LBCC Diagnostic Imaging Program

DI 141 Radiation Biology

Fall 2021 CRN 25315

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Virtual Classroom https://zoom.us/j/9519289278
Office Location: HOC 205
Virtual Office: https://linnbenton.zoom.us/j/3115216059
Office Hours: By appointment. Email to set up a mutually convenient time.

COURSE DESCRIPTION

Content is designed to provide an overview of the principles of the interaction of radiation with living systems. Radiation effects on molecules, cells, tissues and the body as a whole are presented. Factors affecting biological response are presented, including acute and chronic effects of radiation.

REQUIRED TEXT (PROVIDED)

- *Radiologic Science for Technologists, 12th edition*, by Stewart C. Bushong

SUPPLEMENTAL TEXTS (PROVIDED)

- *Principles of Radiographic Imaging: An Art and a Science,* by Richard R. Carlton

MOODLE

We'll be using Moodle for this class. 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**. They are staffed at varying times Mondays through Saturdays and closed on Sundays.

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.

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

- This is a **hybrid** class. Most weeks the course is **asynchronous**, meaning students complete work on their own, but by the required deadlines (see the Course Outline on page 4). **Four live review sessions** will be held for this class in the Zoom virtual classroom. Attendance is mandatory. These review sessions will be held on:
    - **Wednesday, October 13th from 2:00pm to 3:00pm**
    - **Wednesday, November 3rd from 2:00pm to 3:00pm**
    - **Wednesday, November 17th from 2:00pm to 3:00pm AND**
    - **Monday, November 22nd, 2020 from 2:00pm to 3:30pm**
- Lectures have been **recorded** for each week's topic and embedded within a **Moodle lesson**. Once the lesson has been completed, students will have access to a **playlist** with all lesson videos they may reference without having to re-do the lesson.
- Students are **expected** to **review** each week's **Lesson** in Moodle **between** the time the **Module opens on Saturdays at 12:00pm** and **Fridays at 11:59pm**. This is to allow adequate time for students to work on the week's assignment and take the quiz.
- **Quizzes (Quiz #)** are taken **asynchronously** by students each week. Students will have access to each module's quiz **following the completion of each module's lesson.** The lesson **MUST be completed** in order for the **quiz** to **unlock**. Students *will not* be permitted to take the quiz without **completing the lesson** first.
- The deadline for taking the quiz each week is **Sunday night at 11:59 pm**. The quizzes assess the student's understanding of the required reading, assigned homework and recorded lecture.
- **Assignments** are also due by **Sunday nights at 11:59pm** each week.
- This course *does not* have a **midterm** exam.
- The **final exam** for this course will be held on **Monday, November 29th from 9:00am to 11:00am** in the **virtual classroom**.

COURSE OBJECTIVES

- Describe principles of cellular biology.
- Discriminate between direct and indirect ionizing radiation.
- Discriminate between the direct and indirect mechanisms of radiobiological effects.
- Discuss the direct and indirect effects of ionizing radiation.
- Identify sources of electromagnetic and particulate ionizing radiations.
- Identify sources of radiation exposure.
- Describe radiation-induced chemical reactions and potential biological damage.
- Evaluate factors influencing radiobiologic/biophysical events at the cellular and subcellular level.
- Identify methods to measure radiation response.
- Describe physical, chemical and biological factors influencing radiation response of cells and tissues.
- Explain factors influencing radiosensitivity.
- Recognize the clinical significance of lethal dose.
- Identify specific cells from most radiosensitive to least radiosensitive.
- Employ dose response curves to study the relationship between radiation dose levels and the degree of biologic response.
- Examine effects of limited vs. total body exposure.
- Relate short-term and long-term effects as a consequence of high and low radiation doses.
- Differentiate between somatic and genetic radiation effects and discuss specific diseases or

syndromes associated with them.
- Discuss stochastic (probabilistic) and non-stochastic (deterministic) effects.
- Differentiate between the stochastic (probabilistic) and nonstochastic (deterministic) effects of radiation exposure.
- Describe embryonic and fetal effects of radiation exposure.
- Discuss risk estimates for radiation-induced malignancies.
- Describe acute radiation syndrome.

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 2-3 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.

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 their own to become proficient.**
- **If you do not understand something or need clarification, it is your responsibility to ask for assistance.**
- **There are specific deadlines, so this course is not self-paced. It is up to the student to keep up with their assignments and deadlines.**
- **Issues with technology are not valid reasons for turning in late work.**
- **No late work is ever accepted.**

COURSE OUTLINE

Week	***Dates***	***Topic***	***Required Reading***	***HW***	***Lesson***	***Assignments***	***Assessment***
1	9/27-10/3	Intro to Radiation Biology	Bushong Chapters 10 & 29 Article: *Radiation Biology and Protection*	**HW 1** **20 Notecards**	**Lesson 1** due by **FRI 10/1 @ 11:59pm**	**Assignment 1** due by **SUN 10/3 @ 11:59pm**	**Quiz 1** due by **SUN 10/3 @ 11:59 PM**
2	10/2-10/10	Principles of Radiation Biology	Bushong Chapter 30	**HW 2** **20 Notecards**	**Lesson 2** due by **FRI 10/8 @ 11:59pm**	**Assignment 2** due by **SUN 10/10 @ 11:59pm**	**Quiz 2** due by **SUN 10/10 11:59 PM**
3	10/9-10/17	DNA Damage and Repair	Bushong Chapters 31 & 32	**HW 3** **20 Notecards**	**Lesson 3** due by **FRI 10/15 @ 11:59pm**	**Assignment 3** due by **SUN 10/17 @ 11:59pm**	**Quiz 3** due by **SUN 10/17 @ 11:59 PM**
3	**W 10/13 2:00pm to 3:00pm**	**Mandatory Review Session**					
4	10/16-10/24	Target Theory & Dose Response	Bushong Chapters 30, 31 and 32	**HW 4** **20 Notecards**	**Lesson 4** due by **FRI 10/22 @ 11:59pm**	**Assignment 4** due by **SUN 10/24 @ 11:59pm**	**Quiz 4** due by **SUN 10/24 @ 11:59 PM**
5	10/25-10/31	*Midterm week*					
6	10/30-11/7	Acute Effects of Radiation Exposure	Bushong Chapter 33	**HW 6** **20 Notecards**	**Lesson 6** due by **FRI 11/5 @ 11:59pm**	**Assignment 6** due by **SUN 11/7 @ 11:59pm**	**Quiz 6** due by **SUN 11/7 @ 11:59 PM**
6	**W 11/3 2:00pm to 3:00pm**	**Mandatory Review Session**					
7	11/6-11/14	Late Effects of Radiation Exposure	Bushong Chapter 34, p. 461-472	**HW 7** **20 Notecards**	**Lesson 7** due by **FRI 11/12 @ 11:59pm**	**Assignment 7** due by **SUN 11/14 @ 11:59pm**	**Quiz 7** due by **SUN 11/14 @ 11:59 PM**
8	11/13-11/21	Radiation and Pregnancy	Bushong Chapter 34, p. 472-477	**HW 8** **20 Notecards**	**Lesson 8** due by **FRI 11/19 @ 11:59pm**	**Assignment 8** due by **SUN 11/21 @ 11:59pm**	**Quiz 8** due by **SUN 11/21 @ 11:59 PM**
8	**W 11/17 2:00pm to 3:00pm**	**Mandatory Review Session**					

9	11/20-11/28	Review	All reading to date				
9	**M 11/22 2:00pm to 3:30pm**	**Mandatory Final Review Session**					
10	M 11/29 9:00am to 11:00am	Final Exam					

MODULES

This course has one module per week inside Moodle. Each module is generally made available on **Saturday at 12:00 p.m.** Module 1 will unlock at noon on Saturday, Saturday, September 25th. Module 2 will unlock at noon on Saturday, October 2nd, 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 week's Moodle folder.

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**. Difficulties have also been **occasionally** noted with **Safari**. 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.

READING

Reading is assigned each week. It's strongly recommended that students **complete the reading assignment *prior* to reviewing the recorded lesson**. Regardless of whether or not students choose to follow this recommendation, it is expected that students will complete the required reading each week.

CLASS ATTENDANCE

Students are expected to attend the four scheduled Virtual Classroom sessions provided by LBCC faculty for this course at the scheduled times. Students will be called upon during class. Students enrolled in Virtual Classroom sections of the course are required to participate utilizing a webcam and headset with an attached microphone.

- **Interaction during the live review sessions is an integral part of class and cannot be substituted.**
    - Attendance and participation will both be scored as part of your final evaluation this term. Tardies, not being present in class when called upon and/or missing all or portions of *any* Diagnostic Imaging class will result in a lower score in the "Punctuality and Attendance" category on your final evaluation.

- 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 be 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 may be asked to show **your workspace**. 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 quick 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.

COURSE ASSIGNMENTS

Students will be required to take weekly quizzes, submit online graded weekly assignments, and complete other assignments/ projects (both graded and ungraded) as given. A written final exam constitutes a large portion of the final grade. Assignments and quizzes must be completed/submitted by the due date in order to be graded. Late work is not accepted.

HOMEWORK (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 portions of the reading material and are provided as an additional study resource for the weekly pre-lecture quizzes, midterm and the final exam. Homework will be made available online within the Moodle class Saturday 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. The homework assignments are provided as practice. They will allow almost instantaneous feedback, so students may see if there are specific areas that need additional study/review.

LESSONS (7 LESSONS @ 10-20 POINTS EACH = ~100 POINTS)

Students are expected to complete the Lesson in each week's Module. Students will have access to the lesson beginning at **12:00pm on Saturdays** and will have until **11:59pm on Friday** nights to complete it. Students will **answer questions** after each video portion of the lesson and a **point will be earned** for each **correct** answer. If a student answers *incorrectly*, they will have another **opportunity** to answer the question. *Students may complete the lesson up to five times*. The **highest score** earned from the lesson will be **recorded** in the **gradebook** and calculated as part of the students **cumulative course grade**.

All video pages must be visited, all questions must be answered and the last **"end of lesson" button** clicked in order to have the lesson **100% completed** and the **score recorded** in the gradebook. A **progress bar** is included as part of the lesson to help students visualize the percentage of the lesson completed. **Each lesson may only be completed once**. Once the lesson is completed, a playlist of all the videos in the lesson will be made available in Moodle, along with the post-lecture slides so the students may have continued access to the content for review if and when desired throughout the term.

Students should also be aware that the **weekly quiz** will *not* unlock or be **available** to them until ***after*** the student has **completed the week's lesson**.

WEEKLY QUIZZES (7 QUIZZES @ 10 POINTS EACH = 70 POINTS)

Quizzes (Quiz #) assess the student's understanding of the required reading, assigned homework and the recorded lecture (as contained within the weekly Lesson). Quizzes are taken **asynchronously** by students each week. Students will have access to each module's quiz **once the lesson has been completed until Sunday night at 11:59 p.m.** Quizzes are **closed note, closed book** and may only be taken **once**.

The amount of time given for a quiz may vary depending on the number of questions. The guideline we use for determining the amount of time to be used for an assessment is based on the following:

- 1 minute for multiple-choice, true/false, or fill-in-the blank questions
- 2 minutes for matching or short answer questions
- 3 minutes for essay questions

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.

Once a student begins taking a quiz, they **must finish**. The assessment may not be saved and resumed at a later time.

All students are expected to take quizzes with **integrity**, jeopardizing neither their own work, nor that of others.

Every quiz will start with an **ethics statement**. This is where students are asked to verify that they are taking the quiz *without using notes, accessing the internet or other forms of academic dishonesty.* Taking quizzes with integrity means students are **abiding by the 8th item of the ARRT Code of Ethics**:

> ***"The radiologic technologist practices ethical conduct appropriate to the profession."***

An extra ***30 seconds*** **has been added to each quiz** to allow you time to **read this statement** and then **verify that you are taking your assessment with good integrity** by selecting the **"yes" option**.

Please allow **up to one week *from the due date*** for the quiz to be graded and returned. You will know your quiz has been reviewed and graded by your instructor when you see a score and the initials "**chp**" in the comments for that particular quiz.

ASSIGNMENTS (7 ASSIGNMENTS @ 30-50 POINTS EACH = ~300 POINTS)

There will be weekly graded assignments. The assignments are **due by SUNDAY night at 11:59 p.m.** the week it is assigned. Assignments are to be completed online within the Moodle class. Assignments may only be submitted once. Assignments will be **made available Saturdays at 12:00 p.m.** the week it is assigned and **must be completed by the following Sunday night at 11:59 p.m**. Weekly assignments are open note/book. You may work on your assignments with other students, but it is expected any work you submit is your own. Short answer/essay questions should be ***written in your own words***. Students who submit identical answers will not receive credit as this is considered plagiarism. Consequences can be severe for plagiarism; please see the Academic Honesty Policy for more 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. If the assignment is not submitted, it will *not* be graded and the student will earn a zero for that assignment. Late assignments will not be accepted. Assignment answers will not be available until after all assignments have been submitted.

Assignments will be **graded** and **made available** for review **within 1 week of the due date**. You will know your assignment has been reviewed and graded by your instructor when you see a **score** and the **initials "chp"** in the **comments** for that particular assignment.

20 NOTE CARDS (~140 TOTAL NOTE CARDS @ 0 POINTS EACH = 0 POINTS)

You will be provided a list of **20 terms/concepts/ideas** each week. You are expected to create one handwritten or electronic note card for each term/concept/idea. Please note: choosing to **handwrite** your notecards may be **more beneficial** to you than typing them, so handwriting is encouraged! Students who opt to do electronic notecards are encouraged to register with a free website such as StudyBlue, Quizlet or Cramberry.

Write the **required term on one side** and a **definition/explanation on the other**. It is expected that you will use these note cards to quiz yourself and your classmates as you prepare for the final exam. These note cards do not count for points, but it is expected that you will complete them each week to help you study for the midterm and final.

Past students have also reported that they found these notecards **helpful** for **review** in **preparation** for the **ARRT licensing exam**, so students are encouraged to keep them once the course has been completed!

POP QUIZZES (POINTS TBA)

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

PROJECTS / OTHER ASSIGNMENTS (POINTS TBA)

Students may be assigned specific group projects and/or solo projects or other assignments throughout the term at the discretion of the instructor. Some additional projects/assignments will be graded and some assignments/projects will not be graded, depending on the task. Completing ungraded assignments/projects is considered to be part of the participation of the course.

FINAL EXAM (1 FINAL EXAM @ 400 POINTS)

The final exam will be **comprehensive** and will cover material presented in weeks 1 through 8 of the course. It will be closed note/book and proctored in the virtual classroom. The final exam will consist of multiple-choice questions. The final exam for this course will take place on **Monday, November 29, 2021 from 9:00am to 11:00am**.

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%

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.

SYLLABUS CHANGE POLICY

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

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)