El Paso Community College
Syllabus
Part II
Official Course Description

SUBJECT AREA	**Diagnostic Medical Sonography**
COURSE RUBRIC AND NUMBER	**DMSO 1342**
COURSE TITLE	**Intermediate Ultrasound Physics**
COURSE CREDIT HOURS	**3 (Credits) 3 : 1 (Lec Lab)**

I. Catalog Description

Continues the study of Basic Ultrasound Physics. Includes interaction of ultrasound with tissues, the mechanics of ultrasound production and display, various transducer designs and construction, quality assurance, bioeffects, and image artifacts. May introduce methods of Doppler flow analysis. A grade of "C" or better is required in this course to take the next course. **Prerequisite: DMSO 1302. (3:1). Lab fee. Physics Mock Exam fee.**

II. Course Objectives

Upon satisfactory completion of the course, the student will be able to:

A. Unit I. Doppler

1. Provide the basic description of how a doppler instrument operates.
2. Define the Doppler effect.
3. Define Doppler shift and provide the formula.
4. Describe the importance of Doppler angle in this mode of ultrasound examination.
5. Identify the most significant difference between a continuous wave doppler system and a pulsed wave Doppler system.
6. Define:
   a. Frequency Spectrum
   b. High Pass Filter
   c. Spectral Broadening
7. Define aliasing and describe what causes this effect.
8. Define Fourier transformations (Fourier Technique).
9. Explain how color flow instruments differ from pulsed wave and continuous wave ultrasound instruments.

B. Unit II. Artifacts

1. Define imaging artifact.
2. Describe the difference between useful and detrimental artifacts.
3. Given an artifact's category, define whether it is a useful or detrimental artifact.
4. Explain the relationship between the missing reflector artifact and resolution.
5. Define acoustic speckle.
6. Explain how section thickness artifacts are created.
7. Give two examples of an enhancement phenomenon artifact.

8. Define focal banding.
9. Define multi-path artifact.
10. Define mirror-image artifact.
11. Explain what effects propagation speed errors can cause.

C. **Unit III. Biological Effects**

1. Define biological effects as it relates to ultrasound.
2. Explain risks vs. benefits.
3. Define in vivo and in vitro studies.
4. Explain the AIUM's position, and why they are considered the "voice" of the ultrasound field.
5. Provide three biological considerations that can occur as the result of ultrasound exposure.
6. Explain the position of the AIUM for the following areas:
   a. In Vivo Mammalian Bioeffects
   b. Thermal Bioeffects
   c. Cavitation Bioeffects
   d. In Vitro Studies
7. Explain the position of the AIUM regarding epidemiologic studies.

D. **Unit IV. Quality Assurance, Quality Control, and Performance Testing**

1. Explain the purpose of performance of testing.
2. Define how the testing devices are categorized.
3. Define imaging performance and provide the six parameters associated with it.
4. Define test performance.
5. Describe the external shape and internal components of the AIUM 100 mm Test Phantom.
6. Explain why tissue equivalent phantoms are used.
7. Define the following terms:
   a. SUAR Test Object
   b. PIRTO
   c. Beam profiler
   d. Hydrophone
   e. Spectrum Analyzer

. E. **Unit V. Arterial Hemodynamics**

1. Flow and flow related definitions
   - Power, work, energy, potential energy
   - kinetic energy, flow, resistance, pressure and velocity
2. Simplified law of hemodynamics
3. Resistance equation
4. Poiseuille's Law
5. Viscosity, friction and inertia
6. Bernoulli's Equation
7. Flow profiles
8. Reynold's Number
9. Diameter and area reduction measurement
10. Peripheral resistance
11. Effects of exercise
12. Occlusions

F. **Unit VI. Venous Hemodynamics**

1. The hearts pumping action
2. Venous resistance and transmural pressure
3. Hydrostatic pressure
4. Respiratory Effects
5. Calf muscle pump

G. **Unit VII. Physical Principles**

1. Vascular and electrical physical principles
2. Information display
3. AC/DC coupling
4. 2 and 4 wire measurements
5. Plethysymography
6. Inflow and Outflow studies
7. Photoplethysmography
8. Oculoplethysmography
9. Measuring arterial pressure
10. Cuff size
11. Arterial pressure measurements
12. Reactive hyperemia
13. Occlusion pressures
14. Arteriovenous Fistula
15. Transcutaneous Oximetry
16. Transcranial Doppler

III. THECB Learning Outcomes (WECM)

1. Describe pulse-echo principles and actions.
2. Identify instrument options and transducer selection.
3. Recognize common image artifacts; and describe potential bioeffects.

IV. Evaluation

A. Methods

1. Homework, Lab Sheets and Quizzes – Written homework assignments will be given periodically; late assignments will not be accepted. Additionally, unannounced quizzes will be given during class time to assess comprehension and application of course objectives. Absence during a quiz can not be made up.
2. Unit Examinations - Unit examinations will be administered at the end of a specified unit or units to assess mastery of course objectives. All exams are written and consist of fill in the blank, multiple choice, true/false, matching, essay, or a combination of the preceding. An exam missed because of an excused absence must be made up on the day that the student returns to class. An exam missed because of an unexcused absence can not be taken and the student will receive a grade of zero (0) for that exam.
3. Comprehensive Final Examination – This examination is given to assess your mastery of the course objectives.
4. Testing strategy – Exam and quiz questions may come from any content within the required text resources and unit lectures. Prior to testing of current unit/s concept/s, ALL pertinent Chapters/s, ALL reading material, ALL lecture content, ALL chapter exercises, ALL conceptual questions, ALL class exercises and ALL other available self evaluation methods (assigned or not) which, pertain to those concept/s, unit lecture/s and chapter/s should be reviewed and completed for optimal testing outcomes.

B. Grading Scale

100 – 92 = A
91 – 83 = B
82 – 75 = C
74 – 67 = D
66 – 0 = F

A total final course grade of below **C** (i.e., less than 75%) is **not** acceptable for completion of professional (DMSO) courses.

C. Final Grade Determination

The final grade determination for this course is calculated as follows:

Homework & Quizzes	15% toward final grade
Unit Examinations	65% toward final grade
Comprehensive Final Examination	20% toward final grade
Total	100%

D. Remediation

Your progress in the class will be discussed with you periodically to review areas of concern or improvement. You should understand that failure to achieve a combined course average of at least 75% will prevent your continuation in the Ultrasound program; therefore, any problem regarding course content that you are concerned about should be addressed to me as soon as possible.

E. Health Occupations Division Policy Regarding Scholastic Dishonesty

Scholastic dishonesty shall constitute a violation of these rules and regulations and is punishable as prescribed by Board policies. Scholastic dishonesty shall include, but not be limited to, cheating on a test, plagiarism, and collusion.

Cheating on a test shall be construed as:

1. Copying from another student's test paper.
2. Using test materials not authorized by the person administering the test.
3. Collaborating with or seeking aid from another student.
4. Knowingly using, buying, selling, stealing, or soliciting, in whole or in part, the contents of an unadministered test.
5. The unauthorized transporting or removal, in whole or in part, of the contents of the unadministered test.
6. Substituting for another student, or permitting another student to substitute for one's self, to take a test.
7. Bribing another person to obtain an unadministered test or information about an unadministered test.

"Plagiarism" shall be defined as the representation of another's published works as one's own.

"Collusion" shall be defined as the unauthorized collaboration with another person in preparing written work for fulfillment of course requirements.
Any student involved in scholastic dishonesty as identified above, or in the Student Handbook, may, at the discretion of the faculty;

a. Have the test or paper graded zero (0).
b. Be removed from the class.

c. Be recommended for administrative dismissal from the course or program.

The stringency of this policy is understandable when read in the context of an educational program preparing individuals for a health career where the safety and well-being of the public are largely dependent upon the knowledge and ethical responsibility of the health personnel. Evidence of unethical behavior, such as cheating, precludes the instructional faculty's ability to declare prospective graduates to be reliable and ethical.

It is my policy to recommend that that any student violating any of the standards of scholastic dishonesty as outlined above be removed from my course and from the Diagnostic Ultrasound program.

F. Attendance

Attendance in class is required to best assimilate the lecture and textbook material. Frequent absences are discouraged.

G. Tardiness

You are tardy when you are more than 10 minutes late from class. Consistent tardiness is disruptive to the class and you may not be allowed into the class should this continue.

V. Disability Statement (Americans with Disabilities Act [ADA])

EPCC offers a variety of services to persons with documented sensory, mental, physical, or temporary disabling conditions to promote success in classes. If you have a disability and believe you may need services, you are encouraged to contact the Center for Students with Disabilities to discuss your needs with a counselor. All discussions and documentation are kept confidential. Offices located: VV Rm C-112 (831-2426); TM Rm 1400 (831-5808); RG Rm B-201 (831-4198); NWC Rm M-54 (831-8815); and MDP Rm A-125 (831-7024).

VI. 6 Drop Rule

Students who began attending Texas public institutions of higher education for the first time during the fall 2007 semester or later are subject to a 6-Drop limit for all undergraduate classes. Developmental, ESL, Dual Credit and Early College High School classes are exempt from this rule. All students should consult with their instructor before dropping a class. Academic assistance is available. Students are encouraged to see Counseling Services if dropping because exemptions may apply. Refer to the EPCC catalog and website for additional information.