

DMS-2985: PHYSICS REVIEW

Cuyahoga Community College

Viewing: DMS-2985 : Physics Review

Board of Trustees:

November 2020

Academic Term:

Fall 2021

Subject Code

DMS - Diagnostic Medical Sonography

Course Number:

2985

Title:

Physics Review

Catalog Description:

Global review of physics in relation to sonography. Test-taking skills, image identification, and physical concept scenarios covered. Special focus on exam content outline topics to assist students preparing to take national credentialing examinations for sonography.

Credit Hour(s):

1

Lecture Hour(s):

1

Requisites

Prerequisite and Corequisite

DMS-235A Sonographic Principles, Performance, and Safety or concurrent enrollment; and DMS-235B Doppler Principles and Instrumentation or concurrent enrollment, or DMS-2350 Sonographic Instruments and Physics, or concurrent enrollment.

Outcomes

Course Outcome(s):

Adjust the instrumentation of the ultrasound equipment necessary to create an optimal diagnostic image.

Objective(s):

1. Describe the properties of ultrasound waves.
2. Describe the transducer basics such as architecture, frequencies, sound beam, lateral and longitudinal resolution, and display modes.
3. Describe and discuss current topics related to image evaluation, display and preservation.
4. Define Doppler effect and Doppler equation.
5. Define pulsed and continuous wave, color flow, and spectral display.

Methods of Evaluation:

1. Quizzes
2. Group discussion
3. Homework assignments
4. Mock registry exams

Course Content Outline:

1. Concepts
 - a. Sound interactions
 - b. Critical thinking

- c. Hemodynamics
 - d. Instrumentation
 - e. Storage
 - f. Display
 - g. Doppler
2. Skills
- a. Adjust equipment instrumentation for optimal imaging
 - b. Select the proper transducer to use and describe why stating its properties and construction
 - c. Relate how the different parameters of sound affect each other
 - d. Discuss the benefits and contraindications of the varying storage devices used for imaging
 - e. Describe the purpose and characteristics of Doppler ultrasound
3. Issues
- a. Bioeffects
 - b. Transmission
 - c. Transducer design
 - d. Storage limitations
 - e. Current trends

Topical Outline

1. Review of physical principles of ultrasound
 - a. Nature of sound
 - b. Properties of sound
 - c. Propagation of sound
 - d. Physical units of sound
 - e. Reflection, refraction, and attenuation of sound
 - f. Bioeffects - As Low As Reasonably Achievable (ALARA)
2. Review of sonographic instrumentation
 - a. Piezoelectric effect
 - b. Transducer design
 - i. Sound beam formation
 - ii. Focusing
 - iii. Pulse duration
 - iv. Transducer arrays
 - v. Beam resolution
 - c. Pulse echo instruments
 - i. Range equation
 - ii. Knobology
 - iii. Signal processing
3. Image, storage and display principles
 - a. Scan converters
 - b. Image storage
 - c. Display devices
4. Review of Doppler
 - a. Physical principles
 - b. Instrumentation
 - c. Principles of color flow
 - d. Hemodynamics
5. Current trends
 - a. Contrast agents
 - b. Elastography
 - c. Hybrid imaging

Resources

Edelman, Sidney K. *Understanding Ultrasound Physics: Fundamentals and Exam Review*. 4th ed. Dallas, TX: ESP, 2012.

Hoskins, Peter, Martin, Kevin and Thrush, Abigail, et al. *Diagnostic Ultrasound: Physics and Equipment*. 3rd ed. Boca Raton: Taylor & Francis Group, 2019.

Kremkau, Frederick. *Sonography Principles and Instruments*. 10th ed. St.Louis: Saunders, 2020.

Owen, Cindy A. and James A. Zagzebski. *Ultrasound Physics Interactive Mock Exam, SPI Edition* . Pasadena: Davies , 2017.

Owen, Cindy A, and Zagzebski, James. *Ultrasound Physics Review: A Review for the ARDMS SPI Exam*. Pasadena: Davies, 2017.

Miele, Frank R. *Ultrasound Physics and Instrumentation*. 5th ed. Forney, TX: Pegasus Lectures, 2013.

Hedrick, Wayne R. *Technology for Diagnostic Sonography*. 1st ed. St. Louis, MO: Elsevier Science, 2012.

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