

EVOLUTIONARY GENOMICS (BIOL 6750/4750) FALL 2017

Class meetings: Tu. & Th. 10:30–11:45
Lilly White 006
Website: Log-in to Canvas
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Office: BNR 355
Office Hours: by appointment

1 DESCRIPTION OF THE COURSE AND LEARNING OBJECTIVES

This course examines the theory and conceptual foundations of evolutionary genetics and genomics and provides instruction and experience conducting genomic data analysis using computer-based procedures. A substantial portion of our time in this class will be devoted to reading and discussing articles from the primary literature and relevant book chapters. We will also spend a large portion of our time working with and analyzing real genomic data. This will be augmented by short lectures that I will use to introduce or clarify difficult topics or material. By the end of the course students will (1) understand the conceptual framework of evolutionary genetics and genomics and be familiar with the major gaps in our knowledge in this field, (2) be familiar with the types of questions that can be addressed with genomic data, (3) be able to use computer-based methods to make inferences from genome-scale DNA sequence data, and (4) have the vocabulary and skills to understand scientific papers in the field of evolutionary genomics.

2 SUGGESTED TEXTS

A text book is not required for this course, but I will use material from the following texts, which you are encouraged to use as references. Required book chapters and the articles from primary literature will be provided in pdf format via the course website.

- Ewens, W. 2004. *Mathematical Population Genetics. I. A Theoretical Introduction*. Second Edition. Springer Press, New York, USA.
- Gillespie, J. 2004. *Population Genetics: A Concise Guide*. Second Edition. John Hopkins University Press, Baltimore, USA.
- Lynch, M. 2007. *The Origins of Genome Architecture*. Sinauer Associates, Sunderland, USA.

3 ASSESSMENT

Your performance will be evaluated based on your participation in class and a final paper. Letter grades will be calculated on the standard USU scale with in-class participation, data analysis reports and a final paper accounting for $\frac{1}{3}$ of your grade each.

3.1 CLASS PARTICIPATION

Learning in class requires you to be present and prepared. You are expected to have completed all reading assignments before coming to class and to be prepared to discuss the material (this does not mean that you must understand the material fully, just that you are ready to talk about it). You will be asked to lead a subset of the discussions. As the discussion leader, you will be expected to have prepared specific questions or identified key areas for discussion and to help guide the class through the material (I will always help with this too).

3.2 DATA ANALYSIS REPORTS

We will also spend time during and outside of class analyzing genomic data sets. You will be able to work on the data sets alone or in groups. For each data set, you will be required to submit a report (preferably using R markdown). Specific requirements for each report will be included in the assignments. Reports can be submitted by individuals or groups (even if you work together on the analyses, you can write your own individual reports if you want).

3.3 FINAL PAPER

You will complete a research paper as a capstone experience for this course. The research paper can be done independently or in groups (2-3 students per group). Your paper must address a topical question in evolutionary genomics and can involve data analysis (including re-analysis of published data), the use of computer simulations or development of theory, or meta-analysis or synthesis of published work. A simple literature review is not appropriate. My expectation is that the final paper will be something that could be published in a peer-reviewed journal. Along these lines, any paper prepared as the final paper for this class that has been submitted in good faith to a peer-reviewed journal and is under review (or accepted) before the due date for this paper will be given an *A* (this is not a requirement for an *A* on the final paper).

A draft of the paper is due on **December 6th** and the final paper is due by **December 12th**.

4 LIST OF MAJOR TOPICS

1. Fundamentals of evolutionary (population) genetics (weeks 1–4)
2. Causes of genetic variation in nature (weeks 5–11)
3. Inference from DNA sequence data (weeks 5–11)
4. Genomes and genome evolution (weeks 12–15)
5. Genomic data analysis (weeks 12–15)

5 ADDITIONAL ITEMS

- The schedule of topics, assignments, and all other details in this syllabus are subject to change with fair warning.
- ADA compliance: Students with physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations in accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973. All accommodations are coordinated through the Disability Resource Center in Room 101 of the University Inn, 797-2444 voice, 797-0740 TTY, or toll free at 1-800-259-2966. Please contact the DRC as early in the semester as possible. Alternate format materials (Braille, large print or digital) are available with advance notice.
- Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any “unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature.” If you feel you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266.
- Students whose religious activities conflict with the class schedule should contact me at the beginning of the semester to make alternative arrangements.
- Cheating and other forms of academic dishonesty are listed in The Code of Policies and Procedures for Students at Utah State University (revised September 2009), Article VI, Section 1. If you are found to be engaged in academic misconduct, at a minimum you will receive no credit for that exam or assignment. Repeat or serious offenders can expect more serious consequences.