

# D H 305A: INTRODUCTION TO DENTAL RADIOGRAPHY I

## Foothill College Course Outline of Record

Heading	Value
<b>Effective Term:</b>	Summer 2021
<b>Units:</b>	2
<b>Hours:</b>	2 lecture per week (24 total per quarter)
<b>Advisory:</b>	Not open to students with credit in D H 60A.
<b>Degree &amp; Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Non-GE
<b>Transferable:</b>	CSU
<b>Grade Type:</b>	Letter Grade Only
<b>Repeatability:</b>	Not Repeatable

## Student Learning Outcomes

- Describe radiation interaction with biological matter (chromosomal, carcinogenesis) and identify the radiation protective factors provided to the patient to reduce radiation absorption and exposure

## Description

The first in a series of four dental radiology courses for the dental hygiene student. Component parts, functions, operations of the dental x-ray unit and radiation safety are emphasized. Relationships between anatomical and radiographic landmarks are analyzed. Intended for students in the Dental Hygiene Baccalaureate Degree Program; enrollment is limited to students accepted in the program.

## Course Objectives

The student will be able to:

- Understand basic principles and concepts of radiation in general and x-radiation in particular
- Explain the radiation effects of ionizing radiation on living tissue
- Discuss radiation bioeffects and its relation to human health and safety
- Compare radiation protection procedures for the operator and the patient
- Compare the different intraoral techniques used for bitewing, occlusal, and periapical radiography using currently accepted methods
- Plan the selection of appropriate radiographic surveys and film types for patients
- Recognize and compare skull and dental anatomy seen on radiographic films or textbook diagrams or pictures
- Compare and contrast the identification and description of atypical dental anatomical findings
- Demonstrate the technique of proper film processing, and understand film chemistry, and the influence of silver halide crystals size

## Course Content

- The dental x-ray machine
  - Amperage, voltage, roentgen, contrast, density
  - X-ray production in the Coolidge tube
    - Wavelength properties

- Wavelength penetration
  - Amplitude
  - Frequency
- Source of electrons and thermionic energy
  - kVp and kinetic energy
  - Tungsten target and copper stem
  - Photon interaction with matter; scatter and secondary radiation
  - Characteristic radiation, Bremsstrahlung radiation
  - Ionization, free radical formation
    - Stochastic effects
    - Nonstochastic effects
    - Radiation injury
    - Radiation sickness
  - Biologic effects of radiation production
    - Effects of ionizing radiation on the individual cell
    - Theories of the effect of radiation on the cell
    - Radiosensitivity of individual tissues
      - Chronic
      - Acute
    - Cumulative effect of x-ray damage
      - Medical illness
      - Somatic effects
      - Genetic effects
      - Chromosomal damages
    - Maximum permissible dose
      - Radiation measurements
        - rad
        - rem
        - roentgen
        - gray
        - sievert
        - MPD operator
        - MPD patient
      - Lead equivalency
        - Thyroid collar
        - Lead cape
        - Lead apron
      - Inherent filtration devices
        - Lead housing
        - Insulating oil
      - Added filtration components
        - Aluminum filter
        - Collimator
        - Federal, State, Local levels of radiation regulations
      - Film speed, analog conversion, digital capture
        - Film processing equipment
        - Plate scanning equipment
        - Digital technology and equipment
        - 3-D imaging
      - Radiation protective measures
        - FDA and ADA guidelines for the patient exposures
        - Time factors related to dental insurance
        - Need factors related to risk
      - ALARA principle
      - Intensifying screens
        - Radiation reduction
        - Light spectrum wavelength
        - Properties of luminance
    - Radiation protective factors for the operator
      - Wall construction
      - Exposure button placement
      - Dosimeter

4. Training and licensing
5. Distance and angles away from patient
- D. X-ray production
  1. Contrast
    - a. Long scale
    - b. Short scale
    - c. Dentist preference; hygienist preference
    - d. Contrast manipulation
    - e. Contrast discrimination for disease detection
  2. Density
    - a. Effects of milliamperage and kilovoltage on density and contrast
  3. Effects of receptor/tubehead placement on image
    - a. Magnification
    - b. Target anode to object distance
    - c. Object to receptor distance
  4. Effects of time, milliamperage, and kilovoltage on x-ray production
- E. Intraoral radiographs
  1. Radiation measurements
    - a. mA, kVp, time differentials for molar, premolar, incisor and occlusal
  - b. Filmholder types
- F. Extraoral
  - a. TMJ
  - b. Cephalometric
  - c. Water's
  - d. Panoramic images
    1. Focal trough positioning
    2. Biteplate positioning
    3. Infection control
    3. Patient preparation
    4. Indications for use
    5. mA, kVp, time, skull size
- G. Dental anatomy
  1. Anatomical landmarks of the skull
  2. Intraoral anatomical landmarks
  3. Comparative dental radiographic anatomy of film and digital
  4. Periodontal radiographic anatomy
  5. Mounting radiographs
- H. Image characteristics
  1. Penumbra
  2. Disease misinterpretations
  3. Radiopaque typical and atypical findings
  4. Radiolucent typical and atypical findings
- I. Film processing
  1. Darkroom regulations
  2. Chemical composition of the developing solutions
    - a. Influence of pH, time, temperature
  3. Influences of film speed, silver halide crystals, emulsion gel, packets
  4. Manual and automatic processing techniques

## Lab Content

Not applicable.

## Special Facilities and/or Equipment

Multimedia classroom

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Written and or slide quizzes  
Midterm

Final exam  
Technique evaluation of dental radiographs  
Quality analysis of dental radiographs

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture  
Discussion  
Cooperative learning exercises  
Demonstration

## Representative Text(s) and Other Materials

Iannucci and Howerton. Dental Radiography, Principles and Techniques, 5th ed. 2017.

Yamamoto, J.. Radiology Lab Policy and Information Manual. .

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

- A. Read assignments from the course primary textbook chapters listed on the course schedule that average two chapters per assignment.
- B. Review and complete the multiple choice quiz located at the end of each chapter.
- C. Read and comprehend the lecture syllabus that averages 20-30 pages.
- D. Identify head and neck landmarks using skull pictures, drawings, textbooks and slides.

## Discipline(s)

Dental Technology