ECE 700 TOPIC 5: BIOMEDICAL ULTRASONICS (SPRING 2018)

Course Description and Aims

This is a course dedicated to the technical foundations of biomedical ultrasound, and it is designed for graduate students. We will cover the physical principles behind ultrasound, its medical imaging modes, and its therapeutic usages.

Teaching Staff

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Course Learning Outcomes

By the end of this course students should be able to demonstrate a threshold level of mastery of the following learning outcomes:

1. Describe how ultrasound is used in diagnostics and therapy
2. Summarize the imaging principles related to ultrasound
3. Give examples on the biomedical applications of ultrasound
4. Explain the potential safety concerns on ultrasound

Course Teaching and Learning Activities and Alignment with Learning Outcomes

Tentative course topics and their alignment with the learning outcomes are described below:

Course Topic	Learning Outcomes
Basic ultrasound principles	1
Basics of ultrasound imaging	2
Ultrasound image acquisition	2
Ultrasound-based blood flow measurements	1, 3
Ultrasound biomicroscopy	1, 3
Nonlinear ultrasonics and its imaging applications	1, 2
Principles of acoustic cavitation	1
Principles of acoustic radiation and streaming	1
Thermal-based ultrasound therapy	1, 3
Microbubbles in imaging and therapy	1, 3
Ultrasound-induced bioeffects	4

Course Prerequisites

Background in general wave physics (ECE 105 or equivalent) and signals theory (ECE 207 or equivalent) is preferred. Literacy in human biology is not mandatory, but will be a plus.

Grade Breakdown

In-Class Discussions	10%
Assignments & Term Project	40%
In-Class Quizzes	20%
Final Exam	30%

References & Course Website

No textbook is required for this course. Selected course readings will be posted on LEARN. Students are advised to regularly consult the LEARN site for this course.