McLennan
COMMUNITY
COLLEGE

WACO, TEXAS

COURSE SYLLABUS

AND

INSTRUCTOR PLAN

Radiographic Imaging Equipment

RADR _ 2309 _F1

Michelle Morphis, MBA, R.T. (R) (ARRT)

NOTE: This is an 8-week course.

NOTE: This is a Blended/Hybrid course.

COVID 19 Notice:

McLennan Community College is committed to providing you with every resource you need to reach your academic goals. We are also concerned for your safety. We are working through COVID-19 guidelines to make sure we offer a safe environment for you and our faculty. This will include smaller class sizes to manage social distancing and proper cleaning techniques. You will have the advantage of a physical classroom experience but may also need to work part of the time online as we adjust to limited classroom capacity. This will also allow us the flexibility to move online if so directed by federal, state and/or local COVID 19 guidelines. Faculty and staff are preparing now to ensure that you have the best experience in the midst of these uncertain times.

Course Description:
Studies the equipment and physics of x-ray production, basic x-ray circuits, and the relationship of conventional and digital equipment components to the imaging process.
Semester Hours 3 (3 lec/1 lab)

Prerequisites and/or Corequisites:
Successful completion of RADR courses in Semester 1, with a grade of a "C" or better.

Course Notes and Instructor Recommendations:
The course utilizes required textbooks. The course outline will indicate assigned readings and exams for each unit. Additional reading assignments will be provided on Brightspace or via internet readings. Other assessments may be found in the course calendar through Brightspace. Electronic devices with Wi-Fi access will be encouraged but not required in the classroom. The course provides a foundation of information that will be utilized in other Radiography courses

Instructor Information:
Instructor Name: Michelle Morphis
MCC E-mail: mmorphis@mclennan.edu
Office Phone Number: 254.299.8584
Office Location: CSC A-14
Office/Teacher Conference Hours: As posted on door.
Other Instruction Information: Due to Covide-19, students will not be allowed to meet with a professor for an in-person office conference. However, students may request a Zoom conference. Refer to Brightspace announcements for any changes to in-person meetings.

Required Text & Materials:
Title: Radiologic Science for Technologists
Author: Stewart Carlyle Bushong
Edition: 10th
Publisher: Moby Elsevier
ISBN: 978-0-323-08135-1

MCC Bookstore Website: http://www.mclennan.edu/bookstore/

Methods of Teaching and Learning:

Information-- manages information by acquiring and evaluation information, organizing and maintaining information, interpreting and communicating information, and using computers to process information.

Systems-- understands complex interrelationships, including understanding how social, organizational, and technological systems work and how to operate effectively with them, how to monitor and correct performance, and improve or design systems.

Course Objectives and/or Competencies:

SCANS FOUNDATIONS

Basic Skills-- reading, writing, performing arithmetical and mathematical operations, listening, and speaking.

Thinking Skills- thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning to discover rules or principles underlying relationships and applying that knowledge to solving problems.

Personal Qualities- displays responsibility, self-esteem, sociability, self-management, and integrity and honesty.

After completion of all lectures, presentations, homework and reading assignments the student will be able to:

After completion of all lectures, presentations, homework and reading assignments the student will be able to:

I. Essential Concepts of Radiologic Science:
1. Identify the difference between matter and energy. (F01, F02, C03)
2. Define electromagnetic radiation and ionizing radiation. (F01, C03)
3. Explain how x-rays were discovered. (F01)
4. Discuss human injury caused by radiation. (F01)
5. Discuss the derivation of scientific systems of measurement (F01)
6. List basic radiation protection equipment. (C05)

II. The Structure of Matter (The Atom)
1. Relate the history of the atom. (F01)
2. Identify the structures of the atom. (F02, C03, C04)
3. Describe electron shells and instability within atomic structure. (F01, F02, C03)
4. Define radioactivity and recognize characteristics of alpha and beta particles. (F01, F02, C04)
5. Explain the difference between the two forms of ionizing radiation – particulate and electromagnetic. (F01, F02, C05)

III. Electromagnetic Energy (Radiation)
1. Identify the properties of photons. (F01, F02, C03)
2. Explain and solve the inverse square law. F01, F02, C04, C05)

3. Define wave theory and quantum theory. (F01, F02, C03, C04, C05)
4. Discuss the electromagnetic spectrum. (F01, F02, C03, C04, C05)

IV. Electromagnetism

Electricity

1. Identify the electric charges of protons and electrons. (F01, F02, C04)
2. Define electrification and state examples. (F01, F02, C04)
3. List the laws of electrostatics. (F01, F02, C04, C05)
4. Name examples of conductors, insulators and superconductors. (F01, F02, C04, C05
5. Describe electric circuits and recognize circuit element symbols. (F01, F02, C04, C05)
6. Define direct and alternating current. (F01, F02, C05)
7. Identify units of electric potential and electric power. (F01, F02, C05)
8. Explain and solve Ohm's Law. (F01, F02, C04, C05)

Magnetism

1. Discuss the history and discovery of naturally occurring magnetic materials. (F01, F02)
2. Define magnetic dipole. (F01, C05)
3. List the three classifications of magnets. (F01, F02, C05)
4. Identify the interactions between matter and magnetic fields. (F01, F02, C04)
5. List and discuss the four laws of magnetism. (F01, F02, C05)

Electromagnetism

1. Discuss the development of the battery. (F01, F02, C05)
2. Relate the experiments of rested in defining the relationship between magnetism and electric current. (F01, F02, C04, C05)
3. Describe the helix, solenoid and electromagnetic induction. (F01, F02, C05)
4. Identify the laws of electromagnetic induction. (F01, F02, C04, C05)
5. Describe electromechanical devices. (F01, C05)
6. Describe the different types of transformers. (F01, C05)
7. Explain and solve the Transformer Law. (F01, F02, C04, C05)

V. The X-ray Imaging System

1. Identify the components of the operator's console. (F01)
2. Explain the operation of the high voltage generator, including the autotransformer, filament transformer and the rectification system. (C03, C04, C05, F01, F02)
3. Relate the important differences between single-phase and three-phase power, including voltage ripple and patient exposure dose. (C03, C04, C05, F01, F02)
4. Define the power rating in watts. (C03, C04, C05, F01, F02)

VI. The X-ray Tube

1. Describe the different support designs for the x-ray tube. (C03, C04, C05, F01, F02)
2. List the parts of the housing that protect the x-ray tube. (C03, C04, C05, F01, F02)
3. Identify the components of the X-ray tube. (C03, C04, C05, F01, f02)
4. Describe the cathode and the filament current. (C03, C04, C05, F01, F02)
5. Describe the parts of the anode and the induction motor. (C03, C04, C05, F01, F02)

6. Define the line focus principle and the heel effect. (C03, C04, C05, F01, F02)
7. Identify why tungsten is used for the target. (C03, C04, C05)
8. Identify the three main causes of tube failure. (C03, C04, C05)
9. Explain and use the tube rating charts. (C03, C04, C05, F01, F02)

VII. X-ray Production

1. Discuss the interactions between electrons and the x-ray target. (C03, C04, C05, F01, F02)
2. Explain how mAs, kVp, added filtration, target material and voltage ripple affect x-ray emission spectra. (C03, C04, C05, F01, F02)

VIII. X-ray Emission

1. Define radiation quantity in relation to intensity in roentgens. (C03, C04, C05, F01, F02)
2. Define radiation quantity in relation to mAs. (C03, C04, C05, F01, F02)
3. List and define the factors affecting the quantity of x-rays in the beam. (C03, C04, C05, F01, F02)
4. Explain x-ray quality or penetrability. (C03, C04, C05, F01, F02)
5. List and discuss the factors affecting the quality of the x-ray beam. (C03, C04, C05, F01, F02)

IX. X-ray Interaction with Matter

1. List and describe the five interactions that occur between x-ray and matter. (C03, C04, C05, F01, F02)
2. Compare and contrast the features of Compton's Scattering with the Photoelectric Effect. (C03, C04, C05, F01, F02)
3. Explain the relationship between atomic number and K-shell binding energy. (C03, C04, C05, F01, F02)
4. Describe differential absorption. (C03, C04, C05, F01, F02)
5. Define attenuation. (C03, C04, C05, F01, F02)

X. Fluoroscopy

1. Discuss the development of fluoroscopy. (C03, C04, C05, F01, F02)
2. Explain visual physiology and its relationship to fluoroscopy. (C03, C04, C05, F01, F02)
3. Describe the components of an image intensifier. (C03, C04, C05, F01, F02)
4. List the approximate kilovolt peak levels for common fluoroscopic examinations. . (F01, F02, C04, C05)
5. Discuss the role of the television monitor and the television image in forming fluoroscopic images. (C03, C04, C05, F01, F02)

****Legend****

C01 Resources. Allocating: 1.1 Time, 1.2 Money, 1.3 Materials and Facilities, 1.4 Human Resources.

C02 Interpersonal Skills. Works with others: 2.1 working in teams, 2.2 teaching others, 2.3 serving customers, 2.4 Leading, 2.5 Negotiating, 2.6 Working with different cultures.

C03 Information. Acquires and uses information: 3.1 Acquiring and evaluating data,

3.2 Organizing and maintaining files, 3.3 Interpreting and communicating,
3.4 Processing information with computers.
C04 Systems. Understands complex interrelationships: 4.1 Understands social, technological and organizational systems, 4.2 Monitoring and correcting performance, 4.3 designing and/or improving systems.
C05 Technology. Works with a variety of technologies: 5.1 Selects equipment and tools, 5.2 Applies technology to tasks, 5.3 Maintains and troubleshoots technologies.
F01 Basic Skills. Reads, writes, performs mathematical operations, listens, and speaks: 1.1 Reading, 1.2 Writing, 1.3 Arithmetic/mathematics, 1.4 Speaking, 1.5 Listening
F02 Thinking Skills. Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn and reason: 2.1 Creative thinking, 2.2 Decision making,
2.3 Problem solving, 2.4 seeing with the mind's eye, 2.5 knowing how to learn,
2.6 Reasoning
F03 Personal Qualities. Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty: 3.1 Responsibility, 3.2 Self-esteem,
3.3 Sociability, 3.4 Self-management, 3.5 Integrity/honesty.

Course Outline or Schedule:

This is a guide for the semester. The instructor may adjust the schedule when necessary. All updates will be given in a timely manner and will be announced in class and/or Brightspace.

RADR 2309 Spring 2020	Content	Assigned Reading	Exam
1	**Module 1** **Chapter 1- Essential Concepts of Radiologic Science* **Chapter 2 The structure of Matter* *Review Module 1*	**Module 1** CH 1 & 2	
2	**Module 2** **Chapter 3-Eelctromagnetic Energy* *Chapter 4-Electricity, Magnetism, & Electromagnetism* *Review Module 2*	**Module 2** CH 3 & 4	**Module 1** *CH 1 & 2* Sun - 3/21
3	**Module 3** *Chapter 5- The X-ray Imaging System* *Chapter 6-The X-ray*	**Module 3** CH 5 & 6	**Module 2** *CH 3 & 4* Mon-3/29
4	**Module 3** *Chapter 6-The X-ray Tube* *Review Module 3* **Module 4** *Chapter 7-X-ray Production*	**Module 3** CH 6 **Module 4** CH 7	
	Holiday- April 10		
5	**Module 4** *Chapter 7-X-ray Production Continued* *Chapter 8- X-ray Emission*	**Module 4** CH 7 & 8	**Module 3** *CH 5 & 6* Sun – 04/11
6	*Chapter 9- X-ray Interaction with Matter* *Review Module 4* ***Module 5*** *CH 25- Fluoroscopy*	**Module 4** CH 9 **Module 5** CH 25	**Module 4** *CH 7,8,& 9* *Sun* - 4/21
7	***Module 5*** *Review Module 5* *Review for Final*	**Module 5** CH 25 **CH 13	**Module 5** *CH 25* *Wed – 4/28*
8	**FINALS WEEK**		**May 5th** **@ 1:00 pm** **FINAL EXAM**

Course Grading Information:

Your grade in this course will be based upon your performance in the following areas:

Grading Area	Percentage of Course Grade
Assignments	20%
Quizzes	25%
Module Exams	30%
Comprehensive final exam	25%
Total Course Grade	100%

The course grade will be applied to the following scale:
90-100% A
80-89% B
75-79% C
60-74% D
59% or less F

Remember: This is an RT course—C is the minimum acceptable grade!
Any grade below 75 is considered a failing grade for this course. In order to progress through the program, you must meet the minimum acceptable grade requirement.

Course Grading Information:
Throughout the course, grades in Brightspace will indicate grades with a decimal following such as, 85.3, 89.5 etc. These grades will remain as posted in the grade book but the final course grade will be rounded up or down to the nearest score depending on the number in the tenth place only. If a score is .5 to .9 the grade will be rounded up to the next number. If a score is .4 or below to .1, it will remain that number. (Example: 89.5 will be posted as a 90, where 89.4 will remain an 89)

Late Work, Attendance, and Make Up Work Policies:
Absenteeism will result in the student having less information and will usually result in a lower grade. When absences accumulate to 25% in the course, the student may have a low probability of success and will be at risk for being dropped for unsatisfactory performance. A roll sheet will be passed around the classroom for your initials to attest to your presence in class. If a student is tardy and/or leaves early three times during the eight-week course, then one absence will be counted. Students whether present or absent, are responsible for all material presented or assigned for the course and will be held accountable for that material in the determination of grades in the course.

Late assignments will be given a 10 point deduction on the first day missed and five points on the 2nd day missed. On the 3rd day, the student will not be allowed to submit assignments and will be given zero (0) points for the missed assignment. If worksheets are missed, see the make-up instructions below the calendar due dates in the syllabus.

Make-up tests will only be allowed under certain circumstances and is up to the discretion of the instructor. There will not be any make-up quizzes or in-class assignments. If a missed test occurs due to illness, military, or funeral reasons, documentation will be necessary for consideration to take the test. Considering the nature of a missed exam, the instructor may decide to replace the missed unit exam with the grade of the final exam.

Performance Goal, Expectation, and Requirements

The Radiologic Technology program coursework is designed to provide students with a structured comprehensive curriculum that prepares them for a career as a professional health care provider. It is imperative that students develop and maintain a strong knowledge base of course material and competencies to be successful.

Therefore, the minimum grade expectation of all coursework and assessments in this course is to achieve an 80% or higher. Students that do not achieve the minimum grade of 80% will be required to complete an activity of remediation assigned by the instructor immediately following. The activity requirements will vary as they will be customized according to factors such as the students' needs, the purpose of the assignment, its content, etc., and the instructor will maintain all records of completion. Students that fail to complete the required remediation activities will receive an "Incomplete" ("I") grade for the course, regardless of overall passing grade point average, until all work is submitted. An "Incomplete" ("I") in any course must be resolved prior to the start of the following semester or the resulting grade will convert to an "F" and the student will not pass the course.

All remediation for exams must be submitted through Brightspace 1 week from the due date of the exam. Any late remediation will result in a 5 point deduction of the respective exam.

Student Behavioral Expectations or Conduct Policy:

Students are expected to maintain classroom decorum that includes respect for other students and the instructor, prompt and regular attendance, and an attitude that seeks to take full advantage of the education opportunity. Students in this program are seeking a career in the healthcare profession and are expected to exhibit professional behavior that is conducive to learning among peers and the instructor. Behavior that is disrespectful or disruptive will not be

tolerated; the student will be asked to leave the class. Each occurrence will be documented and may result in counseling from the instructor and program director.
Regular and punctual attendance is expected of all students, and each instructor should maintain a complete record of attendance for the entire length of each course. Students will be counted absent from class meetings missed, beginning with the first official day of classes. Students, whether present or absent, are responsible for all material presented or assigned for a course and will be held accountable for such materials in the determination of course grades. In the case of online or hybrid courses, attendance will be determined in terms of participation, as described in the syllabus

Cheating:
If a student is caught in the act of cheating, a zero will be given and may result in potential expulsion from the college. This includes offering students verbal or written information when any assignment, quiz, or exam is measuring the performance of an individual; students viewing another student's work or answers; students submitting work that is not their own; any act of plagiarism; using any mechanism to obtain answers or information that is not approved by instructor prior to assignment, quiz, or exam.

Instructional Uses of E-mail
It is expected for students to check college e-mail on a regular basis as this will be the preferred method of communication.

Instructor Guidelines:
Class Tardy/Late/Early Dismissal:

Is defined by the instructor of this class as any time past the scheduled time for class to begin. **The doors to the classroom will be locked at the start of class and the student will be denied access until the first break of the class.**

Class breaks:
Students will be allowed to take a brief break at approximately 45- 50 minute intervals. A break is designed to allow the student restroom facility time as well as technology breaks to check cell phones/messages, etc. Leaving while class is in session can be disruptive to others. Students may leave but need to understand that the classroom doors are locked and will remain locked and no re-entry will be allowed until the next break or class has officially ended. Should you have an emergent situation and need to leave during class, please gather your belongings quietly and leave since you will not be allowed class access until the next break or until class is over.
Special considerations need to be discussed with the instructor. Please remember that any tardy or early dismissal by the student will be documented. **If a student is tardy and/or leaves early three times during the eight-week course, one absence will be counted.**

*** Click Here for the MCC Academic Integrity Statement**
(www.mclennan.edu/academic-integrity)
The link above will provide you with information about academic integrity, dishonesty, and cheating.

*** Click Here for the MCC Attendance/Absences Policy**
(https://www.mclennan.edu/highlander-guide/policies.html)
Click on the link above for the college policies on attendance and absences. Your instructor may have additional guidelines specific to this course.

* *You will need to access each link separately through your Web browser (for example: Mozilla Firefox, Chrome, Microsoft Edge or Safari) to print each link's information.*

McLennan COMMUNITY COLLEGE

ACADEMIC RESOURCES/POLICIES

Student Support/Resources:
MCC provides a variety of services to support student success in the classroom and in your academic pursuits to include counseling, tutors, technology help desk, advising, financial aid, etc. A listing of these and the many other services available to our students is available at http://www.mclennan.edu/campus-resource-guide/

College personnel recognize that food, housing, and transportation are essential for student success. If you are having trouble securing these resources or want to explore strategies for balancing life and school, we encourage you to contact a success coach by calling (254) 299-8226. Students can visit the Completion Center Monday-Friday from 8 a.m.-5 p.m. to schedule a meeting with a success coach and receive additional resources and support to help reach academic and personal goals. Paulanne's Pantry (MCC's food pantry) provides free food by appointment to students, faculty and staff based on household size. Text (254) 870-7573 to schedule a pantry appointment. The Completion Center and pantry are located on the Second Floor of the Student Services Center (SSC).

MCC Foundation Emergency Grant Fund:
Unanticipated expenses, such as car repairs, medical bills, housing, or job loss can affect us all. Should an unexpected expense arise, the MCC Foundation has an emergency grant fund that may be able to assist you. Please go to https://www.mclennan.edu/foundation/scholarships-and-resources/emergencygrant.html to find out more about the emergency grant. The application can be found at https://www.mclennan.edu/foundation/docs/Emergency_Grant_Application.pdf.

Minimum Technical Skills:
Students should have basic computer skills, knowledge of word processing software, and a basic understanding of how to use search engines and common web browsers.

Backup Plan for Technology:
In the event MCC's technology systems are down, you will be contacted/notified through your MCC student email address. Please note that all assignments and activities will be due on the date specified in the Instructor Plan, unless otherwise noted by the instructor.

*** Click Here for the Minimum System Requirements to Utilize MCC's D2L|Brightspace (https://www.mclennan.edu/center-for-teaching-and-learning/Faculty%20and%20Staff%20Commons/requirements.html)**
Click on the link above for information on the minimum system requirements needed to reliably access your courses in MCC's D2L|Brightspace learning management system.

Email Policy:
McLennan Community College would like to remind you of the policy (http://www.mclennan.edu/employees/policy-manual/docs/E-XXXI-B.pdf) regarding college email. All students, faculty, and staff are encouraged to use their McLennan email addresses when conducting college business.

A student's McLennan email address is the preferred email address that college employees should use for official college information or business. Students are expected to read and, if needed, respond in a timely manner to college emails.

Instructional Uses of Email:
Faculty members can determine classroom use of email or electronic communications. Faculty should expect and encourage students to check the college email on a regular basis. Faculty should inform students in the course syllabus if another communication method is to be used and of any special or unusual expectations for electronic communications.

If a faculty member prefers not to communicate by email with her/his students, it should be reflected in the course syllabus and information should be provided for the preferred form of communication.

Email on Mobile Devices:
The College recommends that you set up your mobile device to receive McLennan emails.

Forwarding Emails:
You may forward the emails that come to your McLennan address to alternate email addresses; however, the College will not be held responsible for emails forwarded to an alternate address that may become lost or placed in junk or spam filters.

Accommodations/ADA Statement
Any student who is a qualified individual with a disability may request reasonable accommodations to assist with providing equal access to educational opportunities. Students should contact the Accommodations Coordinator as soon as possible to provide documentation and make necessary arrangements. Once that process is completed, appropriate verification will be provided to the student and instructor. Please note that instructors are not required to provide classroom accommodations to students until appropriate verification has been provided by the Accommodations Coordinator. Instructors should not provide accommodations unless approved by the Accommodations Coordinator. For additional information, please visit mclennan.edu/disability.

Students with questions or who require assistance with disabilities involving physical, classroom, or testing accommodations should contact:

disabilities@mclennan.edu
254-299-8122
Room 319, Student Services Center

*** Click Here for more information about Title IX**
(www.mclennan.edu/titleix)
We care about your safety, and value an environment where students and instructors can successfully teach and learn together. If you or someone you know experiences unwelcomed behavior, we are here to help. Individuals who would like to report an incident of sexual misconduct are encouraged to immediately contact the Title IX Coordinator at

titleix@mclennan.edu or by calling Dr. Drew Canham (Chief of Staff for Equity & Inclusion/Title IX) at 299-8645. Individuals also may contact the MCC Police Department at 299-8911 or the MCC Student Counseling Center at MCC by calling 299-8210. The MCC Student Counseling Center is a confidential resource for students. Any student or employee may report sexual harassment anonymously by visiting the following website: http://www.lighthouse-services.com/mclennan/.

McLennan's Title IX webpage (http://www.mclennan.edu/titleix/) contains more information about definitions, reporting, confidentiality, resources, and what to do if you or someone you know is a victim of sexual misconduct, gender-based violence or the crimes of rape, acquaintance rape, sexual assault, sexual harassment, stalking, dating violence, or domestic violence.

* *You will need to access each link separately through your web browser (for example Mozilla Firefox, Chrome, Microsoft Edge, or Safari) to print each link's information.*