

Intermediate Physics (DMSO 1342)



Credit: 3 semester credit hours (3 hours lecture)

Prerequisite/Co-requisite: Passed all previous 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#0-926444-4-7
www.esp-inc.com

Course Objectives

1. Describe pulse-echo principles and actions.
2. Identify instrument options and transducer selection.
3. Identify common image artifacts.
4. Describe potential bioeffects.

Course Outline

- A. LIT
 - a. Policies
 - b. Academic calendar
 - c. Classroom policies
- B. Axial and Lateral Resolution
 - a. Axial resolution
 - i. Spatial pulse length
 - b. Lateral resolution
 - i. Beam width
 - c. Focusing
 - i. Methods
 1. Conventional
 2. Electronics
 - ii. Effects of focusing
- C. Display Modes
 - a. A mode
 - b. B mode
 - c. M mode

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- D. Two-Dimensional Imaging
 - a. Transducers
 - i. Mechanical
 - ii. Linear Phased
 - iii. Annular phased
 - iv. Linear sequential
 - v. Vector
 - b. Slice thickness or elevation resolution
- E. Real Time Imaging
 - a. Temporal Resolution
 - b. Imaging Depth
 - c. Number of Pulsed per Image
 - i. Sector size
 - ii. Single vs. multi focus
 - iii. Scan line density
- F. Pulsed Echo Instrumentation
 - a. Pulser
 - b. Beam former
 - c. Receiver
 - i. Amplification
 - ii. Compensation
 - iii. Compression
 - iv. Demodulation
 - v. Reject
 - d. Output Power vs. Receiver Gain
- G. Displays and image Processing
 - a. Display controls
 - b. Analog and digital image data
 - c. Magnification
 - i. Write
 - ii. Read
 - d. Coded Excitation
 - e. Spatial Compounding
 - f. Frequency Compounding
 - g. Edge Enhancement
 - h. Persistence
 - i. Fill-in Interpolation
 - j. Emerging Technology: Elastography
 - k. PACS and DICOM
 - l. Recording and Archiving Techniques
 - i. Magnetic
 - ii. Chemically
 - iii. Optical media
- H. Dynamic Range
 - a. Dynamic Range of System Components
 - b. Number of choices

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- I. Artifacts
 - a. Image Characteristics
 - b. Basic Assumptions of Imaging System
 - c. Types of Artifacts
 - i. Reverberation
 - ii. Comet tail
 - iii. Shadow
 - iv. Enhancement
 - v. Mirror image
 - vi. Speed error
 - vii. Lobes
 - viii. Refraction
 - ix. Slice thickness
 - x. Lateral resolution
 - xi. Axial resolution

Grade Scale

93 – 100	A
85 – 92	B
77 – 84	C
69 - 76	D (not able to continue in sonography program)
68 and below	F

Course Evaluation

Semester grades will be calculated from the following criteria:

- 1. Unit tests/Final 100%

Course Requirements

- 1. Unit tests

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. All exams will be on the dates specified unless the instructor makes a change. In case of an absence on exam day, the exam must be completed on the day the student returns to class or a grade of zero will be awarded.

6. 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. Excessive tardiness (more than 10 minutes/class or more than 2 consecutive classes)** will result in an absence being awarded. In the event that LIT is forced to cancel classes due to inclement weather, DMS classes and clinical rotation will also be canceled. Notification of closures will be made through local radio and TV stations. Students out of the immediate broadcast area should contact the Program Director for information. **It is extremely important that students communicate with the faculty regarding absences by telephone and/or email at all times.**
7. All assignments are due when stated. Late assignments will result in a drop of **10** points per late day, and more than five days past due will result in a grade of **0**. If a student has an excused absence with written documentation, assignments will be accepted at the beginning of class upon return. Missed in-class assignments receive a grade of **0**.
8. Whenever testing occurs, all books/ backpacks must be placed in the front of the classroom away from the entire class. Cellphones are to be placed in a basket in the front of the room and will be returned when the test is turned in. If a student is caught with an electronic device that was not given to the instructor he/she will be given zero for the exam and can be construed as cheating.
9. It shall be considered a breach of academic integrity (cheating) to use or possess on your body any of the following devices during any examination unless it is required for that examination and approved by the instructor: Cell phone, smart watch/watch phone, laptop, tablet, electronic communication devices (including optical), and earphones connected to or used as electronic communication devices.
 - a. **Cheating on any (lecture) exam results in immediate dismissal from the program and an F for the course.**
10. You will have the length of the class to finish an exam. No extra time will be given.
11. 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.
12. No extra credit assignments will be given in this course.
13. Students with special needs and/or medical emergencies or situations should communicate with their instructor regarding individual exceptions/provisions. It is the student’s responsibility to communicate such needs to the instructor.

14. Additional class policies as defined by the individual course instructor.

Technical Requirements (for courses using Blackboard)

The latest technical requirements, including hardware, compatible browsers, operating systems, software, Java, etc. can be found online at:

https://help.blackboard.com/en-us/Learn/9.1_2014_04/Student/015_Browser_Support/015_Browser_Support_Policy

A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of the online technology and resources.

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. You may also visit the online resource at <http://www.lit.edu/depts/studerv/special/defaults.aspx>

Student Code of Conduct Statement

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at www.lit.edu or obtained in print upon request at the Student Services Office. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document.

Starfish

LIT utilizes an early alert system called Starfish. Throughout the semester, you may receive emails from Starfish regarding your course grades, attendance, or academic performance. Faculty members record student attendance, raise flags and kudos to express concern or give praise, and you can make an appointment with faculty and staff all through the Starfish home page. You can also login to Blackboard or MyLIT and click on the Starfish link to view academic alerts and detailed information. It is the responsibility of the student to pay attention to these emails and information in Starfish and consider taking the recommended actions. Starfish is used to help you be a successful student at LIT.



Course Schedule

Week	Topic	Reference
Week 1	Axial and Lateral Resolution	Edelman's Chapter 10 Power point
Week 2	Display Modes	Edelman's Chapter 11 Power point
Week 3	Test 1 Two-Dimensional Imaging	Edelman's Chapter 12 Power point
Week 4	Two-Dimensional Imaging I	Edelman's Chapter 12 Power point
Week 5	Test 2 Real Time Imaging	Edelman's Chapter 13 Power point
Week 6	Real Time Imaging Test 3	Edelman's Chapter 13 Power point
Week 7	Pulsed Echo Instrumentation	Edelman's Chapter 14 Power point
Week 8	Pulsed Echo Instrumentation	Edelman's Chapter 14 Power point
Week 9	Test 4 Displays and Image Processing	Edelman's Chapter 15 Power point
Week 10	Displays and Image Processing	Edelman's Chapter 15 Power point
Week 11	Dynamic Range	Edelman's Chapter 16 Power point
Week 12	Test 5	Edelman's Chapter 16 Power point
Week 13	Artifacts	Edelman's Chapter 21 Power point
Week 14	Artifacts	Edelman's Chapter 21 Power point
Week 14	Artifacts	Edelman's Chapter 21 Power point

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Week	Topic	Reference
Week 15	Test 6 Registry Review	

Contact information:

Judy Tinsley AAS, RDMS, RVT, RDCS, RT(R)

Office: Room 208, MPC Building

Telephone: (409) 839-2924

E-mail: jatinsley@lit.edu

Office hours: Posted on door