

# DMSO 2351 3A1 Doppler Physics

## CREDIT

3 Semester Credit Hours (3 hours lecture, 0 hours lab)

## MODE OF INSTRUCTION

Face to Face

## PREREQUISITE/CO-REQUISITE:

Passed all previous sonography courses.

## COURSE DESCRIPTION

Doppler and Hemodynamic principles relating to arterial and venous imaging and testing.

## COURSE OBJECTIVES

Upon completion of this course, the student will be able to.

- Describe Doppler and Hemodynamic principles and actions.
- Interpret methods of Doppler flow analysis.
- Describe potential bioeffects.

## INSTRUCTOR CONTACT INFORMATION

Instructor: Tracy Ryals RDMS, 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

- *Understanding Ultrasound Physics* by Sidney K. Edelman, Ph.D. 4<sup>th</sup> edition  
**ISBN# 0-9626444-5-5**
- Computer with internet access
- Webcam for taking exams

## 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.



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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 to 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. If you stop coming to class and fail to drop the course, you will earn an "F" in the course.

### **COURSE CALENDAR**

<b>DATE</b>	<b>TOPIC</b>	<b>READINGS (Due on this Date)</b>	<b>ASSIGNMENTS (Due on this Date)</b>
<b>Tues 1/21</b>	Syllabus Ch 18 Hemodynamics Lecture	Ch 18 Hemodynamics Ch 18 PowerPoint	
<b>Thurs 1/23</b>	Ch 18 Hemodynamics Lecture		
<b>Tues 1/28</b>	Ch18 Hemodynamics Lecture & Review		<b>Quiz #1</b> Due by 11:59 PM
<b>Thurs 1/30</b>	<b>Test #1 in Class</b>		<b>Test #1</b>
<b>Tues 2/04</b>	Review Test 1 Ch19 Doppler Lecture		
<b>Tues 2/06</b>	Out of Class Assignment		
<b>Thurs 2/11</b>	Ch19 Doppler Lecture	Ch 19 Doppler Ch 19 PowerPoint	
<b>Tues 2/13</b>	Ch19 Doppler Lecture		
<b>Thurs 2/18</b>	Ch19 Doppler Lecture Review for Test #2		<b>Quiz #2</b> Due by 11:59 PM
<b>Tues 2/20</b>	<b>Test #2 in Class</b>		<b>Test #2</b>
<b>Thurs 2/20</b>	Review Test 2 Ch20 Optimizing Lecture	Ch 20 Optimizing Doppler Imaging Ch 20 PowerPoint	
<b>Tues 2/25</b>	Ch20 Optimizing Lecture Ch22 Quality Assurance		
<b>Thurs 2/27</b>	Ch22 Quality Assurance	Ch 22 Quality Assurance Ch 22 PowerPoint	
<b>Tues 3/04</b>	Ch20 & Ch22 Review		<b>Quiz #3</b> Due by 11:59 PM
<b>Thurs 3/06</b>	<b>Test #3 in Class</b>		<b>Test #3</b>

<b>Tues 3/11</b>	Spring Break		
<b>Thurs 3/13</b>	Spring Break		
<b>Tues 3/18</b>	Review Test 3 Ch23 Sonographers in the Clinical Setting Lecture	Ch23 Clinical Setting Ch23 PowerPoint	
<b>Thurs 3/20</b>	Ch24 Bioeffects Lecture	Ch 24 Bioeffects Ch 24 PowerPoint	
<b>Tues 3/25</b>	Ch24 Bioeffects Lecture		
<b>Thurs 3/27</b>	Ch23 & Ch24 Review		<b>Quiz #4</b> Due by 11:59 PM
<b>Tues 4/01</b>	<b>Test #4 in Class</b>		<b>Test #4</b>
<b>Thurs 4/03</b>	Review Test 4 New Technologies	New Technologies PowerPoint	
<b>Tues 4/08</b>	New Technologies		
<b>Thurs 4/10</b>	New Technologies Review		<b>Quiz #5</b> Due by 11:59 PM
<b>Tues 4/15</b>	<b>Test #5 in Class</b>		<b>Test #5</b>
<b>Thurs 4/17</b>	Final/Registry Review		
<b>Tues 4/22</b>	Final/Registry Review		
<b>Thurs 4/25</b>	Final/Registry Review		
<b>Tues 4/29</b>	Final/Registry Review		
<b>Thurs 5/01</b>	Final/Registry Review		
<b>Tues 5/02</b>	Final/Registry Review		
<b>Tues 5/06</b>	Final Exam		

\* 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 75%**
- **Course Assignments 5%**
- **Final Exam 20%**

## **GRADE SCALE**

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

## **Course Outline**

### **A. LIT**

1. Policies
2. Academic calendar
3. Classroom policies

### **B. Hemodynamics**

1. Energy
2. Pressure-flow relationships
3. Venous hemodynamics

### **C. Doppler**

1. Doppler Equation
2. Types of Doppler
3. Aliasing
4. Color Flow Doppler
5. Doppler Artifacts

### **D. Optimizing Doppler Imaging**

1. Normal Incidence
2. Color Doppler Gain
3. Spectral Doppler Gain
4. Aliasing
5. Wall Filters

### **E. Quality Assurance**

1. Requirements
2. Objective vs Subjective
3. Phantoms
4. Performance Measurements

### **F. Bioeffects**

1. Converting Sound Energy into Heat
2. Risk-benefit Relationships
3. Mechanisms of Bioeffects
4. Study Techniques
5. Clinical Safety & Prudent Use

## **G. Sonographers in the Clinical Setting**

1. Major Principles
2. Informed Consent
3. Patient-sonographer Interaction
4. Sonographer-work Environment interaction
5. Standard Precautions

## **H. New Technologies**

1. Elastography
2. Fusion Imaging
3. TDI

## **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](mailto: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](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.

## **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 1<sup>st</sup> 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.
- 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 the above requirements are met. By completing the verified 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!!**