RDTK 2640 Fall 2015

RADIATION BIOLOGY AND PROTECTION
Lecture Hours: 2 (2 Lec, TH 9:00-11:00 HS124) **Lab Hours: 0** **Credit Hours: 2**

Instructor: Jennifer Harshman
Office: HS 112B 268-2619 **Office Hours**: 8-9:00 TH **Email**: jharshman@caspercollege.edu

Course Description:
The effects of ionizing radiation on biological systems and essential radiation protection guidelines to minimize radiation exposure of the radiographer, the patient, and the public are covered.

Prerequisites:
ZOO 2010, RDTK 1610.

Required Texts:
Essentials of Radiation Biology and Protection, Forshier, Steve, Delmar, 2009 and
Text book /Workbook, 2009

Methodology:
Lecture, discussion, presentation and demonstration.

Outcomes: Students will have an understanding and practical knowledge of radiation safety.
3. Solve problems using critical thinking and creativity (Critical Thinking Activity Case Presentations)
5. Appreciate aesthetic and creative activities (Life Cycle of the Electron assignment)

Goal/Class Objectives:
The student will:

1. Gain a respect for ionizing radiation and its effects on the human being - self and others.
2. Define terms related to the measurement of radiation.
3. Identify regulations related to the field of radiobiology.
4. Identify parts and functions of cellular structure for further study on cellular effects of radiation.
5. Understand the different system syndromes in relation to radiation exposure.
6. Explain the differences between hematologic and cytogenetic effects of radiation.
7. Analyze the stochastic and non-stochastic effects of radiation exposure.
8. Identify the risk estimation models involved in radiation biology.
9. Discuss the possible genetic and fetal effects of irradiation.
10. Gain a working knowledge of the areas important in radiation protection of personnel and how to reduce the exposure during specific procedures.
11. Explain the different radiation monitoring devices.
12. Identify the structural shielding requirements for radiation protection.
13. Define the dose limits for occupational and non-occupational exposure.
14. Gain a working knowledge of the areas used to reduce patient exposure during imaging procedures.
15. Know how to apply the ALARA concept in daily practice.
16. Understand how to protect patient and other personnel from radiation
17. Through case studies use critical thinking skills to explore different problems and situations associated with radiation biology and protection.

Class Policy:

1. Attendance and Punctuality: Grade can drop for unexcused absences. See Program Policies (sec. 4.0, #3).
2. All assignments are due at the beginning of the designated class period.
3. Late assignments will be penalized 10% for each day late. Late tests will be penalized 25% for each day late.
4. Cheating or plagiarism will result in a course grade of F and thus dismissal from the Program.
5. Test may be made up only when pre-arranged with instructor. Make-up test will only be given during the same week that the original test was given.

Casper College may collect samples of student work demonstrating achievement of the above outcomes. Any personally identifying information will be removed from student work.

Student Rights and Responsibilities: Please refer to the Casper College Student Conduct and Judicial Code for information concerning your rights and responsibilities as a Casper College Student.

Chain of Command: If you have any problems with this class, you should first contact the instructor to attempt to solve the problem. If you are not satisfied with the solution offered by the instructor, you should then take the matter through the appropriate chain of command starting with the Department Head/Program Director, the Dean, and lastly the Vice President for Academic Affairs.

Academic Dishonesty: (Cheating & Plagiarism) Casper College demands intellectual honesty. Proven plagiarism or any form of dishonesty associated with the academic process can result in the offender failing the course in which the offense was committed or expulsion from school. See the Casper College Student Code of Conduct for more information on this topic.

Official Means of Communication: Casper College faculty and staff will employ the student's assigned Casper College email account as a primary method of communication. Students are responsible to check their account regularly. This is also, where you will find course evaluation links during course evaluation periods.

ADA Accommodations Policy: If you need academic accommodations because of a disability, please inform me as soon as possible. See me privately after class, or during my office hours. To request academic accommodations, students must first consult with the college's Disability Services Counselor located in the Gateway Building, Room 344, (307) 268-2557, bheuer@caspercollege.edu . The Disability Services Counselor is responsible for reviewing documentation provided by students requesting accommodations, determining eligibility for accommodations, and helping students request and use appropriate accommodations.

Evaluation Criteria:

A = 92 - 100%	C = 75 - 82%
B = 83 - 91	F = 0 - 74

Grading Components:

1. Assignments:
   a. Critical Thinking Activity 50 points
   b. Life Cycle 30 points
2. Tests 100 points x 4
3. Final 200 points
4. Articles: 25 points each 50 points

Last Day to Withdraw: November 12, 2015

Radiation Biology and Protection
SCHEDULE WITH COURSE CONTENT: Schedule subject to change with instructor notice.

8-27	Course introduction Article discussion Imaging group assignment discussed: Life Cycle of an X-ray *Registry Review- X-Ray Production*
9-3	Ch. 1 – History of Radiobiology Ch. 2 – Cellular Anatomy & Physiology *RR – Target Interactions*
9-10	Critical Thinking Groups formed and cases given Ch. 3 – Cellular Effects of Radiation *RR - X-Ray Beam*
9-17	**Test, Chapter 1, 2, 3** Film Modern Marvels *RR – Imaging Equipment*
9-24	**Assignment Presentations: Life Cycle of an X-ray** Ch. 4- Biological Effects of Radiation Exposure *RR – Generator,Transformer,Rectifier*
10-1	Ch. 4 – Biological Effects of Radiation Exposure Contd. *RR – Components of Fluoroscopy*
10-8	**Test Ch. 4** Ch. 5 – Effects of Long Term Exposure to Radiation *RR - Digital Imaging*
10-15	Ch. 5 cont'd. **Article due: In class discussion** *RR – Types of Imaging Units, Accessories*
10-22	**Test – Ch. 5 Workbook** Ch. 6 – Protection of Personnel *RR – QC Beam Restrictions, Recognizing/Reporting Malfunctions*
10-29	Critical Thinking Activity Case Presentations
11-5	Chapter 6- Continued *RR – Digital IR Systems, Shielding*
11-12	Chapter 7- Protection of Patients

11-19	**Test – Ch. 6, 7** **Article due: In class discussion**
11-26	Happy Thanksgiving!!!
12-3	**FINAL EXAM** Comprehensive final covering Ch. 1-7 ***Reminder for Spring: resume due first day of spring semester classes*** ***Corectec on-line review purchase for Spring Semester*** ***Complete graduate check if did not do so already***
MOCK REGISTRY Finals week December 14-16 Note: The final exams must be taken on the scheduled date/time, or the student will receive a ZERO for the exam.	

RDTK 2640
Radiation Biology & Protection

Assignments:

I. Life Cycle of an Electron Assignment/Presentation:

This assignment will help the student to review the life cycle of x-ray production. Students will form groups and design a drawing which outlines the life cycle of an x-ray, from its beginning inside the x-ray tube as an electron, to the interactions occurring at the anode to produce the x-ray, as it travels through the remainder of the x-ray tube and finally its interaction with matter within the patient. The drawings will be presented in class and each group will discuss a different aspect of the cycle. (One large drawing per group is to be displayed.) Overview of Inverse square Law presented. Additionally, each student will turn in a labeled drawing of the x-ray circuit and an example problem representing the Inverse Square Law.
Group project 30 points presentation due date **September 24**

II. Article Review: One due October 15 and one due November 19

The student will be required to review two current, peer-reviewed articles, related to radiation biology and protection. A one-page, double spaced, typed, summary of each article will be turned in for grading. **The articles can cover any topic associated with radiation biology and protection.** On the dates listed above the student will be expected to discuss the articles' content with the other students in class. The article reviews and presentations will be worth 25 points each for a course total of 50 points.

Presentation Criteria:

1. Summary of the article is clear and presented in a logical manner.
2. Student has a basic knowledge of the subject matter.
3. Student related the information in regard to radiation biology and protection.
4. Student correlated the information to the clinical setting.

Written Article review should include the following:

1. Select current readings from peer-reviewed periodicals and journals – no older than 2005.
2. A complete bibliography must be included with each article review.
3. A summary of the content and ideas presented in the article must be presented in a clear and concise manner.
4. A personal evaluation of the work's applicability in the clinical setting.
5. Grammar, neatness and spelling, as well as content will be evaluated.

III. Critical Thinking: Ethical Issue Activity:

Students will be split into groups and given a problem related to radiation biology and protection. The case study will involve a dilemma in which the group must support or not support through presentation of research they have investigated. Each group will present their case to the entire class, they will discuss solutions/actions that each student thought were appropriate and why, with research to back up their case. Each student will turn in a written component of their part of the presentation.
50 points. Debate scheduled **October 29**

I. Radiation Biology and Protection

Life Cycle of an Electron Assignment/Presentation:

This assignment will help the student to review the life cycle of x-ray production. It is also designed to involve the student in a collaborative project in which the result will include a presentation involving the entire group. Team-work, communication, and critical thinking will be utilized by the students to obtain the final project.

1. Students will form groups and design a large drawing which outlines their part of the entire life cycle of an x-ray, from its beginning inside the x-ray tube as an electron, to the interactions occurring at the anode to produce the x-ray, as it travels through the remainder of the x-ray tube and finally its interaction with matter within the patient. The drawing will represent just the groups' portion of the assignment – main circuit, filament circuit and Inverse Square Law, target interactions, or interactions with matter. The drawings will be presented in class and each group will discuss in detail a different aspect of the cycle. Individual groups will present a portion of their display as outlined below. Everyone must participate in the project to receive full credit.

Group 1: Detailed review of parts of x-ray tube and the production of x-rays through the main circuit.

Group 2: Detailed review of parts of x-ray tube and the production of x-rays through the filament circuit. Example problem illustrating the Inverse Square Law.

Group 3: Detailed review of interactions occurring at the anode to produce x-rays.

Group 4: Detailed review of Interactions occurring between x-rays and matter.

2. Each student will turn in an 8x11 size, labeled diagram of the tube circuit from wall outlet to anode/cathode (the entire main circuit), and an example Inverse Square Law problem.

III. Casper College Radiography Program

Critical Thinking: Ethical Issues in Radiation Biology and Protection

There are a total of four scenarios involved in the assignment. Students will be divided into individual groups. Each group will have an issue and their job will be to defend for or against the stance outlined on the card.

Each group will begin with an opening or introduction statement of 5 minutes in length. After the introduction each member of the group will present a reason for their stance on the issue. For example, if there are four members in the group, there will be four different, strong arguments involved in the presentation. Each member will have 5 minutes to present their information. (25 minutes)

Once both groups have presented they will be given a 15 minute break to prepare closing statements in defense of their cause. The group should utilize the arguments presented by the opposing group to reemphasize their stance. (15 minutes)

At the conclusion of the break the groups will reconvene and begin closing statements. Each group will be given 10 minutes for closing statements. A question/answer period will be allowed from the audience, as well as the other debating team after the groups present their closing statements. The question/answer period will have a time limit of 10 minutes. (20 minutes)

The entire class will have a silent vote on their opinion of the issue, for or against. The vote will not be figured into the final grade for the project, but is intended to encourage each member of the class to weigh the issues and decide how they feel about each one.

Each student will hand in a brief essay that describes their stance on the issue. It should have an introduction statement, and a closing argument. The closing argument should explain why you are "for" or "against" the issue.