DI 140
Radiation Protection

LBCC Diagnostic Imaging Program
Summer 2021

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Class Location: https://zoom.us/j/9519289278
Office Location HOC 205
Office Hours: Email to set up a mutually convenient time

COURSE DESCRIPTION

Content is designed to provide students with an overview of the principles of radiation protection. Topics include: responsibilities of the radiographer for patients, personnel, and the public and radiation health and safety requirements of federal and state regulatory agencies, accreditation agencies, and healthcare organizations.

MOODLE

We'll be using Moodle for this class. Before logging in for the first time, you will have to claim your account at **https://identity.linnbenton.edu/**. If you have any problems logging into Moodle, please contact the **Student Help Desk** by calling **541-917-4630**, texting **541-704-7001**, emailing **student.helpdesk@linnbenton.edu** or logging into a live Zoom video call **https://linnbenton.zoom.us/j/5419174645** (staffed Monday through Thursday 9am to 7pm and 11am to 3pm Friday through Sunday).

REQUIRED TEXT

- **Radiologic Science for Technologists, Twelfth Edition** by Stewart Bushong (Provided)

BASIC NEEDS STATEMENT

Any student who has difficulty affording groceries or food, or who lacks a safe and stable place to live, is urged to contact a **Student Resource Navigator** in the Single Stop Office (T-112): **Amanda Stanley**, **stanlea@linnbenton.edu**, 541-917-4877. The navigator can connect students to resources. Furthermore, please **talk with your instructor** if you are comfortable doing so. This will enable them to provide any resources that they may have.

SCHEDULE

- **Class** is normally held in **real time** in the **Virtual Classroom** on **Wednesdays 11:00 a.m. to 1:15 p.m.**
  - Here is the link to the Traditional summer term schedule.
    - Week 0 Week 1 Week 2 Weeks 3-8 Week 9
  - Here is the link to the Distance Education (DE) student summer term schedule.
    - Week 0 Week 1 Week 2 Weeks 3-8 Week 9
  - The TRAD/DE schedule for Week 10 will be provided by July 31, 2021.
  - It is expected **students will attend all lectures**. Lectures are ***not recorded***.

- **Weekly quizzes** are held during class on **Wednesday**, beginning **July 7th.**
    - A Module 0 quiz is required. However, students will be able to decide when to take it. The quiz will be open **between Saturday, June 19 at 12:00 p.m. and Sunday, June 27 at 11:59 p.m.** Students who choose to not take the quiz during this window of time will not be able to make it up.
    - The password for the weekly quiz will be given in the Virtual Classroom at 11:00 a.m. after students have shown their workspaces. Make sure you are logged in to Moodle a few minutes early to take your quiz promptly at **11:00 a.m**. Class will begin in the Virtual Classroom once the quiz is over.
- The **final exam** for this course is scheduled for **Wednesday, August 25th** at **9:00am**.

CONTACTING THE INSTRUCTOR

Email is the best way to contact the instructor for this class. Emails received between 8:00 a.m. Monday and 5:00 p.m. Friday are generally returned within 24 hours. Emails received after 5:00 p.m. on Friday, or on Saturday or Sunday will be returned on Monday mornings.

Students who call and leave a message on the instructor's office phone should be aware that the instructor is only at the Healthcare Occupations Center 1-2 days/week. Students wishing for a sooner response should email the instructor.

Office hours are held by appointment. Please email to arrange a mutually convenient time. By appointment office hours may take place in the Virtual Office, via phone or in person depending on instructor and student schedules.

COURSE OBJECTIVES

- Identify ionizing radiation sources from natural and manmade sources.
- Identify and justify the need to minimize unnecessary radiation exposure of humans.
- Describe the ALARA concept.
- Explain the objectives of a radiation protection program.
- Comply with legal and ethical radiation protection responsibilities of radiation workers.
- Define radiation and radioactivity units of measurement.
- Identify effective dose limits (EDL) for occupational and nonoccupational radiation exposure.
- Identify the basis for occupational exposure limits.
- Describe the relationship between irradiated area and effective dose.
- Describe the concept of the negligible individual dose (NID).
- Identify effective dose limits for the embryo and fetus in occupationally exposed women.
- Describe the theory and operation of radiation detection devices.
- Identify appropriate applications and limitations for each radiation detection device.
- Express the need and importance of personnel monitoring for radiation workers.
- Describe personnel monitoring devices, including applications, advantages and limitations for each device.
- Compare values for individual effective dose limits for occupational radiation exposures (annual and lifetime).
- Interpret personnel monitoring reports.
- Explain the relationship of beam-limiting devices to patient radiation protection.
- Discuss added and inherent filtration in terms of the effect on patient dosage.
- Explain the purpose and importance of patient shielding.

- Identify various types of patient shielding and state the advantages and disadvantages of each type.
- Use the appropriate method of shielding for a given radiographic or fluoroscopic procedure.
- Explain the relationship of exposure factors to patient dosage.
- Explain how patient position affects dose to radiosensitive organs.
- Identify the appropriate image receptor that will result in an optimum diagnostic image with the minimum radiation exposure to the patient.
- Select the immobilization techniques used to eliminate voluntary motion.
- Apply safety factors for the patient, health care personnel and family members in the room during radiographic/fluoroscopic procedures.
- Distinguish between perceived risk and comparable risk.
- Perform calculations of exposure with varying time, distance and shielding.
- Demonstrate how time, distance and shielding can be manipulated to keep radiation exposures to a minimum.
- Identify performance standards for beam-limiting devices.
- Describe procedures used to verify performance standards for equipment.
- Describe the operation of various interlocking systems for equipment.
- Identify conditions and locations evaluated in an area survey for radiation protection.
- Distinguish between controlled and non-controlled areas and list acceptable exposure levels.
- Describe “Radiation Area” signs and identify appropriate placement sites.
- Describe the function of federal, state and local regulations governing radiation protection practices.
- Describe the qualifications and responsibilities of a radiation safety officer.
- Demonstrate how the operation of various x-ray and ancillary equipment influences radiation safety and describe the potential consequences of equipment failure.
- Identify emergency procedures to be followed during failures of x-ray equipment.
- Discuss the relationship between workload, energy, half-value layer (HVL), tenth-value layer (TVL), use factor and shielding design.
- Distinguish between primary and secondary radiation barriers.
- Describe the minimum source-to-tabletop distances for fixed and mobile fluoroscopic devices.
- Describe how isoexposure curves are used for radiation protection.

STUDENT EXPECTATIONS

- **YOU are RESPONSIBLE for your own LEARNING.**
- **We provide the structure for that learning, but it is up to you to decide how much or little you get out of the class. It is imperative that you understand “PRACTICE MAKES PERFECT”.**
- **LBCC faculty provides the classroom lecture portion of the course.**
- **Each student is expected to spend extra time studying on his/her own.**
- **There are specific deadlines, so this course is <u>not</u> self-paced. It is up to the student to keep up with his/her assignments and deadlines.**
- **Issues with technology are not valid reasons for turning in late work.**
- **<u>No late work is ever accepted</u>.**

COURSE OUTLINE

Week/Module	Date	Topic	Required Reading	HW	Assignment	Assessment
0	M 6/21 to F 6/25	Orientation	Syllabus Become familiar with your Bushong textbook (see specific things to review on the "Required Reading" link in Module 0)	HW 0	**Assignment 0 due by Sun 6/27 @ 11:59pm**	**Quiz 0 due by Sun 6/27 @ 11:59pm**
1	W 6/30	Intro to Radiation Protection	Article 1-1: Radiation Basics Article 1-2: The Surprising Dangers of CT Scans and X-Rays Article 1-3: Radiation Protection	HW 1	**Assignment 1 due by Sun 7/4 @ 11:59pm**	**Quiz 1 Wed 7/7 @ 11:00am**
2	W 7/7	Equipment and Room Design	Bushong p 491-497	HW 2	**Assignment 2 due by Sun 7/11 @ 11:59pm**	**Quiz 2 Wed 7/14 @ 11:00am**
3	W 7/14	Protecting the Patient	Bushong p 528-537 Article 3-1: Shields and Radiation Safety Article 3-2: A Patient Might be Pregnant- Now What? Article 3-3: Radiation Protection in Pediatric Imaging Article 3-4: AAPM policy text on gonadal shielding	HW 3	**Assignment 3 due by Sun 7/18 @ 11:59pm**	**Quiz 3 Wed 7/21 @ 11:00am**
4	W 7/21	Protecting the Technologist & Staff	Bushong p 539-555 Article 4-1: Radiation Safety for Radiologic Technologists	HW 4	**Assignment 4 due by Sun 7/25 @ 11:59pm**	**Quiz 4 Wed 7/28 @ 11:00am**

5	W 7/28	Radiation Dose & Dosimetry	Bushong p 497-506, 547-555 Article 5-1: Radiation Dose in X-Ray and CT Exams	HW 5	**Assignment 5 due by Sun 8/1 @ 11:59pm**	**Quiz 5 Wed 8/4 @ 11:00am**
6	W 8/4	Radiation Protection Math	Bushong p 145-149, 481-485	HW 6	**Assignment 6 due by Sun 8/8 @ 11:59pm**	**Quiz 6 Wed 8/11 @ 11:00am**
7	W 8/11	Regulations & Organizations	Review OARS 333 and 337 ARRT Standards of Ethics	HW 7	**Assignment 7 due by Sun 8/15 @ 11:59pm**	**Quiz 7 Wed 8/18 @ 11:00am**
8	W 8/18	Review	All reading assignments/notes to date	NONE		
9	W 8/25	Final Exam	NONE	NONE	NONE	**FINAL EXAM W 8/25 @ 9:00am**

MODULES

This course has one module per week inside Moodle. Each module is made available on Saturday afternoons at 12:00 p.m. Module 0 will unlock at 12:00 p.m. on Saturday, June 19th. Module 1 will unlock on Saturday, June 26th. Module 2 will unlock on Saturday, July 3rd, etc. Your instructor is often working on the next module during prep time on Fridays and even up until unlock time on Saturday morning. Unlocking the module earlier than Saturday morning would require your instructor to email students multiple times about changes. Students desiring to get a headstart on the next week's content may consult the syllabus for the required reading assignment and get started on that.

IMPORTANT: Students are **expected** to review the "**Module # Information**" **book** (look for the green book icon) linked inside each Moodle module. **Other activities within that module will not unlock until after the student has reviewed the relevant module information**. If you discover you cannot see the module's homework, assignment, quiz or other activities, **go back to the "Module # Information" link and review each of the pages contained within it**. Once you've done that, the rest of the content will be unlocked and available to you.

MOODLE HELP

Help with **Moodle** is available via the **Student Help Desk** in the LBCC main campus Library. The hours are **Monday through Thursday 8:00 a.m. to 4:00 p.m.**. If you have any problems with Moodle, please contact the **Student Help Desk** by calling **541-917-4630**, texting **541-704-7001**, emailing **student.helpdesk@linnbenton.edu** or logging into a live Zoom video call **https://linnbenton.zoom.us/j/5419174645** (staffed Monday through Thursday 9am to 7pm and 11am to 3pm Friday through Sunday).

If LBCC tech support is **not available** or is **unable to help** with any **Moodle issues**, please contact the instructor via email at hansenc@linnbenton.edu with a **description of the problem**, what you've **tried** and what **browsers** you've used.

ONLINE RESOURCES/LINKS

This hybrid online course contains many links. A concerted effort is made to ensure all materials are accessible. However, if you discover a link to be broken or missing, *first* check it in another browser. Sometimes things work in Mozilla but not Chrome or vice versa. **Use of Internet Explorer is strongly discouraged**. If you have checked it in at least two browsers and discover that it is still not functional, please email the instructor to let her know which link is broken/non-functional, which browsers you have checked and where the specific link is located so the problem may be remedied.

PRINTING

The LBCC campus store is providing printing services for students who need them. To use this service, students should **email printing@linnbenton.edu** with their document as an attachment. The LBCC print shop will print it for them, and notify them when it is available for pickup at the LBCC Campus Store's curbside location. Students should direct questions about printing costs to **printing@linnbenton.edu** as well.

CLASS ATTENDANCE

Students are expected to attend scheduled Virtual Classroom sessions provided by LBCC faculty for this course at the scheduled time. Students will be called upon during class. Students enrolled in Virtual Classroom sections of the course are required to participate utilizing a webcam.

- Lectures will NOT be recorded. **Real-time interaction is an integral part of each lecture** and cannot be substituted.
- Students are expected to complete weekly required text readings **prior** to Virtual Classroom lessons with the LBCC faculty.
- Students may access the Virtual Classroom for this course at https://zoom.us/j/9519289278
- Students should bookmark this link in several browsers (Mozilla, Chrome, etc.) so that it is available should access to the classroom via Moodle unavailable for any reason.
- Students with smartphones are encouraged to download the Zoom app to use as a backup plan for accessing a live class session should internet service on the student's computer be interrupted.
- If the student has difficulty accessing the Virtual Classroom or other tech issues related to the Virtual Classroom, the student should call **Zoom Tech Support at 1-888-799-9666 extension 2**.

VIRTUAL CLASSROOM EXPECTATIONS

1. Students must have a **headset with an attached microphone on at all times**. Do not talk into the computer's built-in microphone or use your computer's speakers to hear class! Feedback is a major issue and can be avoided by wearing a headset.

2. Arrange yourself in your work space in such a way that **you are well lit** and **easy to see at all times**. Your back should not be to a window or other bright light source.

3. You must be **on webcam at all times**. We need to see your **entire face**. The top of your head or just your eyes does not suffice!

4. You will be required to **show your workspace prior to each quiz**. Your workspace should be clean with no books/papers/etc open or around. Your cell phone should be put away.

5. Your **webcam** must be **able to show your workspace**. For some students, this may mean you have to purchase a separate webcam that attaches to your computer.

6. When asked to show your work space, do so in a **slow and deliberate sweeping motion** so we can see the whole area. This should take about **5-7 seconds**. Doing it too quickly negates the purpose and you may be asked to do it again if you go faster than this.

7. If you have a **question or a comment**, please **raise your hand**.

8. Please **mute your microphone** unless it is your turn to talk.

9. Students are expected to treat the virtual classroom like a **traditional classroom**. It is essential students **make arrangements** to **attend class** in a **distraction-free space**. Household chores, babysitting, maintenance appointments, watching TV (or having a TV on in the background), etc. should *not* be performed or scheduled during class time.

    a. Ask yourself: Would I _____ in a traditional classroom?

    b. **If the answer is no, then it should not be done in the virtual classroom either.**

10. Student **participation** in the virtual classroom is **evaluated each term** on the student's **professional evaluation** and students will receive a **score** to reflect the level to which they were **engaged** and **participated** in the virtual classroom.

HOMEWORK (8 HOMEWORK ASSIGNMENTS @ 0 POINTS EACH)

There will be weekly *ungraded* homework assignments for students to use as a study tool. The homework assignments allow the student to determine how well they understand the material and are provided as an additional study resource for the quizzes and for the final exam. Homework will be made available online within the Moodle class Saturday afternoons at 12:00 p.m. the week it is assigned and must be completed by the following Sunday night at 11:59 p.m. Homework may be completed and submitted multiple times. Make sure to "submit" each time you take it or you will be locked out. The homework assignments are provided as practice. They will allow almost instantaneous feedback, so that students may see if there are specific areas that need additional study/review. Students will have access to online homework questions for topics covered in class. The material covered in the homework can come from the textbooks, lectures, homework , and prepared activities. The homework assignments may be completed using whatever resources are available. It is expected that students will complete the homework assignment each week at least once.

ASSIGNMENTS (8 ASSIGNMENTS @ 20-60 POINTS EACH)

This course has **one graded assignment per week**. Weekly assignments are always due by **Sunday night at 11:59 p.m**. Review the course calendar for details. **Assignments must be submitted by the deadline in order to be graded.** This requires students to select the **submit** button within the Moodle assignment. Clicking the "submit" button by the deadline is the electronic equivalent of the student consciously choosing to submit their work for grading on time to their instructor. **If the assignment is not submitted, it will not be graded and the student will earn a zero for that assignment.**

Students may enter and save the assignment as many times as they want during the week, but they may only submit it once. **Once an assignment has been submitted, it cannot be accessed again until the instructor has graded it.**

Students are encouraged to not wait until the last minute to work on or complete assignments. Students are *encouraged* to make back-ups of their work by copying and pasting written answers into a Word or Google doc to refer to should there be a technology failure. **Issues with technology are not valid reasons for turning in late work**. Please allow up to one week *from the due date* for the assignment to be graded and returned. Late work is not accepted.

ADDITIONAL PROJECTS / OTHER ASSIGNMENTS

Students may be assigned weekly individual and/or group assignments/projects throughout the term at the discretion of the instructor. Some additional projects/assignments may be graded and some assignments/projects may not be graded, depending on the task. Completing ungraded assignments/projects is considered to be part of the participation of the course. Please allow up to one week *from the due date* for the additional assignment/project/other assignment to be graded and returned.

WEEKLY QUIZZES (8 QUIZZES @ 10 POINTS EACH)

Quizzes assess content from the previous week's reading material, class activities, lab and lecture. **All quizzes are expected to be taken with integrity.** This means they are **closed note/closed book** and provide a true assessment of your learning. Quizzes may only be taken **once**. With the exception of the Week 0 quiz (see the Course Outline above), quizzes will be given **once a week** on **Wednesdays** during the **first 10 minutes** of class beginning at 11:00 a.m.

> **Taking quizzes and other online assessments with integrity is one way in which you demonstrate your ability to abide by the 8th item of the ARRT Code of Ethics:**
>
> ***"The radiologic technologist practices ethical conduct appropriate to the profession."***

Quizzes will be given during the **first 10 minutes** of class beginning at 11:00 a.m. The amount of time given for a quiz may vary depending on the number of questions. Students are encouraged to login to Moodle and the Virtual Classroom a minimum of 5-10 minutes early. The **password** for the quiz will be given inside the Virtual Classroom once students have done a "sweep" of their workstations to demonstrate that no notes, books, cell phones or other resources are at their workstation. Once the password has been given, students will need to click over to the quiz inside the Radiation Protection class in Moodle and take it. Each assessment has a maximum of 10-20 minutes allowed, depending on the quantity and type of questions asked. Students not logged into class by **11:05 a.m.** will *not* be given the password or have access to the quiz. Students not finished when time is up will not be granted additional time and will be "kicked out" of the assessment.

The guideline we use for determining the amount of time to be used for an assessment is based on the following:

- 1 minute (60 seconds) for each multiple-choice, true/false, or fill-in-the blank question
- 2 minutes (120 seconds) for each matching or short answer question
- 3 minutes (180 seconds) for each essay question

We have developed this guideline to help students be successful when taking the national licensing exam given by the ARRT. The ARRT exam allows *less than one minute per multiple choice question*. To help students best prepare for this capstone exam and entry into the profession, we have found it important to help students prepare by getting used to one minute per multiple choice question during the duration of the program.

Students will need to use their time wisely when taking assessments. Don't spend too much time on any one question. Answer the questions you know first and skip the ones you don't initially know. Once you have gone through the entire assessment, go back to answer any unanswered questions. Any questions that are not answered when time is up may not be made up or completed later, so it's a good idea to record your best guess.

Quizzes are closed note, closed book assessments and may only be taken once. All students are expected to take quizzes with **integrity**, jeopardizing neither their own work, nor that of others. Once a student begins taking a quiz, he/she **must finish**. The assessment may not be saved and resumed at a later time.

Class will resume at once the quiz is over inside the Virtual Classroom. Class will not wait for students who are late finishing assessments.

Please allow **up to one week** *from the due date* for the quiz to be graded and returned.

POP QUIZZES (5 POINTS EACH)

Pop quizzes may be given at any time at the instructor's discretion. Pop quizzes may be given in the Virtual Classroom. Students absent from class for any reason when a pop quiz is given may not make up the assignment or missed points. Students late to the Virtual Classroom when a pop quiz is announced may not take the pop quiz and are thus ineligible to earn points on the pop quiz.

WRITTEN FINAL EXAM (300 POINTS)

The final exam will be comprehensive and consist of multiple choice questions. It will be closed note/closed book and proctored at the Lebanon site. The date and time of the final exam will be announced as soon as it has been scheduled by the program director. Once a student begins his/her final exam, he/she may not leave the testing room. If a student leaves the testing room during the final, he/she will only be graded on the portion completed prior to leaving the room. Please plan accordingly.

GRADING SCALE

This is a three (3) credit, letter grade course. When these points are combined, the final grading scale is:

A = 91.5 – 100%
B = 82.5 – 91.4%
C = 74.5 - 82.4%
FAIL = ≤ 74.4%

SYLLABUS CHANGE POLICY

The syllabus is subject to change as the instructor evaluates the progress of students and their understanding of concepts.

COURSE FAILURE POLICY

Diagnostic Imaging students must complete each course, including this one, within the Diagnostic Imaging program with a grade of at least 75%. A letter grade of F will be applied to the course if a student scores a 74.4% or below. The Diagnostic Imaging program does not utilize the letter grade "D". Students who can not pass coursework with the minimum standard grade will fail academically, which will then make the student ineligible to proceed in the program. As a result of academic failure, the student will be terminated from the program. Students who fail didactic can only enter the program again through reapplication.

LBCC COMPREHENSIVE STATEMENT OF NONDISCRIMINATION

LBCC prohibits unlawful discrimination based on race, color, religion, ethnicity, use of native language, national origin, sex, sexual orientation, gender, gender identity, marital status, disability, veteran status, age, or any other status protected under applicable federal, state, or local laws. For further information see Board Policy P1015 in our Board Policies and Administrative Rules. Title II, IX, & Section 504: Scott Rolen, rolens@linnbenton.edu, 541-917-4425; Katie Winder, winderk@linnbenton.edu, 541-917-535, LBCC, Albany, Oregon. To report: linnbenton-advocate.symplicity.com/public report.

DISABILITY SERVICES POLICY

You should meet with your instructor during the first week of class if:

- You have a documented disability and need accommodations.
- Your instructor needs to know medical information about you.
- You need special arrangements in the event of an emergency.

If you have documented your disability, remember that you must make your request for accommodations through the Center for Accessibility Resources (CFAR) Online Services webpage every term in order to receive accommodations. If you believe you may need accommodations but are not yet registered with CFAR, please visit the CFAR Website for steps on how to apply for services or call 541-917-4789.

STATEMENT OF INCLUSION

The LBCC community is enriched by diversity. Everyone has the right to think, learn, and work together in an environment of respect, tolerance, and goodwill. I actively support this right regardless of race, creed, color, personal opinion, gender, sexual orientation, or any of the countless other ways in which we are diverse. (Related to Board Policy #1015)