

Course: PHYS 3611 Ultrasound Physics Lab

Dr. Karen Williams, office P&ES 208, ph 580/559-5394, kwillims@mac.com

Office hours: 9-10:50 MWF, 12-1 T, 1-2 WR

Prerequisites: PHYS 1214 or PHYS 2225 (Gen. Physics II or Engineering Physics II)

Course Time: 1-4 pm Monday.

Course/Section Requirements

PHYS 3611 Ultrasound Lab Manual by Dr. Karen Williams.

Course Objectives.

Students will observe echos in various objects and will experiment with two transducers, and echoscope, various polyacrylic blocks and phantoms and make measurements of depth, size of block, frequency, and attenuation coefficient. Students will examine the propagation of longitudinal and transverse waves yielding values of elastic constants or moduli of elasticity. Students will image using T, D, B, M modes and using stationary and moving media. Students will observe the frequency by calculation from the period and from FFT. Students will be able to produce a stationary wave and demonstrate the Debye-Sears effect.

Attendance.

Attendance is critical in this course due to the lab nature of the course.

Course Description.

Laboratory course in ultrasound physics which covers general design and function of transducers, echo signal description, measuring depth in time, depth, build, and motion modes; Fourier transform calculations of frequency, effects of sound in various media, calculation of various properties of matter using sound waves, use of phantoms in imaging, propagation of sound in matter, use of continuous and pulsed wave transducers, and delivery of energy via sound waves. Designed as an acoustics course for physics majors and beginning course in imaging for medical physics majors and as an elective course for pre-medical and pre-physical therapy majors who will use ultrasound technology.

Topical Outline of the Course.

- 8/17 Intro/Lab1 Waves and frequency
- 8/24 Lab 2 How Ultrasound Waves are Created/Lab 3 Measuring Freq using T mode
- 8/31 Lab 4 Measuring Transducer Freq using T Mode
- 9/7 No lab - Labor Day
- 9/14 Lab 5 Measuring Depth with T Mode/ Lab 6 Measuring Speed of Sound
- 9/21 Lab 7 Measuring Depth D Mode
- 9/28 Lab 8 Measuring Depth with B Mode
- 10/5 Lab 9 Moving Transducer over Phantom Block M Mode
- 10/12 Lab 10 Attenuation Coefficient of Polyacrylic
- 10/19 Lab 11 Double Slit, measuring wavelength of laser
- 10/26 Lab 12 Finding Wavelength by Debye Sears Method
- 11/2 Lab 13 Finding Speed of Ultrasound Waves in Unknown fluid
- 11/9 Lab 14 Energy Deposition by Ultrasound Waves
- 11/16 Lab 15: US Application: Breast Model
- 11/23 Lab 16: Heart Valve Model
- 11/30 Lab 17: Detection of Materials Damage by DGS
- 12/7 (Monday) Final Exam: 11:30-2:30

Grading.

Each lab will be graded on a possible of 20 pts.

There will be a final exam worth 50 pts. required of all students.

The exam will be more like a lab practical exam.

If you are not performing work in your group, you will not receive the total points for that lab.

The course will be graded according to the grading scale: 92% lowest A, 82% lowest B, 72% lowest C, 60% lowest D. Your final grade will be calculated by adding all the points possible and then by dividing by the number of points possible in the course. Your lowest lab score will be dropped so that allows you to miss one lab without penalty.

Dates:

Sept. 7 Labor Day Holiday

Nov. 25-27 Thanksgiving Holiday

Oct 15-16 Fall Break Holiday

Nov. 30 Last day to drop

Nov. 4 Last day drop with W

7. ADA Voluntary Self-Identification Policy:

East Central University is committed to providing equal access to university programs and services for all students. Under university policy and federal and state laws, students with documented disabilities are entitled to reasonable accommodations. If any member of the class has a documented disability requiring academic accommodations, s/he should report to the Office of Disability Services (telephone #: 580/559-5297). A student seeking reasonable accommodations originating from a documented disability must register with the Office of Disability Services so that said accommodations may be provided.

8. Writing Proficiency Policy:

In keeping with the university's emphasis on writing proficiency, all student produced writing will be expected to reflect clear content, coherent and organized structure, and adherence to stylistic and mechanical standards articulated by the professor. Students needing help with writing are encouraged to visit the Writing Center and talk with Dr. Kevin Davis in DH 101.