MSU TEXAS
MIDWESTERN STATE UNIVERSITY

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
Credit	3 hours
Term	Fall 2020
Time & Location	**Lecture:** Online and in labs **Labs:** A – Monday 1pm-2:50pm B – Monday 3pm-4:50pm C – Tuesday 8am-9:50am D – Tuesday 10am-11:50am E – Monday 8am-9:50am All labs Centennial Hall 230 unless otherwise notified
Dates	August 24, 2020 – December 7, 2020
Time Commitment	Each week students should expect to spend 2 hours online, 2 hours in lab, and at least 9 hours studying on course material (15 week term)
Prerequisites	None

Professor

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

Assistant Professor, Radiologic Sciences

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: Student Specific: Tuesdays 1 pm – 4 pm & Wednesdays 9 am – 11 am
General: Thursdays 9 am – 12pm & 1 pm – 3 pm
and by appointment (preferred)

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 or at least acknowledge all student communications within five (5) business days. If this time period will be 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 asked for to respond before repeating your request.

Course Description

This course discusses: introductory Newtonian and radiographic physics; x-ray circuitry and tube operation; x-ray production and interaction with matter. It includes a weekly lab component where students will apply the principles they have learned in lecture by conducting experiments.

Course Objectives

Upon completion of this course, you will:

- Describe 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.

Teaching Methodology

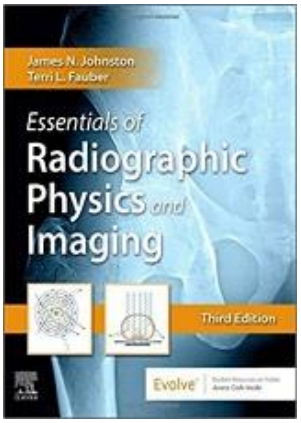
This course is taught using a hybrid of traditional lecture and social constructivism methodologies. There will be individual reading assignments, quizzes over reading material prior to class lectures and discussions, experimentation and worksheets to reinforce class lectures and discussions, group projects and presentations, and a closed book final examination.

Course Materials

Textbooks

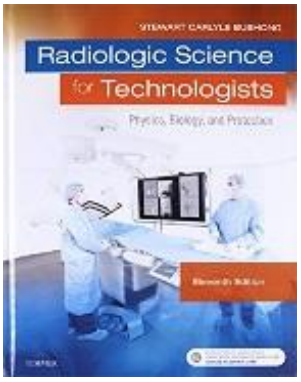
Required

Johnston, J.N. & Fauber, T.L. (2016). *Essentials of radiographic physics and imaging* (3nd Ed.). St. Louis, MO: Elsevier. ISBN: 978-0-323-56668-1



Recommended (Required for RADS 3763)

Bushong, S.C. (2017). *Radiologic Science for Technologists* (11th Ed.). St. Louis, MO: Elsevier. ISBN: 978-0-323-35377-9



Computer Requirements

You need access to an up-to-date Windows or Mac computer with an good internet connection in this course. You will also need a webcam and microphone for any Zoom sessions and remote testing. NOTE: Chromebook will not work for this course. D2L does not work well with Internet Explorer. Chrome or Firefox are the preferred browsers when working in D2L.

You will also need a subscription to Top Hat. Several courses in Fall 2020 and Spring 2021 including this one will use Top Hat as a curriculum delivery method.

You will also need a subscription to Rad Tech Boot Camp (RTBC). I will incorporate some of the content in RTBC for you to review. You will use RTBC in multiple courses throughout the remainder of your program.

Assignments

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

1.	Chapter Quizzes (11)	10%
2.	Module Tests (3)	30%
3.	Lab Report and Participation	20%
4.	X-Ray Circuit and Tube Group Project	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

Important Dates

All times are MSU campus time. All dates are subject to change as needed

Date	Required Reading	Lecture Videos	Lab Assignment	Quiz/Project
August 24-25	1 Introduction	Course Introduction 1-1: Radiographic Technique 1-2: Radiographic Equipment 1-3: Scientific Notation 1-4: History of X-rays 1-5: Units of Measure 1-6: Newtonian and Relativistic Physics 1-7: Special Radiologic Quantities	Introduction How to Write a Lab Report Experiment 0: Probability	Quiz Chapter 1 due Friday, August 28 11:59pm
August 31-Sepember 1	2 The Atom	2-1 History of the atom 2-2 Bohr's Model 2-3 Atomic Nomenclature 2-4 Electron Shells & Binding Energy 2-5 Atomic Classifications 2-6 Chemical Bonds	Experiment 1: Bohr's Model and Electron Shells	Quiz Chapter 2 due Sunday, August 30 11:59pm
September 7-8	3 Electromagnetic Radiation	3-1 Electromagnetic Spectrum 3-2 Property of Waves 3-3 Particulate Radiation 3-4 Inverse Square Law 3-5 Ionization 3-6 Properties of X-rays	Online due to Labor Day	Quiz Chapter 3 due Sunday, September 6, 11:59pm
September 14-15	Module 1 Test (Chapters 1-3) in Lab			

All dates are subject to change as needed

Date	Required Reading	Lecture Videos	Lab Assignment	Quiz/Project
September 21-22	4 The X-ray Circuit	4-1 Electrostatics & Electrodynamics 4-2 Voltage, Current, Resistance, & Ohm's Law 4-3 Electric Circuits & Devices	Experiment 2: Electric Circuits and Ohm's Law	Quiz Chapter 4-1 through 4-3 due Sunday, September 20, 11:59pm
September 28-29	4 The X-ray Circuit	4-4 Electromagnetism & Electromagnetic Induction 4-5 The X-ray Circuit 4-6 Rectification, Generators, & Ripple	Experiment 3: Magnetic Flux Fields and Electromagnetism	Quiz Chapter 4-4 through 4-6 due Sunday, September 27, 11:59pm
October 5-6	5 The X-ray Tube	5-1 The X-ray Tube Housing 5-2 The Cathode	Experiment 4: Electromagnetic Induction and Step Up/Down Transformers	Quiz Chapter 5-1 through 5-2 due Sunday, October 4, 11:59pm
October 12-13	5 The X-ray Tube	5-3 The Anode 5-4 The Line Focus Principle & Anode Heel Effect 5-5 Extending Tube Life	Experiment 5: AC to DC Rectification	Quiz Chapter 5-3 through 5-5 due Sunday, October 11, 11:59pm
October 19-20	Module 2 Test (Chapters 4-5) in Lab			

All dates are subject to change as needed

Date	Required Reading	Lecture Videos	Lab Assignment	Quiz/Project
October 26-27	6 X-ray Production	6-1 Characteristic Interactions 6-2 Bremsstrahlung Interactions	Experiment 6: mAs and Dose Relationship	Group Projects due Sunday, October 25, 11:59pm Quiz Chapter 6-1 through 6-2 due Sunday, October 25, 11:59pm
November 2-3	6 X-ray Production	6-3 Beam Quality and Quantity 6-4 Beam Filtration	Experiment 7: Inverse Square Law	Quiz Chapter 6-3 through 6-4 due Sunday, November 1, 11:59pm
November 9-10	7 X-ray Interactions	7-1 Classical & Compton Scattering 7-2 Photoelectric Absorption	Experiment 8: 15% Rule	Projects scores will be announced this week – RAD WEEK! Quiz Chapter 7-1 through 7-2 due Sunday, November 8, 11:59pm
November 16-17	7 X-ray Interactions	7-3 Other X-ray Interactions	Experiment 9: Differential Absorption of X-rays	Quiz Chapter 7-3 due Sunday, November 15, 11:59pm
November 23-24	Module 3 Test (Chapters 6-7) in Lab			
November 30	Final Review	Chapters 1 - 7	Online Live 8 am	None
December 7	Final Examination with ProctorU at 10:00 am Campus Time			

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 a 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 you. 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 course work must be completed in the semester the course is taken. I do not give incomplete grades except as noted below.

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 you being dismissed from the program. Any withdrawal from this course will result in you being dismissed from the BSRT program. If you are dismissed, you will need to reapply for program admission under the rules then in force. This course will have to be repeated. You are only allowed to repeat this course once.

Radiographic Imaging Equipment Assignment Details

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

1.	Chapter Quizzes (11)	10%
2.	Module Tests (3)	30%
3.	Lab Report and Participation	20%
4.	X-Ray Circuit and Tube Group Project	10%
5.	Final Examination	30%

Chapter Quizzes (10%):

Each of the 7 chapters will have a multiple-choice question quiz or quizzes that will be taken through Top Hat according to the published schedule. Because some of the chapters are divided into two parts, the total number of quizzes is 11. You will receive both participation credit for each question answered (0.5 points per question) and credit for correct answers (0.5 points per question). You are encouraged to first read the chapter, watch the online lectures on Top Hat, and then take the quiz after each lecture with their book and any notes ready. You should attempt the quiz individually and not work with other students. The purpose of the pre-lab quizzes is for you to determine what is not understood and create a list of questions that should be answered during face-to-face lab time.

In any class, I reserve the right to have a "pop quiz" without notice. If a pop quiz is given, it will be averaged into the chapter quiz grade.

Module Tests (30%):

There are three 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 lab session.

Lab Report and Participation (20%):

You will complete a lab worksheet for each weekly lab session. These worksheets will be turned in for credit for attendance at that lab session. The points earned will be on an all or nothing basis. Worksheets which are complete or show evidence of serious work will be given full credit. Missing worksheets or worksheets not demonstrating serious work will not earn any points. This participation grade will account for half of the lab grade.

The other half of the lab grade will be from a written lab report. This lab report will be 2-4 pages long not including the title page and reference list. The lab report will follow the scientific experiment model and be in APA format. I will provide you with the grading rubric and an example report prior to any student report due date. Each student randomly will be assigned a lab topic to write a report on. The report will be due one week after the lab and should be uploaded to the appropriate dropbox on D2L. You may not trade lab report topics without my prior approval.

Missing lab worksheets and lab reports may not be made up and will not be accepted late. Attendance at all lab sessions is required and lab experiments will not be repeated. Students participating in university approved activities with the proper documentation may have their lab moved to one of the other available times that week but may not make up lab assignments if they miss all available labs that week.

Some of the experiments will require the use of high voltage, X-ray radiation, and handling radioactive isotopes. All experiments will be conducted safely and with the use of proper safety equipment and pose no risk to the students if directions are followed. All students are expected to follow required safety instructions and the directions of the professor. Failure to do so may result in disciplinary action.

X-Ray Circuit and Tube Group Project (10%):

Each group will create an electronic poster in PDF format explaining how an X-Ray circuit and tube function. A poster template will be provided. The parts of the circuit and tube should be label either numerically (1, 2, 3) or alphabetically (A, B, C). The poster cannot have any individual group members' names on it. Groups can create funny group names and place these on the poster. The group may also have an over all theme for the poster and base the individual parts on that theme. I will show some examples of previous projects in lab.

Along with the display, each group will turn a short (no more than two [2] page report describing the process that occurs when the controls (kVp, mA, and time) are set and the exposure button is pressed until X-rays exit the tube. The report should be properly cited with a separate title page and reference list using APA formatting. If the textbook is the only source, then no in text citations are required. If other sources are used, then normal in text citations are mandatory. The group name should be on the report. Student names shall not be on the report.

A group of five professors (not the instructor) will be given a rubric and tasked to grade each submission. Submissions will be graded on accuracy of the poster and report, completeness of the poster and report, and artistic creativity. Each judge will give each submission a score between 0 – 100. For each submission, the high and low scores will be discarded and the other three scores will be averaged together to determine a final score. This final score will be the grade for the project that each member of the group will receive based on the grading scale in this syllabus. Any group member who is reported by the group as not having participated is subject to receiving a reduced grade or a zero on the project based upon the individual circumstances.

Reasons for past projects being graded down which are easy to avoid include:

- Not all of the parts are clearly labeled.
- The circuit pathway is not clearly defined.
- The X-ray circuit is shown and properly labeled, but the inside of the tube is not shown and not properly labeled.
- The paper does not follow APA format or has errors in APA formatting.

Final Examination (30%):

The Final Examination will cover Chapters 1 – 7. The exam will be made up of 100 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. It will be given on the scheduled date published in the university final schedule unless otherwise notified. The examination will be given via ProctorU. You will have one hour to complete the examination

Technical Difficulties

On occasion, you may experience problems with accessing D2L, accessing class files located within D2L, connecting with your internet service, or you may encounter other computer related problems. Make me 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, keep in mind 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 reason for me 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 me 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 8am and 5pm.
- Use the D2L help link in D2L.

- Contact me.
- For other computer access issues, go online to the MSU Information Technology Website.

Attendance

Attendance is required for all lab sessions. Since we only meet once a week, you may have one absence without penalty. However, remember that lab experiments and worksheets cannot be made up. Each absence after the first will result in 10% being taken off your semester grade. Should you be mathematically unable to achieve a semester grade of 75% due to a combination of grades and excessive absences, I may initiate your administrative withdrawal from the course. This will result in you being dismissed from the BSRT program at the end of the semester.

However, with the current pandemic, you are not to come to class if you are exhibiting any symptoms associated with COVID-19. You will need a physician's documentation of the illness and the physician's clearance to return to any class. In the event of a documented illness, I will help you to meet the requirements of this course, including providing alternative assignments, unless the duration of the illness precludes you having time to complete the course in a meaningful way. In this eventuality, your individual circumstances, and any decision to grant an incomplete grade, will be handled on a case-by-case basis. Please refer to the University's policies and expectations from MSU Texas Return to Campus webpage and MSU Texas Coronavirus Update webpage. The health and safety requirements on these pages will be strictly enforced in all classes.

Requesting a Withdrawal

The last opportunity to drop this course with a grade of "W" is 4:00pm on December 4, 2020. All withdrawals **must be initiated by you**. After this date dropping the course results in a grade of "F". Withdrawal from this course will result in you being dismissed from the BSRT program.

In an emergency or extenuating circumstance, you may request a grade of "Incomplete" before grades are submitted. If I grant the "Incomplete," you have until thirty (30) days after the beginning of the next long semester to complete the course requirements. If you do not complete the course requirements within the deadline, the grade of "Incomplete" will automatically convert into a grade of "F".

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 which can be loaned

to qualified individuals. A student/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 Director of the Counseling Center 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 you and me. If there is no resolution, you must follow this sequence:

1. Department Chair – Dr. Beth Vealé (940-397-4611)
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 in academic integrity. Your participation in this course comes with the expectation that your work will be completed in full observance of the MSU Code of Student Conduct. You 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 and are NOT to be shared, copied, or plagiarized from other sources. When you submit your efforts for grading, you are attesting you are abided by this rule.

An online plagiarism service may be used in this course. Your assignments may be uploaded to the service for identification of similarities to other student papers and published works.

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 me 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.

- You may NOT submit papers and assignments that you have previously submitted for this or other courses.
- The use of materials generated by agencies engaged in "selling" term papers is also plagiarism.

Academic dishonesty (cheating, plagiarism, etc.) will not be tolerated in this class. Whenever you are unsure of whether a particular situation will be interpreted as academic dishonesty, you should ask me for clarification. If you are guilty of academic dishonesty, a grade of zero (0) will be given for the quiz, assignment, etc. Cases may also be referred to the Dean of Students for possible dismissal from the university.

You 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
- Me

Please Note

By enrolling in this course, you expressly grant MSU a "limited right" in all intellectual property created by you for the purpose of this course. The "limited right" shall include but shall not be limited to the right to reproduce your 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 for plagiarism.

Senate Bill 11

Senate Bill 11 Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's campus carry webpage. If you have questions or concerns, please contact MSU Chief of Police Patrick Coggins by email at mpatrick.coggins@msutexas.edu.