Virginia Western Community College
DNH 130
Oral Radiography for the Dental Hygienist

Prerequisites
Admission to the Dental Hygiene Program

Course Description
Introduces the practical study and application of dental radiology. Presents aspects of chemistry, biology, and anatomy that correlate to dental radiography. Encompasses knowledge of technique, treatment, diagnosis and prognosis.
Studies radiation physics, biology, safety, and exposure techniques for intra- and extra-oral radiographic surveys. Laboratory provides practice in exposure, processing methods, mounting, and interpretation of normal findings.

Semester Credits: 2 **Lecture Hours: 1** **Lab/Clinical/Internship Hours: 3**

Required Materials

Textbook:
Dental Radiography Principles and Techniques. Iannucci, Joen M. and Howerton, Laura Jansen. 4th Edition. Elsevier, 2011. ISBN: 9781437711622

Exercises in Oral Radiography. Langlais, Robert. Elsevier, 2004. ISBN: 978021600253

Clinical Practice of the Dental Hygienist. Wilkins, Esther M. 10th Edition. Lippincott, Williams, & Wilkins, 2009. ISBN: 9780781763226.

Virginia Western Community College Dental Hygiene Student Guidelines & Procedures Manual

Other Required Materials:
Rinn XCP Film holders and Beam Alignment Devices
Evolve website for Dental Radiography Principles and Techniques. 4th Edition.
https://evolve.elsevier.com/staticPages/index.html.

Course Outcomes

At the completion of this course, the student should be able to:

- List the uses of radiographs in dentistry and discuss techniques for exposing intraoral and extraoral dental films including advantages and disadvantages
- Discuss the physics of fabricating x-ray energy and relate that to how it affects the radiographic image and radiation exposure to the patient.
- List the types and effects of radiation to humans and different types of tissues and explain how it occurs on a cellular level
- List the steps to take before, during and after exposure to reduce the amount of radiation to patients
- Identify normal anatomy and interpret specific pathological conditions on radiographs of the oral cavity

Dental Hygiene Competencies/Student Learning Outcomes

Domain: Ethical Values and Professionalism

- Apply the ADHA Code of Ethics as a guide for ethical consciousness, decision-making, and practice.
- Adhere to state & federal laws, regulations, & recommendations in the provision of dental hygiene care.
- Assume responsibility and accountability for dental hygiene actions and services, according to protocols.
- Serve all clients without discrimination, appreciating population diversity.
- Communicate effectively using verbal, non-verbal, written & electronic communication skills

Domain: Dental Hygiene Process of Care

- Apply the general, biomedical, dental and dental hygiene sciences to the delivery of educational, therapeutic, and preventive services to diverse populations.
- Provide accurate, consistent & complete documentation for assessment, diagnosis, planning, implementation & evaluation of dental hygiene services.
- Use principles of risk management to assess & manage risk, and prevent liability.
- Evaluate the safety and efficacy of oral health products, interventions, and treatments.
- Utilize critical thinking and problem solving skills.

Course Information:
A study of the nature, physical properties, biological effects, methods of control, safety, and the techniques for exposing, processing, and mounting x-rays; identification of anatomical landmarks, and interpretation of radiographic findings is also included. Laboratory procedures will include the application of these techniques. The lecture portion of this class will be distanced from LFCC. (The lab portion will be at the home campus of the student.)

Course Purpose:
To instruct the dental hygiene student in exposing, processing, mounting, and interpretation of dental radiographs.

Topical Description

Module 1:
- Radiation History
- Introduction to Radiographic Exams
- Dental X-Ray Equipment
- Dental X-Ray Film
- Dental X-Ray Film Processing
- Digital Radiography

Module 2:
- Radiation Protection
- Infection Control and Protection

Module 3:
- Bite Wing Technique
- Film mounting and viewing
- Radiation Biology

Module 4:
- Radiation Physics
- Paralleling Technique
- Advantages and Disadvantages

Module 5:
- Exposure and Technique errors
- Radiation Characteristics

Module 6:

- Quality Assurance in the Dental Office
- Dental X-ray Image Characteristics
- Bisecting Technique

Module 7:

- Normal Anatomy: Intraoral Images
- Imaging of Patients with Special Needs

Module 8:

- Introduction to Image Interpretation
- Identification of Restorations, Dental Materials and Foreign Objects

Module 9:

- Interpretation of Dental Caries
- Panoramic Technique
- Normal Anatomy: Panoramic Images

Module 10:

- Occlusal and Localization Techniques
- Interpretation of Periodontal Disease

Module 11:

- Interpretation of Trauma and Pulpal and Periapical Lesions
- Descriptive Terminology

Module 12:

- Extraoral Radiography
- Three-Dimensional Digital Imaging

Module 13:

- Dental Radiographs and the Dental Radiographer
- Patient Relations and the Dental Radiographer
- Patient Education and the Dental Radiographer
- Legal Issues & the Dental Radiographer

Learning Objectives

Module 1:

- Summarize the importance of dental radiographs.
- List the uses of dental radiographs.
- Summarize the discovery of x-radiation.
- Recognize the pioneers in dental x-radiation and their contributions and discoveries.
- List the highlights in the history of x-ray equipment and film.
- List the highlights in the history of dental radiographic techniques.
- Define the key words associated with dental x-ray equipment.
- Discuss the regulation of dental x-ray machines in the federal, state, and local levels.
- Recognize dental x-ray machines used for intraoral and extraoral films.
- Identify the component parts of the dental x-ray machine.
- Describe the purpose and use of dental x-ray film holders and devices.
- Identify commonly used dental x-ray film holders and devices.
- Define the key words associated with dental x-ray film.
- Describe in detail film composition and latent image formation.
- List and describe the different types of x-ray film used in dentistry.
- Define intraoral film and describe intraoral film packaging.
- Identify the types and sizes of intraoral film available.
- Discuss film speed
- Define the key words associated with processing of dental x-ray film.
- Describe in detail how a latent image becomes a visible image.
- List and discuss the five steps of film processing.
- List and describe the four basic ingredients of the developer solution.
- List and describe the four basic ingredients of the fixer solution.
- Discuss the parts of the processing tank: insert tanks, master tank, and lid
- List and describe the equipment needed for manual film processing.
- List and discuss the procedural steps for manual film processing.
- Describe the care and maintenance of the processing solutions, equipment, and equipment accessories used in manual film processing
- Define the key terms associated with digital imaging.
- Describe the purpose and use of digital imaging.
- Discuss the fundamentals of digital imaging.
- List and describe the equipment used in digital imaging.
- List and describe the two types of digital imaging.
- Describe the patient and equipment preparations required for digital imaging.
- List and discuss the advantages and disadvantages of digital imaging

Module 2:

- Define the key words associated with radiation protection
- Describe in detail the basics of patient protection before x-ray exposure.
- Discuss the different types of filtration, and state the recommended total filtration for dental x-rays operating above and below 70 kVp.
- Describe the collimator used in dental x-ray machines, and state the recommended diameter of the useful beam at the patient's skin.
- List six ways to protect the patient from excess radiation during x-ray exposure.
- Describe the importance of receptor handling and processing after patient exposure to x-radiation.
- Discuss operator protection in terms of adequate distance, shielding, and avoidance of the useful beam.
- Describe personnel equipment-monitoring devices used to detect radiation.
- Discuss radiation exposure guidelines; including radiation safety legislation, maximum permissible (MPD), maximum accumulated dose (MAD), and the ALARA concept.
- Discuss with the dental patient what radiation protection steps will be used before, during, and after x-ray exposure
- Define the key words associated with radiation injury.
- List the determining factors for radiation injury.
- Describe the mechanisms, theories, and sequences or radiation injury.
- Define and discuss the dose-response curve and radiation injury.
- Discuss the short-term and long-term effects as well as the somatic and genetic effects of radiation exposure.
- Describe the effects of radiation exposure on cells, tissues, and organs.
- Identify the relative sensitivity of a given tissue to x-radiation.
- Define the key terms associated with infection control.
- Describe the rationale for infection control.
- Describe three possible routes of disease transmission.
- Describe the conditions that must be present for disease transmission to occur.
- Discuss personal protective equipment (PPE), hand hygiene, sterilization and disinfection of instruments, and the cleaning and disinfection of the dental unit and environmental surfaces

Module 3:

- Define the key terms associated with bite-wing technique.
- Describe the purpose and use of the bite-wing image.
- Describe the appearance of opened and overlapped contact areas on a bite-wing image.
- State the basic principles of the bite-wing technique.
- List the two ways a receptor can be stabilized in the bite-wing technique, and identify which film size is recommended for exposures in the adult patient.
- List the three receptor sizes that can be used in the bite-wing technique, and identify which one is recommended for bite-wing exposure.

- Define the key terms associated with film mounting and viewing.
- List the individuals who are qualified to mount and view dental radiographs.
- Describe when and where films are mounted.
- List five reasons to use a film mount.
- Describe what information is placed on a film mount.
- Discuss the importance of normal anatomy in film mounting.
- Describe how the identification dot is used to determine film orientation.
- List and describe two methods of film mounting and identify the preferred method.
- Define the key words associated with radiation injury.
- List the determining factors for radiation injury.
- Describe the mechanisms, theories, and sequences or radiation injury.
- Define and discuss the dose-response curve and radiation injury.
- Discuss the short-term and long-term effects as well as the somatic and genetic effects of radiation exposure.
- Describe the effects of radiation exposure on cells, tissues, and organs.
- Identify the relative sensitivity of a given tissue to x-radiation.

Module 4:

- Identify the structure of the atom.
- Describe the process of ionization.
- Discuss the difference between radiation and radioactivity.
- List the two types of ionizing radiation, and give examples of each.
- List the characteristics of electromagnetic radiation.
- Describe the different sizes of receptor used with paralleling technique and how each receptor is place in the bite-block.
- State the five basic rules of the paralleling technique.
- Describe the patient and equipment preparations that are necessary before using the paralleling technique.
- Discuss the exposure sequence for 15 periapical receptor placements using the paralleling technique.
- Describe each of the 15-periapical receptor placements recommended for use with the XCP instruments.
- Summarize the guidelines for periapical receptor positioning.
- Explain the modifications in the paralleling technique that are used for a patient with a shallow palate, bony growths, or a sensitive premolar region.
- List the advantages and disadvantages of the paralleling technique.

Module 5:

- Define the key terms associated with exposure and technique errors.
- Identify and describe the appearance of the following film exposure errors: unexposed receptor, film exposed to light, underexposed receptor, and overexposed receptor.

- Describe horizontal and vertical angulation.
- Identify and describe the appearance of the following periapical technique errors: incorrect horizontal angulation, incorrect vertical angulation (foreshortened images and elongated images), and incorrect beam alignment (cone-cut images).
- Describe and identify proper receptor placement for bite-wing radiographs.
- Identify and describe the appearance of the following bite-wing technique errors: incorrect horizontal angulation, incorrect vertical angulation, and incorrect position-indicating device (PID) alignment (cone-cut images).
- Identify and describe the appearance of the following miscellaneous technique errors: film bending, film creasing, phalangioma, double exposure, movement, and reversed film.
- Define the key words associated with radiation characteristics.
- Describe the effect that the kilovoltage peak has on the quality of the x-ray beam.
- Describe how milliamperage influences the quantity of the x-ray beam
- Identify the range of kilovoltage and milliamperage required for dental radiography.
- Describe how increasing and decreasing exposure factors affect the density and contrast of the image

Module 6:

- Define key words associated with quality assurance in the dental office.
- List quality control tests and quality administration procedures that should be included in the quality assurance plan.
- Discuss the purpose and frequency of testing dental x-ray machines.
- Describe the tests used to check for fresh film and adequate film-screen contact; discuss the frequency of testing and the interpretation of test results.
- Describe the test used to check for darkroom leaks and proper safe lighting; discuss the frequency of testing and the interpretation of test results.
- Define the key terms associated with the bisecting technique.
- State the rule of isometry.
- State the basic principles of the bisecting technique, and illustrate the location of the receptor, tooth, imaginary bisector, central ray, and position-indicating device (PID).
- List the beam alignment devices that can be used with the bisecting technique.
- Describe the receptor size used with the bisecting technique.
- Describe correct and incorrect horizontal angulation.
- Define the key words associated with dental x-ray image characteristics.
- Differentiate between radiolucent and radiopaque areas on a dental radiograph.
- Describe a diagnostic dental radiograph.
- List the two visual characteristics of the radiographic image.
- List the factors that influence film density and contrast.
- Discuss the difference between high and low contrast.

Module 7:

- Define the key terms associated with normal anatomy on intraoral images.
- State the difference between cortical and cancellous bone.
- Define the general terms that describe prominences, spaces, and depressions in bone.
- Identify and describe the normal anatomic landmarks of the maxilla on a human skull.
- Identify and describe the normal anatomic landmarks of the maxilla as viewed on dental images.
- Define the key terms associated with patients who have special needs.
- List the areas of the oral cavity that are most likely to elicit the gag reflex when stimulated.
- List two precipitating factors responsible for initiating the gag reflex.
- Describe how to control the gag reflex using operator attitude, patient and equipment preparations, exposure sequencing, and receptor placement and technique.
- Describe common physical disabilities and what modifications in technique may be necessary during the imaging examination.
- Describe common developmental disabilities and what modifications in technique may be necessary during the imaging examination

Module 8:

- Define the key terms associated with interpreting images.
- Summarize the importance of interpretation of images.
- Define the roles of the dentist and dental auxiliary in the interpretation of dental images.
- Discuss the difference between interpretation and diagnosis.
- Describe who is able to interpret dental images.
- Describe when and where dental images are interpreted.
- Describe how radiographic interpretation can be used to educate the dental patient about the importance and use of dental images.
- Define the key terms associated with identifying restorations, materials, and foreign objects on dental images.
- Discuss the importance of interpreting dental images while the patient is present.
- On dental images, identify and describe the radiographic appearance of the following restorations: amalgam, gold, stainless steel and chrome, post and core, porcelain, porcelain-fused-to-metal, composite, and acrylic.
- On dental images, identify and describe the radiographic appearance of the following dental materials and devices: base materials, metallic pins, gutta percha, silver points, removable partial dentures, complete dentures, orthodontic bands, brackets, and wires, fixed retainers, implants, suture wires, splints, and stabilizing arches and wires.
- On dental images, identify and describe the radiographic appearance of the following miscellaneous objects: jewelry, eyeglasses, and patient napkin chains.

Module 9:

- Define the key terms associated with the interpretation of dental caries.
- Describe dental caries.
- Explain why caries appears radiolucent on a dental image.
- Discuss interpretation tips for evaluating caries on a dental image.
- Discuss the factors that may influence the image interpretation of dental caries.
- Define the key terms associated with panoramic imaging.
- Describe the purpose and uses of panoramic imaging.
- Describe the fundamentals of panoramic imaging.
- Describe the equipment used in panoramic imaging.
- Identify and describe the patient preparations, equipment preparations, and patient positioning procedures needed before exposing a panoramic film.
- Identify the patient preparation and positioning errors seen on panoramic radiographs.
- Discuss the causes of patient preparation and positioning errors and the necessary measures needed to correct such errors.
- Define the key terms associated with normal anatomy on panoramic images.
- Identify and describe the bony landmarks of the maxilla and surrounding structures as viewed on the panoramic image.
- Identify and describe the bony landmarks of the mandible and surrounding structures as viewed on the panoramic image.
- Identify air space images as viewed on the panoramic image.
- Identify soft tissue images as viewed on the panoramic image

Module 10:

- Define the key terms associated with occlusal and localization techniques.
- Describe the purpose of the occlusal examination.
- List the uses of the occlusal examination.
- Describe the patient and equipment preparations necessary before using the occlusal technique.
- State the recommended vertical angulations for the following maxillary occlusal projections: topographic, lateral (right or left), and pediatric.
- State the recommended vertical angulations for the following mandibular occlusal projections: topographic, cross-sectional, and pediatric.
- Define the key terms associated with interpreting periodontal disease.
- Describe the healthy periodontium.
- Briefly describe periodontal disease.
- Discuss the importance of the clinical and examination and interpretation of dental images in the diagnosis of periodontal disease.
- Describe the limitations of dental images in the detection of periodontal disease.
- Describe the type of dental images that should be used to document periodontal disease and the preferred exposure technique.

Module 11:

- Define the key terms associated with the interpretation of trauma, pulpal lesions, and periapical lesions as viewed on a dental image.
- Describe and identify the appearance of crown, root, and jaw fractures as viewed on a dental image.
- Describe and identify the appearance of an avulsion as viewed on a dental image.
- Describe and identify the appearance of internal and external resorption as viewed on a dental image.
- Describe and identify the appearance of pulpal sclerosis, pulpal obliteration, and pulp stonesas viewed on a dental image.
- Describe and identify the appearance of a periapical granuloma, cyst, and abscess as viewed on a dental image.
- Describe and identify the appearance of condensing osteitis, sclerotic bone, and hyper cementosis as viewed on a dental image.
- Identify the categories of information that should be documented for all lesions viewed on dental images.
- Define descriptive terminology and describe why the dental professional should use descriptive terms.
- Define the terms dental image, x-ray, radiolucent, and radiopaque.
- Distinguish between dental image and x-ray.
- Distinguish the terms radiolucent and radiopaque

Module 12:

- Define the key terms associated with the extraoral imaging.
- Describe the purpose and uses of extraoral imaging.
- Describe the equipment used in extraoral imaging.
- Detail the equipment and patient preparations necessary before exposing an extraoral projection.
- Identify the specific purpose of each of the extraoral film projections.
- Describe the head position, the receptor placement, and beam alignment for each of the following extraoral films: lateral jaw projection- body of the mandible, lateral jaw projection- ramus of the mandible, lateral cephalometric projection, posteroanterior projection, Waters projection, submentovertex projection, reverse Towne projection, and transcranial projection.
- Define the key terms associated with three-dimensional digital imaging.
- Describe the purpose and uses of three-dimensional digital imaging.
- Describe the equipment used in three-dimensional digital imaging.
- Detail the equipment and patient preparation necessary before exposure to x-radiation using three-dimensional digital imaging.
- Identify advantages and disadvantages of three-dimensional digital imaging.

Module 13:

- Discuss the importance of dental radiographs.
- List the uses of dental radiographs.
- Discuss the benefits of dental radiographs.
- List examples of common dental conditions that may be evident on a dental radiograph.
- Discuss the knowledge and skill requirements of the dental radiographer.
- List the responsibilities that may be assigned to the dental radiographer.
- Discuss the professional goals of the dental radiographer.
- Define the key words associated with patient relations.
- Discuss verbal, nonverbal, and listening skills and explain how each can be used to enhance communication.
- Discuss how facilitative skills can be used to enhance patient trust.
- Define a relationship of trust between the dental professional and the patient.
- Discuss the importance of first impressions, chairside manner, and attitude, and explain how each can enhance patient relations.
- Summarize the importance of educating patients about dental radiographs.
- List the three methods that can be used by the dental radiographer to educate patients about dental radiographs.
- Answer common patient questions about the need for dental radiographs, x-ray exposure, the safety of dental x-rays, and other miscellaneous concerns.
- Define the key words associated with legal issues.
- List the federal and state regulations affecting the use of dental x-ray equipment.
- Describe the general application of federal and state regulations as they affect the dental auxiliary.
- Describe the licensure requirements for exposing dental radiographs.
- Define the legal concept of informed consent.
- Describe ways to obtain informed consent from a patient.

Laboratory Schedule (flexible)

- Lab Reception duties reviewed and schedule handed out
- Orientation to x-ray machines demo parts and operation
- Orientation to automatic processor/ Manual processor (Site specific-see clinic manual)
- Introduction to film packets/digital receptors/phosphor plates
- Review protocols for exposing radiographs on clients
- Electronic Chart must be made – Fill out appropriate forms
- Have student process 2 films- one exposed to light (use the one they opened) and one unexposed using the automatic processor
- Sterilize XCP
- Review Automatic processor competency

- Demo/ infection control and glove usage
- Demo XCP and how to place it in the mouth comfortably
- Have student practice placing film on each other using aseptic technique
- Demonstrate duplication process
- Automatic Processor Competency- all students
- Student take horizontal (4) and vertical (7)bwx on Dxtrr
- Take and develop FMS paralleling technique on DXTRR right side
- Students continue taking radiographs
- Timed HBWX Competency
- Submit client info for your FMS client
- Take ½ FMX using snap- a- ray
- Take 4 horizontal bwx using tabs
- Take pedo bwx
- Finish all competencies to date
- Taking a FMX on a patient
- Evaluation of FMS on patient-already taken;
- Review procedure for taking Pan
- Digital radiographs
- Submit client info (chart) for your Pan client
- Occlusal maxillary and mandibular projection (DXTRR)
- Expose two films to demonstrate localization technique
- Panoramic competency
- Confirmation of need for panoramic radiograph
- Schedule for exposing panorex
- Take develop and evaluate pan on Client
- Critique/Grade with instructor
- Have DDS review film
- Finish Radiographic requirements / review pans

Note to Instructors

1. Each student has an individual file folder for Faculty use only.
2. Each file folder contains Master Tally Sheet, all 6 Competency Forms and all radiographs with critique forms.
3. Competencies
4. Radiographs
5. Student Lab duties
6. Student Tardiness / Unexcused Absence
7. Student participation
8. Assignments / Homework
9. Lab Grading

Virginia Western Community College
School of Health Professions
(540) 857-6019

3091 Colonial Ave SW
Roanoke, VA 24015