

# DMSO 1302 Basic Physics

## CREDIT

3 Semester Credit Hours (3 hours lecture)

## MODE OF INSTRUCTION

Face to Face



**LAMAR INSTITUTE  
OF TECHNOLOGY**

## COURSE DESCRIPTION

This course provides a foundational exploration of basic ultrasound physics with a specific emphasis on acoustical principles within human tissue. Students will examine the mechanics of ultrasound transmission in soft tissues, the phenomena of sound energy attenuation, and the influential parameters governing sound propagation. Furthermore, this course delves into the concept of resolution in sound beams, explaining its implications for the quality and precision of ultrasound imaging. Through a blend of theoretical concepts and practical applications, students will develop a strong understanding of the fundamental principles of ultrasound technology and its pivotal role in medical diagnostics and imaging.

## COURSE OBJECTIVES

- Upon completion of this course, the student will be able to
  - Describe the interaction of sound in soft tissues
  - Explain sound production and propagation
  - Understand the principle of US transducers and sound beams
  - Conceptualize Axial & Lateral Resolution
  - Summarize the basic principles and techniques of ultrasound

## INSTRUCTOR CONTACT INFORMATION

Instructor: Tracy Ryals, RDMS, RVT

Email: [taryals@lit.eu](mailto:taryals@lit.eu)

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 4<sup>th</sup> edition  
ISBN#0-9626444-5-5  
[www.esp-inc.com](http://www.esp-inc.com)
2. Computer with webcam

## 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.
- 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.

## COURSE CALENDAR

DATE	TOPIC	READINGS (Due on this Date)	ASSIGNMENTS (Due on this Date)
06 – 03	Syllabus Ch 1 The Basics	Chapter 1 & PP	
06 – 05	Ch 2 Sound Ch 3 Describing Sound Waves	Chapter 2, 3, & PPs	
06 – 10	Ch 4 Describing Pulsed Waves	Chapter 3 & PP	<b>Quiz 1 due @ 11:59 PM Test #1 Opens @ 12 PM</b>
06 – 12	Test # 1		<b>Test #1 Due @ 7PM</b>
06 – 17	Review Test #1 Ch 5 Intensities	Chapter 5 & PP	
06 – 19	Holiday – No class		
06 – 24	Ch 6 Interaction of Sound & Media	Chapter 6 & PP	
06 – 26	Ch 6 Interaction of Sound & Media	Chapter 6 & PP	
07 – 01	Ch 7 Range Equation	Chapter 7 & PP	<b>Quiz 2 due @ 11:59 PM Test #2 Opens @ 12 PM</b>
07 – 03	Test # 2		<b>Test #2 Due @ 7 PM</b>
07 – 08	Review Test #2 Ch 8 Transducers		
07 – 10	Ch 8 Transducers Ch 9 Sound Beams	Chapter 8 & PP	
07 – 15	Ch 9 Sound Beams	Chapter 9 & PP	<b>Quiz 3 due @ 11:59 PM Test #3 Opens @ 12 PM</b>

07 – 17	Test # 3		<b>Test #3 Due @ 7 PM</b>
07 – 22	Review Test # 3 Ch 10 Axial & Lateral Resolution	Chapter 10 & PP	
07 – 24	Ch 10 Axial & Lateral Resolution	Chapter 10 & PP	
07 – 29	Ch 11 Displays	Chapter 11 & PP	<b>Quiz 4 due @ 11:59 PM Test #4 Opens @ 12 PM</b>
07 – 31	Test # 4		<b>Test #4 Due @ 7 PM</b>
08 – 05	Review Test #4 & Review for Final		
08 – 07	Review for Final		
08 – 12	Review for Final		<b>Final Opens 8 AM</b>
08 – 14	Final Exam		<b>Final Due @ 7 PM</b>

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

### **COURSE EVALUATION**

Final grades will be calculated according to the following criteria:

- **Unit Exams 85%**
- **Course Assignments 5%**
- **Final Exam 10%**

### **GRADE SCALE**

- 93-100    A
- 85-92    B
- 77-84    C
- 69-76    D
- 0-68     F

### **Course Outline**

- A. LIT
  - a. Policies
  - b. Academic calendar
  - c. Classroom policies
- B. The Basics
  - a. Metric system
  - b. Graphs
- C. Sound
  - a. Sound waves
  - b. Acoustic parameters
    - i. Acoustic variables
- D. Describing Sound Waves
  - a. Period
  - b. Frequency

- c. Strength
  - i. Intensity
  - ii. Power
  - iii. amplitude
- d. Wavelength
- e. Propagation speed
- E. Describing Pulsed Waves
  - a. Pulsed Ultrasound
  - b. Pulse Duration
  - c. Spatial Pulse Length
  - d. Pulse Repetition Period
  - e. Duty Factor
- F. Interaction of Sound and Media
  - a. Decibels
  - b. Attenuation
  - c. Attenuation Coefficient
  - d. Reflection and Transmission
  - e. Impedance
- G. Range Equation
  - a. Range equation
    - i. Time of flight
    - ii. Go return time
    - iii. 13 microsecond rule
- H. Axial Resolution
- I. Transducers
  - a. Basic transducer construction
    - i. Types of transducers
  - b. Transducer frequencies
  - c. Sound beams
    - i. Anatomy of a sound beam
    - ii. Focused
    - iii. Unfocused
- J. Sound beam
  - i. Focal depth
  - ii. Divergence
  - b. Huygens' principle
    - i. Spherical waves

## **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](mailto:specialpopulations@lit.edu). You may also visit the online resource at [Special Populations - Lamar Institute of Technology \(lit.edu\)](http://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](http://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

- 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.***
- 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.
- All exams will be done online through BlackBoard. 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.
  - 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***

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!!**