Syllabus

Integrative Biology 161 – Spring 2021
Population and Evolutionary Genetics (4 units)

Lectures: 11:00-12:30 on Zoom (links posted on bCourses).

Instructor: Prof. Rasmus Nielsen
Email: rasmus_nielsen@berkeley.edu
Office: 4134A VLSB
Office Hours: Mon 3-4, Wed 3-4

Prerequisites: Bio 1B, Math 10A and 10B, 16A, or equivalent.

Course Format: The course consists of 3 hours of lectures (Tu, Th 11:00 – 12:30 pm) and two hours of computer exercises and/or discussion each week in section.

Required Text: Nielsen, R. & M. Slatkin. 2013. An Introduction to Population Genetics: Theory and Applications. Sinauer Associates Inc., Sunderland, MA. We will also use pdfs that will be available on bcourses in the *"files"* folder.

Requirements and Grading: Attendance at lectures and participation in classroom discussions and computer exercises are required of all students. The computer labs will account for 20% of the final grade. There will be two mid-term exams (taken during class meeting time) and each will account for 20% of the course grade. The final exam will account for 20% of the course grade and is non-cumulative, and will only cover material from the last third of the course. In addition, there is a project which will account for 20% of the grade. The midterms and final are open book exams and you can use any resources available to you, but you cannot communicate with other people while you take the exams. If the grade average of undergraduate students in the class is lower than B, grading will be done on a curve to enforce a B average.

Project: There will be a research project accounting for 20% of your final grade. On the last day of class students will submit a written paper with an introduction, methods, results and discussion section not to exceed 8 pages of double-spaced text in Times 12 font for a non-analytical written report and 4 pages for an analytical project. Project ideas and datasets will be presented to you in the lab section, but you are not limited to these. Ideas for all projects must be approved by the GSI or the instructor who will ask you to give a short presentation in lab on your chosen topic. All papers will be searched for evidence of plagiarism, which is strictly prohibited.

Lecture schedule:

#	Date	Topic
1	1/19	Introduction, genetic data & genotyping (pp. 1-4)
2	1/21	Allele and genotype frequencies; Hardy-Weinberg equilibrium theory (pp. 5-20)
3	1/26	Mutation and Genetic drift I (pp. 21-33)
4	1/28	Mutation and Genetic drift II (pp. 21-33)
5	2/2	Coalescence theory: relating theory to data (pp. 35-57)
6	2/4	Coalescence theory: relating theory to data (pp. 35-57)
7	2/9	Population subdivision (pp. 59-76)
8	2/11	Population subdivision (pp. 59-76)
9	2/16	Inferring population history & demography I (pp. 77-105)
	2/18	*Midterm 1*
10	2/23	Inferring population history & demography I (pp. 77-105)
11	2/25	Quantitative genetics 1 (pp. 215-232)
12	3/2	Quantitative genetics 2 (pp. 215-232)
13	3/4	Linkage disequilibrium & gene mapping (pp. 107-128)
14	3/9	Linkage disequilibrium & gene mapping (pp. 107-128)
15	3/11	Selection 1 (pp. 129-151)
16	3/16	Selection 1 (pp. 129-151)
17	3/18	Selection in a finite population (pp. 153-177)
	3/23	*Spring Recess*
	3/25	*Spring Recess*
	3/30	*Midterm exam 2*
18	4/1	The neutral theory & tests of neutrality 1 (pp. 179-194)
19	4/6	The neutral theory & tests of neutrality 1 (pp. 179-194)
20	4/8	Selection in human populations (see pdfs)
21	4/13	Selection II: Interactions & conflict 1 (pp. 195-214)
22	4/15	Selection II: Interactions & conflict 2 (pp. 195-214)
23	4/20	Introgression (see pdfs)
24	4/22	Ancient DNA and human origins II (see pdfs)
25	4/27	Ancient DNA and human origins III (see pdfs)
26	4/29	The emergence and evolution of SARS-CoV-2