

**LANCASTER GENERAL COLLEGE OF NURSING AND HEALTH SCIENCES
DIAGNOSTIC MEDICAL SONOGRAPHY PROGRAM**

SYLLABUS

- I. Title: DMS 200 – ULTRASOUND PHYSICS
- II. Course Description: This course will provide the student with a practical understanding of the principles of ultrasound physics as it applies to diagnostic medical imaging. The course material will focus on physical principles of sound energy, transducer and equipment design, sound production/transmission/attenuation, imaging artifacts, and safety/biological effects.
- III. Prerequisite: Physics, DMS 110
- IV. Placement: Year II – Semester I
- V. Time Allotment: Theory 45 hours
 Clinical Laboratory 0 hours
- VI. Faculty: Robert M. Hess, BS RDMS
- VII. Credits: 3
- VIII. Evaluation: 3 Unit Exam 300 Points
 Quizzes 100 Points
 Assignment 50 Points

 Total Theory Points 450 Points
- *A grade of "C" (2.0) is required to pass the theory portion of the course.**
- IX. Textbooks: UNDERSTANDING ULTRASOUND PHYSICS, Edelman, EPS, 2004
- X. Course Objectives: Given the theoretical content, at the completion of Ultrasound Physics, the student will demonstrate that he/she has the knowledge to:
1. Demonstrate an understanding of ultrasound physical principles.
 2. Classify various ultrasound transducers by design and function.
 3. Identify functional components of a pulse-echo ultrasound imaging system.
 4. Apply concepts of ultrasound physics to energy transmission and image resolution.
 5. Describe the physical causes of ultrasound imaging artifacts.
 6. Identify the potential bioeffects from ultrasound exposure.

- XI. School Policies: Students are held accountable for all policies in the Student Handbook and any revisions made to those policies during the academic year.
- XII. Class:
- A. Importance of Attending Class

Education comprises more than just private reading and passing of exams. Students should recognize that active and informed participation in class is essential to the development of their intellectual abilities and scholarly growth. Students must also recognize the importance, for both the present and the future, of achieving an academic record that reflects their intellectual ability. Such records are seldom achieved without regular attendance and participation in class activities. Attendance will be taken.
 - B. Student Responsibility for Missed Material

Students are responsible for all material presented and announcements made in class, regardless of attendance. It is the student's responsibility to obtain materials and assignments if absent.
 - C. Unit Examinations

Examinations should only be missed in extenuating circumstances. A student who misses an examination will be required to make up the examination on the next day of lecture. Contact the Course Faculty prior to the next lecture day to make arrangements to take the exam.

A student who misses an examination, regardless of the reason, will have ten percent (10%) deducted from the grade achieved on the exam.
Example: The exam is worth sixty (60) points, the student takes the exam and achieves a grade of 52/60. The score of 52 is then decreased by ten percent (10%) or five (5) points, thus the grade on the exam will be 47/60. An alternate examination may be given for the make-up examination.
 - D. Class Behavior

Once class has started, the instructor has the prerogative not to admit students into lecture. Students will be dismissed from class for any inappropriate behavior.
 - E. Written Assignments:

All submitted written work must follow the College of Nursing and Allied Health Writing Guidelines.

XIII. Other:

A. Academic Dishonesty and Plagiarism

Academic dishonesty violates the spirit and purpose of an academic community, and is therefore subject to disciplinary action. Academic dishonesty includes cheating on examinations, unauthorized duplicated submission of work, and/or unauthorized possession of exams.

Plagiarism is an act of academic dishonesty. Any work submitted that is not your own is an act of plagiarism. In preparing assignments, you must acknowledge in writing, any use of outside sources or any assistance you received in preparing an assignment.

If an instructor believes that a student has committed an act of academic dishonesty or has plagiarized material, the instructor will award a failing grade for that assignment to the student. If the occurrence is during an examination, the student will receive a zero for that portion of their grade and must leave the room.

If the student disagrees with this decision, the student may follow the grievance procedure.

XIV.

CONTENT	HOURS	STUDENT ACTIVITIES	COURSE OBJECTIVE
I. Units of Measurement A. Scientific Notation B. Metric Units C. Conversion of Units	Class: 3 hrs	Edelman, Ch. 1 SDMS PHY., p. 1-22	1
II. Properties of Sound Energy A. Definition B. Types of Waves C. Frequency/Wavelength/Period D. Sound Frequency E. Frequency vs Time F. Velocity G. Velocity vs Distance/Time H. Velocity vs Frequency/Wavelength I. Amplitude vs Intensity J. Reflection vs Transmission K. Reflection vs Refraction L. Logarithms and Decibels M. Attenuation N. Interference	Class: 14 hrs	Edelman, Ch. 2-7	1
III. Transducers A. Definition B. Piezoelectric Effect C. Transducer Frequency D. CW Transmission E. PW Transmission F. Damping G. Matching Layer H. Pulse Duration vs SPL I. Axial Resolution J. Beam Geometry K. Lateral Resolution L. Transducer Arrays M. Beam Focusing N. Beam Steering O. Sector vs Vector P. Array Summary Q. Apodization R. Slice Thickness	Class: 7 hrs	Edelman, Ch. 7-10, 12 SDMS PHY, p. 23-38	1,2,4
CONTENT	HOURS	STUDENT ACTIVITIES	COURSE OBJECTIVE

<p>IV. Pulsed Wave Ultrasound</p> <p>A. PRF vs PRP</p> <p>B. Duty Factor</p> <p>C. Max. Imaging Depth(Time)</p> <p>D. Max. Imaging Depth(Atten.)</p>	<p>Class:</p> <p>4 hrs</p>	<p>Edelman, Ch. 4,7,13</p> <p>SDMS PHY., p. 39-52</p>	<p>1,2</p>
<p>V. Instrumentation and Display</p> <p>A. Beam Former</p> <p>B. Signal Processor</p> <p>C. Image Processor</p> <p>D. Memory</p> <p>E. Display</p> <p>F. Recording Devices</p>	<p>Class:</p> <p>8 hr</p>	<p>Edelman, Ch. 11,14,15</p> <p>SDMS PHY., p. 53-62</p>	<p>3</p>
<p>VI. Artifacts</p>	<p>Class:</p> <p>3 hr</p>	<p>Edelman, Ch. 20</p> <p>SDMS Phys, p. 77-84</p>	<p>5</p>
<p>VII. Quality Assurance</p> <p>A. Test Phantoms</p>	<p>Class:</p> <p>1 hr</p>	<p>Edelman, Ch. 21</p> <p>SDMS PHY., p. 85-89</p>	<p>6</p>
<p>VIII. Bioeffects</p> <p>A. Beam Geometry</p> <p>B. Intensity Measurements</p> <p>C. Heating</p> <p>D. Cavitation</p> <p>E. Bioeffect Indices</p>	<p>Class:</p> <p>5 hr</p>	<p>Edelman, Ch. 22</p> <p>SDMS Phys, p. 90-96</p>	<p>6</p>