**Course Objectives/Course Outline**
**Spokane Community College**

**Course Title:** **Cat Scan**
**Prefix and Course Number:** **RAD 238**

**Course Learning Outcomes:**
**By the end of this course, a student should be able to**:

- Discuss the history of CT and its advantages as an imaging modality in the health field.
- Discuss the background of computer systems and how they have evolved in Radiology departments today.
- Trace the history of digital image processing, the steps in digitizing an image, the characteristics of digital image processing, and the advantages of digitizing an image.
- Demonstrate knowledge of the basic principles of Computed Tomography.
- Identify and describe the basic components of a data acquisition scheme in CT with consideration to generator type, detector characteristics, and the five generations of CT Scanners.
- Differentiate dynamic versus spiral and helical scanning.
- Trace the history of image reconstruction techniques while identifying the various algorithms used during this process.
- Describe the major components of the CT Scanner, implementing the elements of a CT image processing system, CT gantry, display, storage and recording devices.
- Evaluate the techniques used for image manipulation in CT.
- Identify the properties which effect image quality in CT Scanning.
- Discuss biological effects of CT and adhere to radiation protection guidelines.
- Explain quality control for CT Scanners, stating the benefits of a QC program selection of technique for QC measurements and tests performed in a QC program.
- Survey post processing computer manipulations, e.g. 3-D CT reconstruction.

**Course Outline**:

**I**. Computed Tomography Generations
    A. History of Computed Tomography
    B. Capabilities of Computerized Tomography
        1. First
        2. Second
        3. Third
        4. Fourth
        5. Fifth
        6. Spiral
II. Components, Operations and Processes
    A. Data acquisition
        1. Methods
            a. Slice-by-slice

- b. Volumetric
- 2. Elements
  - a. Beam geometry
    - 1) Parallel
    - 2) Fan
    - 3) Spiral
- 3. Data acquisition system (DAS)
  - a. Components
    - 1) Tube
    - 2) Detectors
    - 3) Filters
    - 4) Collimators
    - 5) Analog-to-digital converter (ADC)
  - b. Functions
    - 1) Measurement of transmitted beam
    - 2) Encoding measurements into binary data
    - 3) Logarithmic conversion of data
    - 4) Data transmission to computer
- 4. Data acquisition process
  - a. Scanning/raw data/image data
    - 1) Rays
    - 2) Views
    - 3) Profiles
      - a) Pixels
      - b) Matrices
      - c) Voxels
  - b. Attenuation
    - 1) Linear attenuation coefficients
    - 2) CT/Hounsfield numbers
      - a) Baseline reference numbers
        - i) Water equal to 0
        - ii) Bone (white) equal to 400 – 1000
        - iii) Air (black) equal to – 1000
  - c. Selectable scan factors
    - 1) Scan field of view
    - 2) Display field of view
    - 3) Matrix size
    - 4) Slice thickness
    - 5) Algorithm
    - 6) Scan time and rotational arc
    - 7) Radiographic tube output
    - 8) Region of interest (ROI)
    - 9) Magnification
    - 10) Focal spot size and tube geometry

B. Factors controlling image appearance

C. Anatomical structures

- 1. Artifacts
- 2. Contrast resolution
  - a. Window width

3. Grayscale manipulation
    a. Window level
4. Distortion
5. Noise
6. Spatial resolution

D. Postprocessing
1. Image reformation
2. Image smoothing
3. Edge enhancement
4. Grayscale manipulation

III. Radiation Protection
A. Methods for reducing radiation dose to the patient
1. Technical factor selection
2. Technical adjustments for children
3. Scatter radiation reduction

B. Reducing the radiographer’s exposure to scatter radiation