



Rowan College
at
BURLINGTON COUNTY

RADIOGRAPHY

CODE: RAD 107

TITLE: Principles of Radiation Protection and Biology

DIVISION: Health Sciences

COURSE DESCRIPTION: This course focuses on the radiation effects on cells and living tissues. It presents the principles and responsibilities of radiation protection and identifies federal and state regulations.

CO-REQUISITE: RAD 129, 150, 152, BIO 114/115

PRE-REQUISITE: RAD 113, 117, 127, 140, 142

CREDITS: 2 cr.

REQUIRED MATERIALS (CHECK BOOKSTORE FOR LATEST EDITION):

Click on the bookstore for the supplies which you are attending each class.

Rcbc.edu/bookstore

COURSE LEARNING OUTCOMES:

Upon completion of this course, students will be able to:

- Identify and justify the need to minimize unproductive radiation exposure of humans
- Distinguish between somatic and genetic radiation effects.
- Differentiate between the stochastic and nonstochastic defects of radiation exposure.
- Explain the objectives of a radiation protection program.
- Define radiation and radioactivity units of measurement.
- Identify dose equivalent limits (DEL) for occupational and non-occupational radiation exposure.
- Describe the as low as reasonably achievable (ALARA) concept.
- Identify the basis for occupational exposure limits
- Distinguish between perceived risk and comparable risk
- Describe the concept of negligible individual risk level (NIRL).

- Identify ionizing radiation sources from natural and man-made sources.
- Comply with legal and ethical radiation protection responsibilities of radiation workers.
- Calculate dose equivalent limits with reference to the National Council on Radiation Protection and Measurements (NCRP) reports.
- Describe the theory and operation of radiation detection devices.
- Identify appropriate applications and limitations for each radiation detection device.
- Describe how isodose curves are used for radiation protection
- Identify performance standards for beam-directing, -defining and limiting devices.
- Describe procedures used to verify performance standards for equipment and indicate potential consequences of performance standards failure.
- 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 requirements for and responsibilities of a radiation safety officer.
- Express the need and importance of personnel monitoring for radiation workers.
- Describe the characteristics of a molecule.
- Describe the principles of cellular biology.
- Identify sources of electromagnetic and particulate ionizing radiations.
- Discuss directly and indirectly ionizing radiations.
- Identify sources of radiation exposure.
- Describe radiation-induced chemical reactions and potential biologic damage.
- Evaluate factors influencing radiobiologic/biophysical events at the cellular and sub cellular level.
- Identify methods to measure radiation response.
- Describe physical, chemical and biologic factors influencing radiation response of cells and tissues.
- Explain factors influencing radiobiologic sensitivity.
- Recognize the clinical significance of LD 50/30 and LD 30.
- Examine effect 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 as well as discuss specific diseases or syndromes associated with them.
- Discuss stochastic and non-stochastic effects.
- Discuss risk estimates for radiation-induced malignancies.

GENERAL EDUCATION OUTCOMES IN THIS COURSE:

Written and Oral Communication: Communication	* Students will logically and persuasively support their points of view or findings. * Students will conduct investigative research which demonstrates academic integrity, originality, depth of thought, and mastery of an approved style of source documentation.
Quantitative Knowledge and Skills: Mathematics	* Students will analyze data to solve problems utilizing appropriate mathematical concepts. * Students will logically solve problems using the appropriate mathematical technique.
Scientific Knowledge and Reasoning: Science	* Students will demonstrate critical thinking skills in the analysis of scientific data.
Technological Competency or Information Literacy: Technology	* Students will demonstrate competency in office productivity tools appropriate to continuing their education. * Students will demonstrate the skills required to find, evaluate, and apply information to solve a problem.
Ethical Reasoning and Action	* Students will take a position on an ethical issue or a situation and defend it.

CORE COURSE CONTENT:

- Justification and responsibility for radiologic procedures
- Biological damage potential of ionizing radiation
- Early radiologic procedures
- X-ray production and energy
- Concept of attenuation
- Different systems of units
- Units of exposure
- Absorbed dose and absorbed dose equivalent
- Conversion factors from one system of unit to another
- Cell constituents and division
- Compare/contrast mitosis and meiosis
- Linear energy transfer

- Radiolysis of water
- Law of Bergonie and Tribondeau
- Cell radiosensitivity, organic damage from radiation
- Early somatic effects LD 50/30
- Late somatic effects and genetic effects
- Regulatory Agencies
- ALARA
- Radiation Protection Acts of 1968 & 1981
- Occupational / Nonoccupation absorbed dose limits
- Personnel monitoring, film badge, pocket ionization chamber, thermoluminescent dosimeter
- Protection of patient
- Voluntary and involuntary motion
- Beam limitation devices
- Filtration
- Gonadal shielding devices
- Exposure factors, screen and grids, repeats, fluoroscopic procedures, patient dose and special considerations
- Mammography, pediatrics and pregnancy
- Protective devices for the radiographer
- Protective devices for fluoroscopy
- Protective measures for mobile radiography
- Inverse square law

COURSE ACTIVITIES:

Course activities vary from course to course and instructor to instructor. Below is a listing of some of the activities students can anticipate in this course:

- ▶ **Writing assignments:** students will analyze current issues in the field using current articles from the popular press as well as library research including electronic resources databases.
- ▶ **Speaking assignments:** students will present research individually or in groups using current technology to support the presentation (e.g., PowerPoint presentation); students will participate in discussions and debates related to the topics in the lessons. Discussions may also focus on cross-cultural and legal-ethical dilemmas as they relate to the course content.
- ▶ **Simulation activities:** Trends and issues will analyzed for their ethical as well as social or legal significance. Students might role-play common situations for classmates to analyze. Current news articles may be used to generate discussion.

- ▶ Case Studies: Complex situations and scenarios will be analyzed in cooperative group settings or as homework assignments.
- ▶ Lectures: This format will include question and answer sessions to provide interactivity between students and instructor.
- ▶ Speakers: Representatives from various related fields may be invited to speak.
- ▶ Videos: Related topics will provide impetus for discussion.

EDUCATIONAL TECHNOLOGY:

Rowan College at Burlington County advocates a technology enhanced teaching and learning environment. Advanced technological tools may be used in any course section to facilitate instruction. Many of our sections are web-enhanced, which means that some of your work will be submitted or completed online. Web enhancements may include on-line materials, grade books, testing and quizzes and assignment submission. Many students enjoy the flexibility and convenience that these online enhancements have provided, however if you have concerns about the technology involved, please speak to your instructor immediately.

STUDENT EVALUATIONS:

The student will be evaluated on the degree to which student learning outcomes are achieved. A variety of methods may be used such as tests, quizzes, class participation, projects, homework assignments, presentations, etc.

See individual instructor's course handouts for grading system and criteria (point value for each assessment component in course, e.g. tests, papers, presentations, attendance etc.), number of papers and examinations required in the course, and testing policy including make ups and/or retests.

GRADING STANDARD:

- A Mastery of essential elements and related concepts, plus demonstrated excellence or originality.
- B+ Mastery of essential elements and related concepts, showing higher level understanding.
- B Mastery of essential elements and related concepts.
- C+ Above average knowledge of essential elements and related concepts.
- C Acceptable knowledge of essential elements and related concepts.
- D Minimal knowledge of related concepts.
- F Unsatisfactory progress. This grade may also be assigned in cases of academic misconduct, such as cheating or plagiarism, and/or excessive absences.

For other grades, see the current ROWAN COLLEGE AT BURLINGTON COUNTY catalog.

COLLEGE POLICIES:

The current college catalog and student handbook are important documents for understanding your rights and responsibilities as a student in the RCBC classroom. Please read your catalog and handbook as they supplement this syllabus, particularly for information regarding:

- ▶ Academic Integrity Code
- ▶ Student Conduct Code
- ▶ Student Grade Appeal Process

OFFICE OF STUDENT SUPPORT AND DISABILITIES SERVICES:

RCBC welcomes students with disabilities into the college's educational programs. Access to accommodations and support services for students with learning and other disabilities is facilitated by staff in the Office of Student Support (OSS). In order to receive accommodations, a student must contact the OSS, self-identify as having a disability, provide appropriate documentation, and participate in an intake appointment. If the documentation supports the request for reasonable accommodations, the OSS will provide the student with an Accommodation Plan to give to instructors. Contact the Office of Student Support at 609-894-9311, ext. 1208 or visit the website at: www.rcbc.edu/studentsupport

ADDITIONAL SUPPORT/LABS:

RCBC provides academic advising, student support personal counseling, transfer advising, and special accommodations for individuals with disabilities free to all students through the Division of Student Services. For more information about any of these services, visit the Laurel Hall on the Mt. Laurel Campus, or call (609) 894-9311 or (856) 222-9311, then dial the desired extension:

- Ext. 1557 Academic Advisement and Counseling
- Ext. 1803 Special Populations
- Ext. 2737 Transfer Center

Or visit the following websites:

Academic Advising www.rcbc.edu/advising
Student Support Counseling www.rcbc.edu/counseling
Transfer Center www.rcbc.edu/transfer

RCBC offers a free tutoring for all currently enrolled students. For more information regarding The Tutoring Center call Extension 1495 at (609) 894-9311 or (856) 222-9311 or visit the Tutoring Center Website at www.rcbc.edu/tutoring

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