

BE517 Optical Microscopy of Biological Materials 2009fall

Instructors: Phil Allen (pallen@bu.edu); Jerome Mertz (jmertz@bu.edu)

Lectures: Monday and Wednesday 12-1pm room 501, 44 Cummington St.
Lab: Thursdays 4-7pm 501,509 suites 44 Cummington St.

The overall goal of this class is to provide hands-on training in state-of-the-art optical microscopy techniques to address questions in biology and biological materials. We will present basic concepts in imaging and detection, which we will then apply in various laboratory exercises. By the end of the course, the student will be familiar with all the instruments in the BME imaging facility and have gained the necessary tools to carry out modern biological imaging experiments.

Class expectations: This class is strongly based on experimental learning. Your overall grade will be made up of class participation, lab reports and a final project.

- A) Class participation (20%): We will be carrying out various experiments each week, and attendance is necessary for success in this class. Participation in class and lab discussion at a graduate level is expected.
- B) Exams (20%): One midterm exam will be given during the course.
- C) Lab reports (30%): Most weeks you will be performing an experiment typical of that done in modern bio-imaging research labs. You are expected to provide a report of that experiment in the form of a very small paper (2-3 pages without figures). Expected format is: introduction, materials and methods, results, discussion and conclusions. Major discussion points introduced from outside the lab should be referenced. Reports are due at the Wednesday lecture following the Thursday lab. Note: you will be expected to maintain a lab notebook, however reports should be handed in separately. If you're lab is handed in late, it will be penalized 10% per week for two weeks. *Any reports turned in more than two weeks after the due date will receive no credit.*
- D) Final project (30%): At the end of the class, students will identify a paper in which a biological question is specifically addressed by optical imaging. The student will write a 5 to 10 page paper analyzing the paper in context of other work, and present a 25-30 minute presentation of that work to the class. *All papers and presentations need to be handed in on the due date. Extensions will not be granted short of serious illness or other emergency.*

Missed classes, and extra-class access: If you miss a class or lab, contact Phil Allen (pallen@bu.edu) to arrange access to the facility and or to organize repeating a laboratory. Access to hardware and computers in the facility will be available during normal business hours depending on previous commitments.

Tentative class & lab schedule:

<u>week</u>		<u>lab</u>
week #1	8/31/09	Lecture –basic concepts
week #2	9/07/09	bright field 1: CCD cameras, noise
week #3	9/14/09	bright field 2: DIC, phase contrast
week #4	9/21/09	fluor. 1: fixed cells, psf, filters
week #5	9/28/09	fluor. 2: photobleaching and correlation
week #6	10/05/09	maintaining cells on the microscope
week #7	10/12/09	fluor. 3: resolution, detection localization
week #8	10/19/09	fluor. 4: ligand sensitive dyes –mito. potential
week #9	10/26/09	fluor. 5: ligand sensitive dyes –Ca ²⁺ imaging
week #10	11/02/09	confocal and TIRF
week #11	11/09/09	confocal and TIRF
week #12	11/16/09	open lab
week #13	11/23/09	Thanksgiving
week #14	11/30/09	final presentations
week#15	12/07/09	final presentations

Open labs could be labs/ demo's involving Multiphoton microscopy, Ultrasound imaging, MP, microCT, MRI .

References: (these will be placed at the student's disposal)

Methods in Cellular Imaging – Ammasi Periasamy

Cell Biological Applications of Confocal Microscopy, Second Edition (Methods in Cell Biology) – Brian Matsumoto

Fundamentals of Light Microscopy and Electronic Imaging - Douglas B. Murphy

Confocal Microscopy Methods and Protocols (Methods in Molecular Biology) - Stephen W. Paddock

Video Microscopy : The Fundamentals (The Language of Science) - Shinya Inoué

Live Cell Imaging - Robert D. Goldman

Useful web sites:

<http://micro.magnet.fsu.edu/primer/> (very useful and detailed; well worth perusing)

<http://www.cellsalive.com/>