

PHYS/BME 325 – Physical Measurements of Biological Systems
Tues/Thurs 1:10 - 2:35 pm
Stevenson Center 6638

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Course Description

A survey of the state-of-the-art in quantitative physical measurement techniques applied to cellular or molecular physiology. Topics include: fluorescence imaging and spectroscopy; micromechanical measurements, e.g. optical and magnetic tweezers; molecular measurements via vibrational spectroscopy; magnetic resonance spectroscopy and imaging; electrochemical instrumentation; and microfluidics for cellular instrumentation. A very significant part of the course will be directed towards meta-content, i.e. helping you learn to communicate effectively as a scientist. To that end, you will spend most of your time for this class reading and critiquing articles from the literature, giving oral presentations, and writing a short research proposal.

The course will be team taught in a modular seminar format, with each module consisting of alternating lecture (by one of the instructors) and presentation of assigned research articles (each led by one of the students). With 8 students this semester, the goal will be for each student to present 4 articles during the semester. These presentations should target 25-30 minutes in length, including time for class discussion.

Instead of problem assignments, this course is designed around directed readings. I expect you to read the assigned material BEFORE each class session (that includes sessions in which your fellow students will be presenting papers). As much as possible, the assigned readings will be placed on the class website (www.vanderbilt.edu/lsp/B325/) as pdf files (username: claccess, password: _____).

The day before each class, you will need to go the course website and submit answers to a couple of open-ended discussion questions about the assigned readings (i.e. WARM-UPS). There will also be space there to submit any questions you have about the reading or feedback about parts of the material that you find particularly difficult. The earlier you submit these, the more I and the other instructors will be able to adjust the lectures accordingly. I'll also post a standard WARM-UP on days before student presentations. You are expected to answer these WARM-UPS too in order to give your peers some guidance as to what parts of the assigned papers were difficult and what topics might require a little extra background material. Your submissions to WARM-UPS, along with your active participation in class, will determine 20% of your grade.

Towards the end of the semester, you will each be expected to write a short research plan for a mini-NIH proposal that describes the novel application of a biophysical technique to an open question in biology. The proposal subject can be related to your own research interests. I just ask that you don't re-use a previous proposal or propose the research you are doing now. Each student will then be assigned to review two other students' proposals and we will get together in a mock study section to evaluate the proposals. More details on this writing assignment are on a separate handout.

Overall, your grade will be determined by your performance in presenting articles (4 x 12.5% = 50%), by classroom participation (20%) and by the written NIH-style mini-proposal (30%).