**2021 BENG 5500/6500 Course Syllabus**

**Class Time & Location**

Tuesday & Thursday:  7:30 - 8:45 am   
Lecture – Zoom   
Labs - New Engineering Building, Room 305 (Computer lab)

**Course Content**

* Explain flux balance analysis
* Explain the basic *E.coli* core metabolic model
* Demonstrate the ability to effectively use the “Cobra Toolbox”
* Explain and demonstrate robustness analysis
* Explain and demonstrate flux variability analysis
* Explain and demonstrate phenotype phase plane analysis
* Explain and demonstrate parsimonious analysis
* Explain and demonstrate the process of determining gene knockouts for optimizing bioproduct production
* Explain and demonstrate constraint-based modeling using randomized sampling
* Explain and demonstrate dynamic flux balance analysis
* Explain and demonstrate dynamic regulatory flux balance analysis
* Explain and demonstrate the process of optimizing bioproduct production

**Course Outcomes**

At the completion of the course, students will be able to do the following:

* Demonstrate a qualitative understanding of
  + flux balance analysis,
  + the Cobra Toolbox,
  + robustness analysis,
  + phenotype phase plane analysis,
  + parsimonious analysis
  + determining gene knockouts for optimizing bioproduct production,
  + randomized sampling,
  + dynamic flux balance analysis,
  + dynamic regulatory flux balance analysis,
  + optimizing bioproduct production.
* Demonstrate the ability to use the Cobra Toolbox.

**Required Textbook**

*Systems Biology: Constraint-based Reconstruction and Analysis, Bernhard O. Palsson, Cambridge University Press, 2015*

**Course Website**

USU Canvas

**Student Projects**

* The class will include a required research project. The research project will require a written paper.
* No late projects will be accepted

**Labs**

* Labs will collaboratively done as a team and should typically be held on Thursdays. The students should find a meeting time that works for all of them.
* The students should work independently on the labs but should feel free to talk to other team members when working on the lab and finally to compare final results.
* Professor Hinton can answer lab questions via e-mail.
* The labs will not be graded.

**Class**

* The classroom experience is designed to simulate a corporate project team that includes multiple engineers and scientists. In this case, project team will have a weekly group meeting to discuss the project they are working on with their supervisor (Professor). In that meeting everyone reviews their progress on their part of the project and discusses issues they are facing and the concerns they have about the next week’s work.
* In principle, this is a collaborative learning environment, where all parties learn from each other through discussion and other forms of interaction. There will be discussion during each class period about the material learned the previous week and material to be learned in the coming week. A student will be chosen to lead the discussion during each class period.

**Grading**

* Student participation - 40%
* Student Project – 60%