

El Paso Community College
Syllabus
Part II
Official Course Description

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| SUBJECT AREA | <u>Dental Hygiene</u> |
| COURSE RUBRIC AND NUMBER | <u>DHYG 1304</u> |
| COURSE TITLE | <u>Dental Radiology</u> |
| COURSE CREDIT HOURS | <u>3 2 4</u> Credits Lec Lab |

I. Catalog Description

Studies the fundamentals of oral radiography, including techniques, interpretation, quality assurance, and ethics. A grade of "C" or better is required in this course to take the next course. Lab recommended.

Prerequisites: BIOL 2401 and BIOL 2402 and CHEM1306 and 1106. Corequisites: DHYG 1103 and DHYG 1201 and DHYG 1219 and DHYG 123 and 1431. (2:4) Lab fee. Professional Practice Insurance required. Dental Hygiene Discipline.

II. Course Objectives Theory

The theory section of this syllabus corresponds to the parts and chapters found in the text.

Part I: Radiation Basics

- A. Unit I: Dental Radiography: Historical Perspective and Future Trends
 - 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 PID's reduce patient radiation exposure.
 - 5. Identify the two techniques used to expose dental radiographs.
 - 6. List five uses for dental radiographs
 - 7. Become aware of other imaging modalities available for use in the detection and evaluation of oral conditions.
 - 8. Define key terms.

- B. Unit 2: Characteristics and Measurement of Radiation
 - 1. Draw and label a typical atom.
 - 2. Describe the process of ionization.
 - 3. Differentiate between radiation and radioactivity.
 - 4. List the properties shared by all energies of the electromagnetic spectrum.
 - 5. Explain the relationship between wavelength and frequency.
 - 6. List the properties of x-rays.
 - 7. Identify and describe the two processes by which kinetic energy is converted to electromagnetic energy within the dental x-ray tube.
 - 8. Differentiate between primary, secondary and scatter radiations.
 - 9. List and describe the four possible interactions of dental x-rays with matter.
 - 10. Define the terms used to measure x-radiation

11. Match the *Système Internationale* (SI) units of x-radiation measurement to the corresponding traditional terms.
 12. Identify three sources of naturally occurring background radiation.
 13. Define key terms.
- C. Unit 3: The Dental X-ray Machine: Components and Functions.
1. Identify the three major components of a dental x-ray machine.
 2. Identify and explain the function of the five controls on the control panel.
 3. Differentiate between alternating and direct electrical currents.
 4. Explain the relationships between AC and DC dental x-ray machines and their effects on film and digital image receptors.
 5. State the three conditions necessary to produce x-rays.
 6. Draw and label the parts of a dental x-ray tube.
 7. Trace the production of x-rays from the time the exposure button is activated until x-rays are released from the tube.
 8. Demonstrate, in sequence, steps in operating a dental x-ray machine.
 9. Define key terms.
- D. Unit 4: Factors Affecting Radiographic Quality
1. Evaluate a radiographic image in identifying the basic requirements of acceptability.
 2. Differentiate between radiolucent and radiopaque areas on a dental Radiograph.
 3. Define radiographic density and contrast.
 4. List the rules for casting a shadow image.
 5. List the variables that affect film contrast.
 6. Describe how geometric factors affect image sharpness.
 7. Identify the causes of image magnification and distortion.
 8. Explain the effect milliamperage, kilovoltage and exposure time have on image density.
 9. Explain the effect variations in target-surface, object-image receptor and target-image receptor distances have on image quality.
 10. Demonstrate practical use of the inverse square law.
 11. Define key terms.

Part II: Radiation Biology and Radiation Safety

- E. Unit 5: Effects of Radiation Exposure
1. Differentiate between direct and indirect theories of biological damage.
 2. Differentiate between 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 or radioresistance of various kinds of cells in the body.
 7. Explain the difference between somatic and genetic effects.
 8. Explain the difference between short- and long-term effects of irradiation.
 9. Identify critical tissues for dental radiography.
 10. Discuss the risks versus benefits of dental radiographs.
 11. Utilize effective dose equivalent to make radiation exposure comparisons.
 12. Define key terms.
- F. Unit 6: Radiation Protection
1. Adopt the ALARA concept.
 2. Use the selection criteria guidelines to explain the need for prescribed radiographs.
 3. Explain the roles communication, working knowledge of quality radiographs and education play in preventing unnecessary radiation exposure.

4. Explain the roles technique and exposure choices play in preventing unnecessary radiation exposure.
5. Compare inherent, added and total filtration.
6. State the federally mandated limited diameter of the intraoral dental x-ray.
7. List two functions of the collimator.
8. Explain how PID shape and length contribute to reducing patient radiation exposure.
9. Identify film speeds currently available for use in dental radiography.
10. Explain the role image receptor holders play in reducing patient radiation exposure.
11. Advocate the use of a lead/lead equivalent thyroid collar and apron.
12. Explain the role darkroom protocol and film handling play in reducing patient radiation exposure.
13. Summarize radiation protection methods for a patient.
14. Explain the roles time, shielding and distance play in protecting a radiographer from unnecessary radiation exposure.
15. Utilize distance and location to take a position an appropriate distance and angle from the x-ray source during an exposure.
16. Describe radiation safety protocol for use with portable, hand-held devices. (NOMAD Pro 2)
17. Describe radiation monitoring devices.
18. Summarize radiation protection methods for a radiographer.
19. List organizations responsible for recommending and setting exposure limits.
20. State the maximum permissible dose (MPD) for radiation workers and for the general public.
21. Define key terms.

Part III: Dental X-ray Image Receptors and Image Production

- G. Unit 7: Dental X-ray Film and Processing Methods
1. List and describe the four parts of an intraoral film packet.
 2. Describe latent image formation and explain how it becomes a visible radiographic image.
 3. Identify the intraoral film speeds currently available for dental radiographs.
 4. Explain how duplicating film is different than radiographic film.
 5. List is sequence the steps in processing dental films.
 6. Identify and explain the role developer plays in processing a radiographic image.
 7. List requirements for safelighting a darkroom.
 8. Identify equipment needed for manual film processing.
 9. Identify equipment needed for automatic film processing.
 10. Compare manual and automatic processing methods, stating advantages and disadvantages of each.
 11. Explain the role chemical replenishment and solution changes play in maintaining optimal processing chemistry.
 12. List conditions that will diminish the quality of stored dental x-ray film.
 13. Define key terms.
- H. Unit 8: Dental Radiography and Image Acquisition
1. Explain the fundamental concepts of digital radiography and image acquisition.
 2. Describe the characteristics of a digital image.
 3. List equipment needed to acquire a digital image.
 4. Explain the use of software in digital image interpretation.
 5. Differentiate between direct and indirect digital imaging.
 6. Describe the difference between narrow and wide dynamic range.
 7. Describe and compare three types of digital image receptors.
 8. Discuss digital imaging's effect on radiation dose to a patient.
 9. Identify benefits and limitations of digital radiographic imaging.
 10. Define key terms.

Part IV: Dental Radiographer Fundamentals

- I. Unit 9: Infection Control
 - 1. List the conditions that make up the chain of infection.
 - 2. State the purpose of infection control.
 - 3. Identify methods of breaking the chain of infection.
 - 4. State the roles the Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA) play in providing guidelines for infection control.
 - 5. List personal protective equipment (PPE) recommended for dental radiographers.
 - 6. Explain how to maintain hand and respiratory hygiene.
 - 7. Compare the different levels of Environmental Protection Agency (EPA) -regulated disinfectants.
 - 8. Explain the role of surface barriers in infection control.
 - 9. Differentiate between semi-critical and noncritical objects used during radiographic procedures.
 - 10. Demonstrate competency in following infection control protocol prior to, during and after radiographic procedures.
 - 11. Demonstrate competency in following infection control protocol for handling and processing intraoral image receptors.
 - 12. Demonstrate competency in following infection control protocol when using an automatic processor with a daylight loader attachment.
 - 13. Define key terms.

- J. Unit 10: Legal and Ethical Responsibilities
 - 1. Discuss federal and state regulations concerning the use of dental x-ray equipment.
 - 2. Describe licensure requirements for individuals who expose dental radiographs.
 - 3. Identify specific risk management strategies pertaining to dental radiography.
 - 4. Respond to a patient exercising self-determination in refusing a radiographic examination.
 - 5. List criteria for informed consent.
 - 6. List the details that must be documented in a patient's record regarding a radiographic examination.
 - 7. Describe elements required before releasing a copy of a patient's radiographic images.
 - 8. State how long radiographic images should be maintained and available.
 - 9. Describe the role of DICOM.
 - 10. List the advantages of cloud sharing over other methods of storing and sharing digital radiographic images.
 - 11. Identify a cloud sharing system that is HIPAA compliant.
 - 12. Explain Joint Photographers' Expert Group (JPEG) impact on digital radiographic images.
 - 13. Identify the role professional ethics play in guiding a radiographer's behavior.
 - 14. Define key terms.

- K. Unit 11: Patient Relations and Education
 - 1. Value the need for patient cooperation in producing quality radiographs.
 - 2. List aspects of patient relations that help to gain confidence and cooperation.
 - 3. Explain how professional appearance and first impression affect patient relations.
 - 4. Explain how to project an attitude of professionalism.
 - 5. State examples of facilitation skills.
 - 6. Explain the relationship between verbal and nonverbal communication.
 - 7. Demonstrate the patient management strategy Show-Tell-Do.
 - 8. Explain the goals of patient education.

9. Describe methods of patient education.
10. Respond to questions frequently asked regarding a radiographic examination.
11. Define key terms.

Part V: Radiographic Techniques

- L. Unit 12: Introduction to Radiographic Examinations
1. State the difference between intraoral and extraoral radiography.
 2. Compare the three intraoral radiographic examinations.
 3. Identify the two intraoral techniques.
 4. List the five rules for 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 horizontal and vertical angulation.
 8. Explain point of entry.
 9. List five contraindications for using the patient's finger to hold the image receptor during exposure.
 10. Explain the basic design of image receptor positioners/holders.
 11. Describe proper patient seating position.
 12. Demonstrate a systematic and orderly sequence of the exposure procedure.
 13. Define key terms.
- M. Unit 13: The Periapical Examination-Paralleling Technique
1. Discuss the principles of the paralleling technique.
 2. List the advantages and limitations of the paralleling technique.
 3. Identify, assemble and position image receptor holders for use with the paralleling technique.
 4. Explain the importance of achieving accurate horizontal and vertical angulation in obtaining quality diagnostic radiographs using the paralleling technique.
 5. Identify vertical angulation errors unique to the paralleling technique.
 6. Demonstrate the image receptor positioning, horizontal and vertical angulation and points of entry for maxillary and mandibular periapical exposures using the paralleling technique.
 7. Define key terms.
- N. Unit 14: The Periapical Examination-Bisecting Technique
1. Discuss the principles of the bisecting technique.
 2. List the advantages and limitations of the bisecting technique.
 3. Identify, assemble and position image receptor holders for use with the bisecting technique and distinguish these holders from those used with the paralleling technique.
 4. Explain the importance of achieving accurate horizontal and vertical angulation in obtaining quality diagnostic radiographs using the bisecting technique.
 5. List the recommended predetermined vertical angulation settings used with the bisecting technique.
 6. Identify vertical angulation errors unique to the bisecting technique.
 7. Locate facial landmarks used for determining the points of entry with the bisecting technique.
 8. Demonstrate image receptor positioning, horizontal and vertical angulation, and points of entry for maxillary and mandibular periapical exposures using the bisecting technique.
 9. Define key terms
- O. Unit 15: The Bitewing Examination
1. Describe the bitewing radiographic technique.
 2. Match the bitewing examination with two ideal uses.
 3. List the four (4) sizes of image receptors that can be used for bitewing examinations, 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. Differentiate between horizontal and vertical bitewing radiographs.
 7. Explain the role occlusion plays in aligning an image receptor for exposure of premolar and molar bitewing radiographs.
 8. Explain the effect of incorrect horizontal angulation on the resultant bitewing image.
 9. Identify positive and negative vertical angulations.
 10. State the recommended vertical angulation for bitewing exposures.
 11. Identify vertical angulation errors unique to the bitewing technique.
 12. Demonstrate image receptor placement, horizontal and vertical angulation, and points of entry for horizontal and vertical posterior bitewing examinations.
 13. Demonstrate image receptor placement, horizontal and vertical angulation and points of entry for a vertical anterior bitewing examination.
 14. Define key terms.
- P. Unit 16: The Occlusal Examination
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 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. Define key terms.
- Q: Unit 17: The Panoramic Examination
1. List the 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 ALARA.
 8. Describe the purpose of a panoramic cassette.
 9. List the components of 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 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 with the focal trough.
 14. Match errors made in patient-positioning procedures with the characteristic effect on the appearance of the panoramic radiograph.
 15. List exposure and image receptor handling errors and describe how these will affect the appearance of the panoramic radiograph.
 16. Define key terms.

Part VI: Radiographic Errors and Quality Assurance

- R. Unit 18: Identifying and 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.
 4. Apply appropriate corrective actions for technique errors.

5. Recognize errors caused by incorrect radiographic processing.
 6. Apply appropriate corrective actions for processing errors.
 7. Recognize errors caused by incorrect radiographic image receptor handling.
 8. Apply appropriate corrective actions for handling errors.
 9. Identify causes of film fog.
 10. Apply appropriate actions for preventing film fog.
 11. Define key terms.
- S. Unit 19: Quality Control and Environmental Safety in Dental Radiography
1. State the objectives of dental radiographic quality control.
 2. Explain the role competent radiographer plays in quality assurance.
 3. Describe quality control tests for monitoring a dental x-ray machine.
 4. Describe quality control tests for monitoring a darkroom and processing equipment.
 5. Describe quality control tests for monitoring radiographic image receptors.
 6. Describe quality control tests for monitoring view boxes and computer monitors used to view radiographic images.
 7. List precautions to put in place that protect digital radiographic images.
 8. List data supplied by Safety Data Sheets (SDS) for radiographic processing chemistry.
 9. Describe safe handling procedures for radiographic processing chemicals and materials.
 10. Describe environmentally sound options for disposal of radiographic processing chemistry and materials.
 11. Define key terms.

Part VII: Viewing and Interpreting Dental Radiographic Images

- T. Unit 20: Image Orientation and Introduction to Interpretation
1. List advantages of mounting film-based radiographs.
 2. Identify anatomical landmarks that assist with distinguishing radiographs of the maxilla and mandible.
 3. Describe characteristics of a quality film mount.
 4. Discuss the use and importance of the embossed film identification dot.
 5. Compare labial and lingual methods of film mounting.
 6. List steps to an orderly mounting procedure.
 7. List anatomic generalizations that aid in image orientation.
 8. Describe actions that will assist in correctly orienting digital images.
 9. Explain the difference between interpretation and diagnosis.
 10. Describe equipment used to view radiographic images.
 11. Demonstrate image viewing according to the suggested steps presented.
 12. Describe the use and care of radiographic images during and after patient care.
 13. Define key terms.
- U. Unit 21: Recognizing Normal Radiographic Anatomy-Intraoral Radiographs
1. Explain how two-dimensional radiographs present a challenge to developing interpretation skills.
 2. List facial and cranial bones important to radiographic interpretation.
 3. Differentiate between the radiographic appearance of cortical and cancellous bone.
 4. Differentiate between the radiographic appearance of the lamina dura and the PDL space.
 5. List and identify the radiographic appearance of the structures of the teeth.
 6. Demonstrate use of a systematic method for interpreting dental radiographs.
 7. Categorize bony landmarks as to whether they will appear radiopaque or radiolucent on a dental radiograph.
 8. Identify significant anatomy recorded on dental radiographs of the maxilla and mandible.
 9. Define key terms.
- V. Unit 22: Recognizing Normal Radiographic Anatomy-Panoramic Radiographs

1. Describe the unique appearance of normal anatomy as recorded by a panoramic radiograph.
 2. Explain why panoramic radiographs present with streaked and blurred images.
 3. List the types of tissues and artifacts that will be recorded on panoramic radiographs.
 4. Describe the appearance of air spaces on a panoramic radiograph.
 5. Explain how the panoramic technique produces ghost images.
 6. Identify the main factor that determines the width of the focal trough.
 7. Identify maxillofacial bony anatomic landmarks of the maxilla and surrounding tissues as viewed on a panoramic radiograph.
 8. Identify maxillofacial bony anatomic landmarks of the mandible as viewed on a panoramic radiograph.
 9. Identify the hyoid bone and cervical vertebra as viewed on a panoramic radiograph.
 10. Identify maxillofacial air spaces as viewed on a panoramic radiograph.
 11. Identify positioning guide artifacts as viewed on a panoramic radiograph.
 12. Identify ghost image artifacts as viewed on a panoramic radiograph.
 13. Define key terms.
- W. Unit 23: Radiographic Appearance of Dental Materials and Foreign Objects
1. Explain the need for a clinical examination in conjunction with radiographic interpretation.
 2. Explain the effect two-dimensional radiographs have on the identification of dental materials.
 3. Rank dental materials according to degree of radiopacity.
 4. Describe the role radiographs play in evaluating dental restorations.
 5. Identify the radiographic appearance of amalgam.
 6. Identify the radiographic appearance of full metal, PFM, and stainless-steel crowns.
 7. Identify the radiographic appearance of a fixed bridge.
 8. Identify the radiographic appearance of retention pin and post and core restorative materials.
 9. Identify the radiographic appearance of dental liners, bases and cements.
 10. Identify the radiographic appearance of endodontic fillers.
 11. Identify the radiographic appearance of implants, orthodontic and surgical materials.
 12. Identify the radiographic appearance of an amalgam fragment.
 13. Define key terms.
- X. Unit 24: The Use of Radiographs in the Detection of Dental Caries
1. Explain why caries appear radiolucent on radiographs.
 2. Define the role radiographs play in detecting caries.
 3. Identify the ideal type of projection and technique 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 caries.
 6. Describe the radiographic appearance of occlusal surface caries.
 7. Describe the radiographic appearance of buccal/lingual surface caries.
 8. Describe the radiographic appearance of cemental/root surface caries.
 9. Describe the radiographic appearance of recurrent and rampant caries.
 10. Explain the importance of radiographically monitoring arrested caries.
 12. Identify conditions that resemble dental caries radiographically and discuss how to distinguish these from caries.
 13. Define key terms.
- Y. Unit 25: The Use of Radiographs in the Evaluation of Periodontal Diseases
1. List the uses of radiographs in the assessment of periodontal diseases.
 2. Differentiate between horizontal and vertical bone loss.
 3. Identify three local contributing factors for periodontal disease that radiographs can help detect.

4. Explain the purpose of using radiographs to image root morphology.
 5. List the limitations of radiographs in the assessment of periodontal diseases.
 6. Explain the parameters for using vertical and horizontal bitewing, and periapical radiographs to record periodontal disease.
 7. Recognize the roles vertical and horizontal angulations play in imaging periodontal diseases.
 8. Describe the radiographic appearance of the normal periodontium.
 9. Describe the radiographic appearance of gingivitis.
 10. Describe the radiographic appearance of mild periodontitis.
 11. Describe the radiographic appearance of moderate periodontitis.
 12. Describe the radiographic appearance of severe periodontitis.
 13. Define key terms.
- Z. Unit 26: Describing Radiographic Anomalies Lesions and Opportunistic Screening
1. Use correct terminology to describe the radiographic appearance of dental anomalies.
 2. Describe anomalies and pathologic lesions by density, size, shape, border, architecture, location and effect on surrounding tissues.
 3. Differentiate between radiolucent, radiopaque and lucent-opaque lesions.
 4. Explain how to document the size of a lesion detected on a radiographic image.
 5. Differentiate between regular- and irregular-shaped lesions detected on a radiographic image.
 6. Differentiate between well-defined and a poorly defined border of a lesion detected on a radiographic image.
 7. Explain the difference between lesion architecture that is unilocular, multilocular, focal opacity, multifocal or a target lesion.
 8. Explain the importance of documenting location of anomalies and lesions detected on a radiographic image.
 9. Explain the importance of examining adjacent structures and surrounding tissues for changes caused by an anomaly or lesion.
 10. List and describe the radiographic appearance of common developmental anomalies.
 11. List and describe the radiographic appearance of common radiopaque lesions.
 13. Differentiate between external and internal resorption.
 14. List and describe the radiographic appearance of common lucent-opaque lesions.
 15. Explain the significance of opportunistic screening.
 16. Define key terms.

Part VIII: Radiographic Techniques for Specific Needs

- AA. Unit 27: Pediatric Radiographic Techniques
1. List signs and symptoms that would indicate a pediatric radiographic need.
 2. List conditions a pediatric patient might present with that would prompt a need to adapt a standard radiographic procedure.
 3. Identify factors that influence the number of radiographs, and size of image receptors to be exposed on a pediatric patient.
 4. Explain the reasoning behind the recommendation to use the largest size image receptor that can be tolerated by a pediatric patient.
 5. Determine the type and number of radiographs, and size of image receptor to use to image primary dentition.
 6. Determine the type and number of radiographs, and size of image receptor to use to image transitional mixed dentition.
 7. Identify extraoral radiographic examinations that may benefit a pediatric patient.
 8. Demonstrate adaptations and modifications to standard paralleling and bisecting techniques that aid in obtaining a pediatric radiographic examination.
 9. Adjust standard adult exposure settings to those settings considered appropriate for pediatric radiographs.
 10. Commit to Image Gently® campaign goals.

11. Demonstrate a radiographic examination use of Show-Tell-Do.
 12. Demonstrate a radiographic examination of modeling.
 13. Interpret a set pediatric radiographic images.
 14. Define key terms.
- BB. Unit 28: Radiographic Techniques for Patients with Special Needs
1. Discuss strategies for managing apprehension during a radiographic examination.
 2. Discuss strategies for managing patients with autism spectrum disorder (ASD).
 3. Explain ways to manage a patient with disabilities.
 4. Identify opportunities to develop cultural sensitivity and cultural competence.
 5. Discuss strategies for managing radiographic procedures for a patient with age-related changes.
 6. Use evidence-based guidelines to educate patients who may be reluctant to accept radiographic assessment of need.
 7. Define key terms.
- CC. Unit 29: Radiographic Techniques for Specific Oral Conditions
1. Demonstrate ability to appropriately adapt standard radiographic techniques to meet specific oral condition challenges.
 2. List and define gag reflex stimuli.
 3. Describe methods to prevent and manage a gag reflex during a radiographic examination.
 4. Demonstrate recommended image receptor placement when challenged with large, sensitive tori.
 5. Demonstrate image receptor placement for use with the paralleling and the bisecting techniques in edentulous regions.
 6. Explain the need to expose multiple radiographs of mal-aligned teeth.
 7. Explain how to avoid canine-premolar and molar overlap
 8. Describe the difference between a standard and a disto-oblique periapical radiograph.
 9. List steps to obtain a maxillary and a mandibular disto-oblique periapical radiograph.
 10. Explain the need to alter an image receptor positioner to prevent unequal distribution of the arches.
 11. Explain how to overcome the challenge of not imaging distal of canines on a bitewing radiograph.
 12. Explain how to overcome the challenge of not imaging root apices on a periapical radiograph.

Part IX: Alternate Imaging Modalities

- DD. Unit 30: Supplemental and Extraoral Radiographic Techniques
1. Explain the need for multiple radiographs during endodontic procedures.
 2. Describe the characteristics of an image receptor positioner used to expose working radiographs during endodontic procedures.
 3. List three methods of localization.
 4. Explain the relationship between shadow casting principles and the definitive method of localization.
 5. Explain the role the tube shift method of localization plays in imaging root canals.
 6. List two radiographic images needed for the right-angle method of localization.
 7. Explain the S.L.O.B. rule.
 8. Utilize the buccal-object rule to determine the buccal-lingual location of a foreign object.
 9. Explain the need for a specialized image receptor positioner when using a hand-held x-ray device.
 10. List possible uses for duplicate radiographs.
 11. Describe the difference between duplicating and radiographic film.
 12. List possible uses of extraoral radiographs.
 13. Identify types of extraoral radiographs used to image the oral and maxillofacial regions.
 14. Define key terms.

- EE. Unit 31: Three-Dimensional Imaging
1. Describe the purpose and use of three-dimensional imaging.
 2. Describe the three suggested categories of oral conditions for the prescription of a cone beam computed tomography (CBCT) examination.
 3. Explain how CBCT differs from medical computed tomography (CT).
 4. Explain the purpose of changing the field of view (FOV).
 5. Explain the effect changing voxel size has on an image.
 6. List the three anatomical planes of CBCT slice image data.
 7. List oral conditions that would most benefit from a CBCT images.
 8. Discuss how CBCT settings can reduce radiation exposure.
 9. Describe the appearance of artifacts that occur on CBCT images.
 10. Explain the challenges to interpretation of image data produced by CBCT technology.
 11. Define key terms.

Laboratory: The laboratory portion of this course is designed to enhance the theory portion. Unit objectives, in the laboratory portion, match the objectives found in the theory portion, however may or may not be addressed the same day as the lecture.

Part I: Radiation Basics

- A. Unit 1: Dental Radiography: Historical Perspective and Future Trends
1. Tour the radiology laboratory; discuss past and present trends in radiology
 2. Introduction of radiology machines, equipment, image receptors and image receptor holders.
- B. Unit 2: Characteristics and Measurement of Radiation
1. Re-enforce the properties of x-rays.
 2. Continued conversations during lab on the effects of ionizing radiation on living tissue.
 3. Discussion on scatter-radiation.
 4. Use scientific terminology in lab for description of radiation used in dental radiology.
- C. Unit 3: The Dental X-ray Machine: Components and Function
1. Identify components of a wall mounted dental x-ray machine.
 2. Demonstrate the functions of the pre-set control panel.
 3. Demonstrate the sequence that must be followed in operating the dental x-ray machine.
 4. Identify the components of the hand-held dental x-ray machine.
 5. Demonstrate the functions on the hand-held control panel.
 6. Demonstrate the sequence that must be followed in operating the hand-held dental x-ray machine.
- D. Unit 4: Factors Affecting Radiographic Quality
1. Identify the basic requirements of an acceptable diagnostic radiograph.
 2. Differentiate between radiolucent and radiopaque areas on a dental radiograph.
 3. Demonstrate and identify radiographic density and contrast.
 4. Demonstrate how mA, kVp and exposure time affect image density.

Part II: Radiation Biology and Radiation Safety

- E. Unit 5: Effects of Radiation Exposure
1. Discuss situations and other sources that may increase exposure to radiation.
 2. Identify tissues/cells of the human body that are radiosensitive and areas that are radioresistant.
- F. Unit 6: Radiation Protection

1. Identify the evidence-based guidelines to determine necessary radiographs for the patient.
2. Demonstrate radiation protection methods for the patient.
3. Demonstrate radiation protection methods for the operator.
4. Demonstrate the use of the lead apron and thyroid collar.
5. Demonstrate film handling and processing.
6. Demonstrate the safety protection zone when using hand-held x-ray devices.
7. Discuss protocols to follow when using the hand-held x-ray device or wall mounted x-ray machines.

Part III: Dental X-ray Image Receptors and Image Production

- G. Units 7: Dental X-ray Film and Processing Methods
1. Identify the contents in dental x-ray film packet.
 2. Identify and compare the various intraoral films according to size and customary usage.
 3. Demonstrate darkroom protocol for safelighting.
 4. Demonstrate automatic film processor protocol for intraoral film.
 5. Discuss and demonstrate the steps for disposal of film packet waste and proper lead foil disposal.
 4. Identify intraoral film speeds and their relation to radiation exposure.
 5. Demonstrate the use of duplicating film.
 6. Demonstrate correct methods of film storage and protection.
- H. Unit 8: Digital Radiography and Image Acquisition
1. Identify use of laptop and software needed for digital image acquisition.
 2. Identify the image receptors and image receptor holders.
 3. Demonstrate equipment set-up procedures for digital imaging.
 4. Identify and discuss proper care and maintenance of digital imaging equipment.

Part IV: Dental Radiographer Fundamentals

- I. Unit 9: Infection Control
1. Demonstrate infection protocol always in radiology as instructed.
- J. Unit 10: Legal and Ethical Responsibilities
1. Demonstrate the use of all items that must be documented in the patient's record to include, but not inclusive to: Informed Consent, Medical/Dental History, HIPAA Agreement and El Paso Community College Program Policy Agreement.
- K. Unit 11: Patient Relations and Education
1. Demonstrate patient education in radiology.
 2. Discuss with patient the benefits that derive from preventive care including radiation procedures.

Part V: Dental Radiographic Techniques

- L. Unit 12: Introduction to Radiographic Examinations
1. Demonstrate the three types of intraoral x-ray examinations.
 2. Identify the two types of intraoral radiographic techniques.
 3. Discuss the importance of a cursory exam in determining the technique for intraoral radiographic examination.
 4. Understand the principles of Shadow Casting; geometric principles.
 5. Demonstrate horizontal and vertical angulations.
 6. Identify the anatomical planes used in radiography.
 7. Identify the anatomical landmarks used in dental radiography.
 8. Demonstrate proper patient seating position.

9. Identify the different size image receptor and image receptor holders used for intraoral radiography.
 10. Demonstrate image receptor horizontal and vertical orientations within the oral cavity.
 11. Explain the importance of following a sequence during radiographic examinations.
 12. Identify the embossed dot on a film and the importance of how this determines positioning in film holder and subsequent mounting procedures.
 13. Demonstrate how to determine the selection of the image receptor.
- M. Unit 13: The Periapical Examination-Paralleling Technique
1. Discuss the principles of paralleling technique.
 2. Select the type and number of films required to make a complete periapical survey.
 3. Identify and be able to assemble and position image receptor holders for the paralleling technique.
 4. Demonstrate image receptor rules of placement in the oral cavity to achieve accurate horizontal and vertical angulations with equipment designed for paralleling technique.
 5. Demonstrate patient preparation for the paralleling technique.
 6. Demonstrate point of entry with use of an aiming device.
 7. Identify paralleling technique as the method of choice for intraoral radiographic examinations.
- N. Unit 14: The Periapical Examination-Bisecting Technique
1. Discuss the principles of bisecting technique.
 2. Explain the importance of a cursory exam to determine the use of this technique for intraoral radiographic examinations.
 3. Identify and be able to assemble equipment for bisecting technique.
 4. Demonstrate the proper patient positioning utilizing anatomical planes.
 5. Identify the correct positive and negative vertical angulations that aid radiographer during the bisecting technique.
 6. Identify facial landmarks used for determining the points of entry for bisecting technique.
 7. Demonstrate image receptor rules of placement in the oral cavity, horizontal and vertical angulations and points of entry used for bisecting technique.
- O. Unit 15: The Bitewing Examination
1. State the purpose of the bitewing examination.
 2. Differentiate between periapical and bitewing radiographs.
 3. Identify the various sizes of image receptors used for a bitewing examination.
 4. Identify the various image receptor holders used for a bitewing examination.
 5. Identify the size and number of image receptor best suited for a child with primary or mixed dentition.
 6. Identify the difference between horizontal and vertical bitewing examinations and when to recognize which one would be best suited for diagnostic purposes.
 7. Explain the role occlusion plays in aligning an image receptor for exposure, especially for premolar radiographs.
 8. Demonstrate film placement for posterior areas.
 9. Demonstrate film placement for anterior areas using vertical orientation of image receptor.
 10. Demonstrate horizontal and vertical angulations and point of entry to prevent technique error.
- P. Unit 16: The Occlusal Examination
1. State the purpose of the occlusal examination.
 3. Demonstrate the occlusal examination for maxillary and for the mandibular arches.
 3. Explain the vertical angulations and points of entry used for the occlusal examination.
 4. Explain the difference between topographical and cross-sectional techniques for an occlusal examination.
 5. Demonstrate of steps for the maxillary topographical survey.

6. Demonstrate of steps for the mandibular cross-sectional survey.

Q. Unit 17: The Panoramic Examination

1. Explain the uses of panoramic radiography.
2. Explain the different panoramic image receptors available in radiography.
3. Discuss and compare the advantages and disadvantages of panoramic versus intraoral radiographic surveys.
4. Demonstrate the basic steps in operating a panoramic machine.
5. Discuss patient preparation prior to taking a panoramic image to prevent technique error.
6. Identify the anatomical planes that determine head position in the focal trough of a panoramic machine.
7. Identify errors made in patient head positioning that lead to characteristic appearance on panoramic radiograph.

Part VI: Radiographic Errors and Quality Assurance

R. Unit 18: Identifying and Correcting Undiagnostic Radiographs

1. Discuss the retake policy of radiographic images.
2. Discuss and identify the characteristics of a quality diagnostic radiograph.
3. Identify technique errors and how to apply appropriate corrective actions for these types of errors.
4. Identify image receptor placement errors and how to apply corrective actions for this type of error.
5. Identify processing errors and how to apply appropriate corrective action to prevent processing errors
6. Identify causes of film fog and how to apply appropriate actions to prevent film fog.

S. Unit 19: Quality Control and Environmental Safety in Dental Radiography

1. Demonstrate the use of a step-wedge.
2. Demonstrate how the step-wedge determines quality control for radiographic x-ray machine and darkroom equipment for processing radiographs.
3. Demonstrate the procedure for white light leaks in the darkroom.
4. Demonstrate the procedure for safelight conditions.
5. Demonstrate safe handling procedures for processing chemicals and materials.
6. Discuss precautions used to protect and store digital images.
7. Discuss quality control for view boxes and computer monitors used to view radiographic images.
8. Identify location of emergency eye-wash stations and provide instruction on use.
9. Discuss proper protocol for radiographic waste and lead foil disposal.

Part VII: Viewing and Interpreting Dental Radiographic Images

T. Unit 20: Image Orientation and Introduction to Interpretation

1. Identify the radiographic mounts for film surveys.
2. Identify the radiographic templates for digital image surveys.
3. Identify anatomic landmarks that assist with distinguishing radiographs of the maxilla and mandible.
4. Discuss the importance of the embossed dot on a film.
5. Demonstrate how to mount films in an orderly fashion.
6. Explain the difference between interpretation and diagnosis.
7. Identify the equipment we use to view radiographic images.
8. Describe the use and care of radiographic images during and after patient care.

U. Unit 21: Recognizing Normal Radiographic Anatomy-Intraoral Radiographs

1. Explain two-dimensional radiographs present interpretation challenges.

2. Identify facial and cranial bones important for interpretation.
 3. Identify trabecular bone from cortical bone.
 4. Identify lamina dura from the PDL space.
 5. Identify the radiographic appearance of the structures of the teeth.
 6. Demonstrate the systematic method for interpreting radiographs.
 7. Identify bony landmarks that appear radiopaque or radiolucent on radiographic images.
 8. Identify significant anatomy recorded on dental radiographs of the maxilla and mandible.
- V. Unit 22: Recognizing Normal Radiographic Anatomy-Panoramic Radiographs
1. Identify the unique appearance of normal anatomy that is recorded on a panoramic radiograph.
 2. Identify the types of tissues and artifacts that will be recorded on a panoramic image.
 3. Identify air spaces on a panoramic image.
 4. Explain how ghost images are created on panoramic radiographs.
 5. Identify maxillofacial bony anatomic landmarks of the maxilla and the mandible.
 6. Identify the hyoid bone and cervical vertebrae.
- W. Unit 23: Radiographic Appearance of Dental Materials and Foreign Objects
1. Explain why a clinical examination is needed in conjunction with radiographic interpretation.
 2. Identify dental materials and foreign objects in dental radiographs.
 3. Identify the differences in radiopacity of various dental materials and foreign objects in radiographs.
 4. Identify the radiographic appearance of crowns, fixed bridges, amalgams, composite restorations, veneers, retention pins, post core restorative materials, dental liners, endodontic fillers, implants, surgical materials and orthodontic materials.
- X. Unit 24: The Use of Radiographs in the Detection of Dental Caries
1. Explain why dental caries appear radiolucent in radiographic images.
 2. Identify the type of projection and technique factors that enhance ability to image caries on a radiograph.
 3. Identify the categories of caries depth.
 4. Identify the appearance of proximal caries, occlusal caries, cemental/root caries and buccal/lingual caries.
 5. Identify recurrent caries.
 6. Identify areas that resemble caries radiographically and how to distinguish these areas from caries.
- Y. Unit 25: The Use of Radiographs in the Evaluation of Periodontal Diseases.
1. Explain how radiographs help in the assessment of periodontal diseases.
 2. Explain the limitations of radiographs in the assessment of periodontal diseases.
 3. Differentiate between horizontal and vertical bone loss.
 4. Explain the role of vertical bitewings and periapical images are used to record periodontal disease.
- Z. Unit 26: Describing Radiographic Anomalies, Lesions and Opportunistic Screening
1. Explain the terminology used for describing anomalies.
 2. Discuss descriptive terms to identify lesions by size, shape, density, architecture, location and effect on surrounding tissues.
 3. Identify anomalies and lesions using terms radiopaque, radiolucent or lucent-opaque.
 4. Differentiate between external and internal resorption.
 5. Explain the importance of opportunistic screening.

Part VIII: Radiographic Techniques for Specific Needs

AA. Unit 27: Pediatric Radiographic Techniques

1. Discuss how to determine if radiographs are indicated for the pediatric patient.
2. Discuss how to determine the size and number of image receptor to be used on the pediatric patient.
3. Demonstrate the radiographic examination and technique for the radiographic examination for children.
4. Identify when the extraoral radiographic examination would be indicated for the pediatric patient.
5. Demonstrate how to modify the control panel of the x-ray machine for the pediatric patient.
6. Demonstrate how to modify the settings on the hand-held device for pediatric exposures.
7. Demonstrate the Show-Tell-Do for the pedo radiographic examination.
8. Identify primary dentition from permanent dentition on radiographs and how to interpret the images.
9. Encourage students to visit the Image Gently® campaign for additional information on pediatric radiology.

BB. Unit 28: Radiographic Techniques for Patient with Special Needs

1. Discuss strategies for managing the apprehensive patient during a radiographic examination.
2. Discuss strategies for managing the patient that is on the spectrum of autism.
3. Discuss strategies to manage a patient with disabilities.
4. Discuss strategies for managing the elderly patient.
5. Discuss conversations using evidence-based guidelines that will educate the patient concerned with the need for radiographic assessments.

CC. Unit 29: Radiographic Techniques for Specific Oral Conditions

1. Identify specific oral conditions that require specific radiographic techniques.
2. Define the gag reflex and techniques to prevent and manage the gag reflex.
3. Demonstrate the placement of the image receptor in areas of anatomical restrictions.
4. Demonstrate image receptor placement for edentulous areas.
5. Explain and demonstrate how to avoid premolar/canine overlap.
6. Explain and demonstrate how to position the image receptor holder to achieve equal distribution of the arches.
7. Explain and demonstrate how to capture the distal of the canine for premolar periapical and premolar bitewing images.
8. Explain and demonstrate how to avoid not imaging the root apices on a periapical radiograph.

Part IX: Alternate Imaging Modalities

DD. Unit 30: Supplemental and Extraoral Radiographic Techniques

1. Explain the methods of localization to determine the buccal-lingual location of a foreign object by applying the S.L.O.B. rule.
2. Explain the need for specialized image receptor equipment when using the hand-held device.
3. Explain possible uses for extraoral radiographs and the types used to image maxillofacial regions.
4. Explain the difference between duplicating film and radiographic film.
5. Explain when duplicating film would be used in dentistry.

EE. Unit 31: Three-dimensional Imaging
No lab for this topic of discussion

III. THECB Learning Outcomes (WECM)

1. Identify the histological and embryological development of the orofacial structures.
2. Locate the major structures of the head and neck.
3. Compare various teeth including the crown and root morphology.

IV. Evaluation

- A. Lecture portion of the course (60% of course final average)
1. Examinations:
Four examinations will be given during the semester. The examinations given during the semester will cover only the lecture units presented since the preceding examination.
Exams are worth 50% of Lecture grade.
 2. Quizzes:
A quiz will be given each week on the previous lecture presentation. No quiz on exam day.
Quizzes are worth 10% of Lecture grade.
 3. Final Examination:
The final examination will be a comprehensive examination of the entire lecture course.
Final Exam is worth 40% of Lecture grade.
- B. Laboratory portion of this course (40% of course final average)
1. Radiographic Surveys:
Three full mouth surveys to be done on Dexter (manikin)
Three full mouth surveys to be done on Adult Patients.
One bitewing survey on Dexter using the NOMAD (hand-held device)
Radiographic surveys are worth 80% of Laboratory grade.
 2. Laboratory Competencies/Case Studies:
Required assignments when a student is not assigned to a radiology room.
Competencies/Case Studies are worth 20% of Laboratory grade.
- C. Grade for the course will be an average of the lecture portion and the laboratory portion of this course. The student must pass each portion with a minimum of 75% to pass the course.
- D. Grading Scale
- A = 93 - 100
B = 83 - 92
C = 75 - 82
D = 70 - 74
F = 69 and below

Note to the student: A grade of “C” or better is required to meet the standards for Dental Hygiene. A grade that is .5 or greater will be rounded up to highest grade.

V. Disability Statement (American with/Disabilities Act [ADA])

EPCC offers a variety of services to persons with documented sensory, mental, physical, or temporary disabling conditions to promote success in classes. If you have a disability and believe you may need services, you are encouraged to contact the Center for Students with Disabilities to discuss your needs with a counselor. All discussions and documentation are kept confidential. Offices located: VV Rm C-112 (831-2426); TM Rm 1400 (831-5808); RG Rm B-201 (831-4198); NWC Rm M-54 (831-8815); and MDP Rm A-125 (831-7024).

VI. 6 Drop Rule

Students who began attending Texas public institutions of higher education for the first time during the Fall 2007 semester or later are subject to a 6-Drop limit for all undergraduate classes. Developmental, ESL, Dual Credit and Early College High School classes are exempt from this rule. All students should consult with their instructor before dropping a class. Academic assistance is available. Students are encouraged to see Counseling Services if dropping because exemptions may apply. Refer to the EPCC catalog and website for additional information.

VII. Title IX and Sex Discrimination

Title 9 (20 U.S.C. 1681 & 34 C.F.R. Part 106) states the following "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any educational program or activity receiving Federal financial assistance." The Violence Against Women Act (VAWA) prohibits stalking, date violence, sexual violence, and domestic violence for all students, employees and visitors (male and female). If you have any concerns related to discrimination, harassment, or assault (of any type) you can contact the Assistant to the Vice President for Student and Enrollment Services at 915-831-2655. Employees can call the Manager of Employee Relations at 915-831-6458. Reports of sexual assault/violence may also be reported to EPCC Police at 915-831-2200.

VIII. Dental Hygiene Entry-Level Competencies

Core Competencies

- C1. Apply ethical reasoning to dental hygiene.
- C2. Comply with state and federal laws governing the practice of dentistry and dental hygiene.
- C3. Use critical thinking skills and comprehensive problem-solving to identify oral health care strategies that promote patient health and wellness.
- C4. Use evidence-based decision making to evaluate emerging technology and treatment modalities to integrate into patient dental hygiene plans to achieve high-quality, cost-effective care.
- C5. Assume responsibility for professional actions and care based on accepted scientific theories, research, and the accepted standard of care.
- C9. Apply quality assurance mechanism to ensure continuous commitment to accepted standards of care.
- C10. Communicate effectively with diverse individuals and groups, serving all persons without discrimination by acknowledging and appreciating diversity.
- C11. Record accurate, consistent, and complete documentation of oral health services provided.
- C12. Initiate a collaborative approach with all patients when developing individualized care plans that are specialized, comprehensive, culturally sensitive, and acceptable to all parties involved in care planning.
- C13. Initiate consultations and collaborations with all relevant health care providers to facilitate optimal treatment.
- C14. Manage medical emergencies by using professional judgment, providing life support, and utilizing required CPR and any specialized training and knowledge.

Patient Care (PC)

- PC2. Recognize predisposing and etiologic risk factors that require intervention to prevent disease.
- PC3. Recognize the relationships among systemic disease, medications, and oral health that impact overall patient care and treatment outcomes.
- PC4. Identify patients at risk for medical emergency and manage the patient care in a manner that prevents an emergency.
- PC5. Use patient assessment data, diagnostic technologies, and critical decision-making skills to determine a dental hygiene diagnosis, a component of the dental diagnosis, to reach conclusions about the patient's dental hygiene care needs.
- PC8. Make referrals to professional colleagues and other health care professionals as indicated in the patient care plan.