**Syllabus for BIOL 528 and 528L**

**Quantitative personalized genomics**

**Tues/Thurs 2:00pm-3:15pm and Thurs: 3:30pm-4:45pm**

**Genome Sciences Building 1373**

**Course Directors:**

**Alain Laederach, Ph.D.**

Department of Biology

University of North Carolina, Chapel Hill

Chapel Hill, NC 27514

P: 919 962 6782

alain@unc.edu

[http://ribosnitch.bio.unc.edu](http://ribosnitch.bio.unc.edu/)

Office: GSB 3354: Hours upon appointment

**Tom Christy**

Bioinformatics and Computational Biology Curriculum

University of North Carolina, Chapel Hill

Chapel Hill, NC 27514

twchrist@email.unc.edu

**Prerequisites:**

COMP 116 or 110 (or some programming experience, or Biol 256), 0r MATH 232 or 283, BIOL 202 or 205

**Requirements:**

This course aims to teach you to use computational approaches when investigating and/or modeling biological problems. 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 40% on assignments, 30% on written final exam, 30% 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](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 biological problem computationally. I expect students to attend every class*. Any unexcused absences from class will significantly affect the participation grade*.

**Class Schedule:**

*Week 1:* Matlab installation, Basic programming review, Formatting Data

Assignment #1: Data formatting for input and output.

*Week 2:* Exponential growth through iteration.

*Week 3:*  Analytical Derivation of Exponential Growth

*Week 4:* Noise and its impact on exponential parameter estimation

Assignment #2: Simulating exponential growth.

*Week 5:* Principles of classification

*Week 6:* Optimization of grouping for clinical trials

*Week 7:* Enumeration of groupings through recursion

Assignment #3: Computing optimized working groups for the class

*Week 8:* Nucleic Acids and sequencing

*Week 9:* Visit to the Next Generation Company or Core

Assignment #4: Next generation sequencing technology review

*Week 10:* High throughput evaluation of RNA structure

*Week 11:* Computational techniques for handling ultra-large data sets

*Week 12:* Local and Global alignments in next-gen sequencing analysis

*Week 13:* Systematic evaluation of Bias in next-gen sequencing data

Assignment: SHAPE-JumP RNA structure determination

*Week 14:* Personalized genomics and disease-association

*Week 15:* Written Final Exam.