Dear Colleagues;

Thank you for considering the attached syllabus, which we submit for consideration for Arts and Sciences team teaching support.

This course has emerged from our recognition that increasingly, computational skills are essential to approach biological questions on a genomic scale, but that in the absence of appropriate biological context and appreciation, it is difficult for computational analyses alone to yield new biological insight. Students who are literate in both disciplines will be especially well positioned to participate in emerging areas of research, development, medicine and related fields. Furthermore, students in one field with only a working knowledge of the other will be better able to contribute to large interdisciplinary groups. With this in mind, we propose a course joint between Molecular Genetics and Biostatistics (Public Heath) in “an introduction to genomic data analysis.”

Interdisciplinary context and the instructional team
For this course, we utilize a single biological question (centered around stem cells, cell differentiation, and the genetic processes that cause cells to transition between these states) as a framework for understanding and applying statistical methods and R-based software for the interpretation of genome-scale data. The course uses the expertise of the two instructors in animal development (Chamberlin) and biostatistics (Rempala), providing an interdisciplinary expertise that would not be possible with just one instructor. Each instructor will contribute to 50% of instruction, with alteration between a class on the biological context and a class on the statistical and computational concepts. The course will be offered as a 7 week course, with two, two-hour sessions per week.

Benefit to students
We expect the course will be suitable for both undergraduate and graduate students, and the pre-requisites are framed in order to be open to students from different majors. It is our intention that the background and assumptions for the biological questions will be supplied in the class, such that students from Statistics and Biostatistics will benefit from learning about an in-depth biological question. Likewise, basic instruction on statistical methods for genomic data analysis will allow students from Molecular Genetics and other Biological Sciences majors to develop their data-analysis skills. A final team project involving students from different academic backgrounds will allow them to practice collaboration, and contribute their distinct expertise.

Course learning goals
There is a detailed statement of learning goals and curriculum competencies are in the syllabus.

Relationship to other offered courses

We envision that the course has several unique features compared to other courses

1. A biostatistics class that focuses on a specific biological question, rather than only on tools
2. An entry-level course that can serve as an entry point for students to take more advanced courses
3. A focus on the statistical principles underlying genomic data analysis

Distinction from other courses:

Molecular Genetics 5623. We envision that the proposed course will include statistical and data analysis methods, rather than a primary focus on biological questions.

Bioinformatics 5730, 5750. We envision that the proposed course will offer a unique integration of biological questions with statistical data analysis compared to this existing offering. The specific biological question identifies which analytical methods are discussed.

Statistics 6625. The proposed course will be at the 5000 level, and therefore open to undergraduates. The proposed course focuses on genomic methods and specific biological questions, rather than statistical genetic theory.

Sincerely,

Helen Chamberlin and Grzegorz Rempala