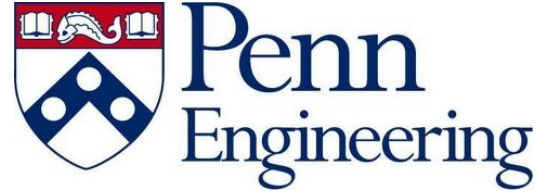


**University of Pennsylvania  
 Summer Academy in Applied Science and Technology  
 Biotechnology Program  
 July 2014**



Faculty Advisor: Dr. Matthew Lazzara mlazzara@seas.upenn.edu  
 Lecture Instructors: Dr. Sean Holleran seanholl@seas.upenn.edu  
 Dr. Miriam Wattenbarger mwattenb@seas.upenn.edu

Lab Instructor: Dr. Robert Bucki buckirobert@gmail.com

Blackboard Site: canvas.upenn.edu  
 EAS022-2013B: SAAST Biotechnology

Format: Lectures 9:00am – Noon (daily)  
 Lab 1:30pm – 4:00pm (daily)  
 Group Research Proposal  
 Journal Club (two days per week)  
 Guest Speakers  
 Field Trips

Lecture Topics: Prokaryotic and Eukaryotic Cells  
 Chemistry of Cellular Components  
 DNA Replication, Transcription and Translation  
 Proteins and Protein Folding  
 Recombinant DNA Technology  
 Cell Growth Kinetics  
 Bioreactors and Fermentation  
 Protein Separations  
 Drug Delivery

Requirements: Two exams on lecture material / journal club / guest speakers  
 Weekly written report and oral presentation for each team  
 Two weekly meetings with graduate student mentor  
 Lab Reports  
 Lab Exam  
 Lab Presentation

Grade Distribution: Exams 20% (each exam is 10%)  
 Journal Club 15% (participation score)  
 Lab 30%  
 Research Proposal 35% (3 papers + 3 presentations)

**Exams:** The exams will cover the content from class lectures, journal club discussions and guest lecture material. The format of each exam will be a mix of multiple choice, true/false, short-answer type questions. Each exam will be a closed book exam.

Exam #1 = Tuesday July 15 (9:00AM)  
Exam #2 = Thursday July 24 (9:00AM)

**Journal Club:** The class will be split into two smaller groups for journal club to facilitate class discussion. An article will be distributed to the class (or posted on the website) at least one day prior to the journal club meeting. The students are expected to read the journal article before class and to be prepared to discuss the article. We will read and discuss four or five articles during the course. The grade is based on class participation.

**Lab:** Dr. Bucki will direct the afternoon lab with the assistance of the RTAs. The details about the lab, and the lab expectations, will be discussed by Dr. Bucki during the first lab period.

**Research Proposal:** Students will be divided into teams of three students for the research proposal portion of this course. Each student team will be responsible for developing their proposal idea, submitting three drafts of their written proposal, and giving a status-update presentation at the end of each week (including a final presentation on the last day of the course).

Recent journal articles will be used to develop a proposal for a new set of experiments, device, or technique related to biotechnology. The proposal is not only a literature review of current work, but a proposal for a new project based on the current literature. Each group should develop a novel idea that *may* be tested. However, there will be no experimental work done on the project during the class.

More detailed information about this portion of the course is available in the separate *Research Proposal* handout.

**Final Comment:** Please be aware of *ALL* of your resources for this course - Dr. Holleran, Dr. Wattenbarger, Dr. Bucki, six RTAs, and seven graduate student mentors. We encourage you to talk with any and all of us if there is anything you would like to be done differently. Let someone know if you are having any problems.

## BIO LAB TOPICS:

### Week I

1. Laboratory Safety, Procedures and Regulations. Biotechnology in CF treatment.
2. Measuring and dispensing liquids. How to Pipette.
3. Cell Biology Laboratory - Using Imaging to Identify DNA and F-actin Structures in A549 lung epithelial cells. DNA/F-actin bundles in CF sputum
4. Drug Discovery – developing antibacterial molecules that resist inhibitory effects of DNA and F-actin. Bacteria killing assay. DNA stimulate biofilm formation.
5. CFU-counting of results from previous experiment/Evaluation of biofilm mass (CV staining)

### Week II

6. Recombinant DNA Technology (part I). DNase I (Pulmozyme), a recombinant protein currently used in CF treatment. pGLO™ Bacterial Transformation. Gold nanoparticles in CF diagnosis.
7. Iron Hill tour
8. Recombinant DNA Technology (part II)
9. Recombinant DNA Technology (part III - data collection and analysis). DNA digestion with DNase I (Pulmozyme). Viscoelastic properties of CF sputum.
10. Restriction Analysis — Links to Biotechnology

### Week III

11. GFP purification/ Application of MNPs to separate bacteria
12. Western blot analysis of Plasma Gelsolin
13. Bioengineering Laboratory: Electromyography, Goniometry and Reflex Response /**Lab report due**
14. / **Final exam**
15. Presentation