# R T 55B: PRINCIPLES OF RADIOLOGIC TECHNOLOGY II

## Foothill College Course Outline of Record

| Heading | Value |
|---|---|
| **Effective Term:** | Summer 2022 |
| **Units:** | 3 |
| **Hours:** | 3 lecture per week (36 total per quarter) |
| **Prerequisite:** | R T 55A. |
| **Advisory:** | Not open to students with credit in R T 52C. |
| **Degree & Credit Status:** | Degree-Applicable Credit Course |
| **Foothill GE:** | Non-GE |
| **Transferable:** | CSU |
| **Grade Type:** | Letter Grade Only |
| **Repeatability:** | Not Repeatable |

## Student Learning Outcomes

- Identify the components of the x-ray circuit.
- Differentiate between step-up and step-down transformers.

## Description

Continuation of R T 55A. Expansion of the principles of x-ray physics, technique and radiation protection. This course emphasizes the circuitry of the x-ray machine, automatic exposure control devices, quality management, radiographic quality and the resulting effect on radiation protection. Intended for students in the Radiologic Technology Program; enrollment is limited to students accepted in the program.

## Course Objectives

The student will be able to:

a. describe the x-ray circuit components and principles.
b. evaluate the principles and application of automatic exposure control (AEC) systems and its effect on radiation protection.
c. describe the troubleshooting methods used to maintain diagnostic x-ray tubes.
d. describe the importance of a good quality management system and how it is accomplished.
e. evaluate the effects of image quality factors on image brightness, contrast, spatial resolution and distortion of digital images.
f. describe the considerations that must be analyzed for setting optimal patient exposure factors.
g. create a personalized technique chart.
h. compute the technical factors for pediatric patients.

## Course Content

a. X-ray circuit
    i. Electricity
        1. Potential difference
        2. Current
            a. Direct
            b. Alternating
        3. Resistance
    ii. Protective devices
        1. Ground
        2. Circuit breaker
    iii. Transformers
        1. Step-up
        2. Step-down
    iv. Components and functions
        1. Primary circuit
        2. Secondary circuit
        3. Filament circuit
    v. Rectification
        1. Purpose
        2. Solid state
        3. Types
            a. Single phase
            b. Three phase
            c. Falling load
            d. High frequency
    vi. Automatic exposure control devices
        1. Ionization chambers
        2. Maximum reaction time
        3. Back-up time
        4. Positioning considerations
            a. Cell locations
            b. Cell size
            c. Cell sensitivity
        5. Compensating for variations of patient size and pathology
b. Automatic exposure control devices
    i. Ionization chambers
    ii. Solid-state detector
    iii. Minimum response time
    iv. Back-up time
    v. Alignment/positioning considerations
        1. Cell locations
        2. Cell size
        3. Cell sensitivity/balance
        4. Compensation issues
        5. Patient size
        6. Pathology/metal
        7. Beam size
        8. Image receptor variations
c. Troubleshooting diagnostic x-ray tubes
    i. Extending tube life
        1. Warm-up procedures
        2. Rotor considerations
        3. Filament considerations
        4. Tube loading
        5. Tube movement
        6. Heat units
    ii. Radiographic cooling chart

iii. Anode cooling chart
iv. Tube housing cooling chart

d. Quality control
i. Definitions
1. Quality improvement/management
2. Quality assurance
3. Quality control
ii. Benefits
1. Patient
2. Reduction in radiation exposure
3. Efficiency of patient care
4. Departmental
5. Consistency in production of quality diagnostic images
6. Cost-effectiveness
iii. Elements
1. Standards for quality
2. Communications
3. Quality management manual
4. Responsibility and administration
5. Test equipment, procedures and training
6. Record-keeping
7. Test review
8. Evaluation
9. Continuing education
iv. Generator calibration
1. kVp
2. Milliamperage
3. Timer accuracy
v. Miscellaneous
1. Illuminator calibration
2. Video monitor calibration

e. Digital radiographic quality factors
i. Effect of mAs, kV, OID, SID, focal spot size, grids, beam restriction, patient motion, patient thickness and beam alignment on:
1. Image brightness
2. Contrast
3. Spatial resolution
4. Distortion

f. Factors affecting the selection of technical factors
i. Patient factors
1. Anatomic thickness
a. Sthenic
b. Hyposthenic
c. Hypersthenic
d. Asthenic
2. Body composition
a. Mass density
3. Pathology
a. Destructive diseases
b. Additive diseases
4. Prime factors
a. mAs
b. kV
c. SID
5. Other factors
a. Post mortem
b. Foreign bodies
c. Casts and splints

g. Technique charts
i. Caliper measurement
ii. Fixed kV/variable mAs
iii. Variable kV/fixed mAs
iv. Anatomically preprogrammed radiography

h. Pediatric techniques
i. Short exposure time
ii. Non-grid
iii. Fixed vs. AEC
iv. Technical factors for birth-12 years of age
1. Using a percentage of the adult technique
2. Using comparison of pediatric body parts to adult body parts in determining technical factors

## Lab Content

Not applicable.

## Special Facilities and/or Equipment

1. Multimedia classroom
2. Classroom with viewboxes
3. Quality control test tools

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Quizzes
Midterms
Final examination
Circuit group project

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Discussion
Cooperative learning exercises
Demonstration

## Representative Text(s) and Other Materials

Bushong, Stewart. Radiologic Science for Technologists. 2021.

Fauber, Terri. Radiographic Imaging and Exposure. 2021.

Clover Learning online platform

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

a. Weekly reading assignments from assigned chapters, approx. 1 chapter per week
b. Assigned videos and practice quizzes on the Clover Learning platform

## Discipline(s)

Radiological Technology