

Course Code: DHG 117**Course Title:** Dental Radiology I**Department:** Allied Health**Effective Date:** Summer 2026**PCS Code:** 1.2 - Occupational/Technical Instruction**CIP Code:** 51.0601**Repeatability:** 0

Credit Hours

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

Lecture: 2

Lab: 3

Clinical: 0

Total: 3

General Course Information

Catalog Description

Theory and procedures for exposing various dental X-ray images, practical experience on mannequins and selected patients, identification, mounting, and general interpretation practiced. Legal and ethical considerations, infection control for radiographic equipment is emphasized.

General Course Objectives

1. Recognize the dangers of dental hygiene and how to minimize exposure for both clinician and patient.
2. Demonstrate proper radiographic techniques when exposing radiation.
3. Interpret different radiographic series for normal and abnormal findings.
4. Choose the correct radiographic recall for your patients.
5. Recall information about dental x-ray film and the correct processing procedures.

Minimum Placement Levels

English	Reading	Math
Placement out of ENG 099	Placement out of CCS 099	Placement out of MAT 072

Prerequisites

Credit in DHG 110, DHG 111, DHG 113, DHG 114, and BIO 122

Admission into the Dental Hygiene program

Methods of Evaluation

2-3 objective exams, 3-5 homework assignments, 8-11 objective quizzes, 1-2 discussion posts, a comprehensive final exam, 10-15 lab activities, and 2-4 lab proficiencies.

Instructional Materials and Additional Supplies

Essentials of Dental Radiography for Dental Assistants and Hygienists by Thomson and Johnson

Darby's Comprehensive Review of Dental Hygiene by Blue

The equipment needed is purchased by the student as part of their student kit in the fall semester of the first year.

Course Content

General Learning Outcomes (GLOs)

- Communication: Students will demonstrate the ability to read, write, listen, and speak effectively.
- Critical Thinking and Information Literacy: Students will demonstrate the ability to evaluate perspectives, evidence, and implications, and to locate, assess, and use information effectively.
- 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
History and Principles of Radiation	1. State when x-rays were discovered and by whom. 2. Trace the history of radiography, noting the prominent contributors. 3. List two historical developments that made dental x-ray machines safer. 4. Explain how rectangular PIDs reduce patient radiation exposure. 5. Identify two techniques used to expose dental radiographs. 6. List five uses of dental radiographs. 7. Define key terms. 8. Describe the process of ionization. 9. Differentiate between radiation and radioactivity. 10. List the properties shared by all energies of the electromagnetic spectrum. 11. Explain the relationship between wavelength and frequency. 12. List the properties of x-rays. 13. Identify and describe the two processes by which kinetic energy is converted to electromagnetic energy within the dental tube. 14. List and describe the four possible interactions of dental x-rays with matter. 15. Differentiate between primary, secondary, and scatter radiations. 16. Define the terms used to measure x-radiation. 17. Match the Système Internationale (SI) units of x-radiation measurement to the corresponding traditional terms. 18. Identify three sources of naturally occurring background radiation.	2	0	0
Bitewing Examination	1. Describe the bitewing radiograph technique. 2. Match the bitewing exam with two ideal uses. 3. List the four sizes of image receptors that can be used for bitewing surveys, explaining advantages and limitations of each size. 4. Identify the size and number of image receptors best suited for a bitewing examination for a child with primary and/or mixed dentition. 5. Identify the size and number of image receptors best suited for a bitewing examination for an adult with and without periodontal disease. 6. Explain the difference between horizontal and vertical bitewing radiographs. 7. Explain the role that occlusion plays in aligning an image receptor for exposure of premolar and molar bitewing radiographs. 8. Compare methods of holding bitewing image receptor in position. 9. Demonstrate image receptor placement, horizontal and vertical angulation, and points of entry for horizontal and vertical posterior bitewing examinations. 10. State the purpose for taking bitewing exposures and their limitations. 11. Describe the criteria for good diagnostic quality bitewing radiographs.	4	12	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Effects of Radiation Exposure and Radiation Protection	1. Differentiate between the direct and indirect theories of biological damage. 2. Differentiate between a threshold dose-response curve and a non-threshold dose-response curve. 3. List the sequence of events that may follow exposure to radiation. 4. Identify factors that determine whether radiation injuries are likely. 5. List three conditions that influence the radiosensitivity of a cell. 6. Determine the relative radiosensitivity and radio-resistance of various kinds of cells in the body. 7. Explain the difference between deterministic and stochastic effects. 8. Explain the difference between somatic and genetic effects. 9. Explain the difference between short- and long-term effects of radiation. 10. Identify critical tissues for dental radiography. 11. Adopt the ALARA concept. 12. Use the selection criteria guidelines to explain the need for prescribed radiographs. 13. Explain the roles communication, working knowledge of quality radiographs, and education play in preventing unnecessary radiation exposure. 14. Explain the roles technique and exposure choices play in preventing unnecessary radiation exposure. 15. State the federally mandated limited diameter of the PID for intraoral dental x-ray. 16. List the two functions of a collimator. 17. Explain how PID shape and length contribute to reducing patient radiation exposure. 18. Identify film speeds currently available for use in dental radiography. 19. Explain the role image receptor holders play in reducing patient radiation exposure. 20. Advocate the use of the lead/lead-equivalent thyroid collar apron. 21. Explain the role darkroom protocol and film handling play in reducing patient radiation exposure. 22. Summarize radiation protection methods for patient. 23. Explain the role time, shielding, and distance play in protecting a radiographer from unnecessary radiation exposure. 24. Describe radiation safety protocol for use with portable, handheld devices. 25. Describe radiation monitoring devices. 26. Summarize radiation protection methods for a radiographer. 27. State the filtration requirements for an intraoral dental x-ray unit that operates above and below 70 kVp. 28. State the maximum permissible dose (MPD) for radiation workers and the general public.	3	4	0
Radiographic Examinations and the Paralleling Technique	1. State the difference between intraoral and extraoral radiography. 2. Explain the three intraoral radiographic examinations. 3. Identify two intraoral techniques. 4. List the five rules of shadow casting. 5. Determine conditions that affect the selection of image receptor size. 6. Select the type and number of image receptors required for a full mouth survey. 7. Explain and demonstrate horizontal and vertical angulation. 8. List five contraindications for using the patient's finger to hold the image receptor during an exposure. 9. Explain the basic design of image receptor positioners/holders. 10. Describe the proper patient seating position. 11. Demonstrate a systematic and orderly sequence of the exposure procedure. 12. Discuss the principles of the paralleling technique. 13. List the advantages and limitations of the paralleling technique. 14. Identify, assemble, and position image receptor holders for use with the paralleling techniques. 15. Explain the importance of achieving accurate horizontal and vertical angulation in obtaining quality diagnostic radiographs using the paralleling technique. 16. Identify vertical angulation errors made when using the paralleling technique. 17. Demonstrate the image receptor positioning, horizontal and vertical angulation, and points of entry for maxillary and mandibular periapical exposures using the paralleling technique.	3	12	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Normal Radiographic Anatomy and Radiographic Anomalies, Lesions, and Opportunistic Screening	1. Define key terms. 2. Explain how two-dimensional radiographs present a challenge to developing interpretation skills. 3. List facial and cranial bones important to radiographic interpretation. 4. Differentiate between the radiographic appearance of cortical and cancellous bone. 5. Differentiate between the radiographic appearance of the lamina dura and the PDL space. 6. List and identify the radiographic appearance of the structures of the teeth. 7. Demonstrate use of a systematic method for interpreting dental radiographs. 8. Categorize bony landmarks as to whether they will appear radiopaque or radiolucent on a dental radiograph. 9. Identify significant anatomy recorded on dental radiographs of the maxilla and mandible. 10. Describe anomalies and pathologic lesions by density, size, shape, border, architecture, location, and effect on surrounding tissues. 11. Differentiate between radiolucent, radiopaque, and lucent-opaque lesions. 12. Explain how to document size of a lesion detected on a radiographic image. 13. Differentiate between regular- and irregular-shaped lesions detected on a radiographic image. 14. Differentiate between a well-defined and poorly-defined border of a lesion detected on a radiographic image. 15. Explain the difference between the lesion architecture. 16. Explain the importance of documenting location of anomalies and lesions detected on a radiographic image. 17. Explain the importance of examining adjacent structures and surrounding tissues for changes caused by an anomaly or lesion. 18. List and describe the radiographic appearance of common developmental anomalies. 19. List and describe the radiographic appearance of common radiolucent, radiopaque, and lucent-opaque lesions. 20. Differentiate between external and internal resorption.	3	5	0
Radiographic Appearance of Dental Materials and Legal and Ethical Responsibilities	1. Define key terms. 2. Explain the need for a clinical examination in conjunction with radiographic interpretation. 3. Rank dental materials according to their degree of radiopacity. 4. Describe the role radiographs play in evaluating dental restorations. 5. Identify the appearance of all restorative materials. 6. Identify the radiographic appearance of implants, orthodontics, surgical materials, and other foreign objects. 7. Discuss federal and state regulations concerning the uses of dental x-ray equipment. 8. Identify specific risk management strategies pertaining to dental radiography. 9. Respond to a patient exercising self-determination in refusing a radiographic examination. 10. List criteria for informed consent. 11. Describe elements required before releasing a copy of a patient's radiographic images. 12. Describe the role of DICOM. 13. Identify the role professional ethics plays in guiding a radiographer's behavior.	2	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
The Use of Radiographs in the Detection of Dental Caries and The Use of Radiographs in the Evaluation of Periodontal Diseases	1. Explain why caries appear radiolucent on radiographs. 2. Define the role radiographs play in detecting caries. 3. Identify the ideal type of projection, technique, and exposure factors that enhance a radiograph's ability to image caries. 4. List and describe the four categories of the caries depth grading system. 5. Describe the radiographic appearance of proximal surface, occlusal surface, buccal/lingual surface, and cemental/root surface caries. 6. Describe the radiographic appearance of recurrent and rampant caries. 7. Explain the importance of radiographically monitoring arrested caries. 8. Describe conditions that resemble dental caries radiographically and discuss how to distinguish these from caries. 9. List the uses of radiographs in the assessment of periodontal diseases. 10. Differentiate between horizontal and vertical bone loss. 11. Identify three local contributing factors for periodontal disease that radiographs can help detect. 12. Explain the purpose of using radiographs to image root morphology. 13. List the limitations of radiographs in the assessment of periodontal diseases. 14. Explain the parameters for using vertical and horizontal bitewing and periapical radiographs to record periodontal disease. 15. Recognize the roles vertical and horizontal angulations play in imaging periodontal diseases. 16. Describe the radiographic appearance of the normal periodontium. 17. List four American Academy of Periodontology disease classification stages and grades, and describe their radiographic appearance.	2	4	0
Dental X-ray Machine and Digital Radiography Image Acquisition	1. Identify components of the x-ray machine. 2. Identify and explain the function of the controls on the control panel. 3. State the three conditions necessary for the production of x-rays. 4. Explain the difference between alternating and direct electrical currents. 5. Explain the relationships between AC and DC dental x-ray machines and their effects on film and digital image receptors. 6. Identify and explain the parts of the cathode and anode and their function in production of x-rays. 7. Demonstrate in sequence the steps in operating the dental x-ray machine. 8. Explain the fundamental concepts of digital radiography and image acquisition. 9. List equipment needed to acquire a digital image. 10. Explain the use of software in digital imaging interpretation. 11. Explain the difference between direct and indirect digital imaging. 12. Describe and compare three types of digital image receptors. 13. Discuss digital radiography's effect on radiation exposure to a patient. 14. Identify benefits and limitations of digital radiographic imaging.	2	1	0
Correcting Undiagnostic Radiographs	1. Understand the need for a retake policy. 2. List the characteristics of a quality radiographic image. 3. Recognize errors caused by incorrect radiographic techniques and ways to correct them. 4. Recognize errors caused by incorrect radiographic image receptor handling and ways to correct them.	1	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Factors Affecting Radiographic Quality	1. Examine a radiographic image, identifying the basic requirements of acceptability. 2. Define radiographic density and contrast. 3. List the rules for casting a shadow image. 4. List the variables that affect film contrast. 5. Describe how geometric factors affect image sharpness. 6. Identify the causes of image magnification and distortion. 7. Explain the effect milliamperage, kilovoltage, and exposure time have on image density. 8. Explain the effect variations in target-surface, object-image receptor, and target-image receptor distances have on image quality. 9. Demonstrate practical use of the inverse square law.	3	0	0
Occlusal Examination, Three-dimensional Imaging, and Other Extraoral Images	1. State the purpose of the occlusal examination. 2. List the indications for occlusal radiographs. 3. Match the topographical and cross-sectional techniques with the condition to be imaged. 4. Compare patient head positions for the topographical and the cross-sectional techniques. 5. Demonstrate the steps for the maxillary and mandibular topographical surveys. 6. Demonstrate the steps for the mandibular cross-sectional survey. 7. Describe the purpose and use of three-dimensional imaging. 8. Describe the three suggested categories of oral conditions for the prescription of a cone beam computed tomography (CBCT). 9. Explain how CBCT differs from medical computer tomography (CT). 10. Explain the purpose of changing the field of view (FOV). 11. List the three anatomical planes of CBCT slice image data. 12. List oral conditions that would most benefit from a CBCT examination. 13. Discuss how CBCT settings can reduce radiation exposure. 14. Describe the appearance of artifacts that occur on CBCT images. 15. Explain the challenges to interpretation of image data produced by CBCT technology. 16. Describe what extraoral images would be needed to evaluate orthodontics, sinuses, and blocked salivary glands.	3	1	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Panoramic Examination and Recognizing Normal Anatomy on Panoramic Images	1. List uses of panoramic radiography. 2. Compare the advantages and limitations of panoramic versus intraoral radiographs. 3. Explain how the panoramic technique relates to the principles of tomography. 4. Identify the three dimensions of the focal trough. 5. Identify and describe panoramic image receptors. 6. Explain the role of intensifying screens in producing a radiographic image. 7. Identify the intensifying screen type recommended for ALARA. 8. List the components of a panoramic x-ray machine. 9. Demonstrate how to use each of the head positioner guides found on a panoramic x-ray machine. 10. Demonstrate the steps used to prepare patient for exposure of a panoramic radiograph. 11. Explain the use of a cape-style lead/lead equivalent barrier or the use of an apron without an attached thyroid collar. 12. Match errors made in patient preparation procedures with the characteristic effect on the appearance of the panoramic radiograph. 13. Identify the anatomical landmarks and planes used to position the dental arches correctly within the focal trough. 14. Match errors made in patient-positioning procedures with the characteristic effect on the panoramic radiographs. 15. List exposure and image receptor handling errors and describe how these will affect the appearance of the panoramic radiograph. 16. Describe the unique appearance of normal anatomy as recorded by a panoramic radiograph. 17. Explain why panoramic radiographs present with streaked and blurred images. 18. List the type of tissues and artifacts that will be recorded on panoramic radiographs. 19. Describe the appearance of air spaces on a panoramic radiograph. 20. Explain how the panoramic technique produces ghost images. 21. Identify maxillofacial bony anatomic landmarks of the maxilla, surrounding tissues, and the mandible as viewed on a panoramic radiograph. 22. Identify the hyoid bone and cervical vertebra as viewed on a panoramic radiograph. 23. Identify maxillofacial soft tissues and air spaces as viewed on a panoramic radiograph. 24. Identify positioning guide and ghost image artifacts as viewed on a panoramic radiograph.	2	4	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
30	45	0