

Basic Ultrasound Physics

Class
DMSO 1302

Basic acoustical physics and acoustical waves in human tissue. Emphasis on ultrasound transmission in soft tissues, attenuation of sound energy, parameters affecting sound transmission, and resolution of sound beams. (3-3-1)

Course Learning Objectives

Summarize the basic principles and techniques of ultrasound; describe the interaction of sound and soft tissues; explain sound production and propagation; describe the components and functions of transducers & imaging instruments; explain hemodynamics and Doppler modalities; describe ultrasound imaging artifacts; explain bioeffects and quality assurance.

Required Textbooks

Textbooks: Understanding Ultrasound Physics.

Fourth edition. Sidney K. Edelman. ISBN: 0-9626444-5-5.

Examination Review for Ultrasound: Sonographic Principles and Instrumentation. Second Edition. Penny, S., Fox, T. ISBN: 978-1-4963-7732-6 (must have access code for website).

Audio/Visuals: Laboratory Equipment: Ultrasound Systems and Phantoms

Weatherford College Library

Evaluation Standards

Exams	40%
Quizzes	15%
Homework	5%
Lab/Presentation	15%
Comprehensive Final Exam	25%

Grading Standards:

A	92-100%
B	85-91%
C	78-84%
F	<78%

You must achieve a minimum of 78% grade to pass this course.

Course Progression

After this course, the student will be able to demonstrate knowledge of the following:

1. Review basics of mathematics (F1, 2, 3, 8, 11, C11, 12, 13, 14)
2. Sound waves and pulsed ultrasound (F1, 2, 3, 8, 11, C11, 12, 13, 14)

3. Ultrasound power, intensity and attenuation (F1, 2, 3, 8, 11, C11, 12, 13, 14)
4. Tissue and Ultrasound Interaction (F1, 2, 3, 8, 11, C11, 12, 13, 14)
5. Ultrasound transducers (F1, 2, 3, 8, 11, C11, 12, 13, 14)
6. Real-time imaging instruments (F1, 2, 3, 8, 11, C11, 12, 13, 14)
7. Dynamic range and harmonics (F1, 2, 3, 8, 11, C11, 12, 13, 14)
8. Hemodynamics & Doppler ultrasound (F1, 2, 3, 8, 11, C11, 12, 13, 14)
9. Artifacts (F1, 2, C11, 12, 13, 14)
10. Quality assurance and biological effects (F1, 2, C11, 12, 13, 14)

Absences

Attendance is the biggest predictor of your success. Attendance for the ONLINE lecture component of this class is considered when you are logged in and active in the Canvas course; posting assignments, taking quizzes, and/or completing discussion boards. If you will be absent/not active in the class for more than 72 hours, it is **YOUR** responsibility to let the instructor know immediately.

All quizzes and exams must be taken at their specified time. An exam missed may *not* be made up, and the student will receive a grade of zero (0) for that exam. Under certain circumstances, exceptions may be made by the instructor, this will be handled on a case-by-case basis. Quizzes may not be made up under any circumstances.

All assignments are due on their specified dates no later than the designated time. Failure to submit an assignment on time will result in a grade of "0." There will be no exceptions to this rule, unless you have previously contacted the instructor by email and have been given permission.

Attendance of every scanning lab session is expected as scheduled. You will be allowed to miss two days (exception for test days) without it adversely affecting your grade. Every one absence over the allotted days will result in your final grade being reduced by one letter grade. If you are more than 15 minutes late to lecture or lab, this will constitute an absence. Being late for lecture or lab less than 15 minutes is considered "tardy". Three tardy-s count as one day absent. You are required to notify the instructor prior to any absences. Failure to do so will result in an unexcused absence.

An exam missed because of an excused absence must be made up the day that you return to class. An exam missed because of an unexcused absence may *not* be made up, and you will receive a grade of zero (0) for that exam. Pop quizzes may not be made up under any circumstances.

A student shall retain all rights to work created as part of instruction or using College District technology resources.

Disabilities

ADA Statement:

Any student with a documented disability (e.g. learning, psychiatric, vision, hearing, etc.) may contact the Office on the Weatherford College Weatherford Campus to request reasonable accommodations. *Phone:* 817-598-6350 *Office Location:* Office Number 118 in the Student Services Building, upper floor. *Physical Address:* Weatherford College 225 College Park Drive Weatherford, TX.

Academic Integrity

Academic Integrity is fundamental to the educational mission of Weatherford College, and the College expects its students to maintain high standards of personal and scholarly conduct. Academic dishonesty of any kind will not be tolerated. Academic dishonesty includes, but is not limited to, cheating on an examination or other academic work, plagiarism, collusion, and the abuse of resource materials including unauthorized use of Generative AI. Departments may adopt discipline specific guidelines on Generative AI usage approved by the instructional dean. Any student who is demonstrated to have engaged in any of these activities will be subject to immediate disciplinary action in accordance with institutional procedures.

SCANS

The Secretary's Commission on Achieving Necessary Skills (SCANS) identified Competencies in the area of Resources, Interpersonal, Information, Systems, and Technology; and foundation skills in the areas of Basic Skills,

Thinking Skills, and Personal Qualities. This course is part of a program in which each of these Competencies and skills are integrated. The specific SCANS Competencies that are recognized throughout this course are noted at the end of the appropriate Competencies or task listed.