A. General Course Information
Title: Radiography I
Credits: 5
Semester: Fall (6 hrs. laboratory and 3 hrs. lecture per week)
Code: RAD 181
Prerequisites: Official acceptance into the radiography program
Corequisites: RAD 180 (Introduction to Radiography)
RAD 182 (Radiography Clinical I)

B. Course Instructor
Elizabeth Romano MS Ed.  R.T. (R)(M)
Office- L114 Phone 201-493-3577
Email: eromano@bergen.edu
Office hours: Mon.  7:30-9:30am
            Tue.  7:30-8:00am
            Wed.- 7:30-8:00am

C. Course Description
RAD 181 - Radiography I, introduces the study of radiography and the ethical considerations of this medical field. The theory and application of positioning, radiation protection techniques, and basic radiographic exposure, along with associated film critiques and laboratory experiments are covered in this course.

D. Statement of Purpose:
The purpose of this course is to:
- Become familiar with all aspects of modern radiography and how it relates to patient care
- Introduce basic positioning principles and practices
- Introduce the processes of analysis, critical thinking and problem solving
- Become proficient in all phases of radiography clinical under the supervision of clinical faculty.
- Prepare the student for clinical experience on patients in the hospital environment.
- Comply with a competency-based education system with regard to lectures, observation, testing, and demonstration and competency evaluations.

E. Course Objectives:
Upon completion of this course, the radiography student will be:
- Able to explain the role of the radiographer and the part radiology plays in medicine.
- Able to provide information on various standards, the positions of the structures and organs of the body, supplemented with practical instruction and application in the lab. Procedures learned and tested on campus can be started within each of the hospitals at a progressive pace.
- Familiar with the factors influencing radiographs and their effect on the quality of a radiograph including patient and operator protection.
- Familiar with the proper handling of patients and meeting their psychological needs.
- Provided with the information on radiation dosages, monitoring devices, and protection devices used to reduce radiation exposure.
- Familiar with the basic medical terminology commonly used in radiography.
• Functioning well under various hospital situations and applying the principles of radiography as taught at the college.
• Defining and describing the clinical data necessary, including the patient’s name, x-ray number, examination date, institution’s name, and proper anatomical markers.
• Analyzing and describing the radiographic image.
• Recognizing and describing the proper film size required for the examination, and that proper collimation was used.
• Defining and describing the routine projections for the part, and that the part has been properly positioned, that positioning landmarks have been identified and utilized, radiographic evidence of proper positioning is demonstrated, and, if applicable, that positioning or immobilizing devices were used.
• Identifying and describing the gross anatomy of the part or region being examined, the anatomy presented on the radiographic image, and any anatomical anomalies present on the radiograph.
• Identifying and analyzing the general quality of a radiograph, identifying any artifacts present on the radiograph, and the corrections that are necessary.
• Presenting acceptable radiographs to the radiologist for interpretation.

F. Course Materials
1. A small notebook for positioning notes in the lab.
2. Required texts, radiography notebook and power-point materials.
3. Initial markers must be ordered for hospital and lab use (2 sets).
4. A dosimeter will be provided for both lab and clinical experience. The students are required to hand them in to the clinical education coordinator when requested.
5. Students are expected to bring their textbook and workbooks to each lecture and lab session.
6. A good medical dictionary is not mandatory but recommended.

G. Required Course Textbook
Title: Textbook of Radiographic Positioning and Related Anatomy
(Plus Bontrager Workbook)
Author: Bontrager, Mosby Systems
Edition: 8th edition

H. Teaching Methodologies
• Formal lectures
• Discussion
• Laboratory group and individual radiographic positioning
• Power-point lecture materials
• Image review in the lab
• Oral presentations of radiographs in the lab
• Labeling of all anatomical structures
• Completion of all related modules
• Review of all procedures in the competency manual
• Other hand-out materials and instructor generated assignments.

I. Determination of Final Course Grades and Related Policies
1. Quizzes 30%
2. Practicum (3) 20% Weeks 5,10,14
3. Midterm 25% (Date will be announced in class)
4. Final examination 25%

- All examinations will be reviewed in class following the exam, and will be kept on file as part of your permanent record.
- Examinations cannot leave the testing area.
- Students may review all tests prior to the final examination, by making an appointment with the instructor.
- Only one comprehensive make-up quiz will be given at the end of the semester for any missed quizzes.
- The program uses the grading system below.

J. Grading System:

**GRADES: POINT VALUE:**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92-100</td>
</tr>
<tr>
<td>B+</td>
<td>89-91</td>
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<tr>
<td>B</td>
<td>83-88</td>
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<tr>
<td>C+</td>
<td>80-82</td>
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<tr>
<td>C</td>
<td>75-79</td>
</tr>
<tr>
<td>F</td>
<td>74 and below</td>
</tr>
</tbody>
</table>

K. Subject Matter

- Medical terminology
- Patient care practices
- Patient transportation
- Positioning of the chest, abdomen, upper extremities
- Overview of radiographic anatomy & physiology
- Radiographic quality
- Basic principles of radiographic exposure
- Basic principles of radiation protection
- Basic imaging equipment and x-ray production
- Technical factors manipulation
- Introduction to digital and computed radiography

L. Weekly Lecture Content

Week 1:
- a. Orientation to course and program
- b. Explanation of the syllabus and course requirements.
- c. Introduction to radiation safety practices and principles
Course Syllabus + Study Guide for Lecture and Laboratory

Week 2
- Radiation safety practices and principles continued
- Terminology associated with radiographic imaging
- Basic body positions, projections and planes.

Week 3
- Introduction to the x-ray tube, Basic x-ray production
- Parts and functions
- Anatomy of the chest and mediastinum
- Chest radiography basic positions

Week 4
- Positions, projections, planes and terms related to patient positioning
- Chest radiography alternate projections/methods

Week 5
- Practicum (Basic Chest – AP, PA, Rt. Lat, Lt. Lat and planes, terms, and positions)

Week 6
- Anatomy and positioning of the abdominal patient (3-way).
- Basic technique principles. Introduction to functions.
- Introduction to basic technique manipulation; mA, exposure time, kV, SID, screens
- Determination of technical factors based on part measurement.

Week 7
- Anatomy of the fingers, hand and wrist.
- Radiography of the fingers, hand and wrist; routine and alternative projections.

Week 8
- Anatomy of the forearm and elbow
- Routine, alternative and trauma projections for the forearm and elbow.
- Introduction to conventional imaging systems; screens and film
- Inverse Square Law and the mAs distance formulas.

Week 9
- Anatomy of the humerus and shoulder girdle.
- Routine, alternative and trauma projections, for the humerus and shoulder.

Week 10
- Midterm examination

Week 11
- Anatomy of the clavicle and scapula.
- Positioning of the clavicle and scapula.
- Grids their composition, use, technical conversions and Immobilization devices and technical considerations

Week 12
- Anatomy of the rib cage and sternum
- Routine and trauma projections and positions for the ribs and breast bone.
c. Technique manipulation; functions varied to mA, exposure time, kVp, screens and distance.

Week 13
a. Introduction to digital radiography, computed radiography and picture archive communications systems.
b. Components of each imaging system
c. Basic functions of each system

Week 14
a. Final examination.

Week 15
a. Review of Final Exam and course.

5. Laboratory Experience Outline
In order to maximize the laboratory experience, students must review and study the lecture content before each laboratory session. Please bring the textbook, notebook and supplemental materials to each laboratory session.

Week 1:
a. Orientation to the lab
b. Control panel, mA, time, kV etc.
c. Basic technique conversions and technique charts
d. Bucky table-top v. cassettes, anode rotation, all locks on machine etc

Week 2
a. Review of terminology
b. Basic body positioning
c. Caring for patients
d. Stretcher and wheelchair; principles of body mechanics.

Week 3
a. Begin Anatomy and positioning of the chest
b. Group position and phantom exposure.
c. Determination of technical factors based on part measurement.
e. Basic technique and radiation protection principles.
f. Review AP, PA, RAO, LAO, RPO, LPO, RIGHT LATERAL, LEFT LATERAL

Week 4
a. Continue Anatomy and positioning of the Chest with alternate projections/methods.
b. Basic technique principles.
c. Radiographs processed and labeled.

Week 5
Practicum

Week 6
Course Syllabus + Study Guide for Lecture and Laboratory

a. Overview of the anatomy of the abdomen
b. Group positioning for the abdomen, including upright and Decubitus
  c. Phantom exposure and basic technique conversions.
d. Determination of technical factors based on part measurement.

Week 7
a. Group positioning of the fingers, hand and wrist.
b. Phantom exposures
c. Labeling images
d. Image critique

Week 8
a. Anatomy of the forearm and elbow
b. Group positioning of the forearm and elbow
c. Cast technique functions.

Week 9
a. Review of x-ray production
b. control panel variables density and contrast experiments.
c. Anatomy of the humerus and shoulder girdle
d. Radiographs of the phantom taken and labeled

Week 10
Practicum (Abdomen, fingers, hand, wrist, forearm, elbow, humerus and shoulder)

Week 11
a. Anatomy and positioning of the clavicle and scapula
b. Group and individual positioning practice.
c. Phantom exposure and labeling.

Week 12
a. Positioning and exposure of the Rib cage and sternum
b. Review of films related to the basic systems.
c. Common fractures and anomalies are presented and discussed.

Week 13
a. Basic introduction to digital imaging
b. Practice for Practicum
c. Basic technique and positioning for pediatric patients.
d. Technique manipulation.

Week 14
a. Practicum (all procedures taught this semester chest to ribs)

Weeks 15
a. Review of all procedures covered.
b. Discussion of radiographic quality demonstrated on films.

6. Unit Objectives
Unit 1:
TOPICS: Orientation to radiography, ethics, basic position and medical terminology, lab equipment, anatomy and positioning of the finger, hand and wrist, basic radiographic technique, basic protection and Radiologic terminology.

UPON COMPLETION OF THIS UNIT, THE STUDENTS WILL BE ABLE TO:

- Discuss terminology prefix and suffixes and positioning planes
- Accurately position the finger, hand, and wrist.
- Explain and identify the anatomy of the finger, hand and wrist.
- Set standard exposure factors on the control panel.
- Understand the functioning of the collimator, bucky tray, tube locks, cassettes, calipers, density, mAs, kVp, FFD, SID, TFD, OFD, T.T., CM contrast, soft rays, and scatter radiation.
- Calculate the greatest density problems involving mAs and kVp, screens and CM measurement.
- Demonstrate central ray locations for the finger, hand and wrist.
- Practice basic darkroom theory.
- Outline the steps required to perform a routine diagnostic procedure.
- Define basic tube terminology.
- Organize a system for positioning when following the criteria for general positioning.
- Understand the function of the film receptor.
- Operate technical modifications for soft tissue.
- Conduct methods of protection for the patient and operator.
- Develop films with the automatic processor and reload cassettes.
- Properly prepare the patient for upper extremity radiography.
- Effectively answer questions regarding an x-ray procedure of the finger, hand, and wrist.
- Understand professionalism, ethics, and legal aspects.
- Practice basic concepts of body mechanics.

Unit 2:
TOPICS: X-ray production, anatomy and positioning of the forearm and elbow (proximal humerus), basic technique conversions, anatomy and positioning of the humerus, shoulder, clavicle and scapula, anatomy and positioning of the chest, basic radiation protections, x-ray film and cassettes, Inverse Square law. and mAs distance formula.

UPON COMPLETION OF THIS UNIT, THE STUDENTS WILL BE ABLE TO:

- Position accurately and explain the anatomy of the forearm, elbow, humerus, shoulder, clavicle, scapula, rib cage and sternum.
- Position accurately and explain the anatomy of the chest on radiographs.
- Apply basic principles for converting exposure factors.
- Explain MPD levels of exposure.
- Outline steps utilized in the protection of the patient and operator.
- Know basic radiation biology concepts.
- Effectively critique radiographs of the upper extremity and chest.
- Explain basic tube components and the process of x-ray production.
- Apply formulas for density, dosage and distance and compute the results.
- Manipulate basic technique functions, mAs, 15%, cassettes and patient thickness.
- Discuss air gap and grid techniques for chest radiography.
- Describe various respiratory pathologies.
- Explain methods to control scattered radiation.
- Understand how distance relates to film density.
- Explain respiratory anatomy.
- Detect motion on a radiograph.
- Identify major thoracic structures.

Unit 3:

**Topics:**
X-ray tube and generating components, anatomy and positioning of the abdomen, basic radiographic technique and radiation protection for abdominal studies, basic grid function, filters, collimators, anatomy in the four quadrants and nine sections of the body, positioning landmarks for abdominal films.

**UPON COMPLETION OF THIS UNIT THE STUDENTS WILL BE ABLE TO:**

- Position accurately and explain the anatomy contained within the abdomen.
- Apply proper technical factors for adequate density and reasonable contrast.
- Describe methods to control motion.
- Discuss basic radiation protection principles in abdomen radiography.
- Effectively critique radiographs of the abdomen and label important structures.
- Explain x-ray production and the steps involved in generating x-rays.
- List the basic components of the x-ray tube.
- Recognize anatomical structures found within the sections and quadrants of the abdomen.
- Demonstrate methods of controlling secondary radiation.
- Compare the grid cassette and its basic function to the bucky.
- Explain rotating and stationary anode tubes and the cathode.
- Discuss leakage, primary, remnant secondary and scatter radiations.
- Describe the calculation of heat units, the anode cooling and tube rating charts.
- Differentiate between inherent, added and total filtration concepts.
- Manipulate technical factors to adjust density and contrast of the radiograph.
- Formulate phototiming and conventional technical factors for abdominal studies.
- Locate major body organs in the abdomen
- Adjust technical factors to control dosage.
I, ___________________________ do hereby attest to the fact that I have read this syllabus and understand what objectives are necessary for successful completion of this course.

I further realize that the minimum passing grade for this course is a 75% which is in alignment with the American Registry of Radiologic Technologists’ certification examination.

My signature below indicates that I have read and understand this Syllabus.

Student signature: ___________________________

Date: ___________________________