DMSO 1342 Intermediate Ultrasound Physics

CREDIT
3 Semester Credit Hours (3 hours lecture)

MODE OF INSTRUCTION
Face to Face

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.

COURSE OBJECTIVES
Upon completion of this course, the student will be able to:
- Describe pulse-echo principles and actions.
- Identify instrument options and transducer selection.
- Identify common image artifacts.

INSTRUCTOR CONTACT INFORMATION

Instructor:	Tracy Ryals RDMS, RVT
Email:	taryals@lit.edu
Office Phone:	Mrs. Ryals 409-234-6033
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

Approved: MM/2023

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. **Three (3) lecture absences will result in a letter grade reduction. Two (2) lab absences will result in a 10 point grade reduction from the overall lab average. Excessive tardiness (more than 15 minutes/class or more than 2 consecutive classes)** will result in an absence being awarded. Also, leaving class early 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.**

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.

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COURSE CALENDAR

WEEK	TOPIC	READINGS (Due on this Date)	ASSIGNMENTS (Due on this Date)
1 **(8/22 - 8/24)**	**TUES:** Syllabus/Ch 11 Display Modes **THURS:** Ch. 11 Display Modes and Ch. 12 Two-Dimension Imaging	Blackboard, Edelman Ch 11, 12 & PP	
2 **(8/29-8/31)**	**TUES / THURS.** Ch. 12 Two-Dimension Imaging	Blackboard, Edelman Ch 11, 12 & PP	
3 **(9/05 - 9/07)**	**TUES:** KAHOOT FOR TEST # 1 **THURS: TEST # 1**	Blackboard, Edelman Ch 11, 12 & PP	**UNIT I TEST OPEN ON Blackboard 9/05/23 – 9/08/23 DUE 9/08/23 @ 5 PM.**
4 **(9/12-9/14)**	**TUES / THURS** Ch. 13 Real- Time Imaging	Blackboard, Edelman Ch. 13 & PP	

5 **(9/19-9/21)**	**TUES:** Ch. 13 Worksheets **THURS: <u>TEST # 2</u>**	Blackboard, Edelman Ch. 13 & PP	**<u>UNIT II TEST OPEN ON Blackboard</u>** **<u>9/19/23 – 9/22/23</u>** **<u>DUE 9/22/23 @ 5 PM.</u>**
6 **(9/26-9/28)**	**TUES / THURS.** Ch. 14 Pulsed Echo Instrumentation	Blackboard, Edelman Ch. 14 & PP	
7 **(10/3-10/5)**	**TUES:** Ch. 14 Pulsed Echo Instrumentation **THURS:** KAHOOT FOR TEST # 3	Blackboard, Edelman Ch. 14 & PP	**<u>UNIT III TEST OPEN ON Blackboard</u>** **<u>10/06/23 – 10/10/23</u>** **<u>DUE 10/10/23</u>** **<u>@ 5 PM.</u>**
8 **(10/10-10/12)**	**TUES: <u>TEST # 3</u>** **THURS:** Ch. 15 Displays and Image Processing	Blackboard, Edelman Ch. 15 & PP	
9 **(10/17-10/19)**	**TUES:** Ch. 15 Displays and Image Processing **THURS:** Ch. 16 Dynamic Range	Blackboard, Edelman Ch. 15, 16 & PP	
10 **(10/24-10/26)**	**TUES:** KAHOOT FOR TEST # 4 **THURS: <u>TEST # 4</u>**	Blackboard, Edelman Ch. 15, 16 & PP	**<u>UNIT IV TEST OPEN ON Blackboard</u>** **<u>10/24/23 – 10/27/23</u>** **<u>DUE 10/27/23</u>** **<u>@ 5 PM.</u>**
11 **(10/31-11/02)**	**TUES/THURS** Ch. 17 Harmonics & Contrast Agents	Blackboard, Edelman Ch. 17 & PP	
12 **(11/07-11/09)**	**TUES:** Ch. 17 Harmonics & Contrast Agents **THURS:** KAHOOT FOR TEST # 5	Blackboard, Edelman Ch. 17 & PP	**<u>UNIT V TEST OPEN ON Blackboard</u>** **<u>11/10/23 – 11/14/23</u>** **<u>DUE 11/14/23</u>** **<u>@ 5 PM.</u>**

13 **(11/14-11/16)**	**TUES: <u>TEST # 5</u>** **THURS:** Ch. 21 Artifacts	Blackboard, Edelman Ch. 21 & PP	
14 **(11/21-11/23)**	**TUES:** Ch. 21 Artifacts **THURS:** *THANKSGIVING*	Blackboard, Edelman Ch. 21 & PP	
15 **(11/28-11/30)**	**TUES:** Ch. 21 Artifacts **THURS:** KAHOOT FOR TEST # 6	Blackboard, Edelman Ch. 21 & PP	
16 **(12/5)**	**TUES: <u>TEST # 6</u>**	Blackboard, Edelman Ch. 21 & PP	**<u>UNIT VI TEST OPEN ON Blackboard 12/01/23 – 12/05/23 DUE 12/05/23 @ 5 PM.</u>**

* 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 100%

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
4. Review Questions
5. Computer with webcam for exams

Course Outline

A. LIT
    a. Policies
    b. Academic calendar
    c. Classroom policies
B. Display Modes
    a. A mode
    b. B mode
    c. M mode
C. Two-Dimensional Imaging
    a. Transducers
        i. Mechanical
        ii. Linear Phased
        iii. Annular phased
        iv. Linear sequential
        v. Vector
    b. Slice thickness or elevation resolution
D. 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
E. 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
F. 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

G. Dynamic Range
    a. Dynamic Range of System Components
    b. Number of choices

H. Harmonics and Contrast Agents
    a. Fundamental and harmonic images
    b. Tissue harmonics
    c. Pulse inversion harmonics
    d. Contrast agents
    e. Contrast harmonics

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
        xii.

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.

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

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. **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.**

5. 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.

6. All assignments are due when stated **at the beginning of class or online at the dates given on the syllabus.** 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.** Missed in-class assignments receive a grade of **0**.

7. 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.**

8. All exams will be online. You will be using LockDown Browser with Webcam 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 occurrence:

- 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 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 resulting in a 50-point reduction or a zero. That is up the situation and your instructor.
- All phones, notes, books, and other papers must be removed from the testing location. 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, it is an automatic 50-point deduction.
- Any suspicious activity that appears to be cheating will result in a zero.

Testing Tips

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. Failure to follow the requirements will result in deductions from your exam grade when reviewed by your Instructor.

9.

a. **<u>Cheating on any (lecture/lab) exam results in immediate dismissal from the program and an F for the course.</u>**

10. You will have the length of the class to finish an exam. No extra time will be given.

11. Class roll is taken by the sign in sheets. If you did not sign in, you will be counted absent.

12. 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.

13. When absent, the student is required to contact the instructor to obtain make-up assignment for missed class. It is the student's responsibility to make up lecture/lab assignments or a grade of zero will be given.

14. 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.

15. There will be no extra credit assignments given in this course.

16. 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.

17. If you fail any test, you are required to get ahold of me and schedule a collaborate session to review the material. It is your duty to be prepared for this meeting.

18. Any taping of the material, when we go over tests/ results, will be considered cheating and you will be dismissed from the program. It is our duty to prepare you for the registry.

19. Additional class policies as defined by the individual course instructor and sonography handbook.

20. **You will get one test reset per semester!!**