MCB C243
Proposal for a new graduate course
Genetics, Genomics, & Development Division,
Department Molecular & Cell Biology
(planned crosslisting as Math C243)

submitted by Lior S. Pachter,
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Metadata for the course:

MCB C243/Math C243
Course title: *Seq: Methods and Applications
(Note: “*Seq” is pronounced “Star Seq”.)
Course description: A graduate seminar class in which a group of students will closely examine recent computational methods in high-throughput sequencing followed by directly examining interesting biological applications thereof.
Units: 3
Offered: Spring
Format: Lecture only
TuTh Lecture
Time: 8:00am-9:30am
Grading: Letter
Final Exam: No scheduled final exam-Final Project
Cross-listed: Math Department-Yes.
Courses that will restrict credit: None.
Prerequisites: graduate standing in Math, MCB, and Computational Biology; or consent of the instructor.
Repeatable for credit: No
Number of students expected to enroll: 8 - 24 students.

Detailed Proposal

The proposal is to create MCB C243 “*Seq: Methods and Applications” as a graduate seminar class in which a group of students will closely examine recent computational methods in high-throughput sequencing followed by directly examining interesting biological applications thereof. The class will meet twice a week for sessions of 1.5 hours. For the first two weeks, the professor will review the basic biology and computational/mathematical techniques underlying high throughput sequencing as a biological tool. Students will also get a chance to choose an application paper to present for weeks 2-8. The next six weeks will start by focusing on a seminal method paper or an exceptionally clear review article, for which the professor will lead students in an exposition of the methods, provide a clarifying summary and answer questions. Each Thursday a student or students will present an application of the week’s method and
lead a group discussion about the application for the second session. (The selection of papers presented below for the “Thursday menus” is merely representative, not exhaustive.) The 9th week will be devoted to an extended discussion of what methods and applications the students found particularly compelling or insightful, their proposed final project, and choosing a paper relating to their final project they would like to present. Students will submit a final project in consultation with the professor, choosing from several options: a) writing a review article of a method not reviewed in week 1-8; b) writing a review article of several applications of a method to a specific disease or problem in biology; c) their own attempt at running a computational analysis based on any *Seq method paper; or c) a paper motivating and sketching out possible strategies and pitfalls of a new method. 8 - 24 students. (8-16 presentations first half of class, 12 - 24 presentations second half of class.)

30% Productive class participation
20% first presentation of a paper
20% second presentation of a paper
10% Insight/Planning Presentations & Discussion (Week 9)
20% Final project.

Sample syllabus (exact methods may differ from year-to-year):

**Week 1:** A review of high-throughput sequencing technology. Students sign up for the Week 2-8 presentations and choose the application paper they wish to present.

**Week 2:** A review of basic mathematical and computational ideas in analyzing sequencing data. Pass/Fail problem set.

Week 3 - 8 Students will be expected to read the method paper before lecture on Tuesday so they can ask questions about it. They will be expected to read the application paper their colleague has chosen for the week before Thursday.

**Week 3: DNA-ase seq:**


Week 4: CHIP-seq


Week 5: RAD-seq


Week 6: RNA-SEQ I:


Week 7: RNA-SEQ II:


**Week 8:** Methyl-Seq


Thursday: Students’ choice.

**Week 9:** Insight and Planning presentations (5-15 minute presentations on what they found most insightful week 1-8, what they would like to do for their final project, and therefore what paper they would like present week 10-14).

**Week 10 - 14:** Students present on a paper relating to their final project.

**Week 15:** Students present their final project.