

DMSO 1342 Intermediate Physics

CREDIT

3 Semester Credit Hours (3 hours lecture)

MODE OF INSTRUCTION

Face to Face

PREREQUISITE/CO-REQUISITE:

Passed all previously required sonography courses.



**LAMAR INSTITUTE
OF TECHNOLOGY**

COURSE DESCRIPTION

Study of the 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.

COURSE OBJECTIVES

By the end of this course, students will be able to:

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

INSTRUCTOR CONTACT INFORMATION

Instructor: Tracy Ryals RDMS (AB, OB), RVT

Email: taryals@lit.edu

Office Phone: 409-247-5130

Office Location: GATEWAY 115

Office Hours: Please see Starfish to schedule an appointment

REQUIRED TEXTBOOK AND MATERIALS

1. Understanding Ultrasound Physics by Sidney K. Edelman, Ph.D 4th edition
ISBN#0-9626444-5-5 www.esp-inc.com
2. Examination Review for Ultrasound: Sonographic Principles & Instrumentation by Tracy Fox, MS RT(R), RDMS, RVT, Steven Penny MA RT(R) RDMS
ISBN #978-1975222109
3. Computer with webcam

ATTENDANCE POLICY

Students are expected to be in class unless prior arrangements have been made. 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. The terminology excused or not excused absence does not apply to this class. All absences are equal. Therefore, no matter the circumstances involved in the student's absence it will be counted towards the total for the semester.

- The sign-in sheet will be taken up 15 minutes after class starts. If you are more than 15 minutes late for class, you will be absent. Also, if you leave the classroom for more than 15 minutes you will be counted absent.
- When absent, the **student is required to contact the instructor** to notify them of the absence and obtain a make-up assignment for missed class. It is the student's responsibility to make up lab assignments or a grade of zero will be given.

It is extremely important that students always communicate with the faculty regarding absences by phone or email.

DROP POLICY

If you wish to drop a course, you are responsible for initiating and completing the drop process by the specified date as listed in the College Calendar on the [Student Success](#) web page. If you stop coming to class and fail to drop the course, you will earn an "F" in the course.

Date	Topic	Reading's (Due by this day)	Assignments (Due by this day)
Tues 08/25	Syllabus Review of previous Chapters		
Thurs 08/27	Ch 12 2D Imaging	Edelman Ch 12 & PP	
Tues 09/01	Ch 12 2D Imaging	Edelman Ch 12 & PP	
Thurs 09/03	In Class Assignment / Review for Test #1	Edelman Ch 12 & PP	
Tues 09/08	Test #1 In Class		Test
Thurs 09/10	Go over Test #1 Ch 13 Real Time Imaging	Edelman Ch 13 & PP	
Tues 09/15	Ch 13 Real Time Imaging In Class Assignment / Review for Test #2	Edelman Ch 13 & PP	
Thurs 09/17	Test #2 In Class	Edelman Ch 13 & PP	Test
Tues 09/22	Go over Test #2 Ch 14 Pulsed Echo Instrumentation		
Thurs 09/24	Ch 14 Pulsed Echo Instrumentation In class assignment – Review for Test #3	Edelman Ch 14 & PP	
Tues 09/29	Test #3 In Class	Edelman Ch 14 & PP	Test
Thurs 10/01	Go over Test #3 Ch 15 Displays & Image Processing	Edelman Ch 15 & PP	
Tues 10/06	Ch 15 Displays & Image Processing	Edelman Ch 15 & PP	
Thurs 10/08	Ch 16 Dynamic Range In class assignment – Review for Test #4	Edelman Ch 16 & PP	
Tues 10/13	Test #4 In Class	Edelman Ch 15 - 16 & PP	Test

Thurs 10/15	Go over Test #4 Ch 17 Harmonics & Contrast Agents	Edelman Ch 17 & PP	
Tues 10/20	Ch 17 Harmonics & Contrast Agents	Edelman Ch 17 & PP	
Thurs 10/22	Ch 17 In Class Assignment Review for Test #5	Edelman Ch 17 & PP	
Tues 10/27	Test #5 In Class	Edelman Ch 17 & PP	Test
Thurs 10/29	Go over Test #5 Ch 21 Artifacts	Edelman Ch 21 & PP	
Tues 11/03	Ch 21 Artifacts	Edelman Ch 21 & PP	
Thurs 11/05	Ch 21 Artifacts - In Class Assignment Review for Test #6	Edelman Ch 21 & PP	
Tues 11/10	Test #6 In Class	Edelman Ch 21 & PP	Test
Thurs 11/12	Review for Final		
Tues 11/17	Review for Final		
Thurs 11/19	Review for Final		
Tues 11/24	Review for Final		
Thurs 11/26	Happy Thanksgiving		
Tues 12/01	Final Exam - In Class		Final Exam

** This schedule is subject to change at the discretion of the instructor.*

COURSE EVALUATION

Semester grades will be calculated from the following criteria:

1. Unit Tests 70 %
2. In Class Assignments 5 %
3. Final Exam 25 %

GRADE SCALE

- 93-100 A
- 85-92 B
- 77-84 C (must pass with a 77 or higher in order to graduate from the program)
- 69-76 D
- 0-68 F

Course Outline

- A. LIT
 - a. Policies
 - a. Academic calendar
 - b. Classroom policies
- B. Two-Dimensional Imaging

- a. Transducers
 - i. Mechanical
 - ii. Linear Phased
 - iii. Annular phased
 - iv. Linear sequential
 - v. Vector
 - b. Slice thickness or elevation resolution
 - C. Real Time Imaging
 - a. Temporal Resolution
 - b. Imaging Depth
 - c. Number of Pulses per Image
 - i. Sector size
 - ii. Single vs. multi focus
 - iii. Scan line density
 - D. 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
 - E. 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
 - F. Dynamic Range
 - a. Dynamic Range of System Components
 - b. Number of choices
 - G. Harmonics and Contrast Agents
 - a. Fundamental and harmonic images
 - b. Tissue harmonics
 - c. Pulse inversion harmonics
 - d. Contrast agents
 - e. Contrast harmonics
 - H. 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

TECHNICAL REQUIREMENTS

For the latest technical requirements, including hardware, compatible browsers, operating systems, etc., review the Minimum Computer and Equipment Requirements on the [LIT Online Experience](#) page. A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of online technology and resources.

DISABILITIES STATEMENT

The Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. LIT provides reasonable accommodations as defined in the Rehabilitation Act of 1973, Section 504 and the Americans with Disabilities Act of 1990, to students with a diagnosed disability. The Special Populations Office is located in the Eagles' Nest Room 129 and helps foster a supportive and inclusive educational environment by maintaining partnerships with faculty and staff, as well as promoting awareness among all members of the Lamar Institute of Technology community. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409)-951-5708 or email specialpopulations@lit.edu. You may also visit the online resource at [Special Populations - Lamar Institute of Technology \(lit.edu\)](#).

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. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document.

ARTIFICIAL INTELLIGENCE STATEMENT

Lamar Institute of Technology (LIT) recognizes the recent advances in Artificial Intelligence (AI), such as ChatGPT, have changed the landscape of many career disciplines and will impact many students in and out of the classroom. To prepare students for their selected careers, LIT desires to guide students in the ethical use of these technologies and incorporate AI into classroom instruction and assignments appropriately. Appropriate use of these technologies is at the discretion of the instructor. Students are reminded that all submitted work must be their own original work unless otherwise specified. Students should contact their instructor with any questions as to the acceptable use of AI/ChatGPT in their courses.

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.

ADDITIONAL COURSE POLICIES/INFORMATION

- No food, drinks, or tobacco products are allowed in class.
- Cell phones and all electronic devices must be turned off during class.
- Children are not permitted in class at any time.
- Assignments are due at the beginning of class or by the date listed in the syllabus.
 - **Late work will not be accepted and will receive a grade of zero.**

EXAM POLICIES & ONLINE TESTING RULES

- Exams will be given in person on scheduled dates unless otherwise announced by the instructor. They will be given through Blackboard and will require Lockdown Browser
- If an in-person exam is missed, a 10-point deduction will apply for each class day missed after the exam date. Students must make up the exam on the first day they return to class. If a student attends any sonography class on test day, the exam must be taken that day or a zero will be assigned.
- For online exams, late submissions will lose 10 points for every hour late beginning at the due time. Exams not submitted by midnight on the due date will receive a zero.

Academic Integrity

- Possession or use of unauthorized devices during exams (cell phones, smart watches, earbuds, tablets, laptops, meta glasses, notes, etc.) is considered cheating unless specifically approved by the instructor.
- Cheating on any lecture or lab exam results in immediate dismissal from the program and an F for the course.

Online Exam Requirements (LockDown Browser & Webcam)

- Exams will require LockDown Browser with webcam and screen monitoring.
- Students must:
 - Test in a well-lit, private location
 - Sit with a mirror behind them showing the full computer screen during the entire exam
 - Always keep face and ears fully visible
 - Remove all phones, watches, notes, books, and papers from the testing area
 - Disable music, TV, and other background distractions
 - Remain in the testing area for the entire exam
 - Avoid reading questions aloud

Point Deductions

- 20-point deductions may be given for:
 - Poor lighting
 - Face or ears not fully visible
 - Screen/computer not visible in mirror during entire examination
 - Wearing hats, hoodies, earbuds, headphones, sunglasses, etc.
 - Reading questions aloud
- Repeated violations may increase to a 50-point deduction.
- 50-point deductions or a zero may result from:
 - Another person being seen or heard during the exam
 - Leaving the testing area during the exam
 - Having unauthorized materials visible during testing