

Advanced Graduate Course in Functional Imaging – Winter Quarter 2016
(Dept. Neurobiology and Behavior #239)

Course Description: Imaging techniques have developed rapidly in recent years, and that development is profoundly affecting virtually all aspects of neuroscience research. The course provides an overview of both the technical and applied aspects of imaging techniques for investigation of the nervous system. The emphasis will be on three areas: cellular/subcellular level imaging of nervous system function (microscopic level), systems-level brain imaging (macroscopic level), and human brain imaging, highlighting similarities among imaging methods and their applications. In addition to lectures and lab visits, students will present relevant papers during the course. It is expected that upon completion of the course students will be able to critically read the literature and be able to choose and apply the best technique(s) appropriate for their research interests.

Course Lecturers: Drs. Ian Parker and Ron Frostig, each faculty in the Department of Neurobiology and Behavior.

Time: Thursday, 9am – noon

Place: TBA

Required Reading Material: Instructor resources (handouts, PowerPoint files, etc.)

Evaluation: Students will be evaluated on the basis of: (i) A 10-page double space (without references, tables, figures, or footnotes) term paper and class presentation of that paper at the last meeting of the class. The paper may deal with any topic within the area of imaging of the nervous system, and must be approved by one of the faculty according to the appropriate level of inquiry (i.e., microscopic, macroscopic or human imaging). Papers will be due on Monday, March 3rd. Paper topics should be approved no later than February 18th. (ii) Papers from literature relevant to the class topics, which will be presented by students during the course. (iii) Class presentation of the final papers on the last week of class. The **final grade** will be determined on the basis of presentation of relevant papers (20%), the final paper (40%) and its class presentation (40%).

CLASS SCHEDULE

- Jan 7th: (IP) Introduction to optical imaging: light, optics, lasers, detectors
- Jan 14th: (IP) Microscopes and how they work; from Leeuwenhoek to multi-photon. Lab visit
- Jan 21th: (IP) Optical probes of cellular structure and function; functional imaging of single neurons
- Jan 28th: (IP) New microscopies, sneaking around the laws of physics + lab visit
- Feb 4th: (RF) Brain activation: physiology and metabolism + Imaging fundamentals
- Feb 11th: (RF) From Video-based to CCD-based and CMOS-based imaging
- Feb 18th: (RF) Applications + Lab visit
- Feb 25st: (RF) Students' presentations of relevant papers from literature.
- March 3rd: (RF) Human imaging (PET, MRI, fMRI).
- Mar 10th: **Student final presentations of their papers**