

Montgomery College

Takoma Park Campus
Radiologic Technology Program
Syllabus RADT 102
Spring 2019

Course Title: Radiologic Technology II Credit Hours:4

Instructor: Ms. Rose Aehle, MS, RT(R,M)
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Syllabi/course content located on Blackboard

<u>Class Hours/Place</u>	Lecture – Section 31481	M 12:30-1:45 pm./HC 423 W 8:00- 9:15 a.m./HC 423
	Lab - Section 31482	W 9:30am -11:10 am./HC 424/430
	Section 32951	W 11:20am- 1:00 pm/ HC 424/430

Office Hours: M 2:00 p.m. – 4:00 p.m.
W 9:00 p.m. – 4:00 p.m.

Texts: Radiologic Science for Technologists, Physics, Biology and Protection 11th Edition, Bushong,
Digital Radiography and PACS Revised 2nd edition
Christi Carter

Course Description: A continuation of RADT 101 with the presentation of more complex theories to further the knowledge of the student. A correlated laboratory will aid the student in synthesizing the material presented in class. Topics covered will be radiation safety and protection, X-ray machinery circuitry and design, analysis of common machine malfunctions and simple repairs, digital and computed radiography, and fluoroscopy. In addition, basic electronic theory will be presented so that the student will be able to understand the different circuits and functions of the circuits in modern X-ray equipment.

Included in the course: electronic theory and design, analysis of common machine malfunctions, digital and computed radiography, and digital/conventional fluoroscopy. In addition, a concentration of establishing appropriate technical factors based on anatomy, patient exposure and the relationship between digital index numbers will be thoroughly discussed. Review of mathematical concepts for determining compensation for technique changes will be incorporated throughout the class. Supporting the contrast objectives in RADT 112, the required ARRT competency of venipuncture and drawing up contrast will be presented in a lab component of this class (T only) (CE) PREREQUISITES: A grade of C or better in mathematics foundation

and RADT 101 and Admission to the RT program or permission of the department. Three hours lecture, two hours laboratory each week

Integration of principles and formulas from Radiographic Physics part I, will be reconsidered through this course. During lab time students will be given opportunity to continue to work on adjusting technique, image critique and alternative procedures as well as basic positioning skills.

Course outcomes:

- Identify the process of converting analog x-ray signals to a digital image including the post processing steps necessary to correct or enhance a captured image.
- Explain the process of archiving images via the PACs system
- Review objectives that affect basic Radiographic image quality including identifying digital artifacts
- Compare conventional image intensification fluoroscopy with digital fluoroscopy capture.
- Discuss alternative radiographic procedures including MRI, CT and conventional tomography
- Apply the rules of electricity and magnetism as they relate to a basic x-ray circuit
- Identify the various quality control tests and their parameters for the diagnostic imaging rooms as well as for basic diagnostic imaging equipment
- Review the recommended levels of radiation allowable to the public/patient and diagnostic imaging personnel.
- Identify the mandated requirements needed in the proper design of a diagnostic imaging room.
- Design an imaging technique chart incorporating knowledge of anatomical specific technical factors

Course Methodology: Learning facilitated and interactive lecture format, interactive media, group activities, lab exercises.

Important Student Information Link

*In addition to course requirements and objectives that are in this syllabus, Montgomery College has information on its web site (see link below) to assist you in having a successful experience both inside and outside of the classroom. It is important that you read and understand this information. The **link below provides** information and other resources to areas that pertain to the following: student behavior (student code of conduct), student e-mail, the tobacco free policy, withdraw and refund dates, disability support services, veteran services, how to access information on delayed openings and closings, how to register for the Montgomery College alert System, and finally, how closings and delays can impact your classes. If you have any questions please bring them to your professor. As rules and regulations change they will be updated and you will be able to access them through the link. If any student would like a written copy of these policies and procedures, the professor would be happy to provide them. By registering for this class and staying in this class, you are indicating that you acknowledge and accept these policies.*

<http://cms.montgomerycollege.edu/mcsyllabus/>

Please refer also to the Radiology Technology Student Handbook and Clinical Education Plan for general college and program policies.

Additional Classroom policies

Classroom Behavior:

Each and every student is expected to behave in ways, which promote a teaching and learning atmosphere. Students have the right to learn; however, they do not have the right to interfere with the freedom of the faculty to teach or the rights of other students to learn. Students will be treated respectfully in return for respectful behavior.

All in-class discussions should be carried out in a way that keeps the classroom environment respectful of the rights of others. This means that, for example, students should not interrupt someone else who is talking regardless of whether that person is the instructor or another student. Students should not monopolize class time by repeatedly interrupting and asking questions in a manner in which hinders the learning process of others. Students are also expected to conduct themselves in ways which created a safe learning and teaching environment that is free from such things as violence, intimidation, sexual harassment or any other form of harassment. Should a student be disruptive in class, then he/she will be asked to leave. The instructor reserves the right to have the student removed by Security if refusal occurs. Please refer to this link regarding Montgomery College's student code of conduct <http://cms.montgomerycollege.edu/mcsyllabus/>

Title IX link

<https://cms.montgomerycollege.edu/TitleIX/>

Electronic Devices

While the use of recording devices and laptops are permitted for lecture and labs the instructor will be recording most lectures on Collaborate which records audio and information shared on the overhead via the instructor computer . During lecture and labs, cell phones or other electronic devices need to be set on silent or vibrate mode. If a student must respond to a cell phone call during class time, they must leave the classroom or lab to do so. Extended absence from the lecture or lab to return a call may be recorded as an unexcused absence and this may impact the student's ability to continue in the lab or lecture that day. Students are urged to use discretion in returning calls during class time. **NO CELL PHONES OR LAP TOPS MAY USED DURING AN EXAMINATION. ALL CELL PHONES MUST BE TURNED OFF PRIOR TO THE BEGINNING OF EXAMINATIONS. NO LAP TOPS WILL BE ALLOWED OUT OF THEIR CASES DURING EXAMINATIONS**

Cell phones and pagers should be kept on vibrate mode and students who must speak on a cell phone, must do so outside of the classroom to prevent disruption to the rest of the class.

Testing policy

To assure testing integrity the following policy is mandated:

- 1) Number 2 pencils will be provided. Student are not to use their pencils or mechanical pencils
- 2) Ear buds, ear phones and any other type of personal audio equipment may not be used
- 3) The instructor reserves the right to assign seating
- 4) Students must raise their hand if there is a question about the test during the test period. Students are not to come to the instructor.
- 5) All personal items must be placed on the ground where the student is seated for the exam. Lockers are available for those who wish to use them.
- 6) Cell phones and lap tops must be placed beside the student on the ground during the test.
 - a. Cell phones should be turned off. Lap tops should be turned off. Books must be closed. Notebooks must be closed
- 7) The instructor reserves the right to remove the exam from the student if the student is exhibiting behavior not conducive to maintaining testing integrity (examples and not limited to: talking to other students during the test, looking at other student's answer key etc.)
- 8) Program will follow the college's policy on Academic dishonesty.

Source: **Academic Dishonesty** and How It Is Handled" from Montgomery College's

Student e-mail

For this class, e-mail will be sent via Blackboard. Assignments not already indicated in this syllabus and other than homework assignments which will be attached to BB. Students will be informed either in class or via BLACK BOARD e-mail for any additional assignments.

Calculator Usage

Calculators will be provided and students are to use these only. No personal calculators are allowed unless they are approved by instructor.

Delayed Opening or Closing of the College

Because of inclement weather or utility failure or for other reasons, it may be necessary to delay opening or suspend all operations of the College or an individual campus. Please refer to the general syllabus link on page 5 of this syllabus.

All inquiries from the news media regarding an emergency event should be directed to the College's Office of Communications.

How Closing and Delays Impact Classes

If a class can meet for 50% or more of its regularly scheduled meeting time OR if the class can meet for 50 minutes or more, it will meet. Montgomery College will always operate on its

regular schedule unless otherwise announced. Depending on the nature of the incident, notifications of emergencies and changes to the College's operational status will be communicated through one or more communication methods including the College's website www.montgomerycollege.edu. For the most up-to-date information regarding College openings, closings, or emergencies, all students, faculty, and staff are encouraged to sign up for email and text alerts via Montgomery College ALERT. Registration information is available at www.montgomerycollege.edu/emergency.

PRINTING AT MONTGOMERY COLLEGE

Students will now be charged for printing any document at Montgomery College
Please refer to this link for more information:

<http://cms.montgomerycollege.edu/edu/department.aspx?id=27707>

RADT102

**PowerPoint's/web links/assignments/information regarding this course uploaded on Blackboard. ALL LECTURES WILL BE RECORDED USING COLLABORATE AND THE COLLABORATE LINK WILL BE POSTED ON BLACKBOARD
Please check regularly**

Course Outcomes (by topic):

Radiographic Technique digital/ Chapters 13/17 Bushong /mock registry
At the conclusion of this topic the student will be able to

1. Calculate missing factors
2. Calculate greater density problems
3. Analyze the relationship between technical factors and their impact on receptor exposure/density, grayscale/ contrast, spatial resolution (recorded detail)
4. Postprocessing as it relates to the digital image
5. Review of MTF and SNR

Image Quality: (Chapter 10 Bushong),
At the conclusion of this topic the student will be able to

1. Evaluate and contrast image quality characteristics based on spatial, geometric factors and contrast resolution
2. Identify the basic anatomy of a characteristic curve for future comparison to the anatomy of a LUT (Look-up Table- see outcomes under digital and PACS on page 5 of the syllabus)
3. Calculate magnification factors
4. Differentiate causes of distortion

5. Compare factors that impact the effect of focal spot blur
6. Review patient and other technical factors that impact radiographic quantity (OD) and quality

Image Artifacts: Chapter 21 (Bushong), Chapter 4 (Carter)

At the conclusion of this topic the student will be able to

1. List and discuss the three categories of artifacts in digital systems
2. Identify specific artifacts associated with digital systems
3. Explain the derivation (source) of exposure artifacts.

Digital Radiography and PACS Chapters 1-5,6,9,10 (Carter)

1. Review Direct and indirect capture systems
2. Discuss LUT, MTF, Nyquist Theorem, aliasing and Moire patterns
3. Identify the different detectors
4. Sequence the image capture in a FPD system
5. Identify flaws and discuss corrections in a FPD
6. Define a CCD and CMOS system
7. Discuss image digital radiographic image acquisition and processing
8. Discuss the fundamentals of PACS and PACS archiving

Fluoroscopy: (Chapter 25 and Chapter 26 Bushong,)

At the conclusion of this topic the student will be able to

1. Discuss the history of fluoroscopy.
2. Explain visual physiology in relation to fluoroscopic illumination.
3. Describe the parts of the fluoroscopic image intensifier.
4. Calculate flux gain and brightness gain.
5. Discuss digital fluoroscopy and compare and contrast it to conventional fluoroscopy
6. Review using SIMS the appropriate technical factors for contrast (GI) studies.

Electricity/Magnetism/ Electromagnetism: (Chapter 4 and 5 Bushong)

At the conclusion of this topic the student will be able to

1. Identify the electric charges of protons and electrons and define electrification. Explain the laws of electrostatics.
2. Name examples of conductors and insulators and describe electric circuits
3. Discuss the history and discovery of naturally occurring magnetic material.
4. List the three classifications of magnets
5. Identify the interactions between matter and magnetic fields.
6. Discuss the four laws of magnetism.
7. Discuss the development of the battery as a reliable source of electric current for scientific investigation.

8. Evaluate and explain the relationship between magnetism and electric current.
9. Demonstrate understanding of the basic function and design of the electric generator, the electric motor, transformer and rectifiers

X-ray Unit (Chapter 4 and 5 Bushong)

At the conclusion of this topic the student will be able to

1. Diagram and distinguish the components of a simplified x-ray circuit, which include transformers and rectifiers.
2. Identify and relate the laws of electromagnetic induction as it pertains to x-ray circuitry
3. Correlate the functions of direct and alternating current as it relates to x-ray production

Alternative Procedures: Chapter 13, Bushong (pgs 261-263) Chapter 28 Bushong, Bontrager

At the conclusion of this topic the student will be able to

1. Identify the directional movements of the tomographic unit.
2. Explain tomographic motion blur theory.
3. Discuss the relationship between tomographic angle and section thickness.
4. Explain general concepts of CT and MRI imaging modalities

Quality Assurance and Quality Control: Chapter 20/22 Bushong

At the conclusion of this topic the student will be able to

1. Define quality assurance and quality control for imaging equipment.
2. List a quality assurance model used in hospitals.
3. Name the three steps of quality control and outline the quality control program schedule for radiographic systems in a diagnostic imaging department.
4. Describe the ten quality control tests for radiographic systems.
5. Discuss the three quality control processes for fluoroscopy.
6. Explain and support the quality control processes for computed (digital) radiography.

Health Physics: Chapter 35 (Bushong)

At the conclusion of this topic the student will be able to

1. Define health physics.
2. List the cardinal principles of radiation protection and discuss the ALARA concept.
3. Explain the meaning of NCRP and the concept of dose limits.
4. Name the dose limits for occupational and non-occupational worker for whole-body, skin, and extremities.
5. Discuss the radiosensitivity of the stages of pregnancy.
6. Describe the recommended management procedures for the pregnant radiographer and for the pregnant patient.

7. Evaluate the radiosensitivity of tissues and organs.
8. Review x-ray quantity and quality and their relationship to mAs and kVp
9. Evaluate a nomogram

Designing Radiation Protection: Chapter 36 (Bushong)

At the conclusion of this topic the student will be able to

1. identify the leakage radiation limit for x-ray tubes.
2. List the beam-on indicators on the control panel.
3. Indicate the nine radiation protection aspects of radiographic equipment.
4. List the nine radiation protection features of fluoroscopic equipment.
5. Discuss the design of primary and secondary radiation barriers.
6. Describe the design of the three types of radiation detection dosimeters used in diagnostic imaging.

Venipuncture/drawing up contrast (Supporting objectives in RADT 112, Lab time in RADT 102 used for the venipuncture simulation)

1. Demonstrate through simulation the appropriate venipuncture technique
2. Demonstrate appropriate sterile and safe techniques in drawing up contrast
3. List the appropriate materials needed for both venipuncture and drawing up contrast

GRADING

93 - 100	A	Any student receiving a grade below a “C” in this course must repeat the course satisfactorily before proceeding to the next course.
86 - 92	B	
78 - 85	C	
77 and below	F	

Grades will be determined by:

Attendance	5%
BB homework assignments	2.5%
Critical thinking assignments	12.5%
Exams (4)	45%
Final Exam	35%
	100%

STUDENTS ARE ENCOURAGED TO CHECK THE GRADING CENTER IN BLACKBOARD REGULARLY

Venipuncture Competency

(Supports objectives in RADT 112, Lab time for RADT 102 is used to complete this competency)- Please note that while there is no percentage of the grade associated with this competency, this competency is an ARRT mandated one and all students must successfully

complete this competency on the lab day they are registered in and as noted in the course schedule. Those students who miss this competency risk unsuccessful completion of this class.

Attendance (5%)

Students are expected to attend all class sessions. In cases involving excessive absences from class, the instructor may drop the student from the class. An excessive absence is defined as one more absence than the number of classes per week during a fall or spring semester; the number of absences is prorated for accelerated sessions.

Students are also expected to be on time for class. Excessive lateness will result in a counseling session with the instructor and persistent lateness may result in unsuccessful completion of the course.

If illness occurs or if an unexpected lateness should occur, the student should contact the instructor via e-mail or leave a voice message.

NO EXAM MAKEUPS will be given without prior permission from instructor.

- ❖ The attendance policy for this course is the same as that stated in the Montgomery College Catalog. Unexcused and excessive absences may result in an administrative drop from the course.
- ❖ Every absence, lateness to class or lab, leaving early or lack of participation in class will result in a 10 point deduction per infraction.
- ❖ Excessive infractions will result in a coaching/counseling process which result in grade deductions or unsuccessful completion of course.

BB Quizzes/Other Homework assignments

Some homework assignments will be assigned as word documents that are to be handed in on the day noted in BB.

Blackboard Quizzes will be posted under the respective folder in BB and will be due by **7:30 am** the day of the examination that covers the objectives on the respective quizzes (the due date will be posted on BB as well as the course outline of the syllabus) Quizzes not completed by the time and date due will be recorded as a zero. There will be no exceptions. Quizzes will be posted in adequate time for students to take and students must make a 90% on the quiz. Students may take the quiz multiple time until a 90% or higher score is reached. Those students who receive less than a 90% and choose not to retake the quiz will receive a zero as the grade for the quiz. Students must meet with the faculty if they are having challenges meeting the 90% grade. A 90% or higher score will be overridden by faculty and students will be given a 100% for the grade. If students have questions about this process, they need to speak to the faculty. This will be reviewed on the first day of class and recorded on collaborate.

Critical thinking Assignments (12.5%)

The ability to critically think is essential for the successful completion of the Radiologic Technology Program. Critical thinking concepts such as self assessment, evaluation, problem solving, deductive reasoning are but a few strategies employed in the diagnostic imaging environment. Use of these and other critical thinking strategies assist in the application of the book knowledge to the clinical setting. To this end throughout the two years in the program students will be required to complete specific didactic and clinical assignments used to assess critical thinking in the classroom and in the clinical rotations. In addition to critical thinking questions imbedded into each didactic exam, a percentage of the final grade for each class (including the clinical courses) will include the grade(s) from each critical thinking assignment.

Critical thinking assignments will be designed to assess student's progress in analyzing, comparing, interpreting and usage of alternative solutions for every day technical and diagnostic dilemmas commonly seen in radiology settings. This assignment is to be completed and assessed by instructor and returned to the student for personal reflection and analysis. To this end, critical thinking assignments and assessment rubrics will be incorporated into the course.

Critical thinking assignment A:

“YOU ARE THE QC SUPERVISOR!”

Image Critique critical thinking assignment rubric is attached to this syllabus. Students will be directed as to how to complete this assignment

Critical Thinking Assignment B:

Journal Article Assignment

One journal assignments related to the field radiology from the current Radiology periodicals found in the classroom, media center or other sources or from the Internet will be due this semester. **Journal assignments may be on any topic as it relates to radiology.** Date for submission of this assignment is noted in the course outline. **Printed copies of article from periodicals and from the Internet must accompany the assignment.** Students are reminded that this is an individual project. Review of the plagiarism policy signed by the student is suggested.

Guidelines for the assignment are as follows:

- Assignment must be typed with a 12 font only
- Assignments should be a minimum of 3 pages long.
- The article must be written within the last three years
- A copy of the article must be attached. If the publication date is not printed on the article, this should be submitted in bibliography style.

- If the article is from the internet, the url must be submitted, the article needs to be written within the last three years and should be from a reputable site.
- Assignments should briefly review the article submitted and students are required assess this article based on current knowledge, historical perspective or any other opinion that indicate that the student has critically evaluated this article.
- A rubric is attached to the end of this syllabus for the student to follow when writing this review

Exams (45%)

Four examinations will be given to assess student comprehension of presented materials. The dates and objectives covered in examination form are noted in the class schedule in this syllabus. Examinations will include multiple choice questions and may include matching, sequencing, true or false, fill in the blank and/or short essay questions. The point value is indicated on the examination. Multiple choice, true or false, matching questions are worth one point. Grades are calculated based on the number of points earned divided by greatest possible points. For example if the test has a total of 89 points and a student earns 79 possible points (79/89) the student's score would be 88.7% which will be rounded up to an 89%. ***Examinations whose questions are to be answered on a scantron will be graded based on the answers recorded on the scantron only.*** All examinations are reviewed in class after graded and open for discussion of content only. Concerns about calculation of grade or possible misgrading may be addressed individually with the instructor after class. Tests are kept in the student file. Students are not given them to keep.

NO EXAM MAKEUPS will be given without prior permission from instructor

Comprehensive Final Examination (35%)

The final examination is given on the date as dictated by the collegewide final schedule found in each semester's Montgomery College Credit Course Schedule and noted in the class schedule. The examination covers all material reviewed in the semester. Questions are primarily designed in multiple choice fashion although some other forms of questions may be designed

RADT 102 -Journal Article Grading Rubric

Please note that if the assignment is handed in without the a copy of the article attached an automatic grade of zero will be assigned and the rubric below will not be considered for the review.)

	Met		Not met -20	Comments
Used correct font				
Used correct size of font				
Two to three pages in length				
Spelling/ neatness				
	<i>Met</i>	<i>Partially Met -1 to 10</i>	<i>Not met -10 to -20</i>	
Reviewed all main points of the article				
Main points reviewed were written in the student's own words				
If quoting from article, appropriate usage of quotations and notation of author was used				
Student evaluated and analyzed the article by drawing conclusions, theorizing and/or assessing content to their current level of education in the field of radiography				

MONTGOMERY COLLEGE
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Radiologic Technology

RADT 102

**YOU ARE THE QC SUPERVISOR! Image Critique Critical Thinking Assignment and Rubric
ASSIGNMENT DUE AND PRESENTED IN A COMBINED LAB ON April 10, 2019**

INSTRUCTIONS: On April 3 during lab you will be given 4-5 random images recorded on films. They will not be separated by anatomy, technical/positioning factors or potential pathology. The films will have demonstrable (though not necessarily quality) images on them. The films will probably not be of the same study. You are to review the images in the April 3 2019 lab to prepare for your presentation of the images on April 10. The role of instructor as you prepare during the April 3 lab is to provide very basic guidance as to your critique. You will be presenting your findings in the April 10, 2019 combined lab. Please be prepared to discuss the following as it pertains to the images you are assessing:

Anatomy attempting to be visualized	
Positioning evaluated	
Technical factors evaluated Density/scale of contrast. Address suggested kVp and/or mAs changes	
Evidence of appropriate collimation and/or shielding if applicable	
Correct image placement (portrait or landscape)	
Markers and marker location	
As a QC supervisor. what would you direct the technologist to do to correct the image?	

