LABETTE COMMUNITY COLLEGE BRIEF SYLLABUS

SPECIAL NOTE:
This brief syllabus is not intended to be a legal contract. A full syllabus will be distributed to students at the first class session.

TEXT AND SUPPLEMENTARY MATERIALS USED IN THE COURSE (if any):

Please check with the LCC bookstore http://www.labette.edu/bookstore for the required texts for this class.

COURSE NUMBER: RADI 125

COURSE TITLE: PRINCIPLES OF RADIATION PHYSICS AND EQUIPMENT OPERATION

CREDIT HOURS: 3

DEPARTMENT: Radiography

DIVISION: Health Science

PREREQUISITE: RADI 117 Radiographic Imaging II

REVISION DATE: 2/2012

COURSE DESCRIPTION:
A basic knowledge of atomic structure and terminology. Also presented are the nature and characteristics of radiation, x-ray production, and the fundamentals of photon interactions with matter.

COURSE OUTCOMES AND COMPETENCIES:
Students who successfully complete this course will be able to without references and with 86% accuracy:

1. Understand the basic radiographic units of measure and equipment design.

- Discuss key events in the discovery and evolution of the use of x-rays.
- Apply general physics fundamentals, including recognition of units of measure and basic calculations.
- Define and use radiologic units of measure.
- Identify the general components of permanently installed radiographic equipment.
- Describe the basic role and function of the general components of a permanently installed radiographic unit.

2. Explain the basic concepts of the atomic structure, electromagnetic, and particulate radiation.

- Discuss atomic theory.
- Describe the nature and structure of the atom.
- Identify the constituents of the atom and the characteristics of each.
- Explain classifications of the atom.
- Describe the principal types of atomic bonding.
- Describe the nature of the electromagnetic spectrum.
- Discuss the energy, wavelength, and frequency of each member of the electromagnetic spectrum and how these characteristics affect its behavior in interacting with matter.
- Explain the relationship between energy and frequency of electromagnetic radiation.
- Explain wave-particle duality as it applies to the electromagnetic spectrum.
- Calculate the wavelength or frequency of electromagnetic radiation.
- Differentiate between x-rays and gamma rays and the rest of the electromagnetic spectrum.
- Identify concepts regarding the electromagnetic spectrum important for the radiographer.
- Describe the nature of particulate radiation.
- Differentiate between electromagnetic and particulate radiation.

3. Understand the x-ray circuit.

- Discuss the nature of electricity in terms of electrostatics and electrodynamics.
- Explain electric potential, current, and resistance.
- Describe conductors and insulators and give examples of each.
- Identify electronic devices important to the understanding of the x-ray circuit.
- Demonstrate a basic understanding of magnetism.
- Explain electromagnetism.
- Explain electromagnetic induction (both mutual induction and self-induction).
- Describe basic generators, motors, and transformers.
- Identify the components of the x-ray circuit as being in the primary, secondary, or filament circuits.
- Explain the role and function of each major part of the x-ray circuit.
- Explain the basic principles of operation of the x-ray circuit from incoming power to x-ray production.

4. Understand the x-ray tube.

- Describe the construction and purpose of the x-ray tube housing.
- Identify the principal parts of the x-ray tube and their purposes.
- Describe the operation of the principal parts of the x-ray tube.
- Discuss anode designs and construction.
- Explain the line-focus principle.
- Explain the anode heel effect.
- Discuss cathode designs and construction.
- Trace the path of electricity through the x-ray circuit and x-ray tube connecting the selections on the operating console to the functions within the unit.
- Use tube rating charts, anode cooling charts, and housing cooling charts.
- Employ methods of safe x-ray tube operation and extending x-ray tube life.

5. Understand the process of x-ray production and x-ray interactions with matter.

- Explain the process of characteristic x-ray photon production.
- Explain the process of bremsstrahlung x-ray photon production.
- Determine characteristic and bremsstrahlung photon energy.
- Describe beam quantity and how milliamperage, kilovoltage peak, filtration, and distance affect it.
- Describe beam quality and how kilovoltage peak and filtration affect it.
- Explain half-value layer.
- Interpret the discrete, continuous, and x-ray emission spectrums.
- Explain the effects of milliamperage, kilovoltage peak, filtration, generator type, and target material on the x-ray emission spectrum.
- Explain classical interactions, including production, energy, effects on patient dose, and effects on image quality.
- Explain Compton interactions, including production, energy, effects on patient dose, and effects on image quality.
- Explain photoelectric interactions, including production, energy, effects on patient dose, and effects on image quality.
- Explain pair production.
- Explain photodisintegration.
- Relate differential absorption to x-ray beam interactions with the human body and image formation.

6. Understand image intensified fluoroscopy and mobile x-ray equipment.

- Describe the principal parts of an image intensifier and their function.
- Explain the operation of an automatic brightness control (ABC).
- Explain the operation of an image intensifier in magnification mode.
- Describe the options for viewing systems and the advantages and disadvantages of each.
- Describe the options for recording systems and the advantages and disadvantages of each.
- Discuss the fundamental principles of operation of the different approaches to digital fluoroscopy.
- Identify the major areas of quality control pertaining to fluoroscopy.
- Differentiate between radiographic and fluoroscopic mobile equipment.
- State the purpose of dedicated units and identify their unique features.
- Recognize the variations required in exposure technique factors for mobile and dedicated units.