Schedule (subject to change)

Monday:
9:00-10:00: A lecture overviewing the central dogma of Molecular Biology and the field of synthetic biology; covering landmark pieces of work and major continuing efforts.

10:00-10:30: L. Clarke 'A Bacterial Thermometer'
10:30-11:00: D. Widmaier 'Secreting Spider Silk in Salmonella'
11:00-11:30: M. Eames 'Remote Controlled Bacteria'

11:30-12:30: Introduction to the concepts of biological parts, devices and systems. Standardization in order to facilitate the reconfiguration of natural genetic elements such as promoters, ribosome binding sites, regulatory RNAs and open reading frames into unnatural arrangements for the rational engineering of cellular behaviors.

12:30-1:30: Lunch (GH N114)

1:30-2:00: Goals of the team challenge laid out.

2:00-3:30: Introduction to MIT's Registry of Standard Biological Parts with Live Demo

3:30 – 5:00: Teams execute registry exercise

Homework: Finish above task/brainstorm ideas for system design.

Tuesday:
9:00-10:00: Overview of major types of parts available to synthetic biologists.

- Promoter function (H. Salis)
- Operator function (H. Salis)
- Inducible systems (H. Salis)
- Ribosome binding sites (H. Salis)
- Transcription terminators (H. Salis)
- Small RNAs/Bacterial Riboregulation (J. Tabor)
- Eukaryotic Promoters (J. Tabor)
- Posttranscriptional regulation (J. Tabor)
- mRNA localization (J. Tabor)
- miRNAs (J. Tabor)
- p-bodies (J. Tabor)
- translation (J. Tabor)
- posttranslational modifications (J. Tabor)
- protein localization (J. Tabor)
- protein degradation (J. Tabor)

10:00-11:30: Journal club

12:30-1:30: Lunch (GH N114)

1:30-2:30: Advanced regulation/Artificial regulatory parts

- Hybrid promoters
- Engineered riboregulators
- Engineered mRNA stability elements
- siRNAs
- RNA-based delivery systems

2:30-3:00: Standard Assembly (Biobricks cloning).
-Going backwards when using biobricks
-Inform teams of challenge

3:00-4:00: Afternoon: Lab. Teams challenged to construct novel genetic logic, such as an XOR transcription gate and specify it in the registry.

~4:00 PM: Checkpoint. Teams chalkboard nascent ideas for XOR, get feedback from students, instructors.

Homework: Finish specifying XOR logic//brainstorm ideas for system design

Wednesday:
9:00-12:30: H. Salis: Modeling gene networks
-Teams given modeling assignments for MATLAB.

12:30-1:30: Lunch

Afternoon: Lab. Write a simulation of your XOR device from Tuesday afternoon.

Homework: brainstorm ideas for system design

Thursday:
9:00-11:00: Teams meet and work on nascent system idea.

11:00-12:30: Checkpoint. Teams Chalkboard nascent system ideas and get feedback from other teams, instructors.

12:30-1:30: Lunch

1:30-3:30: Use the model to weed out designs that may not work and also to help identify the characteristics of the parts that would be necessary to get a desired network behavior.

3:30-5:00. Checkpoint. Teams Present nascent part level systems designs, get feedback.

Homework: Model-driven design. Find parts from the literature which have properties that fulfill the requirements of the simulations.

Friday:
9:00-12:30: Continue finding parts with properties which fulfill simulation requirements from literature.

-Document parts and systems in the registry

12:30-1:30: Lunch

1:30 - afternoon: Finish Simulating, specifying and documenting your system in the registry.

Homework: Prepare presentations for Monday.

Monday:
1:30-3:00: GH 114. Final Presentations.