LINCOLN UNIVERSITY
DI 210 – Advanced Ultrasound Physics and Technology
Fall 2013 Course Syllabus

Credit: 3 units (45 lecture hours)
Class Hours: Thursday, 9:00 – 11:45 AM
Instructor: Chris T. Nguyen, Ph.D. (*)
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　　　　　Home Phone: 510-489-8727   or   Cell Phone: 408-439-3448
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RESOURCE MATERIALS
- **Diagnostic Ultrasound: Principles and Instruments** by Frederick W. Kremkau, Saunders Publishing, **8th edition** (Sonography Principles and Instruments, 2010), ISBN-10: **143770980X**,   ISBN-13: **978-1437709803**
  7th edition (2005), ISBN-10: **0721631924**,   ISBN-13: **978-0721631929**

- ARDMS Physics Test samples from different sources
- "Ultrasonography Examination" by Appleton & Lange
- "Ultrasound Physics Review" by Davies Publishing
- Selected Articles from the Journal of Ultrasound in Medicine
- Selected Articles from the Journal of Ultrasound in Medicine and Biology
- Selected Article from the Journal of the American Society of Echocardiography

COURSE DESCRIPTION
This course provides a quick review of "Physical Principles of Ultrasound" and then introduces advanced technologies, systems, probes, imaging modes, and applications in sonography. *Prerequisites: DI 10 and upper division standing*

COURSE OBJECTIVES AND STUDENT LEARNING OUTCOMES
Upon satisfactory completion of this Course, the students will be able to:

1. Operate some widely used Ultrasound systems by GE, Philips, Siemens and others.
2. Understand and apply different imaging modes: Doppler, Tissue velocity, M-Mode, Color M-Mode, Contrast-Enhanced Imaging, Strain & Strain Rate Measurements, Sonoelastography, and Acoustic Radiation Force Impulse.
3. Optimize system controls for optimal 2D-images, Doppler spectrum accuracy, Power Doppler sensitivity, Strain & Strain Rate measurement accuracy.
4. Understand the theory, operation and handling of different types of Probes: 3D, 4D, TEE, Endovaginal, Endorectal; Understand indications and contra-indications related to probe usage.
5. Understand and recognize all artifacts, particularly the recently reported ones. Learn to avoid them or to utilize them to our advantage (2D-Imaging and Doppler).

6. Understand Bio-Effects namely Thermal and Mechanical ones. Select suitable Thermal Index (TI) and Mechanical Index (MI) for particular applications (Imaging of bones, Contrast Imaging. Observe ALARA.
7. Properly maintain the systems, probes, and related equipment / materials for optimal Quality & Reliability and Safety. Understand different types of phantoms, targets.
8. Understand other commonly used imaging modalities (MRI, Mammography, CT scan, PET Scan…) for correlation with Ultrasound results.
9. Understand simple statistical calculations for the interpretation of Ultrasound results such as Distribution, Mean value, Standard Deviation, Sensitivity, Specificity, Accuracy, PPV, NPV.

The two main objectives of this Course are:
   - **Review materials on "Ultrasound Principles and Instrumentation" to prepare the students for the ARDMS Board Registration Physics Test.**
   - **Show the students how to properly, effectively & safely perform US Systems for best results in various Diagnostic Sonography studies.**

INSTRUCTIONAL METHOD
Instructional methods will include lectures by the instructor and lab sessions under his guidance. Classroom activities are collaborative – students should help one another in class as well as in lab. The instructor will be available to assist students with all tutorials and other assignments

The Course consists of **15 lectures, weekly quizzes, 1 Midterm, 1 Final**, **several lab sessions** (30 min. each). **Attendance will be recorded at every class meeting.**

EVALUATION AND GRADING
Evaluation is based on attendance, lab participation, quizzes, midterm and final exams. To successfully complete this course, the student should attend more than 80% of the lectures, and have a total score of 70% or higher.

95-100	A
90-94	A-
87-89	B+
84-86	B
81-83	B-
78-80	C+
76-77	C
74-75	C-
72-73	D+
70-71	D
69≤	F

Class attendance	10%
Quizzes	25%
Midterm Exam	25%
Final exam	40%
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Total	100%

SCHEDULE

      <u>**Lecture #1**</u>: Reviews all materials in DI 10

      <u>**Lecture #2**</u>: Reviews all materials in DI 10

      <u>**Lecture #3**</u>: covers Item 1. Quiz on Lectures #1 and #2

      <u>**Lecture #4**</u>: covers Item 2. Quiz on Lecture #3

      <u>**Lecture #5**</u>: covers Item 3. Quiz on Lecture #4

      <u>**Lecture #6**</u>: covers Item 4. Quiz on Lecture #5

      <u>**Lecture #7**</u>: **Midterm exam** (Items 1, 2, 3 & 4). Lecture Item 5

      <u>**Lecture #8**</u>: covers Item 6. Quiz on Lectures #6 & #7

      <u>**Lecture #9**</u>: covers Item 7. Quiz on Lecture #8

      <u>**Lecture #10**</u>: covers Item 8. Quiz on Lecture #9

      <u>**Lecture #11**</u>: covers Item 9. Quiz on Lecture #10

      <u>**Lecture #12**</u>: reviews Items 1 to 9. Quiz on Lecture #11

      <u>**Lecture #13**</u>: reviews Items 1 to 9, introduces 600+ ARDMS Test Questions.

      <u>**Lecture #14**</u>: reviews Items 1 to 9, answers to 600+ ARDMS Rest Questions

      <u>**Lecture #15**</u>: **Final exam**

(*) INSTRUCTOR AFFILIATIONS
- Member of AIUM (American Institute of Ultrasound in Medicine)
- ASE (American Society of Echocardiography)
- HMS-PGA (Harvard Medical School Postgraduate Association)
- SDMS (Society of Diagnostic Medical Sonography)
- ISEECG (International Society of Electrocardiography)
- Member of CFA (California Faculty Association)
- A Reviewer for the Journal "Ultrasound in Medicine"
- A Reviewer for the Journal "Ultrasound in Medicine and Biology"

STUDENT LEARNING FEEDBACK: Result of the actual **ARDMS Physics Test** is gauged as learning feedback of my students.

Updated: 8/22/2013