A. CATALOG DESCRIPTION
1. Credits: 3
2. Hours/Week: 2 hour lecture, 2 hour lab
3. Prerequisites (Course discipline/number): Dental Assisting Diploma or AAS Degree Students DA 1200, DA1210, DA 1215, DA 1220, DA 1225, DA 1230; Dental Assistant Expanded Functions Certificate students – Certified Dental Assistant and DA 1225; Dental Hygiene Students – DH 1510, DH 1511, DH 1512
4. Co-requisites (Course discipline/number): None
5. MnTC Goals (if any): NA

This course includes the history of radiology, theoretical concepts of the characteristics of radiation, the effects of radiation exposure, roentgenographic anatomy and pathology, radiographic exposure techniques, film processing and mounting, film evaluation, radiation biology and protection, and intra and extraoral radiographic procedures.

B. DATE LAST REVISED (Month, year): April, 2012

C. OUTLINE OF MAJOR CONTENT AREAS:
1. History of Radiology
2. Operator Protection Methods
3. Patient Protection Methods
4. Infection Control
5. Paralleling Technique
   a) Principles of Shadow Casting
   b) Intraoral Film Types
   c) Film Surveys
   d) Film Sizes
   e) Areas to be Recorded on Intraoral Projections
   f) Principles of the Paralleling Technique
      i. Horizontal Angulation
      ii. Vertical Angulation
      iii. Central Ray Entry
      iv. Film Packet Placement
   g) Film Holding Devices
   h) Advantages and Disadvantages of the Paralleling Technique
6. Characteristics of Radiation, the X-Ray Machine, and X-Ray Production
   a) Atomic Structure
   b) Ionization
   c) X-Ray Properties
   d) Electromagnetic Spectrum
   e) Direct and Alternating Current
   f) Voltage and Amperage
   g) X-ray Machine Components
   h) X-Ray Production
7. Imaging Characteristics
   a) Contrast
   b) Radiolucent
   c) Radiopaque
   d) Density
   e) Inverse Square Law
   f) Geometric Unsharpness
      i. Object-Film Distance
      ii. Target-Film Distance
   g) Motion Unsharpness
   h) Operator Error Distortion
      i. Foreshortening
      ii. Elongation
OUTLINE OF MAJOR CONTENT AREAS: Continued...

8. Film Evaluation: Exposure and Processing Errors
   a) Criteria for Film Evaluation
   b) Identification of Errors and their Cause
   c) Correction of Errors
      i. Film too light/dark
      ii. Poor Contrast
      iii. Required anterior/posterior structures not recorded
      iv. Periapical areas not recorded
      v. Vertical/Horizontal Angulation errors
      vi. Improper Central Ray Entry
      vii. Image Unsharpness
   viii. Artifacts
   ix. White/Black Lines
   x. White/Black spots or areas
   xi. Film Fog
   xii. Reticulation

9. Anatomy
   a) Radiographic Appearance
      i. Radiolucent Structures
      ii. Radiopaque Structures

10. Radiograph Mounting
    a) Purpose
    b) Types of Mounts
    c) Types of Mounting
       i. Labial
       ii. Lingual
    d) Procedure
    e) Labeling and Storage

11. Film Composition, Processing, and Quality Assurance
    a) Film Composition
       i. Parts
       ii. Film Speed
       iii. Storage
    b) Recording of the Radiographic Image
    c) Processing Chemicals and Their Action
    d) Darkroom Equipment
    e) Automatic Processing
    f) Manual Processing
    g) Care and Maintenance of Processors
       i. Silver Retrievers
    h) Film Duplication
    i) Quality Control/Quality Assurance
       i. Measures
          1. Coin Test
          2. Normalizing and Monitoring Devices
          3. X-Ray Machine Calibration
       ii. Documentation

12. Patient Management

13. Localization Techniques
    a) Right Angle Technique
    b) Clark’s Rule
    c) Definition Evaluation

14. Radiation Biology and Protection
    a) Definition
    b) X-Ray Photon Interaction with Matter
       i. Thompson Scatter
       ii. Pass Through
C. OUTLINE OF MAJOR CONTENT AREAS: Continued...

iii. Photoelectric Effect
iv. Compton Effect

c) Direct and Indirect Effects
d) Roentgen, Radiation Absorbed Dose, Roentgen Equivalent Man
e) Coulombs per kilogram, Gray, Sievert
f) Exposure and Dose
g) Cellular Effects
h) Short and Long Term Effects
i) Tissue Sensitivity

j) ALARA Principle
k) Primary and Secondary Radiation
l) Radiation Protection Measures
   i. Operator
   ii. Patient
m) Selection Criteria
n) Maximum Permissible Dose
o) Radiation Monitoring
p) Legal Aspects

15. Accessory Techniques
   a) Bisecting Angle Technique
   b) Edentulous Technique
   c) Pedodontic Technique
   d) Vertical and Long Bitewing Technique
   e) Occlusal Technique

16. Extraoral Techniques
   a) Panoramic
      i. Indications
      ii. Equipment
      iii. Procedure
      iv. Errors
   b) Lateral Oblique Jaw
   c) Cephalometric Projection
   d) Posteroanterior Projection
   e) Temporomandibular Joint (Transcranial)
   f) Submentovertex
   g) Tomography

17. Radiographic Interpretation and Pathology
   a) Dental Caries
   b) Periodontal Disease
   c) Calculus
   d) Dental Anomalies
   e) Trauma

18. Digital Imaging
   a) Definition
   b) Types
   c) Equipment
   d) Infection Control
   e) Procedure
   f) Advantages
   g) Disadvantages

19. Implant Radiology

D. LEARNING OUTCOMES (GENERAL): The student will be able to:

1. Retrace the history or radiography.
2. Define radiographic terms.
3. Describe intraoral films.
4. Identify structures recorded on each film.
D. LEARNING OUTCOMES (GENERAL): The student will be able to: Continued...
5. Discuss the uses of radiography.
6. Describe the characteristics of radiation.
7. Operate the x-ray machine safely.
8. Describe the function of the individual parts of the x-ray machine.
10. Describe the factors which affect the x-ray beam and the image it produces.
11. Discuss how the radiographic image is recorded on the x-ray film.
12. Differentiate among factors which can influence the quality of the radiographic image.
13. Describe the paralleling technique.
14. Define horizontal angulation, vertical angulation, and central ray entry.
15. Describe film holding devices that are utilized in the paralleling technique.
16. Demonstrate the intra-oral paralleling technique.
17. Describe advantages and disadvantages of the paralleling technique.
18. Describe the intra-oral bisecting technique.
19. Describe the principles of radiation biology.
20. Practice methods to minimize occupational exposure to radiation.
21. Utilize methods to minimize exposure to the dental patient.
22. Describe the risk versus benefits of dental radiation.
23. Describe the ALARA principle.
24. Describe the legal aspect of dental radiographic exposures.
25. Describe the elements of selection criteria for dental x-ray exposures.
27. Describe film processing chemicals and their action.
28. Describe the necessary components of an adequate darkroom.
29. Describe the care and maintenance of film processors.
30. Demonstrate proper technique for processing radiographs.
31. Demonstrate mounting of dental radiographs.
32. Demonstrate proper labeling of dental radiograph mountings.
33. Demonstrate dental radiograph duplication.
34. Describe methods utilized in quality assurance.
35. Evaluate dental radiographs for errors in exposure technique and processing.
36. Describe patient and anatomy management techniques.
37. Describe localization techniques.
38. Describe extraoral exposure techniques.
39. Describe the concepts utilized in computed tomography.
40. Describe the principles involved in cone beam imaging.
41. Identify normal anatomical landmarks on dental radiographs.
42. Identify pathology on dental radiographs.
43. Apply principles of infection control and hazards management in dental radiography.
44. Describe principles of digital radiology.
45. Demonstrate the intra-oral digital radiography technique.
46. Describe implant radiology techniques.
47. Complete radiographic documentation.
48. Demonstrate professional dental assistant/dental hygienist traits.

E. LEARNING OUTCOMES (MNTC): NA

F. METHODS FOR EVALUATION OF STUDENT LEARNING:
1. Weekly written and oral quizzes
2. Workbook assignments
3. Midterm exam
4. Final Exam
5. Attendance
6. Dental radiography lab and clinic skill evaluations.
G. RCTC CORE OUTCOME(S) ADDRESSED:

- Communication
- Civic Responsibility
- Critical Thinking
- Personal/Professional Accountability
- Global Awareness/Diversity
- Aesthetic Response

H. SPECIAL INFORMATION (if any):

1. RCTC Approved uniform attire, safety glasses, and nametag.
2. Current Certification in American Red Cross CPR/AED for the Professional Rescuer or American Heart Association BLS Healthcare Provider CPR/AED
3. Approved background studies
4. Approved health assessment
5. Hepatitis B Vaccine