Advanced Synthetic Biology
Syllabus for BME 598 – Fall 2012

INFORMATION
Professor  Dr. Karmella Haynes
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Office hours  By appointment only
Classroom  ECG G319
Schedule  M, W, 4:30 – 5:45 pm

OVERVIEW

Unit 1: Biological Parts
Evolutionary biology & conservation, tunable molecular functions, DNA & protein synthesis

Unit 2: Living Machines – engineering principles in biology
Modular design, Stable states, logic evaluators, dynamic functions, learning by building

Unit 3: Applying devices in the real world
Signal amplification, noise, robustness, stochasticity, biosafety containment

COURSE WORK

In-class Exercises (2/Unit, 6 total): guided walk-throughs of computing tools for Syn. Bio.
Problem Sets (2/Unit, 6 total): solve problems using tools from the In-class Exercises
Article Summaries (2/Unit, 6 total):
Project Proposal Stages (1/Unit, 3 total): drafts of the final project proposal
Exams (1/ Unit, 3 total): Take-home essay-style exams, typically 4 questions each
Final: Finished project proposal

Policies: Only 2 make-up assignments will be allowed. Exams can be re-scheduled, but only prior to the assignment date (e.g., 9/24), and must be submitted up to 1 week after the original due date (e.g., 9/26).

Grading
Problem Sets 24%, Project Proposal Stages 18%, Exams 30%, Final 25%
A+ 100, A+ 97, A 94, A- 90, B+ 87, B 84, B- 80, C+ 77, C 74, C- 70, D+ 67, D 64, D- 60, E <60

REQUIRED MATERIALS

Reading: reading materials will be posted on Blackboard
Hardware: laptop computer is strongly recommended
Computer software: Safari internet browser, Microsoft Office, MATLAB, ImageJ

KEY CALENDAR DATES
Session C: 15 weeks

9/3  No class (Labor Day)
9/24  Unit 1 Exam (due 9/26)
10/15  No class (Fall break)
10/29  Unit 2 Exam (due 10/31)
11/12  No class (Vet’s day)
12/3  Unit 3 Exam (due 12/5)
12/19  Final due

Advanced Synthetic Biology
The field of synthetic biology is based on the premise that living systems are modular, and thus, able to be engineered. This idea has spurred a new movement and has made a big impact on application-driven molecular biology. The course will review foundational and recently published work, and reinforce technical information with hands-on exercises (e.g., biological device planning, math modeling, computer simulations, database mining).

The course will focus on molecular biology and empirical data collection, and their relationship with mathematical models. Familiarity with molecular biology (DNA, RNA, & proteins), calculus, and basic engineering language are strongly recommended. Assignments will culminate as a design project proposal to support Ph.D.-level training.

Complete daily schedule & policies will be posted online.