

Intermediate Ultrasound Physics (DMSO 1342)



Credit: 3 semester credit hours (3 hours lecture)

Prerequisite/Co-requisite: Passed all previous cardiac sonography courses.

Course Description

Continuation of Basic Ultrasound Physics. Includes **interaction** of ultrasound with tissues, mechanics of ultrasound production and display, various transducer designs and construction, quality assurance, bioeffects and image artifacts. May introduce methods of Doppler flow analysis

Required Textbook and Materials

1. Understanding Ultrasound Physics by Sidney K. Edelman, Ph. D
ISBN# 0-9626444-4-7

Course Objectives

Upon completion of this course, the student will be able to:

1. Describe pulse-echo principles and action (SCANS: F1, F2, F3, F4, F5, F6, F10, F11, F12)
2. Recognize instrument options and transducer selection (SCANS: F1, F2, F4, F5, F6, F10, F11, F12, C5, C11, C18)
3. Recognize common image artifacts. (SCANS: F1, F2, F4, F5, F6, F10, F11, F12, C5, C11, C12, C18)
4. Describe potential bioeffects. (SCANS: F1, F2, F3, F4, F5, F6, F10, F11, F12, C5, C11, C12, C18)

SCANS Skills and Competencies

Beginning in the late 1980's, the U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS) conducted extensive research and interviews with business owners, union leaders, supervisors, and laborers in a wide variety of work settings to determine what knowledge workers needed in order to perform well on a job. In 1991 the Commission announced its findings in What Work Requires in Schools. In its research, the Commission determined that "workplace Know-how" consists of two elements: Foundation skills and workplace competencies.

Course Outline

- A. Two-Dimensional Imaging
 - a. Mechanical transducers
 - b. Linear array transducers
 - c. Linear sequential transducers
 - d. Convex sequential transducers
 - e. Vector transducers

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- B. Real-Time Imaging
 - a. Frame rate
 - b. Temporal resolution
- C. Pulsed Echo Instrumentation
 - a. Pulser
 - b. Receiver
 - c. Amplification
 - d. Compensation
 - e. Compression
 - f. Demodulation
 - g. Reject
- D. Displays and Image Storage
 - a. Analog
 - b. Digital
- E. Dynamic Range
 - a. Electrical system
 - b. Contrast resolution
- F. Harmonics and Contrast Agents
 - a. Tissue Harmonics
 - b. Contrast Harmonics
- G. Bioeffects
 - a. Devices for measuring bioeffects
 - b. Bioeffects of US on the tissues
 - c. AIUM statements
 - d. Epidemiology
- H. Quality Assurance
 - a. Requirements of a Quality Assurance program
 - b. Devices for measuring quality assurance
 - c. Performance of US equipment

Grade Scale

93 – 100	A
92 – 85	B
84– 75	C
74– 70 (not passing)	D
73.5 and below	F

Course Evaluation

Semester grades will be calculated from the following criteria:

1. Unit tests 100%

Course Requirements

1. Unit tests

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2. Class participation
3. Daily work assignments (worksheets, reading assignments, presentations)

Course Policies

1. No food, drinks, or use of tobacco products in class.
2. Beepers, cell phones, head phones and any other electronic devices must be turned off while in class.
3. Do not bring children to class.
4. If a unit test is missed, arrangements will be made with the instructor to take the test in a timely manner.
5. Attendance Policy: Absences must be limited to serious illness and/or immediate family emergencies. Unexcused absences are not allowed. Three (3) absences will result in a letter grade reduction.
6. Tardiness is discouraged. Excessive tardiness (more than 10 minutes/class) (or more than 2 consecutive classes) will result in an absence being awarded.
7. In the event that LIT is forced to cancel classes due to inclement weather, DMSO/DSEAE classes and clinical rotations will also be cancelled. Notification of closures will be made through local radio and TV stations.
8. If you wish to drop a course, the student is responsible for initiating and completing the drop process. If you stop coming to class and fail to drop the course, you will earn an "F" in the course.

Disabilities Statement

The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building.

Course Schedule

Week of	Topic	Reference
Week 1	Two Dimensional imaging	Edelman: pgs. 163-192
Week 2	Two Dimensional imaging	
Week 3	Test 1	
Week 4	Pulsed Echo Instrumentation	Edelman: pgs. 211-234
Week 5	Pulsed Echo Instrument.	
Week 6	Displays and Image Storage	Edelman: pgs. 235-257
Week 7	Dynamic range	Edelman: pgs. 257-263
Week 8	Test 2	
Week 9	Harmonics	Edelman: pgs. 263-275

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Week 10	Test 3	
Week 11	Artifacts	Edelman: pgs. 329-352
Week 12	Artifacts	
Week 13	Test 4	
Week 14	Quality Assurance	Edelman: pgs. 353-364
Week 15	Bioeffects	Edelman: pgs. 365-385
Week 16	Test 5	