12.2. Describe the bitewing technique
 - 12.3. Differentiate between horizontal and vertical bitewing radiographs
 - 12.4. Compare methods used for holding the bitewing image receptor in position
 - 12.5. Identify the positions of the film placement and the vertical and horizontal angulations normally used for bitewing radiographs
 - 12.6. Demonstrate mounting bitewing films
13. Explain an understanding for exposure and technique errors in dental images
 - 13.1. Identify and correct the types of radiographic errors caused by incorrect radiographic techniques
 - 13.2. Identify and correct the types of radiographic errors caused by incorrect film positioning and angulations of the central ray
 - 13.3. Identify and correct the types of radiographic errors caused by incorrect processing procedures
 - 13.4. Identify the conditions that cause radiographs to be fogged
14. Demonstrate a basic understanding of the anatomical landmarks that are seen on dental radiographs.
 - 14.1. Describe why it is important to recognize and identify normal anatomical landmarks of the face and head.
 - 14.2. Differentiate between the terms radiopaque and radiolucent.
 - 14.3. Recognize and describe the radiographic appearance of all structures of the teeth and the alveolus.
 - 14.4. Name and identify landmarks or structures normally seen on radiographs of the maxillary and mandibular tooth areas.
15. Demonstrate a basic understanding of preliminary interpretations of radiographs by auxiliary personnel.
 - 15.1. Identify at least 4 types of cysts
 - 15.2. Describe the radiographic appearance of at least eight dental anomalies.
 - 15.3. Differentiate between normal and pathological resorption of bone structures and teeth.
 - 15.4. Describe the radiographic appearance of common dental injuries
 - 15.5. Differentiate between preliminary interpretation and diagnosis of the radiograph.
 - 15.6. Identify all radiopaque- and radiolucent-appearing restorative materials and cements.
 - 15.7. Identify the radiographic appearance of dental caries.
 - 15.8. Identify all radiopaque- and radiolucent-appearing prosthetic appliances.
 - 15.9. Identify two methods used to localize objects in the jaws by applying the buccal-object rule.
 - 15.10. Identify the radiographic appearance of periodontal disease.
16. Demonstrate a basic understanding of digital imaging

- 16.1. Explain the fundamental concept of digital radiography
- 16.2. Differentiate between direct and indirect digital imaging
- 16.3. Select the type and number of sensors required to make a complete periapical and bitewing survey for each digital system
- 16.4. Describe 3 types of digital image receptors
- 16.5. Discuss digital radiography's effect on radiation exposure
- 16.6. Identify advantages and limitations of digital radiography
17. Explain the relations of dental radiography and radiation biology
 - 17.1. Compare the theories of biological damage and the possible effects of radiation on cells
 - 17.2. Identify the body cells in order of their radio sensitivity
 - 17.3. Identify the factors that determine radiation injuries
 - 17.4. List the possible short- and long-term effects of irradiation
 - 17.5. Identify the effects of oral radiation therapy
 - 17.6. Define the units of measurement used in radiation exposure
 - 17.7. Discuss the risk versus benefit of dental radiographs.
18. Demonstrate a basic understanding of the bisecting technique
 - 18.1. State the principles of the bisecting technique and illustrate the location of the receptor, tooth, imaginary bisector, central ray, and position-indicating device (PID)
 - 18.2. Describe the receptor size used with the bisecting technique
 - 18.3. Describe correct and incorrect horizontal angulation
 - 18.4. Describe correct and incorrect vertical angulation
 - 18.5. State the basic rules of the bisecting technique
 - 18.6. List advantages and disadvantages of the bisecting technique
19. Demonstrate a basic understanding of special radiographic techniques such as occlusal, edentulous, pediatric, and extraoral.
 - 19.1. Discuss the importance of making radiographic examinations on children.
 - 19.2. Identify the factors that determine when radiographs on children should be made and what type and number of films is best suited in each instance.
 - 19.3. Differentiate the procedures involved on exposing radiographs on children and adults.
 - 19.4. Explain the importance of making a radiographic survey of edentulous areas.
 - 19.5. Identify the film requirements for an edentulous survey.
 - 19.6. Differentiate the procedures used for making the survey in a fully or a partially edentulous patient.
 - 19.7. Identify three reasons for making extraoral exposures.
 - 19.8. Identify the types of surveys and films used in extraoral radiography.
 - 19.9. Differentiate between a conventional and a panoramic x-ray machine.
 - 19.10. Discuss the concept of a focal trough.
 - 19.11. Identify, in sequence, the basic steps in operating a panoramic x-ray unit.
 - 19.12. Identify five major head-positioning errors that result in faulty panoramic radiographs.
 - 19.13. Compare the advantages and disadvantages of panoramic versus intraoral radiographic surveys.
 - 19.14. Describe the fundamentals of three-dimensional imaging
 - 19.15. Identify normal anatomy on a panoramic image.
20. Explain the legal responsibilities of the Dental Assistant
 - 20.1. Compare and contrast the procedure and information that is involved in diagnosis verses interpretation/evaluation of a radiograph
 - 20.2. Indicate who may diagnose from a radiograph

- 20.3. List the type interpretations made from a radiograph and importance of interpretations.
- 20.4. List the type of diagnoses made from a radiograph and importance of these diagnoses.
- 20.5. Demonstrate the proper completion of dental records when taking radiographs
- 20.6. Explain the life cycle of radiographic records and their care and ownership
- 21. Demonstrate a basic understanding of quality assurance in the dental office
 - 21.1. Discuss purpose and frequency of testing dental x-ray machines
 - 21.2. Discuss quality control tests needed for digital imaging procedures
 - 21.3. Detail the importance of operator competence in dental radiographic procedures