ECE 518/BIOM 518: Biomedical Optics **Fall 2019**

Syllabus

Instructor: Randy A. Bartels

Office: B316 Scott Bioengineering

Office Hours: By appointment

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Lecture: 11:00 - 11:50 am , MWF Scott 231

Required Text: *Quantitative Biomedical Optics: Theory, Methods, and Applications* by Irving J. Bigio and Sergio Fantini, Cambridge University Press, 2016, ISBN: 9781139029797

Honor Code "I will not give, receive, or use any unauthorized assistance"

Background: Electromagnetics & Differential Equations.

HW Policy: Due at beginning of class on due date. Graded only if *legible* (as judged by grader). Highly recommended to do it in latex. A correct homework solution is a **narrative** that describes the physical situation, the equations and variables used and their physical importance, and finally draws a conclusion in a way that build intuition about the topic under study. **A list of equations will not be graded and will be returned.** Although late or improperly done homework will not be accepted, one "redo" will be allowed during the semester.

Course Objectives: The objective of this course is to provide students with a fundamental background in optical interactions in biological systems and tissues and to provide the students with an understanding of the capabilities and limitations of the use of optics and lasers in medicine and biology. Fundamental concepts of optics and laser-tissue interaction will be discussed in order to provide a basis for the understanding of the current technology. Successful students will be able to evaluate the capabilities of optical spectroscopic and imaging tools for evaluating physiological condition, health, and behavior of biological systems. They will be able to evaluate and interpret data from biomedical optical measurements, and design optical instrumentation for medical applications.

Grading: Homework, 35% Exam 1, 15% Exam 2 , 15%; Project, 35%.

Topics

1. Introduction to biomedical optics
2. Optical Scattering
3. Monte Carlo Modeling of Photon Transportation in Biological Tissue
4. Radiative Transfer Equation
5. Sensing of Optical Properties and Spectroscopy
6. Various optical imaging modalities in tissues