CH 391L Spring 2012 — Monday 2–5 PM
Synthetic Biology — MBB 2.240
Unique # 52537 — Professor: Barrick

Instructor: Dr. Jeffrey Barrick <jbarrick@cm.utexas.edu>
Office Hours: by appointment Office: MBB 1.436BA Phone: (512) 471-3247

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. Undergraduate students 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/S12. 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 by a straight scale (no curve) based on how many points you accumulate.

		Points	Grade
Topic presentations			
• 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

Class 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, 3-5 participants will have 15 to 20 minutes each 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/S12) that is an in-depth discussion of the topic (aim for ~1000 words, ≥3 citations to scientific reviews and research papers, and explanatory figures.) ***This Wiki report should be finished by the day 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 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 can directly follow the points mentioned in your written Wiki report. 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. 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 (but not required) to bring a laptop to view Wiki pages and related scientific papers *during* in-class presentations.

Topic Updates. 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.

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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 topic's Talk page as if you were responding to reviewers of a scientific paper.

Topic Choice: Topic 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 papers and topics toward your specific interests.

The goal of the topic component of the class is to create a reference work that you 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 can be communicated on the Wiki as with other assignments, or offline (if it is 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=2011.

You will self-organize into groups and submit tentative topics to the instructor by March 26th. 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. If you choose to not post your project on the class Wiki, you will need to provide printed copies of your report to others on the day of your presentation so that they can return comments to you. In this case, you should also turn in a written response to those comments. If you are putting your project on the Wiki, Talk pages can be used for this feedback, as usual.

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 that you do not include copyrighted material (such as figures from papers) that are not in the public domain.*

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 23	**Introduction:** Synthetic biology history, ethics, and challenges. Wiki editing tutorial. Overview of course structure and topics.
2	Jan 30	**Methods:** Biological parts. iGEM registry, metagenomic libraries, *in vitro* selection, comparative genomics, ancestral protein reconstruction.
3	Feb 6	**Methods:** Assembling parts. DNA oligonucleotide synthesis, Gene/genome synthesis, restriction enzyme cloning, BioBricks/BglBricks, PCR techniques, Gibson assembly.
4	Feb 13	**Methods:** Optimizing parts. Genetic screens, combinatorial libraries. Computational methods. Protein folding, metabolic/regulatory modeling.
5	Feb 20	**Parts:** Chassis. Host organisms (*E. coli* and yeast), artificial chromosome replication origins, selectable and counter-selectable genetic markers.
6	Feb 27	**Parts:** Basic gene construction. Polymerases, transcriptional promoters, terminators, ribosome binding sites, codon optimization.
7	Mar 5	**Parts:** Gene regulation. Sigma factors, protein transcriptional regulators (Lac, Ara), riboswitches, sensor genes (light).
	Mar 12	SPRING BREAK
8	Mar 19	**Parts:** Reporter genes. GFP variants, spinach RNA, pigments, smells.
9	Mar 26	**Parts:** Complex parts. Quorum sensing, locomotion, toxin-antitoxin genes, unnatural amino acid systems. ***Topics and groups for final project due***
10	Apr 1	**Systems:** Synthetic organisms. Refactored T7, "Amber-less" *E. coli* synthetic yeast, Polio virus, *Mycoplasma mycoides*.
11	Apr 8	**Systems:** Circuits. Repressilator, toggle switch, counter, edge detection.
12	Apr 15	**Systems:** Metabolic engineering. Artemisinic acid engineering, MAGE lycopene production, biofuels.
13	Apr 22	**Systems:** Atrazine seek and destroy, synthetic ecologies, other topics.
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.