DMS 101
1 lec., 3 lab., 2 credits
Co-requisites: DMS-102, DMS-113, DMS-115

COURSE DESCRIPTION: Ultrasound Physics and Instrumentation I will provide the student with the relevant fundamental physical properties as the basic instrumentation used in diagnostic ultrasound. Modes of operation, imaging and display techniques that relate to high frequency sound production will be stressed.

GENERAL COURSE OBJECTIVES: At the conclusion of this course, the student will be able to:

✓ Discuss how ultrasound can produce images of the human body.
✓ Define the parameters of a sound wave as well as the parameters of pulsed ultrasound.
✓ Define all terms related to ultrasound physics.
✓ Demonstrate how to use equipment related to ultrasound.
✓ Select the proper transducer for any ultrasound procedure.
✓ Explain the role of each component of an ultrasound instrument.
✓ Adjust ultrasound machine controls to obtain a diagnostic image.


COURSE POLICIES:

1. In addition to scheduled tests, a quiz on the previous week’s material will be administered prior to each lecture.
2. Missed quizzes (due to absenteeism or tardiness) cannot be made up. The lowest quiz grade will be dropped.
3. A physicians note must be submitted for any absence on a scheduled test day. The missed test must be made up in the Testing Center before the next class meeting.
4. If recording devises are encouraged and must be used in a manner that is not disruptive to the class. A voice activated unit is recommended.
5. Cell phone use in the classroom is prohibited.

ASSESSMENT: Knowledge of course objectives will be assessed by verbal questions prior to, and at the end of each class, quizzes, tests, and lab worksheets.

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All grades are “absolute” and will not be rounded off.
DMS 101

**COURSE OF STUDY** (Subject to change)

- **Week 1**
  - History of ultrasound
  - Echo production
  - Differences between ultrasound and x-rays
  - Sound wave theory

- **Week 2**
  - Sound wave theory
  - Transducer (crystal element)
  - Piezoelectricity

- **Week 3**
  - Parameters of a sound wave
  - Velocity of a sound wave
  - Pulsed ultrasound

- **Week 4**
  - Power, amplitude, and intensity
  - Decibels

- **Week 5**
  - TEST #1

- **Week 6**
  - Attenuation – definition and computation
  - Attenuation – causes
  - Reflections – specular and non-specular

- **Week 7**
  - Impedance
  - Perpendicular incidence

- **Week 8**
  - Intensity Reflection Coefficient
  - Intensity Transmission Coefficient
  - Oblique Incidence and Refraction
  - Snell’s Law

- **Week 9**
  - TEST #2

- **Week 10**
  - Pulse-echo range equation
  - Scanning modes
  - Transducers: construction, crystals, backing, and matching layer

- **Week 11**
  - Bandwidth
  - Multi-hertz transducers
  - Quality factor
  - Characteristics of a sound beam

- **Week 12**
  - Detail resolution; Axial and Lateral
  - Instrumentation: Pulser, Transducer, Receiver

- **Week 13**
  - TEST #3

- **Week 14**
  - Instrumentation: Image Processors, Memory, and Display
  - Review for final

- **Week 15**
  - FINAL EXAMINATION (CUMULATIVE)