

DEN6301C

Summer 2021

Course Description:

The biology of radiation and radiation safety in dentistry along with radiologic techniques for procuring, exposing and developing dental films.

I. General Information

Course Director:

Course Director: Anita Gohel
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Course Credits: 2
Semester: Summer

Contributing Faculty

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Support Staff

II. Course Goals

This course is designed to introduce basic radiology concepts to pre-doctoral dental students. Students will gain knowledge of the basic concepts of how x-rays are created and interact as well as a familiarity with dental radiographic techniques. This course includes training of students to analyze the biological effects of ionizing radiation and focuses on the influence of current literature on radiation to develop analytic and critical thinking skills and prepare students to be life-long learners.

This course also serves as an introductory course for the Advanced Radiographic Interpretation course, where students expand their knowledge of dental radiology including interpretation of radiographs.

III. Course Overview

This is a combined online lecture course which includes some case discussions and one group project. Students will be expected to review recorded lectures and successfully complete four online quizzes (see schedule with assignments).

IV. Course Outline

A. Introduction

1. Radiology in dental practice
2. Radiographic imaging

B. Intraoral Digital Radiography

1. Principles of digital Imaging
2. CCD/CMOS and Phosphor sensors
3. Imaging theory/shadow casting
4. Bisecting-angle technique
5. Paralleling technique
6. Bitewing radiography
7. Accessory techniques
8. Criteria of image acceptability
9. Technique errors
10. Sensor holding instruments
11. Pediatric dental radiography
12. Edentulous radiography
13. Localization techniques

C. Radiation Physics

1. Atomic structure; characteristics of radiation
2. X-ray machine components
3. Mechanisms of x-ray production
4. Factors affecting the x-ray beam
5. Interactions of x-rays and matter

D. E. Radiographic Image Characteristics

1. Density

2. Contrast
3. Sharpness/resolution
4. Factors affecting image characteristics

F. Extraoral and Panoramic Radiography

1. Tomographic imaging theory
2. Panoramic radiography
3. Other extraoral projections

G. Radiobiology, Safety and Protection

1. Units of measurement
2. Atomic level effects – ionization
3. Direct vs. indirect effects/target theory
4. Tissue effects
5. Whole body effects
6. Cumulative effects
7. Radiation doses in dentistry
8. Occupational doses
9. Non occupational doses
10. Effects of radiation therapy on Oral Tissues
11. Methods for radiation exposure reduction
 - a. Patient
 - b. Staff

11. Statutory regulations

12. Selection criteria

V. Course Material

Required Texts:

White and Pharoah, Oral Radiology – Principles and Interpretation, 8th Ed. C.V. Mosby, 2018.

Articles provided by the instructor in Canvas.

Recommended Texts:

Wheeler's Dental Anatomy and Occlusion, Ash and Nelson, 10th Edition, Saunders, 2015, ISBN: 0323263232

Supplemental Reading:

Dental Anatomy and 3-D Interactive Tooth Atlas, Brown & Herbranson Imaging

A free 2 week trial and/or purchase the product directly through their website at ehuman.com.

Technical support contact information: support@ehuman.com or call 650-233-0200  .

Additional Materials:

[HSC Dental Library Guide](#)

VI. Course Objectives

Lectures, suggested reading assignments, and group project will be the primary teaching methods for this course. Students are encouraged to seek help when needed.

1. Introduction

1. Describe the role of radiology in modern dental practice.
2. Explain and understand basic terminology used in radiology.

2. Intraoral Radiography

1. Describe basic shadow casting requirements for an ideal radiographic image.
2. Describe the theory, correct patient positioning and film placement, and exposure of intraoral radiographs using the paralleling or bisecting-angle technique.
3. Describe and understand the steps in obtaining adequate bitewing radiographs.
4. State the purposes of periapical, bitewing, and occlusal radiographs.
5. Describe the techniques for occlusal and distal oblique intraoral radiographs.
6. Identify the criteria of acceptability for each intraoral projection.
7. Identify and correct various intraoral radiographic technique errors.
8. Identify the rationale for using sensor holders in intraoral radiography.
9. Identify the differences in the type and numbers of films used for the adult dentulous, edentulous, and survey.
10. Identify advance preparations required before exposing dental radiographs.

3. Radiation Physics

1. Describe the atom and its structure.
2. Locate the position of x-radiation on the electromagnetic spectrum.
3. List seven properties of x-rays.
4. Differentiate between ionizing and non-ionizing radiation.
5. Differentiate between particulate and electromagnetic radiation.
6. Describe the functions and locate diagrammatically the various components of a dental x-ray machine.
7. Describe two mechanisms for x-ray production.
8. Describe the effects of various technique factors (mA, time, kVp), distance (inverse square law), filtration,

4. Extraoral and Panoramic Radiology

1. Describe the general principles of and indications for panoramic radiography.
 2. Identify normal anatomic structures and ghost shadows on panoramic projections.
 3. Describe the various extraoral views that may be encountered in dental medicine, and indications for their use.
5. Radiobiology, Safety, and Protection
1. Define basic conventional and international units of radiation measurement.
 2. Describe the effects of ionization on biologic macromolecules.
 3. Describe direct and indirect effects of radiation and state the Target Theory.
 4. Describe the effects of radiation at the tissue/organ system level.
 5. Describe the effects of radiation at the whole body level.
 6. Differentiate between somatic and genetic effects of radiation.
 7. Define stochastic and non-stochastic effects of radiation.
 8. Describe the cumulative effects of radiation.
 9. Describe the theories of linear and non-linear responses to radiation dose and define the concept of ALARA.
 10. Describe the latent period and how it relates to dose, dose rate and radiation type.
 11. Describe the concepts of acute and chronic exposure to radiation.
 12. Identify approximate skin exposure levels associated with various types of dental radiographic procedures.
 13. Identify the maximum permissible dose (MPD) for occupationally exposed persons.
 14. Identify methods for reducing and monitoring radiation exposure to dental office personnel.
 15. Define selection criteria and explain their use in oral radiology.
 16. Describe various methods for dose reduction to the patient during dental radiography.
 17. Describe federal or state regulations regarding dental radiography.
 18. Describe the effects of radiation therapy on oral cavity and ways to manage a patient undergoing radiation therapy in the head and neck region.
6. Basic Principles of Radiological Interpretation
1. Describe the "radiologic" method of reviewing radiographs for normal, normal variants, and pathologic entities and list seven parameters for describing radiologic pathology.
 2. Describe basic radiographic optical illusions that may interfere with routine film interpretation.
 3. Describe optimal conditions for viewing radiographs.
 4. Identify normal anatomic landmarks on intraoral and panoramic radiographs.
 5. Identify various dental restorative materials when seen on radiographs.
7. Computers in Dentistry and Digital Radiography
1. Describe the advantages and disadvantages of digital imaging
 2. Describe various types of sensors

3. Define spatial resolution and gray levels.
4. Describe digital enhancement of images
5. Describe optimal viewing of digital images
6. Describe errors and corrections of digital images

VII. Course Competencies

This course teaches to the following competencies in the "[Competencies for the New Dental Graduate](#)".

Domain VI: Patient Care

A. Assessment, Diagnosis, and Treatment

12: Patient Assessment, Diagnosis, Treatment Planning and Informed Consent: Provide oral health care within the scope of general dentistry to include patient assessment, diagnosis, comprehensive treatment planning, prognosis, and informed consent.

B. Establishment and Maintenance of Oral Health

25: Provide oral health care within the scope of general dentistry to include oral mucosal and osseous disorders.

26: Provide oral health care within the scope of general dentistry to include screening and risk assessment for head and neck cancer.

VIII. Evaluation

1. Four quizzes (10 points each, 40%), group project (20%) and a final comprehensive exam (40%). Exams and quizzes will be multiple choice questions. These assessments will include some images.
2. During the examination, no additional help will be provided by faculty/proctors.

Remediation:

A student that receives an "E" grade must meet with the Course Director to review their examination. A remediation examination is then scheduled for the student.

Student Evaluation of Instruction:

"Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://ufl.bluer.com/ufl/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course

menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.”

IX. Administrative Practices

Administrative practices for all UFCD courses are universally applied. Exceptions to or deviations from these practices are stated in the individual syllabi by the course director. When not individually stated in the syllabus, course administrative practices default to those identified under "Course Policies" on the DMD Student Website:

<https://dental.ufl.edu/education/dmd-program/course-policies/>

X. Grade Scale

DEN6301C Grade Scale

Method	Letter Grade
Scale	100
Tolerance	0.5 (Final letter grades within this range will be rounded up.)
A	95 - 100
A-	90 - 95
B+	87 - 90
B	84 - 87
B-	80 - 84
C+	76 - 80
C	70 - 76
E	0 - 70