Principles of Radiographic Imaging I (RADR 1313 3A1)

LAMAR INSTITUTE OF TECHNOLOGY

INSTRUCTOR CONTACT INFORMATION

Instructor: Brenda A Barrow

Email: babarrow@lit.edu

Office Phone: 409-241-9829

Office Location: MPC 232

Office Hours: Posted on door and in Starfish

CREDIT

3 Semester Credit Hours (3 hours lecture, 0 hours lab)

MODE OF INSTRUCTION

Face-to-Face: This course will be taught in a multimedia format. Lectures, demonstrations, and discussion will be utilized to enhance the cognitive learning process. Students will have outside reading and out of class homework assignments periodically in the semester. The student will be required to utilize both reading and listening skills.

PREREQUISITE/CO-REQUISITE:

RADR 1201 Introduction to Radiography and RADR 1203 Patient Care

COURSE DESCRIPTION

Radiographic image quality and the effects of exposure variables.

COURSE OBJECTIVES

Upon completion of this course, the student will be able to
Apply the basic principles of radiographic image acquisition to image quality.

- Analyze the effects of exposure variables upon image quality.
- Demonstrate knowledge of the components necessary to produce an x-ray beam.

REQUIRED TEXTBOOK AND MATERIALS

A computer with internet access. The computer must be able to run current programs and platforms such as Windows 10 and the internet must be reliable and robust. The course has an online component and will move to a fully online format if necessary. The computer must have a camera and microphone for online conferencing.

- Carlton, Richard. *Principles of Radiographic Imaging, An Art and Science, 6*th edition, Delmar Publishing, ISBN# 10: 1-337-71106-3

- Clover Learning Student Plan (RadTechBootCamp)
- #882 Scan-trons and pencils
- Basic calculator

COURSE POLICIES:

1. No food, drinks, or use of tobacco products in class.
2. Phones, headphones, and any other electronic devices must be turned off while in class.
3. Recording devices may be used except during test reviews and when otherwise stated by the instructor.
4. Lap top computers, I-pad… may be used to take notes during class but may <u>not</u> be used to "surf" the internet, look-up answers, nor anything not directly related to note taking.
5. It shall be considered a breach of academic integrity (cheating) to use or possess on your body any of the following devices during any examination unless it is required for that examination and approved by the instructor: Cell phone, smart watch/watch phone, laptop, tablet, electronic communication devices (including optical), and earphones connected to or used as electronic communication devices.
    - *This is a violation of the Radiologic Technology Student Handbook and will result in dismissal from the program.*

    Students with special needs and/or medical emergencies or situations should communicate with their instructor regarding individual exceptions/provisions. It is the student's responsibility to communicate such needs to the instructor.
6. Do not bring children to class.
7. If you wish to drop a course, the student is responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an 'F' in the course.
8. **ATTENDANCE POLICY:** Class attendance is important to ensure that a student receives the knowledge and skills necessary to be successful in the Radiologic Technology program. Students are expected to be in class on time. If a student is tardy they may enter only if they do so quietly.

    When it becomes necessary to miss a session, it is the responsibility of the *student* to contact the instructor and to inquire about assignments. I will *not* distribute the PowerPoints missed. The student must get the notes from a classmate. If a major test is missed, the test will be administered at the first day the student returns to class or at a time designated by the instructor. There will be a **ten (10) point** reduction for make-up exams.

    To encourage class attendance, students that miss two (2) or more class sessions in a unit will have a five (5) point reduction on that test. Students who are tardy four (4) times will equal one (1) absence.

9. BlackBoard will be utilized for homework assignments. Quizzes will be administered in class. If a student misses an assignment for *any* reason **it may not** be made up. Quiz/homework grades will be averaged for one (1) test grade. Students will be allowed to drop their **lowest** quiz/homework grade at the end of the semester. If more than one quiz is missed a zero (0) will be given. This is already configured in Black Board gradebook
10. Any student who fails to pass a Unit test will be required to attend mandatory tutorial. This may be done before or after class or at lunch break. The tutorial may be individual or in a group session. There will be remediation assignments in Clover Learning Student Plan/RadTechBootCamp. ***These must be successfully completed or the student will not be allowed to take the next unit exam.***

DROP POLICY

If you wish to drop a course, you are responsible for initiating and completing the drop process by the specified drop date as listed on the Academic Calendar. If you stop coming to class and fail to drop the course, you will earn an "F" in the course.

STUDENT EXPECTED TIME REQUIREMENT

For every hour in class (or unit of credit), students should expect to spend at least two to three hours per week studying and completing assignments. For a 3-credit-hour class, students should prepare to allocate approximately six to nine hours per week outside of class in a 16-week session OR approximately twelve to eighteen hours in an 8-week session. Online/Hybrid students should expect to spend at least as much time in this course as in the traditional, face-to-face class.

RADR 1313 COURSE CALENDAR

10:15 – 11:30 Tues/Thurs Course Schedule: all dates are tentative and subject to change

DATE	TOPIC	READINGS (Due on this Date)	ASSIGNMENTS (Due on this Date)
22 Aug	Introduction to course & Basic Math	CH 1	
24 Aug	X-Ray Equipment & Automatic Exposure Controls	CH 6 & 7	
29 Aug	X-Ray Tube	CH 5	
31 Aug	X-Ray Production	CH 8	
5 Sept	X-Ray Interactions	CH 13	
7 Sept	REVIEW		
12 Sept	***TEST I CREATING THE BEAM***		UNIT EXAM 1
14 Sept	go over test		
19 Sept	The Imaging Process	CH 25	
21 Sept	Prime Factors	CH 12	
26 Sept	IR Exposure	CH 26	IR Homework opens 8:00 am
28 Sept	IR Exposure cont.		IR Homework due 8:00 pm
3 Oct	Contrast	CH 27	Contrast Homework opens 8:00 am
5 Oct	Contrast cont.		Contrast Homework due 8:00 pm
10 Oct	The Patient as a Beam Emitter & Pathology Problem & REVIEW	CH 17	
12 Oct	***TEST II ANALYZING THE IMAGE***		UNIT EXAM 2
17 Oct	go over test & Filtration	CH 11	Homework opens 8:00 am
19 Oct	Beam Restrictors	CH 15	
24 Oct	Grids	CH 18	Homework due 8:00 pm
26 Oct	Digital 101 & REVIEW		
31 Oct	***TEST III CREATING THE IMAGE***		UNIT EXAM 3
2 Nov	go over test & Spatial resolution	CH 28	Homework opens 8:00 am
7 Nov	Distortion & SID	CH 29	
9 Nov	Minimizing Patient Exposure & Fuch's handout	CH 14	Homework due 8:00 pm
14 Nov	REVIEW		
16 Nov	***TEST IV GEOMETRIC FACTORS***		UNIT EXAM 4
21 Nov	go over test		
23 Nov	***THANKSGIVING***		
28 Nov	Prep Bowl review for final (Positioning & Technique)		
30 Nov	study		
5 Dec	***FINAL EXAM***		

COURSE EVALUATION

Final grades will be calculated according to the following criteria:

- Major Exams (4) and Quiz average 75% (15% each)
- Comprehensive Final 25%

GRADE SCALE: Grades will be posted in Blackboard Grade Center

A = 93 - 100
B = 84 - 92
C = 77 - 83
D = 65 - 76
F = 0 - 64

**** STUDENTS MUST HAVE A 77 OR ABOVE AVERAGE TO PASS THIS COURSE!***

ACADEMIC DISHONESTY

Students found to be committing academic dishonesty (cheating, plagiarism, or collusion) may receive disciplinary action. Students need to familiarize themselves with the institution's Academic Dishonesty Policy available in the Student Catalog & Handbook at http://catalog.lit.edu/content.php?catoid=3&navoid=80#academic-dishonesty.

TECHNICAL REQUIREMENTS

The latest technical requirements, including hardware, compatible browsers, operating systems, etc. can be online at https://lit.edu/online-learning/online-learning-minimum-computer-requirements. A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of online technology and resources.

DISABILITIES STATEMENT

The Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. LIT provides reasonable accommodations as defined in the Rehabilitation Act of 1973, Section 504 and the Americans with Disabilities Act of 1990, to students with a diagnosed disability. The Special Populations Office is located in the Eagles' Nest Room 129 and helps foster a supportive and inclusive educational environment by maintaining partnerships with faculty and staff, as well as promoting awareness among all members of the Lamar Institute of Technology community. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409)-951-5708 or email specialpopulations@lit.edu. You may also visit the online resource at Special Populations - Lamar Institute of Technology (lit.edu).

STUDENT CODE OF CONDUCT STATEMENT

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at

www.lit.edu. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document.

STARFISH

LIT utilizes an early alert system called Starfish. Throughout the semester, you may receive emails from Starfish regarding your course grades, attendance, or academic performance. Faculty members record student attendance, raise flags and kudos to express concern or give praise, and you can make an appointment with faculty and staff all through the Starfish home page. You can also login to Blackboard or MyLIT and click on the Starfish link to view academic alerts and detailed information. It is the responsibility of the student to pay attention to these emails and information in Starfish and consider taking the recommended actions. Starfish is used to help you be a successful student at LIT.

ADDITIONAL COURSE POLICIES/INFORMATION

COURSE OUTLINE:

At the completion of each chapter the student should be able to…

Ch. 1 Basic Math

1. Brief review of basic math
    a. Fractions
    b. Decimals
    c. Rounding
2. Introduction to Radiology math
    a. mA X sec = mAs
    b. Inverse Square Law
    c. Square Law – Exposure Maintenance Law
    d. 15% Rule

Ch 5 X-Ray Tube

1. describe the parts and function of the cathode
    a. filament
    b. focusing cup
2. describe the parts and function of the anode
    a. target
    b. focal spot
3. discuss the function of the glass envelop
4. discuss the function of the tube housing
5. define parts of beam
    a. primary
    b. remnant
    c. off focus
    d. leakage

6. list recommendations for extending tube life

Ch. 6 X-Ray Equipment

1. list and discuss the different types of x-ray equipment
    a. diagnostic
    b. fluoroscopic
    c. therapeutic
    d. dedicated units
        a. chest
        b. tomography
2. discuss the types of x-ray timers
    a. synchronous motor driven
    b. mAs
    c. AEC

Ch. 7 Automatic Exposure Controls

1. Ionization Chamber configuration
2. Exposure Controls

Ch 8 X-Ray Production

1. explain the process of a Bremsstrahlung interaction
2. explain the process of a Characteristic interaction

Ch 11 Filtration

1. list and discuss the types of filtration
    a. inherent
    b. added
    c. total
2. describe how changes in filtration will affect the tube output
    a. quantity/intensity
    b. quality/energy

Ch 12 Prime Factors

1. discuss how each prime factor will affect the radiographic image
    a. mA
    b. time
    c. kVp
    d. SID

Ch 13 X-Ray Interactions

1. explain and diagram a Coherent interaction
2. explain and diagram a Compton interaction
3. explain and diagram a Photoelectric interaction
4. define Pair Production & Photodisintegration
5. discuss how patient interactions with x-ray photons affect image quality and technique selection

Ch 14 Minimizing Patient Exposure

1. discuss how each prime factor will affect the patient exposure
    a. mA
    b. time
    c. kVp
    d. SID
2. Explain how patient positioning can reduce patient exposure to certain organs
3. Discuss how the following affect patient exposure:
    a. Focal spot size
    b. Filtration
    c. Beam restriction
    d. Shielding
    e. Grids
    f. Image receptors

Ch 15 Beam Restriction

1. describe steps the radiographer can take to reduce the production of scatter
    a. restrict beam
    b. reduce kVp
2. describe the various types of beam restrictors
    a. aperture diaphragm
    b. cone/cylinder
    c. collimator
3. discuss the effect beam restriction will have on the radiographic image
    a. IR exposure
    b. contrast
    c. visibility

Ch 17 Patient as a Beam Emitter

1. define attenuation
2. discuss the basic composition of the human body and how it effects attenuation of the x-ray beam
    a. air
    b. fat
    c. muscle
    d. bone
    e. metal
3. describe how various pathologies affect the attenuation of the x-ray beam
4. classify pathology as being additive or destructive

Ch 18 Grids

1. explain the purpose of a grid
2. describe the construction of grids
    a. radiopaque lines

b. radiolucent interspaces

3. compare and contrast various grid pattern types
    a. linear
        i. parallel
        ii. focused
    b. crosshatched
4. discuss proper use of grids and errors that may result from incorrect use
    a. off focus
    b. off level
    c. off center
    d. inverted
5. calculate new technical factors when changes in grid ratios occur
6. discuss air gap technique

Ch 25 The Imaging Process

Ch 26 IR Exposure

1. define IR Exposure
2. describe the effects of IR exposure changes on the radiographic image in analog image
3. describe how digital image is related to IR exposure
4. define window level
5. discuss the controlling factor of IR exposure (mAs)
6. discuss the factors that influence IR exposure
    a. mA
    b. time
    c. kVp
    d. SID
        i. Inverse Square Law
        ii. Square Law/Exposure Maintenance Law
    e. grid ratio
    f. beam restrictor
7. assess radiographs for proper levels of exposure
8. calculate new exposure factors and patient doses using: mA X time = mAs

Ch 27 Contrast

1. define contrast resolution
2. define differential absorption
3. describe the effects of contrast resolution and differential absorption changes on the radiographic image
4. discuss the controlling factor of contrast resolution and differential absorption (kVp)
5. discuss the factors that influence contrast resolution
    a. grid ratio
    b. beam restrictor

c. scatter
6. assess radiographs for proper levels of contrast resolution
7. calculate new IR exposure factors using the 15% rule
8. determine changes in contrast resolution and differential absorption using 15% rule
9. define window width

Ch 28 Spatial resolution

1. define spatial resolution
2. discuss the factors that affect spatial resolution
    a. SID
    b. OID
    c. focal spot size
    d. anode heel effect
3. describe the appropriate techniques used to reduce patient motion
    a. voluntary
    b. involuntary

Ch 29 Distortion

1. define distortion
    a. size distortion
    b. shape distortion
        i. elongation
        ii. foreshortening
2. discuss the factors that affect size distortion
    a. SID
    b. OID
    c. SOD
    d. tube angle