Evolutionary Genetics
Biology 3225/5225

Instructor: Professor Rob Kulathinal
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Office Hours: Mondays @10:30am – 11:00am (Rm 332/214)
                          Wednesdays @11:30am – 12:00 (Rm 214)

Teaching Assistant: Craig Stanley
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Office Hours: Fridays @10:30am – 11:30 (Rm 207)

Course Description: This class covers fundamental principles of population genetics and comparative genomics. The scope of the class ranges from understanding variation at the population level to addressing species-level questions. Topics covered include classical population genetics, quantitative genetics, molecular evolution, human evolution, phylogenomics and speciation. Lectures will explore recent theoretical and empirical advances in these exciting fields. Students will be assigned problem sets during tutorials as well as be introduced to computational resources, tools and algorithms during computer labs.

Prerequisites: Completion of Biology 1111, 2112, 2203 (Genetics), and Math 1042 (Calculus II), with a grade of C or better in each.

Recommended Course: Biology 3101 (Evolution) is recommended.

Credit Hours: 4.0 (CRN 8225/8772)

Class Location: BioLife Sciences Building, Rm 332 (lectures, tutorials, exams, computer labs)
BioLife Sciences Building, Rm 126 (occasionally for computer labs)
Main Campus, Temple University

Required Textbook: Freeman, S. and J.C. Herron. 2007. *Evolutionary Analysis.* Fourth Edition. Prentice-Hall, Upper Saddle River, NJ. Students are required to read the appropriate chapters *before* each lecture. Additional readings will be assigned from the primary literature. For used copies of F&H, read the article, http://bucks.blogs.nytimes.com/2011/01/14/finding-cheaper-textbooks-2nd-edition/.

Clickers (Turning Point): Required for random class quizzes in addition to population genetics and statistical class demonstrations and exercises. To purchase one, go to http://www.temple.edu/cs/students/crs.htm. Register your clickers at https://sandbox.isc.temple.edu/bb-bridge/crs/.

Class Format: Two lectures (M,W) and one recitation (F), per week. Friday recitations switch between tutorials (5 assignments in total) and computer labs (7 exercises + 3 end-of-semester project classes). All content from tutorials and computer labs will be tested in quizzes and exams. During recitation, lecture material will be reviewed as required, and quantitative assignments and computer exercises will be introduced. Attendance (MWF) is mandatory and active participation is expected during both lectures and recitation.

Blackboard: All course announcements, tutorial assignments, and computer exercises will be placed on Blackboard, as will any updates and modifications to this syllabus. Please ensure that you have an activated email account so that you can gain access to Blackboard and have your clickers automatically assigned for class. To access Blackboard, go to https://blackboard.temple.edu/.

Lectures: Mondays, Wednesdays (BioLife Rm 332) 9:20am-10:30am

Recitation: Fridays (BioLife Rm 332/B126) 9:20-10:30am

Grading:

	Undergraduate	Graduate	Due Date / Comments
Midterm Exam I	20%	20%	TBA
Midterm Exam II	20%	20%	TBA
Assignments (5)	20%	-	select best 4 of 5
Class quizzes	5%	-	unannounced/random Class/Lab
Participation	5%	-	Lectures, recitations, computer mini-projects
Bioinformatics Project	5%	30%	End-of-year
Final Exam (2 hrs)	25%	30%	TBA
Total	100%	100%	

Exams: There will be two midterms and one final examination. Exams are based on lecture notes, assigned readings (from the textbook and primary literature), tutorial assignments, and computer exercises. Unexcused missed exams will result in a zero grade.

Assignments:. Each biweekly tutorial introduces an assignment, which will be due the following Wednesday, at the beginning of class (i.e., 9:20am). Failure to do so will result in a zero grade for that assignment. A total of five tutorial assignments will be provided: only the best four assignments will count for marks (for a total of 20% of your final grade).

Class Quizzes: To ensure that students are keeping up with readings and the course in general, random quizzes will be given during class. Clickers (Turning Technologies) will be used to input data.

Class/Recitation Participation: A total of 5% will be given for class and recitation participation. Please be active in your education and speak up in class!

Accommodations:

Disabilities and Religious Observances: If you need an accommodation based on the impact of a disability, you must contact me at the beginning of the semester (by Jan 30th) to arrange an appointment. At the appointment, we can discuss the course format, anticipate your needs and explore potential accommodations. I rely on the office of Disability Resources and Services (DSR: 215 204-1280, 100 Ritter Annex) for assistance in verifying the need for accommodations and developing accommodation strategies. If you have not previously contacted Disability Resources and Services, I strongly encourage you to do so. Also, conflicts with religious holidays must be brought to my attention at the beginning of the semester (by Jan 30th).

University-Recognized Student Activities: Participation in University-recognized activities such as research conferences, dramatic or musical performances, intercollegiate athletic competitions, or leadership meetings constitutes an important part of a student's educational experience. Deans are responsible for determining which activities fall within this policy and have a list of pre- approved activities. Students with questions should contact their Deans' offices. Students are responsible for reviewing their syllabi and meeting with me at the beginning of the semester (by Jan 30th) to identify potential conflicts and to find suitable solutions.

Attendance and Make-up Exams: Attendance is mandatory for classes, recitation and exams. There will be NO make-up quizzes, assignments, exercises, or exams. If an emergency arises and you cannot attend an exam, you should contact me AS SOON AS POSSIBLE via email to alert me to the situation. DOCUMENTATION OF THE EMERGENCY IS REQUIRED.

Code of Conduct:

Academic Honesty:
Taken from, http://www.temple.edu/bulletin/Responsibilities_rights/responsibilities/responsibilities.shtm

Temple University believes strongly in academic honesty and integrity. Plagiarism and academic cheating are, therefore, prohibited. Essential to intellectual growth is the development of independent thought and a respect for the thoughts of others. The prohibition against plagiarism and cheating is intended to foster this independence and respect.

Academic cheating is, generally, the thwarting or breaking of the general rules of academic work or the specific rules of the individual courses. It includes falsifying data; submitting, without the instructor's approval, work in one course which was done for another; helping others to plagiarize or cheat from one's own or another's work; or actually doing the work of another person.

The penalty for academic dishonesty is a failing grade for a particular assignment or exam. In addition, this action may lead to a failing grade in the course, to suspension, or expulsion from the university.

Students who believe that they have been unfairly accused may appeal through the school or college's academic grievance procedure.

Classroom Etiquette: All students are responsible for enhancing the learning in the classroom. The classroom experience should be a positive one for all students. Following are some basic rules:
- Be on time for class. If you are late, sit in a chair as close to the door as possible and avoid disruptive behavior.
- No talking or whispering to other students. If you have something to say, say it aloud and we will talk about it.
- Minimize the eating of noisy or fragrant food during class.
- Do not leave class early. If you must, inform me at the beginning of class, then sit close to the door and leave with minimum disruption.
- Keep your verbal and nonverbal comments about the ideas of other students considerate and be prepared to defend judgements that you make.

Electronic devices: When you are attending lectures, I expect you to have your **complete and undivided** attention to what is happening in class. Unless you receive special permission from me, all electronic devices in the classroom including cell phones, PDAs, pagers, must be **turned off** and ear buds removed during class. If by chance, you forget to turn the device off, and your phone or pager rings, I expect you to turn it off immediately. If you use a phone for any reason, including reading text messages, I will ask you to leave the classroom and not return for the rest of the class. Computers can be used for note-taking, only if the wifi is turned off and you have asked me for special permission. Of course, for Friday tutorials and computer labs, laptops are expected to be used (and will be provided by the Department for computer labs).

Disruptive behavior: Temple University subscribes to policies requiring respect for other students, including policies pertaining to nondiscrimination, sexual harassment and disruption of the class. Those disrupting the class in any way will be asked to leave the class after a first offense and to drop the course after subsequent problems. Disruptive behavior is defined as any behavior that distracts students concentrating on the normal operation of the class. According to University regulations, I am the final judge of what behavior disrupts my classroom.

Name: _____ Signature: _____ Date: _____

I will make every effort to keep to the schedule of the syllabus. However, the arrangement of topics, assignments, and labs to particular dates on the syllabus is subject to change as the semester progresses. The latest official syllabus will be posted on Blackboard.

Day	Month	Date	Lesson Plan	Topic/Chapter (F&H)	Readings
Wed	Jan	23	Info Session	Course info, administration and introduction	
Fri	Jan	25	Lecture 1	The pattern of evolution: History, evidence	Ch 2
Mon	Jan	28	Lecture 2	Mutation and genetic variation	Ch 5
Wed	Jan	30	Lecture 3	Mendelian genetics in pop'tns I: HWE, selection	Ch 6
Fri	Feb	1	Tutorial #1	Assignment #1: HW equilibrium, chi-square test	due:Feb 6
Mon	Feb	4	Lecture 4	Mendelian genetics in pop'tns I: Selection	Ch 6
Wed	Feb	6	Lecture 5	Mendelian genetics in pop'tns II: Selection, mutation	Ch 6
Fri	Feb	8	Computer Lab #1	Working in the Unix/Linux environment	
Mon	Feb	11	Lecture 6	Mutation, migrat'n, genetic drift, molecular evolution	Ch 7
Wed	Feb	13	Lecture 7	RGD and molecular evolution	Ch 7
Fri	Feb	15	Tutorial #2	Assignment #2: RGD, non-random mating	due:Feb 22
Mon	Feb	18	Lecture 8	Non-random mating and inbreeding	Ch 7
Wed	Feb	20	Lecture 9	Neutral theory and the coalescent	Papers(Bb)
Fri	Feb	22	Computer Lab #2	Sequence analysis and basic alignment	
Mon	Feb	25		Review	
Wed	Feb	27		MIDTERM I	
Fri	Mar	1			
Mon	Mar	4	Lecture 10	Evolution at multiple loci: Linkage and sex	Ch 8
Wed	Mar	6	Lecture 11	Evolution at multiple loci: Quantitative genetics	Ch 9
Fri	Mar	8	Tutorial #3	Assignment #3: Selection, quantitative genetics	due:Mar 20
				SPRING BREAK	
Mon	Mar	18	Lecture 12	Heritability of IQ, course bookkeeping	
Wed	Mar	20	Lecture 13	Genomics and the personalized genome	Papers(Bb)
Fri	Mar	22	Computer Lab #3	Utilizing the power of linux for bioinformatics	
Mon	Mar	25	Lecture 14	Population genomics: Human variation and origins	Papers(Bb)
Wed	Mar	27	Lecture 15	Population genomics: Human selective signatures	Sabeti(07)
Fri	Mar	29	Tutorial #4	Assignment #4: HapMap Project	due:Apr 3
Mon	Apr	1	Lecture 16	Population genomics: Human selective signatures	Beall(10)
Wed	Apr	3	Lecture 17	Estimating evolutionary trees	Ch 4
Fri	Apr	5	Tutorial #5	Assignment #5: Phylogenies	due:Apr 10
Mon	Apr	8	Lecture 18	Phylogenomics: Understanding our primate origins	Papers(Bb)
Wed	Apr	10	Computer Lab #4	Phylogenetic Reconstruction	
Fri	Apr	12	Computer Lab #5	Searching datasets: Databanks, MODs, BLAST	
Mon	Apr	15		Review	
Wed	Apr	17		MIDTERM II	
Fri	Apr	19			
Mon	Apr	22	Lecture 19	Mechanisms of speciation	Ch16
Wed	Apr	24	Lecture 20	Mechanisms of speciation (cont'd)	Ch16
Fri	Apr	26	Computer Lab #6	BLAST as a tool for evolutionary analysis	
Mon	Apr	29	Computer Lab #7	Comparative genomics via BioMart and Galaxy	
Wed	May	1	Computer Lab	Bioinformatics: Mini in-class projects	Due:May 3
Fri	May	3	Computer Lab	Bioinformatics: Informal presentations	
Mon	May	6		Review	
Fri	May			FINAL EXAM	