Gunn College of Health Sciences and Human Services
Shamadzu School of Radiologic Sciences
Bachelor of Science, Radiologic Technology Program
Course Syllabus - Dr. Rodney Fisher

RADS 3513 Radiographic Imaging Equipment

Course Information

Name	RADS 3513 Radiographic Imaging Equipment
Section	301
Credit	3 hours
Term	Summer 2025
Time & Location	**Lecture:**
	Monday, Tuesday & Wednesday, 8:00 am – 8:50 am Centennial Hall 340
	Lab: One hour per week in Radiology Lab Mondays & Tuesdays 9:00 – 9:50 am, 10:00 – 10:50 am, & 11:00 -11:50 am Wednesdays 9:00 – 9:50 am, & 10:00 – 10:50 am
Dates	June 2, 2025 – August 7, 2025
Time Commitment	Students should expect to spend 3 hours per week in lectures, 1 hour in the lab once per week, and at least 9 hours per week studying or completing assignments (10-week summer term).
Prerequisites	None

Professor

Rodney Fisher, Ph.D., R.T. (R) (N) (CT) (BD), CNMT

Assistant Professor / Radiation Safety Officer

E-mail: Rodney.Fisher@msutexas.edu

Phone: (940) 397-4615 **Fax:** (940) 397-4845

Office: Midwestern State University
3410 Taft Blvd, Centennial Hall 430N
Wichita Falls, TX 76309

Office hours: Mondays, Tuesdays, & Wednesday 1:00 pm – 3:00 pm.
Appointments always take preference over walk-ins.

Communicating with the Professor

I prefer email so there is a record of the communication, and often, I am away from my desk. Phone calls may be answered by email when appropriate. I will respond to or at least acknowledge all student communications within five (5) business days. If this time period is longer because I am out of town or for another reason, a news item will be posted online in D2L for the class. Please always give me the time I have asked for to respond before repeating your request.

Course Description

This course discusses introductory Newtonian and radiographic physics, X-ray circuitry and tube operation, and X-ray production and interaction with matter. It also introduces dual-energy X-ray absorption and computed tomography.

Course Objectives

Upon completion of this course, the student will:

- Describe the basic atomic theory and the various forms of energy.
- Describe and apply the basic concepts of electricity and electromagnetism.
- Identify and explain the role of various parts of the X-ray circuit and types of X-ray equipment.
- Discuss the X-ray production process and X-ray interactions with matter.
- Explain how dual-energy X-ray is used in bone densitometry
- Understand introductory CT physics and instrumentation

Teaching Methodology

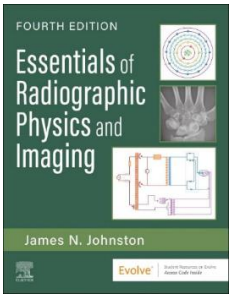
This course uses a hybrid of traditional lecture and social constructivism methodologies. There will be individual reading assignments, quizzes on reading material prior to class lectures and discussions, lab assignments in operating X-ray equipment with a lab final, and an experimental group research project in the lab demonstrating X-ray concepts from the lecture.

Course Materials

Textbooks

Required

Johnston, J. (2024). Essentials of Radiographic Physics and Imaging (4th Ed.). Elsevier. [ISBN: 978-0323930673]. $112.99 – 139.99 at the MSU Bookstore.



RAD Tech Boot Camp

You **must** buy RAD Tech Boot Camp through the bookstore to get the discount and be placed in the correct group with the rest of your class. RAD Tech Boot Camp is $330. The subscription is through the Summer of 2027 and will be used in other courses.

Computer Requirements

You need access to an up-to-date computer with an internet connection in this course. D2L does not work well with Internet Explorer or Edge. Chrome or Firefox are the preferred browsers when working in D2L.

Assignments

There are five types of assignments in this course. The grading will be as follows:

1.	Chapter Quizzes (9)		10%
2.	Module Tests (4)		30%
3.	Lab Grade:		20%
	a) X-ray Suite Worksheet	10%	
	b) Group Lab Report	30%	
	c) Individual Lab Final	30%	
	d) Lab Participation	30%	
4.	RAD Tech Boot Camp		10%
5.	Final Examination		30%

Course Modules

Module 1: Introduction and Basic Physics

- Chapter 1: Introduction
- Chapter 2: Structure of the Atom
- Chapter 3: Electromagnetic and Particulate Radiation

Module 2: X-ray Mechanics

- Chapter 4: The X-ray Circuit
- Chapter 5: The X-ray Tube

Module 3: X-ray Physics

- Chapter 6: X-ray Production
- Chapter 7: X-ray Interactions with Matter

Module 4: Specialized Radiographic Equipment

- Chapter 16: Additional Equipment
- Chapter 17: Computed Tomography

Important Dates

All dates are subject to change as needed

Date	Chapter Lecture or Test	Quiz/Test/Project	RAD Tech Boot Camp Videos and Quizzes (All assignments due 8:00 am)	Lab
May 31	1	D2L Opens		
WEEK 1				
June 02	1	1st Day of Class Chapter 1 Quiz due 8:00 am		Lab orientation and basic tube/collimator/table operation
June 03	1			
June 04	2	Chapter 2 Quiz due 8:00 am		
WEEK 2				
June 09	2			X-ray Suite Worksheet due; Creating an exam; setting a technique; taking a PA hand; completing an exam
June 10	3	Chapter 3 Quiz due 8:00 am		
June 11	3			
WEEK 3				
June 16	1 - 3	Module 1 Test	Assignments 1 & 2	Appending an exam; angling the tube; taking an AP foot
June 17	4	Chapter 4 Quiz due 8:00 am		
June 18	4			
WEEK 4				
June 23	-	No lecture – Tuesday 9:00 lab is on Monday 8:00 this week		Using a table Bucky; detenting the tube; taking an AP knee
June 24	4	2-hour lecture 8:00 – 9:50		
June 25	5	Chapter 5 Quiz due 8:00 am		
WEEK 5				
June 30	5			Experiments 1 & 2
July 01	5			
July 02	4 - 5	Module 2 Review Day		
WEEK 6				
July 07	4 - 5	Module 2 Test	Assignments 3 - 6	Experiments 3 & 4
July 08	6	Chapter 6 Quiz due 8:00 am		
July 09	6			

Date	Chapter Lecture or Test	Quiz/Test/Project	RAD Tech Boot Camp Videos and Quizzes (All assignments due 8:00 am)	Lab
WEEK 7				
July 14	7	Chapter 7 Quiz due 8:00 am		Using a wall Bucky; detenting the tube; 40" SID; know how to properly place a marker on a wall Bucky; taking a lateral skull
July 15	7			
July 16	6 – 7	Module 3 Review Day		
WEEK 8				
July 21	6 – 7	Module 3 Test	Assignments 7 - 8	Using a wall Bucky; detenting the tube; 72" SID; taking a PA chest
July 22	16	Chapter 16 Quiz due 8:00 am		
July 23	17	Chapter 17 Quiz due 8:00 am Last day to withdraw with a "W"		
WEEK 9				
July 28	17			Practice for Lab Final
July 29	17			
July 30	16 - 17	Module 4 Review Day Group Lab Report Due		
WEEK 10				
Aug 04	16 – 17	Module 4 Test	Assignments 9 - 10	Lab Final: start an exam; draw a body part; set a technique; position the tube and body part to the IR; take the image; complete the exam
Aug 05	1 – 7, 16 - 17	Review for Final		
Aug 06		Study Day		
Aug 07 (Thur)	1 – 7, 16 - 17	Final Examination 9:00 am – 11:00 am; ***NOTE: This is a Thursday!***		

Evaluation

Grade Scale
A=100-90
B=89-80
C=79-75
D=74-60
F=59 and below

Grading Cycle
All assignments are graded together as a group to maintain a higher level of consistency. Grading begins on the first business day after the due date, outside of university holidays and professional meetings, and is typically completed before the next due date. You may track your progress through the Gradebook in D2L.

Feedback
Feedback varies throughout the course. The News section of the course is where I will send messages to the entire class. It is best to set up your D2L account to receive an email notification (to the email of your choice) when News items are posted so you do not miss important updates.

1. Click the down arrow in the News section on the 3513-course home page
2. Select Notifications
3. Check the box next to "News - new item available" and then check any other boxes you wish to receive an email notification from.
4. Check the email address you wish to send email notifications. If you need to change this, select "change your email settings" and enter the new email address. This email address should be an email address you check frequently.

You are welcome to email questions to clarify concepts or look for further explanations. If I come across repeated questions, I will provide feedback or supplementary resources in the News section of the course so that everyone can benefit from it. You might look there first because your question may be located there.

Late Work
Online quizzes may not be made up if they are not completed by the due date. Module tests may be given prior to the testing date with prior approval. I normally do not give late tests except in extreme emergencies with acceptable documentation from the student. I reserve the right, in this case, to give a substitute test which may be a different format and could be more difficult. Lab worksheets, lab reports, and group projects will never be granted extensions. All coursework must be completed in the semester the course is taken. I do not give incomplete grades.

Final Course Grade
This is a progression course in the BSRT program. A final course score of 75% is required to pass this course. Any grade below 75% will result in the student being dismissed from the program. Any withdrawal from this course will result in the student being dismissed from the BSRT

program. If the student is dismissed, the student will need to reapply for program admission under the rules then in force. This course will have to be repeated. A student is only allowed to repeat this course once.

Radiographic Imaging Equipment Assignment Details

Assignments

There are five types of assignments in this course. The grading will be as follows:

1.	Chapter Quizzes (9)		10%
2.	Module Tests (4)		30%
3.	Lab Grade:		20%
	a) X-ray Suite Worksheet	10%	
	b) Group Lab Report	30%	
	c) Individual Lab Final	30%	
	d) Lab Participation	30%	
4.	RAD Tech Boot Camp		10%
5.	Final Examination		30%

Course Modules

Module 1: Introduction and Basic Physics
- Chapter 1: Introduction
- Chapter 2: Structure of the Atom
- Chapter 3: Electromagnetic and Particulate Radiation

Module 2: X-ray Mechanics
- Chapter 4: The X-ray Circuit
- Chapter 5: The X-ray Tube

Module 3: X-ray Physics
- Chapter 6: X-ray Production
- Chapter 7: X-ray Interactions with Matter

Module 4: Specialized Radiographic Equipment
- Chapter 16: Additional Equipment
- Chapter 17: Computed Tomography

Chapter Quizzes (10%):

Each of the nine chapters will have a 15-question quiz that will be taken through D2L according to the published schedule. Students will have 30 minutes to complete a quiz. Students are encouraged first to read the chapter, then take the quiz with their book and any notes ready. Students should attempt the quiz individually and not work together. The purpose of the pre-lecture quizzes is for the student to determine what is not understood and create a list of questions that should be answered through the lecture.

Module Tests (30%):

There are four module tests. These tests will be made up of multiple-choice and matching questions. Sources for the questions will be from the previous quizzes and module tests, the textbook, chapter power points and lectures, and lab experiments. Module tests will typically have 30-75 questions and will be completed in the scheduled lecture session.

Lab Grade (20%)

The lab grade consists of a combination of an X-ray Suite Worksheet, a Group Lab Report, an Individual Lab Final, and Lab Participation.

X-ray Suite Worksheet (10%)

Each student will be given a worksheet which they will work on during their first lab session. It will be due at the beginning the next lab session. The worksheet has complete instructions and requires the student to draw a diagram of an X-ray suite, labeling all the required components.

Group Lab Report (30%)

Each group of students will perform four X-ray experiments and write an APA-formatted lab report covering all four experiments.

Each group will schedule a time with me in the energized X-ray lab outside of normal lecture time. Each group will have a maximum of two hours to perform all five experiments. This will mean that each group will need to read over the experiments prior to their lab appointment and come prepared and organized. Each member of the group is expected to take an active part in each experiment.

The four experiments that each group will perform are:

- Reproducibility and Linearity
- mAs and Dose Relationship
- Inverse Square Law
- 15 % Rule

For each experiment, all groups will be provided with a PDF describing each experiment and a data sheet on which to record the results. After the experiments are performed, each group will write a lab report covering all five experiments. The parts of the lab report will be:

Introduction
This section introduces the concept being tested and explains why it is important to radiologic technologists. It should also discuss the expected results for each experiment.

Methodology
This section will list any and all materials needed for each experiment and a detailed step-by-step list of the procedures necessary to perform the experiment.

Discussion
This is what happened during the experiments. All the data is presented in this section. Any issues with performing the experiments should be noted.

Conclusion
This section should summarize all the results. The group should report whether each experiment produced the expected results and explain any unexpected results. There should also be suggestions for further experimentation in these subjects, especially if unexpected results are observed.

This lab report will be approximately 15 pages long, including data tables. This approximate page count does not include the title page and reference list. The lab report will follow the scientific experiment model and be in APA format. Students will be provided with the grading rubric and an example report.

Individual Lab Final (30%)

The lab final will consist of the student will draw a body part and X-ray (PA hand, AP foot, AP knee, PA Chest, or Lateral Skull), and then demonstrate competency by completing the following:

1. Starting an exam
2. Set a technique
3. Positioning the body part with the correct tube/IR relationship
4. Take a properly collimated image
5. Complete the exam

The student will have 10 minutes to complete the Lab Final once the body part has been drawn.

Lab Participation (30%)

The lab participation grade is determined by how well a student interacts with other students in the lab, stays focused on the assigned tasks, and completes the weekly lab check-off sheet. Because of the limited time available in the lab during the summer semester, any absences will result in a loss of 1/3 of the Lab Participation grade. Tardiness will result in a 1/10 deduction of the total Lab Participation grade. Any tardiness over 10 minutes will be treated as an absence.

RAD Tech Boot Camp (10%):

Each RAD Tech Boot Camp assignment corresponds to what is currently being discussed in class. Students will watch the appropriate videos and take the quiz that follows each video. The quiz scores will be added together to determine the overall grade for this part of the course. All assignments are due at 8:00 am on the assigned date. Late submissions will not be accepted.

Assignment #1:
Radiography Math Fundamentals: mAs and Reciprocity (0:00 – 4:44) (1 partial video and 1 Quiz (questions 1 and 2 only)

Assignment #2:
Radiography Math Fundamentals: Inverse Square Law I – III (3 videos and Quizzes)

Assignment #3:
Radiography Image Production: Electrical Physics (3 Videos and Quizzes)

Assignment #4:
Radiography Image Production: The X-ray Circuit (10 Videos and Quizzes)

Assignment #5:
Radiography Image Production: X-Ray Tube and Components (5 Videos and Quizzes – Skip Anode Cooling Charts I&II)

Assignment #6:
Radiography Image Production: Primary Exposure Factors (4 Videos and Quizzes)

Assignment #7:
X-Ray Production and Safety: X-Ray Production (3 Videos and Quizzes)

Assignment #8:
X-Ray Production and Safety: X-Ray interactions with Matter (4 Videos and Quizzes)

Assignment #9:
CT Image Production: CT Basics (2 Videos and Quizzes)

Assignment #10:
CT Image Production: CT Systems and Components (2 Videos and Quizzes)

Final Examination (30%):

The Final Examination will cover Chapters 1 – 7 and 16 - 17. The exam will be made up of 200 multiple-choice and matching questions. Sources for the questions will be from the previous quizzes and module tests, the textbook, chapter power points and lectures, and lab

experiments. Unless otherwise notified, it will be given on the scheduled date published in the university's final schedule. Students will have a two-hour final examination period to complete the examination.

Radiographic Imaging Equipment Course Policy Details

Classroom Conduct

Students should come to class prepared for the topic being discussed that day. Students should also take care of any personal matters, including using the restroom, prior to the start of class, so it is not necessary for them to leave during class. While there may be times when leaving the classroom is unavoidable, it should be an exception rather than a common occurrence. Phone use during class is not permitted unless cleared with the professor prior to the start of class and only for the most exigent of circumstances. If such exigent circumstances are approved that day, then the student should attempt to sit as close to the back door as possible so leaving the classroom to take a call is not a disruption. Leaving the classroom to refill a water bottle or for other inconsequential purposes is not allowed, and the professor may refuse re-entry to the classroom. The student will be recorded as absent for the day.

Tardiness

Students are expected to be in the classroom prior to the start of class. Students entering the classroom after class has begun disrupts the learning environment for the other students. Any student entering the classroom after the start of class will be considered tardy. Three instances of being tardy will count as one absence (see Attendance policy below). Any student trying to enter the classroom ten minutes after the start of class will not be admitted and will be considered absent that day. If the student is more than ten minutes late to class on a day when a module test is being given, the student will receive a zero on the test. Students who are tardy on the final examination date must complete the exam in the remaining time and will not receive any additional time.

Attendance

Attendance is required for all class sessions. A student may have up to three absences. If a student exceeds three absences, the professor may initiate an administrative withdrawal of the student from the course. This will result in the student being dismissed from the BSRT program at the end of the semester. If a student believes there are mitigating circumstances for any absence, the student must provide the professor with documentation prior to the absence or, if not possible, on the first day of returning to class. The professor has sole discretion to determine if an absence should be excused.

Requesting a Withdrawal

The last opportunity to drop this course with a grade of "W" is posted in the class schedule earlier in this syllabus. The student must initiate all withdrawals. After this date, dropping the course results in a grade of "F". Withdrawal from this course will result in the student being dismissed from the BSRT program.

In an emergency or extenuating circumstance, a student may request an incomplete grade before grades are submitted. If the professor grants the incomplete, the student has until thirty (30) days after the beginning of the next long semester to complete the course requirements. If the student does not complete the course requirements within the deadline, the incomplete grade will automatically convert into a grade of "F."

Technical Difficulties

Occasionally, you may experience problems with accessing D2L, accessing class files located within D2L, connecting with your internet service, or other computer-related problems. Make the professor aware of a technical problem as soon as possible. If a problem occurs on our end, such as D2L failure, then a due date extension will typically be granted**. However, remember that it is your responsibility to have (or have access to) a working computer in this class.** ***Assignments and tests are due by the due date, and personal computer technical difficulties will not be considered a reason for the instructor to allow students extra time to submit assignments, tests, or discussion postings.***

Dropbox assignments that can be attached in an email should be emailed to the professor as soon as a problem is encountered. Failure to do so may result in points being lost, regardless of connection issues.
For help options:

- For D2L issues, go online go to the Distance Education Helpdesk
- By phone, call the Distance Education office at 940-397-4868 between 8 am and 5 pm.
- Use the D2L help link in D2L.
- Contact your professor.
- For other computer access issues, visit the MSU Information Technology Website online.

Special Needs

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Midwestern State University endeavors to make reasonable adjustments in its policies, practices, services, and facilities to ensure equal opportunity for qualified persons with disabilities to participate in all educational programs and activities.

The Office of Disability Services (ODS) provides information and assistance, arranges accommodations, and serves as a liaison for students, professors, and staff. The ODS has assistive devices such as books on tape, recorders, and adaptive software, that can be loaned to qualified individuals. A student or employee who seeks accommodations based on disability

must register with the Office of Disability Services in the Counseling Center, Clark Student Center, Room 108. Documentation of disability from a competent professional is required.

Individuals with grievances related to discrimination or lack of accommodation based on a disability are encouraged to resolve the problem directly with the area involved. If the matter remains unresolved, the Office of Disability Services for resolution will provide advice and/or assistance. The grievance procedure may be found in the Student Handbook and Activities Calendar.

The Counseling Center director serves as the ADA Coordinator and may be contacted at (940)397-4618, TDD (940)397-4515, or 3410 Taft Blvd., Clark Student Center Room 108.

Administrative Process

Unresolved issues related to this course should be first addressed between the student and the course professor. If there is no resolution, students must follow this sequence:

1. Department Chair – Dr. Lynette Watts (940-397-4833)
2. College Dean - Dr. Jeff Killion (940-397-4594)
3. Dean of Students – Matthew Park (940-397-7500)

Honor System

RADS 3513 adheres to the MSU Code of Conduct.

In particular, academic dishonesty, however small, creates a breach of academic integrity. A student's participation in this course comes with the expectation that his or her work will be completed in full observance of the MSU Code of Student Conduct. A student should consult the current Student Handbook for answers to any questions about the code.

All components of RADS 3513 are designed to represent the efforts of each student individually or each student group as appropriate and are NOT to be shared, copied, or plagiarized from other sources. When students submit their efforts for grading, they are attesting they abided by this rule.

An online plagiarism/artificial writing detection service may be used in this course. Student assignments may be uploaded to the service for identification of similarities to other student papers and published works or the use of artificial writing generators in place of the student's own work.

Cheating includes but is not limited to

- Use of any unauthorized assistance in taking quizzes, tests, or examinations;
- Dependence upon the aid of sources beyond those authorized by the professor in writing papers, preparing reports, solving problems, or completing other assignments; or
- The acquisition of tests or other academic materials belonging to the university faculty or staff without permission.

Plagiarism includes but is not limited to

- The use of, by paraphrase or direct quotation without correct citation in the text and in the reference list,
- The published or unpublished works of another person.
- Students may NOT submit papers and assignments that they have previously submitted for this or other courses.
- The use of materials generated by agencies engaged in "selling" term papers is also plagiarism.

Using of Artificial Writing Generators includes but is not limited to

- Using any artificial intelligent agent (e.g., Chat GPT) to generate written work that the student uses within their course paper, poster, presentation, or any other project, with or without proper citation, or;
- Using any artificial writing generators in place of traditional methods of research to obtain sources and any interpretations about the content of those sources.

Academic dishonesty (cheating, plagiarism, artificial writing generators, etc.) will not be tolerated in this class. Whenever a student is unsure of whether a particular situation will be interpreted as academic dishonesty, the student should ask the professor for clarification. If students are guilty of academic dishonesty, a grade of zero (0) will be given for the quiz, assignment, etc., and the student will not be given an opportunity to resubmit the assignment. Based on the severity of the cheating, plagiarism, or use of artificial writing generators, the professor reserves the right to fail the student in the course and refer the student to the department chair for further disciplinary action, which could include permanent dismissal from the program. Cases may also be referred to the Dean of Students for possible dismissal from the university and the ARRT as a possible ethics violation.

Students are encouraged to review the tutorials and suggested websites for more information about plagiarism. If you have any questions about what constitutes plagiarism, please consult:

- The University Academic Dishonesty Policy
- The website Plagiarism.Org, or
- The professor

Please Note

By enrolling in this course, the student expressly grants MSU a "limited right" to all intellectual property created by the student for the purpose of this course. The "limited right" shall include, but shall not be limited to, the right to reproduce the student's work/ project in order to verify originality and authenticity and for educational purposes. Specifically, faculty may submit student papers and assignments to an external agency to verify originality and authenticity and to detect plagiarism or the use of artificial writing generators.

Campus Carry / Active Shooter

Campus Carry

Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. The new Constitutional Carry law does not change this process. Concealed carry still requires a License to Carry permit, and openly carrying handguns is not allowed on college campuses. For more information, visit Campus Carry.

Active Shooter

The safety and security of our campus are the responsibility of everyone in our community. Each of us has an obligation to be prepared to appropriately respond to threats to our campus, such as an active aggressor. Please review the information provided by the MSU Police Department regarding the options and strategies we can all use to stay safe during difficult situations. For more information, visit Safety / Emergency Procedures.