Syllabus for BIOL 527 001 and 527L 401
Systems Biology

Tues/Thurs 3:30pm-4:45pm and Tuesday 5:00pm-5:50pm
Wilson 218

Course Director:

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Prerequisites:
COMP 116 (or some programming experience), MATH 232 or 283

Requirements:
This course aims to develop your ability to use computational approaches when investigating and/or modeling biological problems. The course will be run as a "virtual lab" on your laptop or personal computer. You will be expected to learn at least one programming language (Matlab, Python or Perl) to help you solve quantitative problems. Assignments will generally be in class and will be in the form of problem sets. They will be due two weeks after they are assigned, and not accepted after their due date.

Suggested Textbook, not required:
"An Introduction to Systems Biology," Uri Alon,
(http://www.weizmann.ac.il/mcb/UriAlon/bookUri.html)

Grading:
Grading will be based 60% on assignments, 20% on final exam/presentation, 20% on class participation.

TAs and other Resources:
There will be no official TA for the class, however members of the Laederach Lab (http://ribosnitch.bio.unc.edu) will be available to provide some technical assistance as well as guest lectures.

Class Participation:
This class is project focused, and interactions with other classmates are strongly encouraged. Assignments will generally be given to groups (3-4 students per group) and will focus on solving a specific problem.

Class Schedule:
Week 1: Matlab installation, Basic programming, Formatting Data, Modeling Noise in Data.
Assignment: In class non-linear regression problem set.
Week 2: Dynamic relationships between transcription, translation and replication.
Assignment: Next generation sequencing technology overview
Week 3: Next Generation Sequencing Analysis
Assignment: Mapping millions of reads to a reference sequence.
Week 4: Transcription Regulation in the Cell
Assignment: More mappings, estimating rates of transcription.
Week 5: Transcription Networks: Basic Concepts
Assignment: Problem Set on Networks
Week 6: Michelis-Menten and Hill Equations
Assignment: Binding of an Activator to its DNA site
Week 7: Stochastic Processes I
Assignment: None
Week 8: Stochastic Processes II
Assignment: Random selection process modeling
Week 9: Ordinary Differential Equations
Assignment: Dynamics of accummulation
Week 10: Data Annotation and Standardization
Assignment: Nucleic Acid Structural Probing Data Analysis I
Week 11: Data Annotation and Standardization
Assignment: Creating and Making an ISATab file
Week 12: Metabolism and the Citric Cycle
Assignment: None
Week 13: Posttranscriptional Regulation
Assignment: The PAR-Clip Approach
Week 14: Human Genetics Databases
Assignment: 23andMe Discussion.
Week 15: Final Exam Presentations.