

Dental Radiology

**Lamar Institute of
Technology**

DHYG 1304

**Course Syllabus &
Lab Manual**

Fall Semester

**Taught by:
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SCHEDULE (Lecture)

	Chapter	Chapter Title
1 st week	Introduction	
	Chapter 1	Introduction, History of Dental Radiography
2 nd week	Chapter 2	Characteristics and Measurements of Radiation
	Chapter 2 (cont'd)	Characteristics and Measurements of Radiation (cont'd)
3 rd week	Chapter 3	The Dental X-ray Machine
	Chapter 3 (cont'd)	The Dental X-ray Machine
4 th week	Test 1	Chapters 1, 2, and 3
	Chapter 7	Dental X-ray Film
5 th week	Chapter 8	Dental X-ray Film Processing
	Chapter 9 Chapter 10	Infection Control Legal and Ethical Responsibilities
6 th week	Test 2	Chapters 7, 8, 9, 10
	Chapter 4	Producing Quality Radiographs
7 th week	Chapter 5	Effects of Radiation Exposure
	Chapter 6	Radiation Protection
8 th week	Test 3	Chapters 4, 5, and 6
	Chapter 12	Intraoral Radiographic Procedures
9 th week	Slide Test	Radiographic Evaluation
	Chapter 13	The Periapical Examination
10 th week	Chapter 14	The Bitewing Examination
	Chapter 15	The Occlusal Examination
11 th week	Chapter 11 Chapter 17	Patient Relations and Education Quality Assurance in Dental Radiography
	Test 4	Chapters 11, 12, 13, 14, 15 and 17
12 th week	Chapter 23	Radiographic Techniques for Children
	Chapter 28	Panoramic Radiography
13 th week	Chapter 26	Digital Radiography

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	Chapter 24 Chapter 25	Managing Patients with Special Needs Supplemental Radiographic Techniques
14 th week	Chapter 27	Extraoral Radiography
	THANKSGIVING	NO CLASS
15 th week	Slide Test (2 nd Test)	Radiographic Evaluation - Restest
	Test 5	Chapters 23, 24, 25, 26, 27 and 28
16 th week	Final Exam Review	Final Exam Review

Final Exam
TBA

SCHEDULE (Laboratory)

Week of	Topic	Reading Assignment / Supplies
1 st week	Introduction Mounting of Dental Radiographs View Maxillary Landmarks, Mandibular Landmarks	Syllabi Chapter 18, 19, and 20 – Textbook RINN Kit – (x-ray equipment)
2 nd week	Tour the Darkroom Identifying Restorative Materials Identifying Periodontal Conditions Performance Exam Review	Syllabi Chapter 21 and 22 – Textbook RINN Kit –(x-ray equipment)
3 rd week	Identifying Caries Identifying and Correcting Faulty Radiographs Paperwork for patients	Rinn Kit Chapter 16 – Textbook RINN Kit –(x-ray equipment)
4 th week	Finish or review any Units Expose radiographs on mannequin How to Critique x-rays	RINN Kit

Week of:	Group A	Group B
5 th week	FMX.1 (mannequin) Intro. Panorex	FMX.1 (mannequin) Intro. Panorex
6 th week	BW.1 BW.2 PAN.1	FMX.2
7 th week	FMX.2	BW.1 BW.2 PAN.1
8 th week	BW.3 OCC.1 PAN.2	FMX.3
9 th week	FMX.3	BW.3 OCC.1 PAN.2
10 th week	BW.4 OCC.2 PAN.3	FMX.4
11 th week	FMX.4	BW.4 OCC.2 PAN.3
12 th week	FMX.5	FMX.5
13 th week	FMX.6	FMX.6

DENTAL RADIOLOGY

COURSE DESCRIPTION:

This course is a study of radiation physics, hygiene, and safety theories. Emphasis is placed on the fundamentals of oral radiographic techniques and interpretation of radiographs. This also includes exposure of intraoral radiographs, quality assurance, radiographic interpretation, patient selection criteria, and other ancillary radiographic techniques. Prerequisite is admission to the program or permission of program director and Biology 2401/2402.

COURSE OBJECTIVE:

At the completion of this course in Dental Radiology, the student will be able to:

1. Describe basic principles, characteristics, and technical aspects of radiation production including a description of the components, functions, and exposure factors of the dental X-ray unit. (C5.5, C6.3, C6.3, C18.3, C19.3, F3.3, F9.3, F12.3)
2. Describe the benefits and hazards of radiation exposure, measures of radiation protection, and radiation monitoring for patient and operator. (C5.5,
3. Describe the basic techniques, uses, and consideration of preparing intraoral and extraoral radiographs for the adult, child, and special patients. (C5.5, F8.3, F9.3, F12.3, F13.3, F15.3, F16.3, F17.3)
4. Demonstrate proper film processing and darkroom procedures. (C9.4, C18.4, C19.4, C20.3, F9.3, F12.3, F13.3, F15.3, F16.3, F17.3)
5. Position, expose and mount intraoral and extraoral surveys on "DXTRR-II", adult patients, children, and edentulous patients. (C9.4, C11.4, C14.4, C18.4, C19.4, C20.3, F8.3, F9.3, F12.3, F13.3, F15.3, F16.3, F17.3)
6. Identify dental restorations; suspicious areas; pathology of the teeth and supporting structures; and common abnormalities of the teeth and supporting structures on radiographs. (C5.5, F8.3, F9.3, F12.3, F13.3, F15.3, F16.3, F17.3)
7. Identify common inadequacies of exposing and processing radiographs, stating possible corrections. (C5.5, F8.3, F9.3, F12.3, F13.3, F15.3, F16.3, F17.3)

SCANS Skills and Competencies

Beginning in the late 1980's, the U.S. Department of Labor Secretary's Commission on **Achieving Necessary Skills** (SCANS) conducted extensive research and interviews with business owners, union leaders, supervisors, and laborers in a wide variety of work settings to determine what knowledge workers needed in order to perform well on a job. In 1991, the Commission announced its findings in *What Work Requires in Schools*. In its research, the Commission determined that "workplace know-how" consists of two elements: foundation skills and workplace competencies.

CREDIT HOURS

Credit: 3 semester hours

Class: 50 minutes

Laboratory: 3 hours weekly

Prerequisite: Admission to the Dental Hygiene Program

CLASS MEETING TIMES

Lecture	9:30 - 10:20 (Tues and Thurs)	Room 103
Lab	9:00 - 12:00 (Mon)	
	1:00 - 4:00 (Mon)	
	1:00 - 4:00 (Tues)	
	9:00 - 12:00 (Wed)	
	1:00 - 4:00 (Thurs)	
	1:00 - 4:00 (Fri)	

COURSE POLICIES:

General Policy Statements

1. **Attendance Policy.** In order to ensure the students in the dental hygiene program achieve the necessary didactic and clinical competencies outlined in the curriculum, it is necessary that the student complete all assigned lecture classes and scheduled laboratory hours.

If you are unable to attend lecture class or lab, it is **mandatory that you call the appropriate instructor prior to the scheduled class or lab time.** The student is responsible for all material missed at the time of absence. Extenuating circumstances will be taken into account. Extenuating circumstances might include: funeral of immediate family member, maternity, hospitalization, etc.

It is expected that students will appear to take their exams at the regularly scheduled examination time. Make-up examinations will be given **only** if the absence is due to illness (confirmed by a physicians' excuse), a death in the immediate family, or at the discretion of the instructor.

Dental hygiene students will be allowed **two** absences in any lecture or lab. Absences must be accompanied by a written excuse on the next class day. In the event that a student misses class or lab beyond the allowed absences, the following policy will be enforced:

2 absences = verbal warning

3 absences = written warning with the Disciplinary Action Form (DAF)

4 absences = grade will be lowered one full letter grade

2. **Tardy Policy.** Tardiness is disruptive to the instructor and the students in the classroom. It is expected that students will arrive on time for class or lab and remain until dismissed by the instructor. If tardiness becomes an issue, the following policy will be enforced:

Tardy 1 time = verbal warning

Tardy 2 times is considered an absence

3. **Electronic Equipment.** The attention of students is necessary in the classroom. Therefore, media equipment, such as tape recorders, telephones, and pagers are not allowed in the classroom. Please be courteous and turn off all cell phones. No text messaging allowed during class at any time.

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights for persons with disabilities. Among other things, this statute requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you believe you have a disability requiring an accommodation, please contact Special Populations Coordinator at 409-880-1737 or visit the office located in the Cecil Beeson Building.

Radiographic Policy Statements:

1. **Radiographic Surveys.** All radiographic surveys are based upon the dental needs of the patient. The frequency of radiographic surveys will be based upon the "Guidelines for Prescribing Dental Radiographs" published by the American Dental Association, American Academy of Dental Radiography, American Academy of Oral Medicine, and others.
2. **Acceptable Surveys.** The following information is used to determine an acceptable or unacceptable survey.

Type of Survey	Number of Retakes (for acceptable survey)
Full Mouth Survey	14 improvable
Full Mouth Survey (pedo)	8 improvable
Interproximal or Bitewing Survey	5 improvable
Occlusal Survey	4 improvable
Panoramic Survey	0 retakes

Note: 3 Improvable = 1 retake

3. **Late Surveys.** Surveys are assigned for each laboratory session. If a survey (including retakes) is not finished during the laboratory session, the survey will be considered late. Being late on surveys only makes it harder for the student to complete requirements, so it is recommended to stay on schedule.
4. **Retakes.** Retakes will be identified by dental hygiene faculty and are limited to 14 improvable for a full mouth survey, 5 improvable on an interproximal survey, and 4 improvable on an occlusal survey.
5. All **radiographs** taken either for practice or as a laboratory requirement must be **properly processed**. Each radiograph must exhibit the following criteria:
 - a. recorded with the instructor
 - b. mounted and identified by patient and student name
 - c. interpreted and evaluated on a radiographic critique sheet
6. Each **survey will be evaluated by the instructor** using criteria "Periapical Radiographic Evaluation Criteria" and "Bitewing Radiographic Evaluation Criteria" on pages 47-48.
7. **Due Date.** All **assignments must be turned in by the designated due date**. No late work is accepted.

8. **Patient Supply.** All students are expected to supply their own patients. It is wise to begin locating and scheduling radiographic patients immediately.
9. **Dress Code.** The **appropriate dress** is expected and required during laboratory sessions. Clean, pressed, uniforms and lab coats along with name and film badges must be worn at all times. Appropriate clinic shoes are required. Gloves, glasses, and masks are required during patient care at all times.
10. **Accidents Happen.** Instructors realize that accidents happen and are very forgiving when students report equipment breakage. Failure to report equipment breakage or malfunction only hurts you and other students. **PLEASE DO NOT NEGLECT TO REPORT EQUIPMENT BREAKAGE OR MALFUNCTION!**

METHODOLOGY

Each day of class, students are expected to come prepared for the lecture, discussion or whatever is scheduled for that day. This includes any assignments which have been given verbally or listed in the schedule. Due to the progressive nature of this course, lack of, or failure to prepare for class may lead to eventual difficulties or perhaps failure. Excessive lack of preparation will necessitate a discussion with the instructor.

Lecture is two hours each week, (T/TH), for approximately fourteen weeks and laboratory sessions are three hours, once a week, for approximately thirteen weeks. Attendance at all lecture and laboratory sessions is required. Please see attendance policy on page 7.

Each class day material will be covered in lecture sessions. Obviously, everything cannot be discussed in detail in class and the student is, at that point, expected to complete the unaddressed objectives. Any problems or questions with objectives or material should be brought to the attention of the instructor immediately.

Laboratory sessions are scheduled each week according to the students' assigned schedule. Each student will attend one assigned laboratory session each week. Students are required to wear glasses, white lab jacket, name badge, and white clinic shoes during laboratory sessions. Students will also supply their own gloves and masks that will be required during radiology lab.

During the beginning of each laboratory session the assignment will be demonstrated and, if necessary, re-demonstrated. Again, any problems should be directed to the instructor. The specific list of laboratory requirements is listed on one of the following pages. For each one of these requirements the student is to supply a patient. There is an ongoing problem securing qualified patients so the dental hygiene radiology student is advised to locate patients early.

Students are also expected to monitor their progress towards the completion of all requirements. In an effort to aid students in this task, the records of individual students will be available for observation.

REQUIRED TEXTS

Johnson, Orlen N., Thomson, Evelyn M. (2012). Essentials of Dental Radiography for Dental Assistants and Hygienists. 9th Edition. Upper Saddle River, New Jersey: Pearson Prentice Hall. ISBN 0-13-801939-6

COURSE REQUIREMENTS

Lecture Requirements

1. The following information is a tentative list of the lecture requirements. They may vary slightly depending upon the needs of the class as a whole.
 - a. Tests
 - i. 5 unit tests
 - ii. 1 comprehensive final
 - iii. Class quizzes

Laboratory Requirements

1. Skill Evaluations
 - a. Automatic Processing of Radiographic Film
 - b. Mounting Radiographic Film
2. Competency Examinations
 - a. Exposing a Full Mouth Radiographic Survey
 - b. Exposing a Panoramic Radiographic Survey
 - c. Exposing a Digital Radiographic Survey
3. Radiographic Surveys
4. Radiographic Interpretation and Evaluation Exam

EVALUATION CRITERIA

A grade of **70 (C)** or better must be achieved in DHYG 1304 lecture and **all** requirements must be met in lab to pass DHYG 1304 and progress in the dental hygiene program. Failure in either part of the course constitutes a failure in the course.

Grade Scale:

A = 90-100

B = 80-89

C = 70-79

D = 60-69

F = below 60

Laboratory Grade:

Laboratory assignments are a pass/fail grade. Each student must meet minimal competency for all requirements in order to pass DHYG 1304.

Failure to complete or successfully complete laboratory obligations will be
dealt with on an individual basis.

Competencies in Lab cannot be completed on another dental hygiene student.

Only one dental hygiene student may be used as a patient for radiographs.

1. Successful completion of the following **Skill Evaluations**:
 - a. Automatic Processing of Radiographic Film
 - b. Mounting Radiographic Film
2. Demonstrate competency on the following **Competency Exams**:
 - a. Exposing A Full Mouth Radiographic Survey (Acceptable or Not Acceptable)
 - b. Exposing a Panoramic Radiographic Survey (Acceptable or Not Acceptable)
 - c. Exposing an Adult Digital Radiographic Survey (Acceptable or Not Acceptable)
3. **Interpreting and Evaluating Radiographs** (75%)
4. Completion of **Radiographic Surveys**. See contract grade scale below.

Survey Requirements for Bitewing Radiographs	#
# of Vertical Interproximal Survey	2
# of Horizontal Interproximal Survey	2
Total Interproximal Surveys Required	4

Survey Requirements for Full Mouth Surveys	#
DXTRR	1
# of Paralleling Adult Full Mouth Surveys	3
Digital Adult Full Mouth Survey	1
Bisecting Angle Full Mouth Survey (child)	1
Total FMX Surveys Required	6

Survey Requirements for Panoramic Surveys	#
Panoramic Radiographic Survey	3

Survey Requirements for Occlusal Surveys	#
Occlusal Survey (adult patients)	2

RADIOLOGY GRADE COMPUTATION SHEET

Student Name _____

Lecture Grade:

1. total points made on tests
_____, _____, _____, _____, _____, _____ = _____ (A)
2. _____(A) / 5 = _____(B)
3. (B) x .70 = _____(C)
4. final exam = _____ x .20 = _____(D)
5. quizzes = total of grades / by number of quizzes = _____ (E)
6. _____(E) x .10 = _____(F)
7. final lecture grade: (C) + (D) + (F) = _____ (G)

Laboratory Grade: Pass/Fail

Requirements		
Mounting a Radiographic Survey Skill Evaluation	Pass (in 2 attempts)	Fail
Automatic Processing Radiographic Film Skill Evaluation	Pass (in 2 attempts)	Fail
Exposing an Adult Full-Mouth Radiographic Survey Competency Exam	Pass (in 2 attempts)	Fail
Exposing an Adult Panoramic Radiographic Survey Competency Exam	Pass (in 2 attempts)	Fail
Exposing an Adult Digital Radiographic Survey Competency Exam	Pass (in 2 attempts)	Fail
Radiographic Evaluation Exam – Minimum Score of 75%	Pass (in 2 attempts)	Fail
Exposed 2 Acceptable Horizontal Bitewing Surveys	Pass	Fail
Exposed 2 Acceptable Vertical Bitewing Surveys	Pass	Fail
Exposed 1 Acceptable Full-Mouth Survey on Mannequin	Pass	Fail
Exposed 1 Acceptable Digital Full-Mouth Survey	Pass	Fail
Exposed 1 Acceptable Child Full-Mouth Survey	Pass	Fail
Exposed 3 Acceptable Full-Mouth Surveys	Pass	Fail
Exposed 3 Acceptable Panoramic Surveys	Pass	Fail
Exposed 2 Acceptable Occlusal Surveys	Pass	Fail

*Any of the above requirements not met will result in a failing grade in DHYG 1304

COURSE OUTLINE

A. History of Dental Radiography

1. Introduction
2. History of dental radiography
3. Discovery of the x-ray

B. Characteristics & Measurement of Radiation

1. Atomic structure
2. Ionization
3. Ionizing radiation
4. Radioactivity
5. Electromagnetic radiation
6. Properties of x-rays
7. Production of x-rays
8. Interaction of x-rays with matter
9. Units of radiation
10. Background radiation

C. The Dental X-ray Machine

1. Evolution of the x-ray machine
2. X-ray machine components
3. Electricity
4. The x-ray tube
5. Principles of tube operation
6. The x-ray beam
7. Operation of x-ray machine

D. Producing Quality Radiographs

1. Terminology
2. Factors affecting the image
3. Effects of varying the control factors
4. Effects of variations in distances
5. Inverse Square Law
6. Exposure charts

E. Effects of Radiation Exposure

1. Theories of biological effect mechanisms
2. Cell sensitivity to radiation exposure
3. The Dose-Response Curve
4. Factors that determine radiation injury
5. Sequence of events following radiation exposure
6. Short and long term effects of radiation
7. Risk estimates
8. Effects of oral radiation therapy

F. Radiation Protection

1. ALARA
2. Protection Measures for the Patient
3. Protection Measures for the

Operator

4. Radiation Monitoring
5. Organizations responsible for setting exposure limits
6. Guides for Maintaining Safe Radiation

G. Dental X-ray Films

1. Composition of Dental X-ray Films
2. Latent Image Formation
3. Types of Dental X-ray Film
4. Film storage and protection

H. Dental X-ray Film Processing

1. Overview of film processing
2. Film Processing Solutions
3. Darkroom
4. Manual Film Processing
5. Rapid Film Processing
6. Automatic Film Processing
7. Processing Chemical Maintenance

I. Digital Radiography

1. Fundamental Concepts
2. Uses
3. Methods of acquiring a digital image
4. Equipment
5. Characteristics of a digital image
6. Radiation exposure

J. Infection Control

1. Purpose of Infection Control
2. Guidelines
3. Personal protective equipment
4. Infection Control Procedures
5. Daylight Loaders
6. Darkroom Disinfection

K. Legal and Ethical Responsibilities

1. Regulations and Licensure
2. Legal Aspects
3. Ethics
4. Goals

L. Patient Relations and Education

1. Patient Relations
2. Patient Education
3. Goals of the Dental Radiographer

M. Intraoral Radiographic Procedures

1. Intraoral Procedures
2. Fundamentals of Shadow Casting
3. Principles of the Paralleling Technique
4. Principles of the Bisecting Technique
5. Paralleling vs Bisecting Techniques
6. Points of Entry

7. Patient Seating Position
- N. The Periapical Examination-Paralleling**
 1. Fundamental of paralleling technique
 2. Holding the image receptor in place
 3. Horizontal vs. Vertical
 4. Paralleling Technique
 5. Points of Entry
- O. The Periapical Examination-Bisecting**
 1. Fundamentals of Bisecting technique
 2. Holding the image receptor
 3. Horizontal vs. Vertical
 4. Points of Entry
- P. The Bitewing Examination**
 1. Fundamentals of bitewing radiography
 2. The radiographic examination
 3. Holding the bitewing image receptor
 4. Horizontal vs. Vertical
 5. The Bitewing technique
- Q. The Occlusal Examination**
 1. Types of Occlusal Examinations
 2. Fundamentals
 3. Horizontal vs. Vertical
 4. Points of entry
- R. Quality Assurance**
 1. Quality Administration Procedures
 2. Competent Operator
 3. Benefit of Quality Assurance Programs
 4. Quality control
- S. Safety & Environmental Responsibilities**
 1. Requirements
 2. Safe handling of chemicals
 3. Management of waste materials
- T. Radiography for Children**
 1. Assessment of radiographic needs
 2. Suggested exposure intervals
 3. Image receptor sizes
 4. Suggested x-ray techniques
 5. ALARA radiation protection
 6. Patient management
 7. Interpretation
- U. Managing Patients with Special Needs**
 1. The Gagging Patient
 2. The Disability Patient
 3. The Apprehensive Patient
 4. Anatomical Variations
- V. Supplemental Radiographic Techniques**
 1. Acceptable variations
 2. Anatomical variations
 3. Edentulous Survey Techniques
 4. Methods of localization
 5. Film duplicating procedures
- W. Extraoral Radiography**
 1. Purpose and Use
 2. Usefulness
 3. Image receptors
 4. Extraoral Radiographic Techniques
 5. Grids
 6. Tomography, Cone Beam
- X. Panoramic Radiography**
 1. Purpose and Use
 2. Advantages and Limitations
 3. Fundamentals
 4. Concept of focal trough
 5. Components of machine
 6. Importance of patient position
 7. Panoramic imaging errors
 8. Normal anatomical landmarks
 9. Ghost images on radiographs