

## **Course Description**

**SON 1005L | Basic Sonography | 2 credits**

An introduction to the physical principles of diagnostic ultrasound. Basis of imaging with ultrasound is discussed. In conjunction with the lectures, supervised laboratory classes are conducted to familiarize students with the operations of the equipment. Laboratory experience will include equipment use and quality assurance.

## **Course Competencies**

### **Competency 1:**

The student will knowledge and comprehension of the structure of the transducer by

- a. Explaining what is the crystal and the Piezoelectric effect
- b. Defining the matching layering and Damping layer.
- c. Labeling the parts of each transducer type
- d. Describing piezoelectric effect
- e. Describing transducer construction

#### Learning Outcomes

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data

### **Competency 2:**

The student will demonstrate knowledge, comprehension, and application of the basic principles that lead to sound transmission and reflection by

- a. Defining focusing and resolution
- b. Evaluating images that show the use of the focus.
- c. Explaining sound frequency and the echo ranging principle.
- d. Defining energy, waves, units (f, T, I, & A) and acoustic variables
- e. Explaining the relationship of the medium, velocity and propagation speed.
- f. Calculating acoustic impedance, attenuation, TGC & focused/unfocused sound field
- g. Predicting reflection, refraction, critical angle & intensity coefficients.
- h. Understanding bioeffects and explain how to prevent them.
- i. Recognizing artifacts, their cause and prevention

#### Learning Outcomes

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data

### **Competency 3:**

The student will demonstrate knowledge, comprehension, and application of the controls of the ultrasound machine by:

- a. Describing A, M, B-modes, and resolution
- b. Demonstrating ultrasound knobology.
- c. Identifying knobs and their function in 2 D, M mode, and Doppler studies.

#### Learning Outcomes

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data

### **Competency 4:**

The student will demonstrate awareness of the basic principles of ultrasound physics, emphasizing practical relationships in physics to optimizing images by:

- a. Explaining what sound is and its characteristics.
- b. Compare the difference of pulsed and continuous wave ultrasound.
- c. Explain amplitude and intensity of sound as it applies to sonography.
- d. Describing the causes and effects of attenuation and acoustical impedance on ultrasound.
- e. Identifying the causes and effects of incidence, scattering, and refraction of ultrasound.
- f. Describing the factors of attenuation versus depth penetration of ultrasound in human tissues.
- g. Identify resolution and controlling factors of resolution as applied to sonography.
- h. Discussing the basic principles governing sound and sound interactions and various tissue types.
- i. Describing and listing conditions affecting sound transmission such as attenuating factors.
- j. Relating mathematical formulas to the interaction of sound with various mediums.
- k. Describing resolution and effect on the final image.

#### Learning Outcomes

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data