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
Attendance is mandatory.
Students are allowed a maximum of **two (2) absences** during the semester.
• On the **third absence**, the **final course grade will be lowered by one letter** (e.g., A becomes B, B becomes C, etc.).
• There is **no distinction between excused & unexcused absences—an absence is an absence**, regardless of the reason.
• Tardiness of more than **10 minutes**, or being late to **two consecutive classes**, will count as

one absence.
• The **sign-in sheet will be removed 15 minutes after class begins**. Students arriving after this time will be marked **absent**.
• Leaving class for **more than 15 minutes** will also result in an **absence**.
• If you are absent, you must **notify the instructor** and are responsible for **obtaining any missed assignments, notes, or instructions**.

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.
If you drop any sonography course, you cannot complete the program. All courses are required.

Date	Topic	Reading's (Due by this day)	Assignments (Due by this day)
Tues 08/26	Syllabus Go over Final from 1302		
Thurs 08/28	Ch 12 2D Imaging	Edelman Ch 12 & PP	
Tues 09/02	Ch 12 2D Imaging	Edelman Ch 12 & PP	
Thurs 09/04	In Class Assignment / Review for Test #1	Edelman Ch 12 & PP	
Tues 09/09	**Test #1 In Class**		**Test**
Thurs 09/11	Go over Test #1 Ch 13 Real Time Imaging	Edelman Ch 13 & PP	
Tues 09/16	Ch 13 Real Time Imaging	Edelman Ch 13 & PP	
Thurs 09/18	Ch 13 Real Time Imaging In Class Assignment / Review for Test #2	Edelman Ch 13 & PP	
Tues 09/23	**Test #2 In Class**		**Test**
Thurs 09/25	Go over Test #2 Ch 14 Pulsed Echo Instrumentation	Edelman Ch 14 & PP	
Tues 09/30	Ch 14 Pulsed Echo Instrumentation	Edelman Ch 14 & PP	
Thurs 10/02	Ch 14 Pulsed Echo Instrumentation In Class Assignment / Review for Test #3	Edelman Ch 14 & PP	
Tues 10/07	**Test #3 In Class**		**Test**
Thurs 10/09	Go over Test #3 Ch 15 Displays & Image Processing	Edelman Ch 15 & PP	
Tues 10/14	Ch 15 Displays & Image Processing	Edelman Ch 15 & PP	
Thurs 10/16	Ch 15 Displays & Image Processing Ch 16 Dynamic Range	Edelman Ch 15, 16 & PP	
Tues 10/21	Ch 15 & 16 – In Class Assignment Review for Test #4	Edelman Ch 15, 16 & PP	
Thurs 10/23	**Test #4 In Class**		**Test**
Tues 10/28	Go over Test #4 Ch 17 Harmonics & Contrast Agents	Edelman Ch 17 & PP	

Thurs 10/30	Ch 17 Harmonics & Contrast Agents	Edelman Ch 17 & PP	
Tues 11/04	Ch 17 In Class Assignment Review for Test #5	Edelman Ch 17 & PP	
Thurs 11/06	**Test #5 In Class**		**Test**
Tues 11/11	Go over Test #5 Ch 21 Artifacts	Edelman Ch 21 & PP	
Thurs 11/13	Ch 21 Artifacts	Edelman Ch 21 & PP	
Tues 11/18	Ch 21 Artifacts - In Class Assignment Review for Test #6	Edelman Ch 21 & PP	
Thurs 11/20	**Test #6 In Class**		**Test**
Tues 11/25	Review for Final		
Thurs 11/27	**Happy Thanksgiving**		
Tues 12/02	Review for Final		
Thurs 12/04	**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 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 Wi-Fi 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.**
- If you fail an exam, you MUST make an appointment and meet with the instructor to go over the exam.

Exam Policy – In-Person

- All in-person exams will be given on the dates listed unless changed by the instructor.
- If you miss an exam:
    - You will lose 10 points from your test grade.
    - An additional 10 points will be deducted for each class day missed afterward.
- If you attend any sonography class on the test day, you must take the test that day or receive a zero.
- Make-up exams must be taken on the first-class day you return.

Academic Integrity Policy

- It is considered cheating to use or possess the following items during any exam (unless approved for use):
    - **Cell phones, smart watches, laptop, tablet, earphones/buds, Meta glasses, unauthorized calculators or any communication device.**
- **Cheating on any lecture or lab exam will result in:**
    - **Immediate dismissal from the program.**
    - **A final course grade of F.**

Exam Policy – Online

- Online exams will be given on scheduled dates unless changed by the instructor.
- If you miss the deadline:
    - 10 points will be deducted every hour the exam is late, starting from the posted due time.
        - *Example: If the exam is due at 7:00 PM and submitted at 7:01 PM, 10 points will be deducted; at 8:00 PM, 20 points, etc.*
    - After midnight, the exam receives a zero.
- All online exams will be administered through Blackboard using LockDown Browser with Webcam and Screen Monitoring.

LockDown Browser Instructions

- Disable all computer notifications before testing.
- Open the “LockDown Browser” from your desktop (or Applications folder on Mac).
- Close all blocked programs when prompted.
- Log in to Blackboard and begin the exam.
- Complete the Startup Sequence, including the webcam check and environment scan.

Online Exam Violations – Point Deductions

20-Point Deductions:

- Poor lighting in the testing environment.
- Face is not visible always.
- Background noise (TV, music, talking, etc.).
- Reading questions aloud.
- Wearing sunglasses, hats, hoodies, earbuds, or headphones (ears must remain fully visible).

Repeat of any above violation on another exam = 50-point deduction.

Major Violations – 50-Point Deduction or Zero

- Not in a private location (if another person is seen or heard).
- Use or visibility of phones, notes, books, or papers during the exam.
- Leaving the room for any reason during the exam.
- Suspicious activity that appears to be cheating.

These violations may result in a zero or 50-point deduction at the instructor’s discretion.

Academic Integrity Policy

- It is considered cheating to use or possess the following items during any exam (unless approved for use):
  - **Cell phones, smart watches, laptop, tablet, earphones, or any communication device.**
- **Cheating on any lecture or lab exam will result in:**
  - **Immediate dismissal from the program.**
  - **A final course grade of F.**

Testing Tips (Online Exams)

1. Use Google Chrome as your browser.
2. You must have a webcam and microphone connected.
3. Be prepared to scan your testing area. If you can’t move your computer, use a mirror to show your surroundings.

Important Notes

- You are responsible for following all testing requirements.
- Completing the verified signature portion of the exam confirms your agreement to follow all rules.
- **No extra credit is given in this course**.
- You are allowed ONE test reset per semester for technical difficulties with on-line exams only. No exceptions.