

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.

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
ISBN#0-9626444-5-5 www.esp-inc.com
2. Computer with internet access
3. Webcam for taking exams

ATTENDANCE POLICY

- Students are expected to be in class. Absences must be limited to serious illness with a Dr.'s note and/or immediate family emergencies.
- **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 **unexcused** 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.



**LAMAR INSTITUTE
OF TECHNOLOGY**

- The sign in sheet will be taken up 15 minutes after class starts. If you are more than 15 minutes late to class you will be counted 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 and make them aware of the absence and to obtain any missed assignments and/or information for the missed class.

DROP POLICY

If you wish to drop a course, ***you are 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.

Date	Topic	Reading's (Due by this day)	Assignments (Due by this day)
Tues 08/27	Syllabus Go over Final from 1302		
Thurs 08/29	Ch 12 2D Imaging	Edelman Ch 12 & PP	
Tues 09/03	Ch 12 2D Imaging	Edelman Ch 12 & PP	
Thurs 09/05	In Class Assignment / Review for Test #1	Edelman Ch 12 & PP	
Tues 09/10	Test #1 In Class		Test #1 Due
Thurs 09/12	Go over Test #1 Ch 13 Real Time Imaging	Edelman Ch 13 & PP	
Tues 09/17	Ch 13 Real Time Imaging	Edelman Ch 13 & PP	
Thurs 09/19	Ch 13 Real Time Imaging In Class Assignment / Review for Test #2	Edelman Ch 13 & PP	
Tues 09/24	Test #2 In Class		Test #2 Due
Thurs 09/26	Go over Test #2 Ch 14 Pulsed Echo Instrumentation	Edelman Ch 14 & PP	
Tues 10/01	Ch 14 Pulsed Echo Instrumentation	Edelman Ch 14 & PP	
Thurs 10/03	Ch 14 Pulsed Echo Instrumentation In Class Assignment / Review for Test #3	Edelman Ch 14 & PP	
Tues 10/08	Test #3 In Class		Test #3 Due
Thurs 10/10	Go over Test #3 Ch 15 Displays & Image Processing	Edelman Ch 15 & PP	
Tues 10/15	Ch 15 Displays & Image Processing	Edelman Ch 15 & PP	
Thurs 10/17	Ch 15 Displays & Image Processing Ch 16 Dynamic Range	Edelman Ch 15, 16 & PP	
Tues 10/22	Ch 15 & 16 – In Class Assignment Review for Test #4	Edelman Ch 15, 16 & PP	
Thurs 10/24	Test #4 In Class		Test #4 Due
Tues 10/29	Go over Test #4 Ch 17 Harmonics & Contrast Agents	Edelman Ch 17 & PP	

Thurs 10/31	Ch 17 Harmonics & Contrast Agents	Edelman Ch 17 & PP	
Tues 11/05	Ch 17 In Class Assignment Review for Test #5	Edelman Ch 17 & PP	
Thurs 11/07	Test #5 In Class		Test #5 Due
Tues 11/12	Go over Test #5 Ch 21 Artifacts	Edelman Ch 21 & PP	
Thurs 11/14	Ch 21 Artifacts	Edelman Ch 21 & PP	
Tues 11/19	Ch 21 Artifacts - In Class Assignment Review for Test #6	Edelman Ch 21 & PP	
Thurs 11/21	Test #6 In Class		Test #6 Due
Tues 11/26	Review for Final		
Thurs 11/28	Happy Thanksgiving		
Tues 12/03	Review for Final		
Thurs 12/05	Final Exam - In Class		Final Exam Due

** 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 75 %
2. In Class Assignments 5 %
3. Final Exam 20 %

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 Requirements

1. Unit tests
2. Reading assignments
3. Worksheets/In Class Assignments
4. Review Questions
5. Computer with webcam for exams

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

The latest technical requirements, including hardware, compatible browsers, operating systems, etc. can be online at <https://lit.edu/online-learning/online-learning-minimum-computer-requirements>. 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 use of tobacco products in class.
- Cellphones and any other electronic devices must be turned off while in class.
- Do not bring children to class.
- All assignments are due at the beginning of class and/or when stated in the syllabus. ***Late assignments will not be accepted and will result in a grade of ZERO.***
- ***In-Person Exams:*** All exams will be on the dates specified unless the instructor makes a change. In case of an ***absence on exam day***, the student will have a **10 point reduction on his/her test score. The score will continue to drop 10 points for every class day missed following the test.** Also, if the student attends any sonography classes on test day, he/she must take the test that day or a zero will be given. The student will have to make up the test if missed, the class day that the student returns.
- If exams are done online the following rules apply. All exams will be on the dates specified unless the instructor makes a change. **If the student misses an exam due date, the student will be given a 0 after midnight on the day that it was due.** Before midnight the day of the test, the score will drop 10 points for every hour the exam is late beginning with the time it was due. For example, if the test is due at 7:00 and the student turns in the exam at 7:01 the grade drops 10 points. At 8:00 pm, the grade will drop 20 points, etc. The time is set by the individual instructor so 7:00 pm is only an example.
- 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/lab) exam results in immediate dismissal from the program and an F for the course.
- Exams may be done online through BlackBoard. If so, you will be using LockDown Browser with Webcam and screen monitoring. The rules for the tests are:

- Disable all notifications on your computer. This is how LockDown Browser is used to take a test.
- Locate the “LockDown Browser” shortcut on the desktop and double-click it. (For Mac users, launch “LockDown Browser” from the Applications folder.)
- If prompted to close a blocked program (e.g. screen capture, instant messaging) choose **Yes**.
- Log into the course, navigate to the test and select it.
- A Startup Sequence will guide the student through a webcam check and other items required by the instructor.
- The test will then start.

20-point deductions for each of these occurrences:

- Where you are taking your exam must be well lit.
 - If it is not well lit, you will have **20 points** deducted from your test.
- Your face must be visible the **entire length** of the test.
 - If your face cannot be seen even for a few seconds you will have **20 points** deducted from your test.
- No music should be playing nor should a TV/radio/video be on in the background.
- **You may not read the questions out loud.**
 - If you do so, you automatically receive a **20-point deduction**.
- You may not wear sunglasses, hats, hoodies, earbuds, headphones, etc. during the exam. Your ears must be fully visible the entire exam.
 - Failure to comply with this will be a **20-point deduction**.
- ***If you do any of this on another exam it will turn into a 50-point deduction***

50-point reduction or a zero on the entire test

- You must be in a private location. If another person is seen or heard while you are taking your test this could be misconstrued as cheating.
 - If this happens there will be a **50-point deduction** or a zero. This depends on the situation and is at the discretion of your instructor.
- All phones, notes, books, and other papers must be removed from the testing location.
 1. If these items are seen during your exam, you receive an **automatic zero** on the exam.
- Do NOT leave the exam room for any reason, if you do.
 - This is an automatic **50-point deduction**.
- Any suspicious activity that appears to be cheating will result in a **zero**.

Testing Tips for Blackboard Tests

1. You must use Google Chrome browser.
 - You must have a webcam and a microphone attached to your computer
 - Be prepared to scan the room with a camera, if you cannot move your computer, you will need to have a mirror available to assist with scanning the room.

2. It is the ***student's responsibility*** to ensure that ALL of the above requirements are met. By completing the verify signature portion of the exam, you are accepting responsibility for your actions during the exam.
 3. Failure to follow these requirements will result in deductions from your exam grade when reviewed by your Instructor.
- There is no extra credit given for this course.
 - **YOU WILL GET ONE TEST RESET PER SEMESTER!!**