BME333 Modern Optical Microscopy and Imaging – Fall 2011

Time:	Tuesday & Thursday 9:30-10:50 AM
Room:	Tech L168
Instructor:	Dr. Hao F. Zhang
Office:	Tech E334
Phone:	(847) 491-2946
Office hours:	Tuesday & Thursday 11:00 AM -12:00 PM or by appointment
Co-instructor:	Dr. William A. Russin
Office:	Hogan 5150
Phone:	(847) 491-6657
Office hours:	By appointment
Textbook:	***Fundamentals of Light Microscopy and Electronic Imaging***, Douglas B. Murphy, Wiley-Liss, ISBN: 0-471-25391-X
References:	***Biomedical Optics: Principles and Imaging***, Lihong V. Wang and Hsin-i Wu, Wiley Interscience, 1st Edition, ISBN: 0471743046 ***Biomedical Photonics Handbook***, Tuan Vo-Dinh, CRC Press, ISBN: 0849311160 ***Tissue Optics***, Valery Tuchin, SPIE Press, 2nd Edition, ISBN: 0819464333 ***Optics***, Eugene Hecht, Addison-Wesley, 4th Edition, ISBN: 0805385665
Prerequisite:	Physics, Calculus, and Differential equations

Course Objectives: Bio-optical imaging has played a critical role in almost all major breakthroughs in recent biomedical research. Knowledge of current bio-optical imaging technologies is important for students who plan for future careers or graduate studies in biomedicine related fields. This course provides students with (1) Fundamental background of tissue optics; (2) Understanding of physics, strengths, and limitations of various existing bio-optical imaging technologies; (3) Knowledge of emerging bio-optical imaging technologies for anatomic and functional studies; (4) Problem-solving skill when facing a specific biomedical challenge.

Course Outline

Topic
Introduction to optics, optical properties of tissue, and photon-tissue interactions
Monte Carlo simulation
Sensing of optical properties and spectroscopy
Ballistic imaging
Phase contrast and dark-field microscopy
Polarization microscopy

Fluorescence microscopy

Confocal microscopy

Two-photon microscopy

Optical coherence tomography

Grading

Midterm/Monte Carlo Project	30%
Homework	30%
Research project	30%
Final presentation	10%
Total	100%

Key Dates:

Oct. 20: Monte Carlo project due.

Nov. 29: Research project due.

Nov. 29: Final presentation (group 1).

Dec. 01: Final presentation (group 2).

Note: Homework due one week after initial assignment (may be extended for a second week depending on the performance of the majority of the class or specified otherwise). There will be penalty for each class meeting late. Research project requirements will be discussed in class.

It is difficult to find a single textbook which covers all of the aforementioned course material. Accordingly, we will draw upon other references (book chapters, research articles, etc.) and internet resources as needed.

The current schedule is subjected to minor revisions as the semester proceeds.

Skill of searching and retrieving scientific literatures from databases such as SCI and PubMed is required.

The homework and research project involve the use of Matlab.

If unanticipated conflicts arise, the student should contact the instructor at least one week in advance to discuss arrangements for make-up examinations or turning in problem sets late.

Zero tolerance to academic plagiarism and dishonesty