Welcome to 20.109

Laboratory Fundamentals of Biological Engineering

Orientation Lecture
Fall 2012

Expectations
Some of your expectations of us
• that we will come to class and lab prepared
• that our assignments are clear and reasonable
• that we will treat every 109er with respect
• that we will give everyone equal chance at success

Some of our expectations of you
• that you will come to class and lab prepared
• that you will not interfere with each other’s learning
• that you will invest the very best of yourself
• that you will offer honest and frequent feedback

20.109
Laboratory Fundamentals of Biological Engineering

“The most important class you’ll take @ MIT”

“Directing attention not only to what we teach but also to how we teach as well as to how and where our students learn”

Course Mission
 To prepare students to be the future of Biological Engineering
 To teach cutting edge research skill and technology through an authentic research experience
 To inspire rigorous data analysis and its thoughtful communication
DNA Engineering: GFP recombination vector

Experiments
- Design and create vectors for expressing fluorescent protein in mouse embryonic stem cells
- Use fluorescence to analyze recombination of variously damaged DNA substrates

Lab Skills
- Retrieve and manipulate sequences from databases
- Clone PCR-amplified DNA fragments
- Transfect mammalian cells
- Flow Cytometry

System Engineering: Bacterial photography

Experiments
- Measure bacterial photography output
- Screen library for mutations that increase dynamic range of system
- Identify amino acid changes and their consequences

Lab Skills
- Optimize a system
- Genetic screen
- Western analysis
- Sequence analysis
- β-gal assay

Biomaterial Engineering: Phage solar cell

Experiments
- Mineralize phage surface
- TEM to visualize
- Assemble solar cell
- Measure performance

Lab skills
- Phage material production
- Fabrication of bio-based device
- Effect of variation: Ratio of SWNTs to phage
Course Details

Lecture  
Tuesdays and Thursdays 11-12, 16-220

Lab  
Tuesdays and Thursdays 1-5, 56-322
Wednesdays and Fridays 1-5, 56-322

There are no “make-up” labs

You will perform experiments in pairs
Assignments can be worked on together but submitted individually

“Celebrations of learning”

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<th>Module</th>
<th>Oral presentation contribution</th>
<th>Written presentation contribution</th>
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<td>Lab identification (10%)</td>
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<td>Online scoring lab and defense (5%)</td>
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5% Daily Lab Quizzes
10% Lab Notebooks
5% Blog and Summary

“what we learn to do we learn by doing…”