CH 391L Spring 2013 — Monday 2–5 PM
Synthetic Biology — MBB 2.204
Unique # 52960 — Professor: Barrick

Instructor: Dr. Jeffrey Barrick
Office Hours: by appointment Office: MBB 1.436BA

Topics: This course will cover current developments in the techniques, biological parts, accomplishments, problems, ethics, and challenges of synthetic biology.

Prerequisite: Biochemistry (CH339K and CH339L) or equivalent strongly suggested. Undergraduates must have the instructor's permission to register for this course.

Course web page: The course web site on the OpenWetWare (OWW) Wiki will be used to complete assignments: http://openwetware.org/wiki/CH391L/S13. Participants will be required to register an account on OWW and learn to use this Wiki.

Grading: There will be 1000 total points for this course. Final grades will be assigned based on how many points you accumulate. The course will not use +/– grading.

Topic presentations		Points	Grade
• Written reports (Wiki)	300	≥900	A
• Oral presentations	200	800-899	B
Participation (Feedback)	200	700-799	C
Final group project	300	600-699	D
Total	1000	≤599	F

Written reports and oral presentations will be graded according to rubrics provided on the course website. Participation will be graded through a combination of contributions to in-class discussions and documentation of providing feedback on other people's written topics on the Wiki. To receive full credit, you should expect to provide substantive written feedback on at least 50% of the topics discussed in the course.

Course Structure

Each class time will be split into two halves with a 10-15 minute break between them.

New Topics. In the *second* half of each class, several participants will each have 20 to 30 minutes to individually present new topics. To prepare for these ***oral presentations***, you are required to complete a ***written report*** by creating a new page on the OpenWetWare Wiki (under /CH391/S13). This page should provide an in-depth discussion of the research area that you have chosen. Aim for ~1000 words with ≥5 citations to the primary scientific literature, including at least 3 research papers. Also create or find at least one explanatory figure or image to include in your topic and link to at least one previous iGEM project related to your topic, if possible. Your topic should also reference **one key research paper** that the rest of the class will read during the week after seeing your presentation. Don't discuss that paper in detail at this time. Do provide the background leading up to that paper by discussing other research papers. ***This written Wiki report must be finished by the time of your presentation.***

Presentations should be kept simple. They can consist of figures directly from the literature (with proper attribution) and verbal descriptions of the background, experiments, results, and future directions of several recent studies in a research area. You should have at most 10 slides if you prepare a PowerPoint presentation. You can,

instead, show figures directly from the PDF versions of your cited papers. You are also encouraged to directly follow the points mentioned in your written Wiki topic page.

Other members of the class will be expected to ***provide feedback*** by asking questions during your presentation and/or editing the Talk pages for your written Wiki report within a few days afterwards (by midnight on Thursday of the week of the presentation). These comments should be constructive. It is *expected* that your classmates will ask you interesting questions or bring up issues that you can't immediately answer, and that we will all learn from the feedback and revision cycle! You are encouraged to bring a laptop, iPad, etc. to view Wiki pages and scientific papers *during* in-class presentations.

Topic Updates / Paper Discussions. In the *first* half of the next class period, students who presented new topics the previous time will present their answers to questions that were raised during the in-class discussion of their topic or on the Wiki talk pages since they presented. You may need to add additional citations to research papers to expand on the background. To keep a record of your changes, you should keep track of your point-by-point responses and the Wiki edits that you made to your written report on your Wiki topic's Talk page as if you were responding to reviewers of a scientific paper.

After you present these updates, the **entire class** will discuss the **key research paper** relevant to your topic. Everyone in class is expected to be familiar with the details of this paper. The instructor may ask ***any person*** to answer questions about the motivation, methods, experiments, results, implications, etc. when discussing this research paper.

Topic Choice: Topic and paper choices should be discussed with the instructor *and* class at least 1 week prior to the scheduled presentation. A topic list for the course is attached, but there is significant leeway to tailor the topics toward your interests.

One goal of the topic component of the class is to create a reference work that everyone can come back to after completing the class to remember key details.

Final Projects**.** Groups of 3-4 participants will create a proposal for a synthetic biology project. A written document (10-15 double-spaced pages) should describe the motivation for the work (what is the technological or societal impact?) and how it would be accomplished (be very specific about your methods and control experiments you would use to benchmark steps in your progress — use figures). This project will be turned in offline (not on the Wiki), since it might be a research idea that you want to actually work on without immediately sharing it with the world. You should briefly describe the role that each participant had in the preparing the project.

For example project ideas, look at various past iGEM team websites linked from http://igem.org/Team_Wikis?year=2012.

You will self-organize into groups and submit project topics by March 25th. Similar to usual class topics, your group will have 20-30 minutes to present your final project on the last day of class, and you will collectively be responsible for making revisions in response to ideas and questions raised by your classmates. You will need to provide printed or digital copies of your report to others on the day of your presentation so that they can return comments to you. You will turn in a copy of your project that has been revised in response to this feedback at the end of finals week.

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Scholastic Dishonesty: If you are caught in some form of scholastic dishonesty, (for examples, see: http://deanofstudents.utexas.edu/sjs/scholdis_whatis.php) you will receive an F in the course, and you will be reported to Student Judicial Services (Office of the Dean of Students). You will receive no warning before these actions are taken.

Be particularly careful when editing OWW Wiki pages. Do not include copyrighted material (such as figures from papers) that are not in the public domain, unless subject to fair use. Be very careful to not plagiarize, which includes paraphrases your sources.

Other: The University of Austin provides appropriate academic accommodations for qualified students with disabilities upon request. For more information, contact the Office of the Dean of Students at 471-6259, 471-6441 TTY.

It is the policy of The University of Texas at Austin that the student must notify each instructor at least fourteen days prior to the classes scheduled on dates he or she will be absent to observe a religious holy day. For religious holidays that fall within the first two weeks of the semester, the notice should be given on the first day of the semester. The student may not be penalized for these excused absences but the instructor may appropriately respond if the student fails to complete satisfactorily the missed assignment or examination within a reasonable time after the excused absence.

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TOPICS

#	DATE	TOPIC
1	Jan 14	**Introduction:** What is synthetic biology? Overview of course structure and topics. Wiki editing tutorial.
	Jan 21	**Martin Luther King, Jr. Day:** No class.
2	Jan 28	BioBricks - iGEM registry - RFCs, oligonucleotide and gene synthesis technologies, CAD systems for synthetic biology.
3	Feb 4	Refactored and synthetic genomes, T7 and yeast, reduced and "clean" microbial genomes, genome synthesis techniques, Gibson assembly.
4	Feb 11	Evolutionary approaches. Ancestral sequence reconstruction, directed protein evolution, *in vitro* nucleic acid selection. MAGE.
5	Feb 18	Plasmid replication origins, new selectable and counter-selectable genetic markers, biocontainment, toxin-antitoxin modules, metagenomics.
6	Feb 25	Gene regulation and environmental sensing. New regulatory proteins, riboswitches, optogenetics.
7	Mar 4	Reporter genes. GFP variants, spinach RNA, pigments, smells.
	Mar 11	**Spring Break:** No class.
8	Mar 18	Biomaterials (recombinant spider silk). Bioremediation.
9	Mar 25	Circuits. Repressilator, toggle switch, counter, edge detection. ***Topics and groups for final project due***
10	Apr 1	DNA computing, chemical (abiotic) self-replication, gene therapy.
11	Apr 8	Metabolic engineering examples, biofuels, genetically modified crops.
12	Apr 15	Quorum sensing, locomotion, expanded genetic codes.
13	Apr 22	Synthetic ecologies. Pattern formation.
14	Apr 29	***Final project presentations***
	May 14	***Revised written final projects due***

* At the instructor's discretion, the above schedule and topics may be modified. The class will be notified of any changes in class and on the OpenWetWare class web site.