Dental Radiology

Oral Radiology (individual stand alone course)
Location of Clinic:
2411 Imperial Business park Dr.
Imperial, Ca. 92251
LECTURE HOURS: Friday:9:00-11:00 A.M
LAB/CLINIC HOURS: 12:00-3:0O P.M.

Course Syllabus

INSTRUCTOR:	Dr. Betsy Lindbergh, DDS
LAB INSTRUCTORS:	Dr. Betsy Lindbergh DDS Mrs. Lisa Higginbotham RDH Ms. Kathy kidwell RDA
PHONE:	760-355-8606
OFFICE HOURS:	TBD

Course Description

A course to teach the fundamentals of radiation safety and the operation of dental radiology equipment, along with the clinical application of procedures involved in exposing, processing, mounting ,evaluating and interpreting dental roentgenograms.

Text
Jansen, Miles, Van Dis & Williamson, Radiographic Imaging for the Dental Team; – 4th Edition 2009- 2009 W.B. Saunder

Adjunct Text
Torres and Ehrlich, Modern Dental Assisting-9th edition D. Bird and D.S Robinson

Course Objectives:

By the end of this course, a successful student will be able to:

1. Explain the history and development of x-radiation for dentistry and its role in dental diagnosis.
2. Follow the rules of radiation safety for the protection of both the patient and operator.
3. Explain the characteristics of radiation; physics, ionization, the electromagnetic spectrum and the association of x-rays with matter.
4. Identify the components of the x-ray machine and their individual functions.
5. Describe the technical aspects of radiation production and the effects of adjusting the milliamperage, kilovolts, and/or exposure time in the production of a quality dental.
6. Identify the parts of the dental film packet and correctly manipulate it.

7. Demonstrate knowledge of different sizes and types of dental x-ray film, such as pedodontic and adult intraoral film, extraoral film and panoramic dental x-ray film, and their individual uses.
8. Demonstrate the use of dark room facilities and automatic film processors in the development of dental x-ray film.
9. Utilize different position indicating devices (PIDs) when taking intraoral dental x-rays, using both the paralleling and bisecting angle techniques.
10. Identify and correct errors in film placement, using the rules of shadow casting and the inverse square law.
11. Expose, process and correctly mount bitewing and periapical dental x-ray films.
12. Take diagnostic bitewing dental x-ray surveys.
13. Take a full mouth survey (FMX) which clearly shows each interproximal space and each tooth apex at least once.
14. Identify and correct errors in processing of dental x-ray film.
15. Demonstrate competency in anatomical landmarks, anomalies, restorations, caries, periapical lesions and other possible pathological defects in a formal written critique.

Course Requirements

- The course is taught in a combined lecture and laboratory sequence.
- Class attendance for both lecture and laboratory is required.
- Students must complete all assignments on time. Late work will be penalized. If a problem should arise, contact the instructor prior to the due date.
- In-class tests and the final exam must be taken on the scheduled dates. A student will not be allowed to make up an examination or quiz that was missed due to an unexcused absence. If the absence is excused, it is the responsibility of the student to contact the instructor and arrange to make up any examination or quiz that was missed. Exams that are missed due to tardiness may not be made up.
- Students may not work in the Lab without the direct supervision of an instructor. An attending dentist must be present at all times. Neither the student nor the patient may ever take x-rays home.
- Lab coats must be worn at all laboratory sessions.
- Universal precautions must always be observed.
- Students who do not receive a grade of "C" or better in this course will be dismissed from the dental assisting program.
- Students cannot challenge any part of this course.

Please note: The majority of the radiographs taken in this course will be done on DXXTR manikins (you will be placing but not exposing films on your clinic partner). However, you will need Four actual patients to fulfill patient requirements for this course. These patients must have a signed authorization form from DDS instructor and completed medical and dental histories. Furthermore, the patient utilized for bitewings must not have had x-rays within the last year and the patient who is used for the full mouth survey (FMS) may not have had a FMS within the last 3-5 years. You may use your clinic partner as one of your required patients.

Evaluation and Grading

Students are evaluated by means of written tests, laboratory performance and professionalism. Written evaluation consists of frequent exams, written radiograph critiques and a comprehensive final examination. Laboratory performance is evaluated on participation and on radiographs, which are turned in, mounted and critiqued. The professionalism component of the grade will be considered on a satisfactory versus unsatisfactory basis. The staff will counsel any student whose conduct is repeatedly unprofessional and if the student continues to disregard the policies of professionalism, he or she will be dismissed from the class that will result in dismissal from the dental assisting program.

Lab /Clinical Assignments

Students will expose films on a DXXTR manikin in multiple practice sessions. During lab time, the student will also complete a written critique on every group of required films. Instructors will also critique the students work and provide written and verbal feedback. For films to be counted towards your requirements, every film must be taken to the satisfactory level. For retakes, always remember to use the same manikin!

(To be assessed at the satisfactory level)

Lab Assignment	# Required
DXXTR BWS	5
DXXTR Full mouth P.A. Total of 18 P.A.s 4 ofwhich must be bite wings.	4

Clinical experience shall be on 4 patients with one used for the clinical exam

Clinical Assignment	# Required
Patient BWS	2
Patient Full mouth P.A. Total of 18 P.A.s 4 ofwhich must be bite wings.	4

Graded Assignments or Tests

Assignment/Test	#Required	Points
DXXTR BWS (3 unassisted and in conjunction with Competency evaluation)	5	250 (50points each)
DXXTR FMS (unassisted and in conjunction with Competency evaluation)	2	100 (50 points each)
Patient BW	2	200 (100points each)
Patient FMS	4	400(50 points each)
Anonymous FMS Competency · Anatomical landmarks · Interpretation (caries, any pathology) · Process Critique	2	50 (25 points each)
Exams	3	300 (100points)
Final Exam	1	150
Total		1450

Grading Scale

A= 1450 - 1305
B= 1304 – 1160
C= 1159 – 1015
D= 1014 – 870
F= below 869

Graduation Competencies

1. Demonstrate knowledge of basic clinical and behavioral sciences.
2. Apply knowledge of basic clinical and behavioral science in providing patient care.
3. Utilize problem solving and decision-making skills in providing patient care.
4. Demonstrate clinical skills essential for treating patients.
5. Identify the need for radiographs, obtain radiographs of diagnostic quality and distinguish normal from abnormal on radiographs.
6. Utilize accepted infection control procedures.
7. Provide compassionate and humane care to all patients.

DA 102 Oral Radiology Course Schedule

Date	Lecture 9:00 a.m.-11:00a.m.	LAB/ Clinic	Lab / Clinic	Notes	Reading Assignment
Intro. To Da 102- Syllabus	Intro to Dental Radiology and review of sylabus. Lab Intro. to facilities, equip ment, Infection Control and Radiation Safety protocols	LAB	Intro. to Dental Radiography Principles		Syllabus Intro.
01/18/13	Infection Control, Radiation Safety and Equipment demo's	Lab	Intramural radiographic technique, Image processing and quality assurance		Chapt.'s 1,2,
1/25/2013	Film mounting, x-ray properties and the generation of x-rays and radiopgraphic record keeping	Lab	Begin I.C. and R.S. eval's		Text Chapters 3,4
2/1/13	Exam #1	lab	Continue with eval's and mounting		Exam #1
02/15/13	Radiation Basics	lab	Begin with BW's on DXXTR Critiques explained		Text Chapters 5
02/22/13	Image Characteristics	lab	Continue with BW's		Text Chapter 6
03/1/13	Digital Imaging	lab	Continue with BW's and begin Max. anterior PA's on DXXTR. Graded BW's on DXXTR		Text Chapter 7

03/8/2013	Exam #2	Lab/Clinic	Begin Mand. PA's on DXXTR Practice positioning BW's on partner.		Exam#2
03/10/13	Basics of interpretation: Normal vs. abnormal	lab	FMS on DXXTR		Chapter 12
03/17/13	PANORAMIC IMAGING	LAB	Continue with FMS on DXXTR Snap-a-Ray Demo		CHAPTER 8
03/22/13	TROUBLE SHOOTING AND PROCESSING	LAB	Continue with FMS on DXXTR		Chapter 9
3/31/13	CONTD	Clinic	FMS on Patients		Same as last week
4/12/13	Pano and Digital Demo's Exam # 3	Clinic	FMS on Patients		EXAM#3
4/26/13	Accessory Radiographic techniques and patient management	Clinic	FMS on Patients		Chapter 10 and 11
05/03/13	review	Clinic	FMS on patients		Review
5/10/2012	FINAL EXAM	Clinic	FMS on patients		

DA 102 - RADIOLOGY

Laboratory/Clinical Assignments

Clinic/lecture location: All Lecture, Lab and clinical hours will be done at 2411 Imperial Business Park Dr. Located in the city of Imperial, California.

Individual films - Each x-ray taken will be evaluated as to horizontal and vertical angulation, film placement, cone placement, mounting and processing on a satisfactory versus unsatisfactory basis. Forms are available for the critiquing of these films.

DXXTR BW Survey - 50 points; each film will be worth 10 points. Points will be taken off for any incorrect horizontal angle (2), incorrect vertical angle (2), film placement error (2), cone placement error (2) incorrect film mounting (1) and processing error (1). The completed critique is worth 10 points with points deducted for gross errors in assessment.

Patient BW Survey - 100 points; One retake is allowed without affecting the initial grade. Additional retakes will reduce the total by 5 points each and shall not exceed 3 exposures per patient. Five points will be given for completed medical/dental history forms and 5 points for a completed, signed authorization form from the patient's dentist. Each film will be worth 20 points. Errors which will result in a reduction of points include: incorrect horizontal angulation (4), incorrect vertical angulation (4), a film placement error (4), a cone placement error (4), processing errors (3) and a mounting error (1). Any violation of radiation safety rules will result in disqualification (i.e., no apron used, overexposure of the patient, violation of rules of asepsis, etc.) The completed critique is worth 10 points with points deducted for gross errors in assessment.

DXXTR Full Mouth Surveys (1 XCP, 1 Snap-a-Ray) - 100 points each; 5 points will be given for a properly mounted survey, and 5 points for the written critique. Each film will be worth 5 points. A point will be deducted for each error in film placement, horizontal angulation, vertical angulation, cone placement and film processing.

Patient Full Mouth Survey - 150 points; 10 points will be given for completed medical/dental history forms, 5 points for a completed and signed authorization form from the patient's dentist, 10 points for the total survey if each contact and each apex is visible at least once, 5 points for a completed restoration chart and 12 points for a completed written critique. Each film will be worth 6 points with a point being taken off for each error in horizontal or vertical angulation, film or cone placement, processing and/or mounting. Three retakes are allowed without affecting the student's grade. Additional retakes needed shall not exceed 3 exposures per patient and will reduce the total points by 5 points each. Gross violations of radiation safety may result in disqualification of this FMS. To make up this assignment, individual arrangements will have to be made with an instructor.

INSTRUCTIONS FOR COMPLETING X-RAY SURVEY CRITIQUE FORMS

1. Critique forms are multi-functional and are used for both DXXTR and patients.

2. Enter all information on each form. If you are working on a DXXTR manikin, do not fill in the patient data section.

3. Make sure to include the technique that was used and film size.

4. Each form has six (6) numbers listed in each box. These numbers correspond to procedures that could lead to a possible error. The procedures are listed below as well as on every critique form:
   - Film placement
   - Horizontal angulation
   - Vertical angulation
   - Cone placement
   - Processing
   - Mounting

5. When critiquing your films, circle the number(s) that are located in each square that corresponds to any errors you may have made. For example: If you have overlapped the contacts on the maxillary right molar film, you would circle the number 2 (indicating an error in horizontal angulation) in the box representing that film. You do not need to explain errors 1 - 4. However, if your error is processing, a brief explanation is needed; such as, an error in exposure (poor contrast) or chemical contamination.

6. Keep in mind that each interproximal space and each tooth apex must be visible at least once in a FMS. Each interproximal contact must be diagnostic on a BW survey. If these criteria are not met, please determine which x-rays should be retaken and indicate "x" in the small square in the lower right corner of the appropriate box.

7. Your grade for the survey will be determined before any retakes. If a film is retaken before the survey is submitted for a grade, the original film must be clipped to the completed form for grading purposes.

8. As discussed in class, you must also list anatomical features in the appropriate evaluation box. Please refer to your textbook when listing anatomy.

Patient Only Requirements:

1. All restorations and/or suspicious areas are to be listed in the bitewing boxes on the FMS evaluation form. These are the middle boxes in the molar and premolar areas. Include a copy of the patient's restoration chart with each FMS critique. The restoration chart must have been signed off by an instructor.

DA 102 - Oral Radiology Imperial Valley College

Process Evaluation

The student is expected to:

1. Always use aseptic techniques and universal precautions, keeping the rules of radiation safety in mind.
2. Position the patient or manikin properly with the head at an appropriate height, the mid-sagittal plane perpendicular to the floor and the occlusal plane in the correct horizontal position,
3. Select the proper film size for the type of x-ray being taken and for the age and size of the patient,
4. Choose the correct film holding device,
5. Place the film correctly to cover the desired teeth,
6. Position the tube/cone using anatomical landmarks learned in lecture, with correct horizontal and vertical angulation and in order to cover the film completely,
7. Select the proper exposure,
8. Develop the film using proper techniques in the darkroom,
9. Mount the film on the appropriate film mount,
10. Choose the correct form and critique the film prior to submitting it to the instructor for a final grade, and
11. Make complete and accurate entries in the patient's chart as to the number and type of films taken (including retakes).

The instructor is expected to:

1. Observe the student while he/she positions the patient/manikin, places the correct film in the film holding device, positions the film in the mouth to cover the area to be exposed, positions the tube and cone and selects the correct exposure variables,
2. Be available to assist the student if he/she appears to be choosing incorrect items or techniques, and
3. Evaluate and grade the final product.

NOTE: Any violation of asepsis and/or rules of radiation safety will be considered a CRITICAL ERROR and will result in an unsatisfactory evaluation for the procedure for the day. The student will be required to repeat the procedure until a satisfactory result is obtained

Facilites: The location of this course will be at The Smyle Shop which is a facility that is located in the city of Imperial. The address is:

2411 Imperial Business Park Dr.
Imperial, Ca. 92251

There are a total of 6 x-ray tube heads on the premises. The sterilization is centrally based and has a sterile and non-sterile side.

There is a linear flow of processing the contaminated instruments. On the non-sterile side we have a ultrasonic cleaner, waste receptacle, sink for rinsing instruments after being processed in the ultrasonic cleaner. Right next to the sink there is a instrument packaging and wrapping area. Then adjacent to that we have the sterile region which is where two autoclaves are housed. Sterile instruments are labeled or stamped with the date sterilization has occurred and stored in cabinets and drawers on the opposite side.

SPECIFIC LEARNING OBJECTIVES FOR DA 102

UNIT I Introduction - History of radiation and radiation safety

At the end of this unit, successful dental assistant students will be able to:

1. Trace the progress of radiography from its discovery to the present.
2. Name the pioneers of radiography and identify their contributions.
3. Identify techniques that have helped to make x-ray a safe and reliable diagnostic tool.
4. Compare the theories of biological damage and the possible effect of radiation on somatic and genetic cells.
5. Identify the body cells in the order of their radiosensitivity.
6. Identify the factors that determine radiation injuries.
7. List the sequence of events that may follow exposure to radiation.
8. Identify the three areas in the head and neck that are most affected by radiation.
9. List the possible short-term and long-term effects of radiation.
10. Identify the effects of oral radiation therapy.
11. Identify the areas of professional responsibility and concern for radiation safety.
12. Identify the terms used to measure radiation.
13. Differentiate among the various terms used in radiation safety procedures.
14. Differentiate among the various radiation monitoring devices.
15. Identify the procedures for maintaining radiation safety.
16. Identify the goals of quality assurance programs.
17. Recognize the different areas of the x-ray area and their specific utilizations.
18. List the duties of the Radiology Assistant.

UNIT II Scientific principles of radiography including the physics of radiation, the electromagnetic spectrum and ionization

By the end of this unit, successful d students will be able to:

1. Differentiate the various atomic and molecular structures important to radiography
2. Identify the common characteristics of radiation
3. Compare x-ray wavelength to its penetrating power
4. Identify which types of radiation are capable of causing ionization in body tissues
5. Identify two ways dental x-rays interact with matter
6. List asepsis procedures used in the radiography lab

UNIT III The dental x-ray machine and the technical production of x-rays; bitewing x-rays; introduction to x-ray manikin

By the end of this unit, successful students will be able to:

1. Identify the types of x-ray machines and their major parts and components
2. Identify the functions of the electric circuits, the parts of the x-ray tube and control devices of x-ray machines
3. Identify the factors involved in x-ray generation
4. Differentiate between constant potential and varying potential x-ray machines
5. Identify, in sequence, the steps that must be followed in operating the dental x-ray machine
6. Identify the basic requirements of an acceptable diagnostic radiograph
7. Differentiate between the effect of variations in milliamperage, kilovolts, distance and exposure time on the resulting dental radiograph
8. Identify the location of controls for the dental x-ray machine in the Dental Clinic
9. Select the type and number of films required to make a bitewing x-ray survey
10. Compare the methods of holding bitewing films in position
11. Identify positions of bitewing film placement and the vertical and horizontal angulations normally used
12. Demonstrate proper manipulation of the manikin (DXXTR) used to teach placement of dental film

13.Demonstrate placement of bitewing x-rays on DXXTR using the XCP, stick-on and paper tab methods of holding bitewing x-rays

14.Expose bitewing x-rays on DXXTR

15.Mount and critique acceptable bitewing radiographs

UNIT IV Dental x-ray film, film processing and asepsis in radiography

By the end of this unit, successful dental assistant students will be able to:

1.Differentiate between direct-exposure and indirect-exposure films

2.Identify the parts and identification marks on dental x-ray film packets

3.Identify and compare the various intraoral films according to size, customary usage, and film speed

4.Differentiate between intraoral and extra-oral films

5.Identify the parts and intended use of the extra-oral cassette

6.Identify correct methods of film handling and storage

7.Identify, in sequence, the steps in processing radiographs

8.Identify all items of darkroom equipment, the compartments of processing tanks and the types of safe lights

9.List the major ingredients in processing solutions and explain the functions of each ingredient

10.Differentiate among manual, rapid and automatic processing

11.Identify three problem areas in quality control during processing

12.Compare digital radiography with conventional radiography

13.Place bitewing x-rays in the mouths of clinic partners

14.Expose, mount and critique bitewing x-ray surveys on DXXTR

15.Explain and follow rules of asepsis in radiology

16. Management of radiographic record. All radiographs will be kept and stored for five years in a locked file room. Duplicates will be given to patients.

UNIT V Anatomical landmarks, film mounting and interpretation of radiographs

By the end of this unit, successful students will be able to:

1. Describe why it is important to recognize and identify normal anatomical landmarks of the face and head
2. Recognize and identify the facial and cranial bones
3. Name all of the anatomical landmarks of the maxilla and mandible
4. Differentiate between the terms radiopaque and radiolucent
5. Differentiate, radiographically, between cortical and cancellous bone
6. Recognize and describe the radiographic appearance of all structures of the teeth and the alveolus
7. Name and identify all landmarks or structures normally seen on radiographs of the maxillary and mandibular tooth areas
8. Determine whether a periapical radiograph is of the right or left side
9. Identify any given periapical radiograph according to its exact location in the maxilla or mandible and describe how to position it on a film mount
10. Describe how to block out excess light during film viewing
11. Critique anonymous FMS x-rays
12. Mount, correctly, dental x-ray films
13. Expose, mount and critique bitewing x-ray surveys on patients

UNIT VI Intraoral radiography; periapical radiographs

By the end of this unit, successful dental assisting students will be able to:

1. Identify the three basic intraoral procedures
2. Compare the principles of the paralleling and bisecting-angle techniques
3. Locate the points of entry on the face
4. Differentiate between the methods used to obtain proper horizontal and vertical angulation
5. Identify the advance preparations required before radiographs are exposed

UNIT VII Periapical radiographs

By the end of this unit, successful dental assiting students will be able to:

1. Select the type and number of films required to make a complete periapical survey
2. Identify and be able to assemble and position film holders [XCP (extension cone paralleling) or Snap-a-Ray] for the paralleling and/or bisecting-angle techniques
3. Differentiate between the method of positioning the film packet when using the bisecting-angle and paralleling methods
4. Differentiate between conventional periapical film placement and endodontic film placement techniques
5. Place periapical films in DXXTR's mouth, using the XCP
6. Expose, mount and critique a full mouth series of x-rays taken with the XCP

UNIT VIII Interpretation of radiographs

By the end of this unit, successful dental assenting students will be able to:

1.Differentiate between preliminary interpretation and diagnosis of the radiograph
2.Identify all radiopaque and radiolucent-appearing restorative materials
3.Identify the radiographic appearance of dental caries
4.Identify at least four types of cysts
5.Describe the appearance of at least eight anomalies
6.Differentiate between normal and pathological resorption of bone structures and teeth
7.Differentiate between calcifications and ossifications
8.Describe the radiographic appearance of odontogenic tumors
9.Describe the radiographic appearance of dental injuries
10.Identify two methods used to localize objects in the mouth by applying the buccal-object rule
11.Complete critiques of full mouth series of x-rays using the course guidelines
12.Place, expose, mount and critique periapical x-rays taken with the Snap-a-Ray

UNIT IX Identifying and correcting faulty radiographs

By the end of this unit, successful dental assisting students will be able to:

1.Identify the types of radiographic errors caused by faulty exposure techniques

2.Identify the types of radiographic errors caused by incorrect film positioning and angulation of the central ray

3.Identify the types of radiographic errors caused by faulty processing techniques

4.Identify the conditions that cause radiographs to be fogged

5.Identify the importance of quality control during chair-side film positioning procedures

6.Place, expose, mount and critique a full mouth series of x-rays taken with the Snap-a-Ray

UNIT X Occlusal and extraoral radiography

By the end of this unit, successful dental assisting students will be able to:

1.Identify the reasons for making an occlusal survey

2.Compare the topographical with the cross-sectional exposure method

3.Position the film packet and establish horizontal and vertical angulation for maxillary and mandibular areas

4.Identify the types of film used in extraoral radiography

5.Identify three reasons for making extraoral exposures

6.Identify the types of surveys that can be performed extra-orally

7.Differentiate between the steps required to make a temporomandibular joint and lateral skull survey

8.Identify and locate the listed cephalometric landmarks and planes on a cephalometric tracing

UNIT XI Radiography for children and edentulous patients; education of patients about radiography

By the end of this unit, successful dental assisting students will be able to:

1.Show the importance of making radiographic examinations on children

2.Identify the factors that determine when radiographs on children should be made and what type of film is best suited in each instance

3.Differentiate the procedures involved in exposing radiographs on children and adults

4.Explain the importance of making a radiographic survey of edentulous areas

5.Identify the film requirements for an edentulous survey

6.Differentiate the procedures used for making the survey in a fully or a partially edentulous patient

7.Explain the necessity for patient education in radiology

8.Identify the benefits that the patient derives from preventive radiation procedures

9.Describe several methods by which the patient can be educated to appreciate the value of dental radiography

10.Identify the goals of the dental radiographer

11.Place, expose, mount and critique a full mouth series of x-rays on a patient

UNIT XII Panoramic Radiography

By the end of this unit, successful students will be able to:

1.Differentiate between a conventional an a panoramic x-ray machine

2.Identify the main factor that determines the width of the focal trough

3.Identify the major factors that affect the geometry of the image

4.Identify the planes used to position the head correctly

5.Identify, in sequence, the basic steps in operating a panoramic x-ray unit

6.Compare the advantages and disadvantages of panoramic versus intraoral radiographic surveys

7.Identify five major head-positioning errors that result in faulty panoramic radiographs

Policy for the Control and Use of Ionizing Radiation

Radiation Protection Guidelines

Infection Control Procedures for Dental Radiology

Definition of Clinical Competence in Dental Radiology

Guidelines for Critiquing a FMS

POLICY FOR THE CONTROL AND USE OF IONIZING RADIATION

The following policy has been developed in the interest of establishing a consistent standard concerning the use of ionizing radiation within the dental assisting program. The primary goal of this policy is to assure the safe and effective use of ionizing radiation and to minimize, as much as possible, any potential risk from adverse biological effects to patients, students, faculty, and staff. All lecture, lab and clinic sessions will be held at Dr. Lindbergh's Facility (The Smyle Shop) which is located at 2411 Imperial Business park Dr. Imperial, Ca. 92251.

1. Deliberate exposure of an individual to dental diagnostic radiographic procedures for training or demonstration purposes shall not be permitted unless there is a documented diagnostic need for the exposure by a method of the faculty.

2. The operator or dental auxiliary shall not hold the film in place for the patient during the exposure. The use of film-holding device, bite tabs, or other aids are appropriate to position the film during exposure.

3. The operator must stand behind the barrier provided for each x-ray cubicle in the dental clinic and directly observe the patient during each exposure.

4. Neither the tube housing, nor the cone (PID) should be hand held during the exposure. If equipment is non-stable, report the problem to an instructor and to another unit.

5. Only shielded, open-ended cones (PID'S) will be used in order to minimize scatter radiation.

6. When a cylindrically collimated x-ray machine is being used, the circular beam striking the face should not be more than 2.75 inches in diameter.

7. Only film with ANSI (ASA) speed group rating of "D" or faster shall be used.

8. Each dental x-ray machine should contain filtration of 2mm of aluminum equivalent if operation at less than 70 kilovolt peak (Kvp), and 2.5mm of aluminum equivalent if operation at 70 Kvp or above.

9. Lead aprons will be used on all x-ray patients in the Imperial Valley College Program as an additional precaution to prevent unnecessary scatter radiation exposure to the body of the patient.

10. Periodic radiation protection surveys and inspections will be made by the radiation safety officer of the State of California. All recommendations by the radiation safety officer concerning collimination, filtration, beam alignment, roentgen output, radiation leakage, etc., will be implemented immediately.

11. Prescribed exposure and processing techniques will be followed: If the films are too dark in density, the exposure technique and/or processing procedure for that particular machine will be evaluated and corrected.

12. It is general policy of the college that all newly admitted patients should have an adequate, full-mouth radiographic survey FMS prior to diagnosis and treatment in the college's clinic. The following conditions are stipulated:

    a. Dental exposure of the patient to x-radiation shall be kept at the minimum level consistent with clinical requirements of each individual patient. The limits on exposure, in each case, will be determined by the professional judgement of an instructor. Some new adult patients may be diagnosed for treatment using posterior bitewings and specified additional periapical views.

    b. If recent radiographs are available from a private dentist or another institution, they will be requested and reviewed by aa instructor. Only those additional views needed to complete a suitable diagnostic survey will be taken.

    c. Partially edentulous patients will receive a combination of periapical radiographs as deemed appropriate by a dental hygiene instructor.

    d. Child patients, under 12 years of age, will receive bitewings and individually selected periapical views if indicated. An alternative, pediatric FMS, containing fewer films than the adult survey, may be taken. The type of radiographic survey used will be determined by the professional judgement an instructor.

    e. Emergency patients will receive only those radiographs needed to diagnose and treat the immediate emergency problem.

    f. Discretionary x-ray examinations of pregnant women will be delayed until after the termination of the pregnancy. FMS and/or bitewings will not be taken until after delivery. Appropriate emergency dental care may, on occasion, require the use of an x-ray examination during the first trimester, if so, only the minimum number of films required to establish an appropriate diagnosis will be taken. Appropriate protective shielding of the patient will always be used.

1. Subsequent follow-up (recall) radiographic examinations of the dental assistant's patients (FMS, panoramic, bitewings) will be based on the diagnostic need of the patient, as determined by an instructor, after a thorough health history review and oral examination of the patient.

The radiographic examination is a diagnostic procedure; the frequency and extent of each radiographic examination will be determined by the professional judgement of an instructor in the Program.

2. A record of radiation history on every patient of the dental clinic will be monitored and kept within the patient's folder.
3. Quality Assurance Program. This program is designed to produce radiographs of consistently high quality with minimal patient exposure.

    a. Projection Technique
        1. Before dental hygiene students take a FMS on a patient, they have had didactic instruction in dental radiography and laboratory instruction in taking FMS on manikins.
        2. There will be direct supervision of all students during their first FMS of a patient.
        3. All radiographs are reviewed for errors by department faculty or a staff member as soon as possible, after they are taken and processed. Students who must only retake films will be directly supervised and instructed by an instructor.
        4. Film holders and alignment devices will be used to aid students in the correct alignment of the x-ray position indicating device (PID), film and area of interest.

    b. Evaluation of X-ray Machine Performance

    X-ray units will be inspected, and calibrated as necessary, by the State of California on a regular basis. If the quality of x-ray films diminishes greatly between inspections, extra evaluations will be sought.

    c. All film used is double film and is stored in cool, locked cabinets located in the clinic, and film is used according to age sequence. Out-dated film will never be used on patients.

Faculty members ensure that all dental x-ray procedures are in compliance with regulations of the State of California Department of health.

RADIATION PROTECTION GUIDELINES

ALL X-ray equipment operators will follow the following procedures:

1. ONLY the x-ray equipment operator and the patient are permitted in the radiology cubicle when radiographs are taken. (Children of adult patient must remain outside in the reception area.)

2. A thyroid collar and lead apron will be used on EACH patient, for all intraoral radiographic procedures, regardless of how many x-rays are taken.

3. The operator of the x-ray equipment will remain COMPLETELY behind the designated barrier during each radiographic exposure.

4. X-ray equipment operators WILL NOT (under any circumstances) hold films in a patient's mouth during a radiographic exposure.

5. X-ray equipment operators WILL NOT hold or stabilize the x-ray tube head during a radiographic exposure.

6. X-ray equipment operators WILL NOT stand in a direct line with the central ray (CR).

7. The central ray of the x-ray unit should NEVER be directed out the door; the CR should ALWAYS be directed toward the inside walls and not the door.

8. Under exceptional circumstances, it may be necessary for someone to hold a film in a patient's mouth (never on a mannequin). When these circumstances arise, it will be necessary to consult with and receive permission from the radiology faculty member in charge of the clinic. During these special circumstances, the patient's guardian or parent may be used to assist in holding the film in the patient's mouth. Both are draped with a lead apron. Faculty, students, and staff will NOT (under any circumstances) be asked to hold film in a patient's mouth.

Infection Control Procedures for Dental Radiology Areas

1. Lab coats shall be worn at ALL times, whether taking x-rays on patients or DXXTR.

2. Operators must not assume that the x-ray cubicles were cleaned and disinfected by the previous person. Before bringing the patient into the cubicle, prepare the room as follows:
    a. Clean and disinfect all surfaces you plan to touch, including the chair, entire tube head, counter surface and light switch.
    b. Cover the control panel, exposure switch (if hand held), and the counter surface. (Note: both steps "a" and "b" must be taken in radiology.)

3. Operators must wash hands before donning gloves.

4. Gloves shall be worn during all patient x-ray procedures, film and tube head positioning, and during film processing.

5. Supplies and film shall be kept on the covered work surface. Several cotton rolls should be available when needed. The films should be removed from the envelope and placed on a clean paper towel on the covered counter. A paper cup should be used to receive the exposed film.

6. When exposures are completed, or your allotted time is up, you must leave the radiology cubicle exactly as you found it:
    a. Remove and discard all disposables.
    b. Wash your gloved hands or wear overgloves.
    c. Clean and spray disinfectant on all contaminated surfaces that were not covered. (Note: DO NOT spray the control panel)
    d. Turn x-ray unit off and place tube head against wall.
    e. Wipe the lead apron and hang it up.

7. Infection control continues in the darkroom area:
    a. Strip films with washed, gloved hands.
    b. Use a paper towel to lay contaminated film packets on or throw then directly into the trash receptacle. Be sure to separate the lead foil and put it into the recycle container. Film packets shall never be laid directly on the processor.
    c. Films should be handled as little as possible, preferably by the edges.
    d. After all films are in the processor, remove gloves and wash hands in the darkroom sink.
    e. Processed films will be handled by clean, dry hands, no gloves.
    f. When taking panoramic radiographs, come to radiology with washed hands and no gloves. There is no need to wrap anything in this room except the bite-block. Clean the patient positioning area and handles of the panoramic unit before and after making the exposure.

8. Radiographic record keeping: Radiographs will be kept and stored for 5 years in locked file room. Duplicates will be given to the patients.

Definition of Clinical Competence in Dental Radiography

I. Clinical applications of basic (didactic) knowledge.

Upon graduation, the effective dental assisting student will be able to apply basic (didactic) knowledge of dental radiology to clinical procedures by:

A. Routinely reviewing dental and medical histories and by performing a cursory oral examination PRIOR to beginning intra-oral radiographic procedures.

B. Carefully performing infection control procedures for each patient.

C. Applying, at all times, ALARA principles for optimizing the radiologic safety of the patient and themselves by:

- considering the potential of pregnancy PRIOR to initiating the radiographic procedure(s)
- checking for the availability of a recent FMS from another dentist
- observing principles of radiologic safety
- using the lead apron and thyroid shield when appropriate

D. Employing basic principles of radiographic theory and modifying normal procedures as appropriate to the clinical circumstances encountered.

E. Suggesting other radiographic procedures or techniques which may provide additional diagnostic information about the patient's condition.

II. Radiographic Technique Skills

The effective dental assistant student will:

A. Choose the most appropriate method for intraoral radiography, but be flexible enough to modify the procedure as the situation requires; e.g., gagging patients, tongue-tied patients, tori, etc.
B. Have the necessary skills to complete the procedure they are attempting.

C. Respond rationally to unexpected developments, whether by modifying the procedure or by seeking appropriate help and advice.

D. Complete the task in a reasonable amount of time.
E. Perform technical procedures (radiographic techniques and produce good to excellent quality radiographs.)
F. Be capable of determining whether or not the radiograph meets minimal requirements of acceptability and whether or not specific films require retaking.

III. Radiographic Interpretative Skills

The effective dental assistant student will:

A. Be able to list and recognize appropriate exposure, processing, and film viewing factors necessary for proper radiographs.

B. Be capable of accurately identifying all normal anatomic structures visible on an intraoral FMS.

C. Be able to distinguish gross deviations in radiographic form and density from normal structures on all routine radiographic surveys.

IV. Relating to the Patient

The effective dental assistant/student will:

A. Relate well to others and communicate easily in helping create a harmonious working relationship.

B. Seek consultation and advice when appropriate and respect the views of others.

C. Function independently in a clinical situation and complete procedures properly without constant supervision.

D. Conduct himself/herself in a manner appropriate for a professional person.

GUIDELINES FOR CRITIQUING A FMS

These instructions refer only critiquing a FMS taken on a patient prior to an instructor's evaluation for retakes.

Materials needed: one mounted 18 film FMS, on Radiographic Evaluation Sheet, #2 pencil. The student will:

1. Identify all major and minor technique errors by placing the appropriate letter code designation in the appropriate window of the evaluation sheet. USE a #2 pencil.

    a. RETAKES (R) - Identify radiographs with major errors that will require retaking with a small circled "R" in the window of the evaluation sheet. (Mark an "R" only when other radiographs in the series DO NOT SHOW a particular root apex at least once in the FMS or a "key" interproximal space is not visible once without overlapping.)

    b. PACKET PLACEMENT ERRORS (P) - Identify all incorrectly placed film packets where the film is placed more than one-half tooth anterior OR posterior to its proper or "ideal" position. You may wish to place an arrow to indicate the direction the film should be moved in order to correct the error.

    c. HORIZONTAL OVERLAP (H) - Identify as "minor" overlap, any key interproximal space that is overlapped less than ½ the thickness of the enamel. Major overlap is any key interproximal space with overlap obscuring the dentin-enamel junction.

    d. ONE CUTS (C) - Identify ALL cone cuts, no matter how small and insignificant. Any cone cut in excess of 1 cm (about 3/8 of an inch) will be considered excessive and may require retaking of the film if the cone cut compromises the diagnostic value of the radiograph.

    e. INCORRECT VERTICAL ANGULATION (v) - Identify radiographs demonstrating foreshortening or elongation when compared to adjacent radiographs of the same teeth. Foreshortened images should be designated Vf; elongation caused by insufficient vertical angulation should be designated Ve.

    f. DENSITY (D) - Density refers to the relative darkness or lightness of the radiographs in the FMS.

g. All other code designations should be relatively self-explanatory; however, if questions arise, do not hesitate to discuss them with your instructor.

NOTE: Students will be expected to do the above evaluation on EVERY FMS submitted for a grade.

2. Once your preliminary evaluation is complete, discuss your evaluation with the instructor. The instructor will subsequently mark all necessary retakes in INK and you will be given an opportunity to take retakes.

CRITERIA OF RADIOGRAPHIC ACCEPTABILITY

These criteria are used to evaluate periapical and interproximal radiographs taken in our clinic in order to determine retakes.

Maxillary/Mandibular Central Incisor Region:

The radiograph should be centered directly behind the two central incisors. The "key" interproximal space to be opened is the one between the two central incisors. At least 4 mm (1/4 inch) of alveolar bone should be visible beyond the apices of the central incisors.

Maxillary Lateral Incisor Region: (Not taken in a 18 film FMS)

The radiograph should be centered directly behind the lateral incisor tooth. Key interproximal space is the central-lateral contact. At least 4 mm of bone should show beyond the apex of the central and lateral incisors.

Maxillary/Mandibular Cuspid Region:

Packet placement for this radiograph has two acceptable positions: (1) centered directly behind the lateral-canine interproximal space, (2) centered directly behind the cuspid. The key interproximal space is the lateral-canine interproximal space. At least 4 mm of bone should be visible beyond the apex of the cuspid tooth.

Maxillary/Mandibular Premolar Region:

The radiograph should be positioned MESIAL to include the distal one half of the canine. The key interproximal space is the 2nd bicuspid-lst molar interproximal space. At least 4 mm of bone should be visible beyond the apices of both premolars and lst molar.

Maxillary/Mandibular Molar Region:

The radiograph should be positioned DISTAL to include all of the 3rd molar if possible. The key interproximal space is the lst-2nd molar interproximal space. At least 4 mm of bone should be visible beyond the apices of the lst and 2nd molars.

Premolar Interproximal Survey: (Bitewing)

The radiograph should be positioned MESIAL to include the DISTAL half of the mandibular cuspid along with equal portions of both maxillary and mandibular arches (crowns and crestal 1/3 of the alveolar process). The key interproximal space is the MAXILLARY 2nd bicuspid-lst molar interproximal space.

Molar Interproximal Survey: (Bitewing)

The radiograph should be positioned DISTAL to include the LAST ERUPTED tooth in the arch along with equal portions of both maxillary and mandibular arches. The key interproximal space is the MAXILLARY 1st and 2nd molar interproximal space.