



North Central State College

MASTER SYLLABUS

2026-2027

- A. Academic Division: Health Science
- B. Discipline: Radiological Sciences
- C. Course Number and Title: RADS 2470 Radiation Equipment Physics
- D. Assistant Dean: Dr. Jason Tucker, Ph.D.
- E. Credit Hours: 2
Lecture: 2
- F. Pre-requisites: RADS 1275, RADS 2350
Co-requisites: RADS 2421m, RADS 2450m,
- G. Last Course/Curriculum Revision Date: Spring 2024 Origin date: Fall 2025
- H. Textbook(s) Title:

Principles of Radiographic Imaging An Art and Science
(Purchased in RADS 1270)

- Author: Carlton, Adler and Balac
- Copyright Year: 2026
- Edition: 7th
- ISBN: 9780443384158

Bushong's Radiologic Science for Technologists
(Purchased in RADS 1270)

- Author: Stewart Bushong and Elizabeth Shields
- Copyright Year: 2025
- Edition: 13th
- ISBN: 9780323765367

RadTechBootCamp - Clover Learning Student Plan, electronic resource
(Purchased in RADS 1151)

- Vendor: Clover Learning Inc.
- Copyright Year: 2026
- Edition: n/a
- ISBN: 9781951294038

- I. Workbook(s) and/or Lab Manual: None
- J. Course Description: This course is designed to establish a knowledge base of radiographic and fluoroscopic equipment design. The nature and characteristics of radiation, x-ray production, and photon interaction with matter are also included.

K. College-Wide Learning Outcomes:

College-Wide Learning Outcome	Assessments - - How it is met & When it is met
Communication – Written	
Communication – Speech	
Intercultural Knowledge and Competence	
Critical Thinking	
Information Literacy	
Quantitative Literacy	

L. Course Outcomes and Assessment Methods:

Upon successful completion of this course, the student shall:

Outcomes	Assessments – How it is met & When it is met
1. Explain the structure of matter, imaging energy forms, scientific units of base, derived and special quantities used in radiology sciences	Discussion, completed assignments and worksheets weeks 1-2, test week 3, mid-term Week 8, comprehensive final Week 16
2. Differentiate various forms and characteristics of electromagnetic energy found on the electromagnetic spectrum	Discussion, completed assignments and worksheets week 3, test week 5, mid-term Week 8, comprehensive final Week 16
3. Identify the basic terms and vocabulary associated with electricity, magnetism and electromagnetism.	Discussion, completed assignments and worksheets weeks 4-5, test week 7, mid-term week 8, comprehensive final Week 16
4. Diagram and explain the components / function of the x-ray imaging system circuits.	Discussion, completed assignments, worksheets, educational software assignments weeks 6-7, test week 10, comprehensive final week 16
5. Diagram and explain the components / function of the x-ray tube and the production of ionizing radiation	Discussion, completed assignments, worksheets, educational software assignments weeks 8-9, test week 13, comprehensive final week 16
6. Compare and contrast the shape of the x-ray emission spectrum as one variable changes.	Discussion, completed assignments, worksheets, educational software assignments weeks 9-11, test week 13, comprehensive final week 16
7. Differentiate between target interactions and tissue interactions.	Discussion, completed assignments, worksheets, educational software assignments weeks 10-12, test week 13, comprehensive final week 16
8. Diagram and explain the components / function of the image intensifier utilized in fluoroscopic procedures.	Discussion, completed assignments, worksheets, educational software assignments weeks 11-12, test week 15, comprehensive final week 16
9. Explain quality management and differentiate between QA and QC tests used in radiology sciences	Discussion, completed assignments, worksheets, educational software assignments weeks 13-14, test week 15, comprehensive final week 16
10. Use effective oral, written and nonverbal communications skills	Class discussions, assignments and testing weeks 1-16

M. Recommended Grading Scale:

NUMERIC	GRADE	POINTS	DEFINITION
93–100	A	4.00	Superior
90–92	A-	3.67	Superior
87–89	B+	3.33	Above Average
83–86	B	3.00	Above Average
80–82	B-	2.67	Above Average
77–79	C+	2.33	Average
73–76	C	2.00	Average
70–72	C-	1.67	Average
67–69	D+	1.33	Below Average
63–66	D	1.00	Below Average
60–62	D-	0.67	Below Average
00--59	F	0.00	Failure

N. College Procedures/Policies:

North Central State College believes that every student is a valued and equal member of the community.* Every student brings different experiences to the College, and all are important in enriching academic life and developing greater understanding and appreciation of one another. Therefore, NC State College creates an inclusive culture in which students feel comfortable sharing their experiences.

Discrimination and prejudice have no place on the campus, and the College takes any complaint in this regard seriously. Students encountering aspects of the instruction that result in barriers to their sense of being included and respected should contact the instructor, assistant dean, or dean without fear of reprisal.

* *Inclusive of race, color, religion, gender, gender identity or expression, national origin (ancestry), military status (past, present or future), disability, age (40 years or older), status as a parent during pregnancy and immediately after the birth of a child, status as a parent of a young child, status as a foster parent, genetic information, or sexual orientation*

Important information regarding College Procedures and Policies can be found on the syllabus supplement located at

<https://ncstatecollege.edu/documents/President/PoliciesProcedures/PolicyManual/Final%20PDFs/14-081b.pdf>



North Central State College

SYLLABUS ADDENDUM

Academic Division:	<u>Health Science</u>	Discipline:	<u>Radiological Sciences</u>
Course Coordinator:	<u>Heidi Chambers</u>		
Course Number:	<u>RADS 2470</u>	Course Title:	<u>Radiation and Equipment Physics</u>
Semester / Session:	<u>Fall 2026 / Full 16 Week Session</u>	Start / End Date:	<u>8/17/2026 thru 12/11/2026</u>

Instructor Information

Name:	<u>Heidi Chambers</u>	Credentials:	<u>BRST, R.T. (R)</u>
Phone Number:	<u>419-755-4809</u>	E-Mail Address:	<u>hchambers@ncstatecollege.edu</u>
			By appointment, in person or via zoom
Office Location:	<u>152 Health Sciences Building</u>	Office Hours:	<u>Wednesday and Thursday</u>

I. Topical Timeline / Course Calendar (Subject to Change):

Weeks	Topics	Assignment / Activity	Dates
1	Radiation Science Basic Physics & Concepts	Read Chapters 1 and 2 pp. 3-33 CN 1 Note Packet Class Review	Aug 20
2	Structure of Matter	Read Chapter 3 pp. 34-53 CN 2 Note Packet Class Review Worksheet Application	Aug 27
3	Test 1 (CN 1 & CN 2) Electromagnetic Energy	Test 1 (CN 1 & CN 2) Read Chapter 4 pp. 54-68 CN 3 Note Packet Class Review RTBC Video Lessons & Quizzes	Sept 3 Sept 3
4	Electromagnetism	Read Chapter 5 pp. 69-91 CN 4 Part 1 Note Packet RTBC Video Lessons & Quizzes	Sept 10
5	Electromagnetism continued Test 2 (CN 3)	CN 4 Part 2 Note Packet RTBC Video Lessons & Quizzes Worksheet Application Test 2 (CN 3)	Sept 17 Sept 17
6	X-ray Machine / Imaging System	Read Chapter 6 pp. 92-110 CN 5 Note Packet RTBC Class Review	Sept 24
7	X-ray Machine / Imaging System continued Test 3 (CN 4)	Class Review Challenge Questions Worksheet Application Test 3 (CN 4)	Oct 1 Oct 1
8	X-ray Tube	Read Chapter 7 pp. 111-128 CN 6 Note Packet RTBC Class Review	Oct 8
Fall Break Oct 12-16			
9	X-ray Tube continued Test 4 (CN 5)	Challenge Questions RTBC Class Review Test 4 (CN 5)	Oct 22 Oct 22
10	X-ray Production	Read Chapter 8 pp. 129-141 CN 7 Note Packet RTBC Class Review Challenge Questions	Oct 29
11	X-ray Production, Emission & Filtration	Read Chapter 9 pp. 142-152 CN 8 Note Packet RTBC Class Review Challenge Questions	Nov 5
12	Test 5 (CN 6) X-ray Interactions with Matter	Test 5 (CN 6) Read Chapter 10 pp. 153-168 CN 9 Note Packet RTBC Class Review Worksheet Application	Nov 12 Nov 12

Weeks	Topics	Assignment / Activity	Dates
13	Test 6 (CN 7 & CN 8)	Test 6 (CN 7 & CN 8)	Nov 19
	Fluoroscopic Equipment	Read Chapter 19 pp. 275-287 CN 10 Note Packet Class Review Worksheet Application	Nov 19
	Digital Display Device & QC Management	Read Chapter 26 pp. 368-376 CN 11 Note Packet Class Review	Nov 19
14	Thanksgiving Holiday – No Class		Nov 26
15	Test 7 (CN 9 & CN 10)	Test 7 (CN 9 & CN 10)	Dec 3
	QC Management continued	RTBC Class Review CN 11 “Take-Home Quiz”	Dec 3 Dec 7
16	Comprehensive Final	Final Exam – In Person / On Campus	TBD

II. Grading and Testing Guidelines:

Final Grade Calculation

Activity	Qty	Points	Percentage
Exams	7	350	60%
Final Exam	1	120	20%
Other Graded Items			20%
• Note packet assignments	11	110	
• RTBC video lessons and quizzes	10	100	
• Challenge questions and worksheets	5	75	
• Take-home Quiz	1	15	
• Class Attendance	16	80	
		Total: 850	100%

- **Note:** Quantity and point activity may be subject to change based on Course needs.
- **Minimum Course Grade:** The Radiological Department believes that a grade below C+ indicates a lack of mastery of essential skills. Therefore, any student who receives less than C+ in any Radiological Science sequence course cannot continue in the Radiology Program.

III. Examination Policy:

- Students must attend class when tests, oral presentations, and written assignments are scheduled. If the student does not attend class on these days the following deductions will be applied:
 - 1st missed test → minus 5% from the earned score
 - 2nd missed test → minus 10% from the earned score
 - 3rd missed test → minus 15% from the earned score
 - Additional missed tests → result in a zero score
- A student who arrives late to class for a test for any reason may not be permitted to take the test at that time. The test will be treated as a make-up exam with appropriate deduction from the earned score:
 - Late arrival for any exam → minus 5% from the earned score
- The reasons for which a student may be excused from taking an examination, oral presentations, assignments or lab and not receive a deduction in score are as follows:
 - Hospitalization (with documented verification)
 - Death in the immediate family (with documented verification)
 - Personal illness or illness in immediate family - (doctor's excuse required).
- Any student who misses an examination (for any reason) is responsible for contacting the instructor prior to the start of class or examination through Canvas to let the instructor know the reason of absence and schedule the make-up test. Make-up exams are scheduled as close as possible to the missed test date and should occur no later than one week from the missed exam. In cases of **extreme** illness or hospitalization contact should be made no later than 24 hours from the date of absence. If the student does not contact the instructor within the allotted time,

the student may be subjected to a zero on the examination. The instructor will not “chase down” the student to reschedule.

5. No makeup opportunity will be given for absences of unscheduled quizzes (pop quizzes).
6. Exams are administered via the Canvas course and are proctored over Zoom. The student must use two devices (phone and computer) while faculty proctor the examination. Each exam creates a real-time log of the student's activities while in the exam. Navigation away from the exam tab during the examination is not permitted for any reason. Exam logs are randomly checked by faculty after each test. Any student who navigates one time from the exam will receive a zero and a written warning. If a student navigates from the exam more than once, the student will receive a zero on the test and be subjected to the college's academic misconduct process.
7. Any student who scores below a 77% on any examination is **required** to schedule a one on one meeting with the instructor to identify knowledge gaps of the material. The student may be mandated tutoring. The student should not view this as a punishment and view it as a benefit to be as successful as they can be in the program.

IV. **Comprehensive Final Exam Policy:**

1. The Comprehensive Final is administered in person, on campus, and is graded separately from the missed-test deductions in item 1 above. If a student does not attend, the following deduction will be applied:
 - Missed Comprehensive Final → minus 5% from the earned score
2. A student who arrives late to the Comprehensive Final for any reason may not be permitted to take the exam at that time. The exam will be treated as a make-up exam with the following deduction from the earned score:
 - Late arrival → minus 5% from the earned score
3. Excused-absence reasons and the make-up contact procedure follow the same requirements outlined above for all examinations.

V. **Homework Policy**

1. Homework and other assignments only receive full credit when they are submitted on time. Late homework assignments will receive a 50% deduction. One minute past the due date and time is considered late. Technology issues are not an excuse for late submission and are subject to the late assignment deduction. Late homework assignments are accepted up to 7 days from the original due date and time. Assignments submitted more than seven days late will not be accepted and will receive a score of zero, as will all missing assignments. It is the student's responsibility to follow submission due dates and times.
2. All homework assignments, presentations, written assignments and projects must reflect the student's own work. Copying other students work or using AI tools (i.e., Chat GPT or other generative AI software) to complete an assignment is **prohibited**. AI tools may be used when explicitly stated by the instructor for specific assignments. Work found to be completed by copying or with unauthorized AI assistance will be considered a violation of academic integrity and may be subjected to disciplinary actions or the college's misconduct process.

VI. **Attendance Policy**

1. Class attendance is necessary to acquire the knowledge required to be successful in the course. Student attendance is taken and part of the final course grade.
2. Students are responsible for attending every online Zoom class. Classes will meet once a week with a link to the class provided in the Canvas course.
3. In any circumstance where a student will miss an online class, the student must send a message to the instructor through Canvas **prior** to the start of the class. If a student is absent due to illness, the student is not permitted to attend lab for that day. If the student is absent and does not contact the instructor, the student is not permitted to attend lab for that day.