Introduction to Conservation Genetics (WIS 3553)

Course Syllabus, Spring 2021

Instructor: Dr. James Austin

T.A. Ms. Celine Carneiro

contact us through Canvas

Course format:

This is a hybrid class and much of the work will require students to view lectures, videos and assigned readings ahead of meeting with instructors at synchronous times (Mondays and Wednesdays). Assignments (quizzes, data analyses and lab write ups) will take place asynchronously. There will be a series of quizzes in each module that will reinforce the material presented. Meeting times with instructors will involve discussions, genetic analyses tutorials using the R environment, and other exercises.

Course description:

This course will provide students with a conceptual overview of basic population genetics and a practical understanding of examples of how genetics can be applied to the study of wildlife. This is not a go at your own pace course. Students will be expected to complete each modules' requirements by the specified date. Modules will include recorded lectures, online quizzes, discussions, tutorials and exercises using R.

This course is designed for Wildlife Ecology and Conservation majors. This does not mean non-majors should drop the class, but rather understand that we will take a decidedly applied, wildlife approach to the application of genetics. (My definition of wildlife includes all wild species; vertebrates, invertebrates, plants, fishes, terrestrial, etc., that occur in the wild.)

In this class you will develop an appreciation for and learn how to apply and interpret genetic principles to wildlife research and management problems. It is not an adequate genetics course for you if you intend to progress into veterinary sciences or medicine, as we only take a cursory look at important topics such as transmission genetics and molecular genetics.

Virtual Office hours: Office hours will only be held on Zoom. There will be weekly 20 min. windows available on a first come basis. These will be posted weekly on the course calendar. Office hours may be subject to change from week to week depending on our work schedules. Use the calendar tool in Canvas to see the availability of time slots. TA office hours will be posted as we move further into the course.

Class meeting:

When we meet will depend on your registered section. I cannot move you between sections, so you will be expected to attend at your registered times.

Due to the pandemic I will reserve the right to move face-to-face sections to online only as needed. The first week of class will be entirely online only.

Class # 19770 (sect. 08D1): Monday, periods 6-7, 12:50-2:45; Room – MCCB 3086*
Wednesday, period 7, 1:55-2:45; Room - MCCB 3096
Class # 19796 (sect. 08D2): Monday, periods 8-9, 3:00-4:55; Room – MCCB 3086*
Wednesday, period 8 3:00-3:50; Room - MCCB 3096
Class # 26407 (sect. 08D3): Monday, periods 6-7, 12:50-2:45; online
Wednesday, period 7, 1:55-2:45; online
Class # 26409 (sect. 08D4): Monday, periods 8-9, 3:00-4:55; online
Wednesday, period 8 3:00-3:50; online

*Note that "face-to-face" sections will depend on the availability of HyFlex in the assigned classrooms, and on the scheduled activity. **The location of face-to-face meetings are subject to change depending on Hyflex resources**.

R tutorials will be done online only (all four sections) to simplify instruction. These dates will be clearly marked in the respective modules within Canvas. Similarly, **our face-to-face meetings in January will be determined based on the prevalence of the Covid19 in Alachua County at that time.**

Week 1 (January 11 and 13) will be done online for all sections.

Registrar-controlled final exam schedule:

All Sections April 29, 10-12 noon.

Course prerequisites:

Introduction to Statistics (STA 2023) and one of the introductory ecology courses (PCB 3034C, PCB 4044C, PCB 3601C, or FOR 3153C). Requests for waivers on pre-requisites are generally denied.

These prerequisites are set for the following reasons: some of what you will be mastering requires a basic understanding of statistics (means, variance, interpreting statistical significance), and much of what we are going to be learning about relates to organismal ecology (e.g. using genetics to understand mating systems, movement, impacts of environmental change). Thus, a basic background in ecology will help you to appreciate what you are learning.

Students will be required to attend class regardless of whether taking the course face-to-face or online. All online participants will be **required to have a camera on** to be considered present. Attendance will be worth 5% of your final grade. Read the UF

absence policy here: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/ (Links to an external site.)

Course goals:

1. To teach students the foundations of population genetics.

2. To familiarize students with some key applications of genetics to the conservation and management of wildlife.

3. To help students develop communication skills related to the application of genetics in wildlife management.

Course learning objectives:

Week(s)*	Module	Main learning objectives:	Exercises and assignments
1 (Jan 11)	"Start here"	• Recall key aspects of the course presented in the syllabus • Define and describe conservation genetics	• Syllabus quiz • Knowledge pre-test
1-2 (Jan 13-25)	Understanding genetic polymorphisms	• Describe the difference between genotype and phenotype • Dominance • Define key polymorphisms • Discuss the utility of polymorphisms • Calculate allele frequencies from genotypes and phenotypes • Why sex?	• Overview of R (RStudio) • Quantifying genetic diversity using R
3-5 (Jan 27-Feb 8)	Understanding populations	• Explain and give examples of different types of models • Identify and discuss the relationship between allele frequencies and genotype frequencies • Summarize the assumptions of the random mating model • Define the Hardy Weinberg Principle • Simulate single gene evolution in populations and assess the impact of assumptions of the random mating model • Define linkage disequilibrium (LD) and identify key population processes that produce LD	• Modeling population genetic dynamics using R
5-7 (Feb 10-22)	Inbreeding	• Explain the effect of inbreeding with respect to allele frequencies and genotype frequencies • Differentiate between allozygous and autozygous alleles • Calculate an inbreeding coefficient from a pedigree • Give examples of harmful effects of inbreeding • Express the difference between close inbreeding (F) and remote inbreeding (F_{ST}) • Describe the meaning of coalescence	• Genetic rescue • Inbreeding depression

7-8 (Feb 24-Mar 3)	Population structure	• Articulate the effect of population admixture on heterozygosity • Apply and interpret *F*-statistics for a given hierarchical population structure with known allele frequencies	• Distinct Population Segments
9 (Mar 8-10)	Review and MT		
10-11 (Mar 15-22)	Effective population size	• Identify key methods of estimating Ne	• Genetic erosion in captivity
11-12 (Mar 24-31)	Migration, Selection, Genetic drift	• Discuss how migration limits genetic divergence • Calculate and compare estimates of migration • Differentiate between deterministic and stochastic mechanisms of evolution • Model and compare the effect of selection, migration and drift on allele frequencies	• Calculating recent and long-term gene flow and connectivity
Apr 5-7	Hybridization	• Differentiate among natural and anthropogenic hybridization	Hybrid analysis of natural populations
Apr 12-14	Parentage and relatedness	• How to estimate kinship and relatedness • Genomic applications for relatedness	Using kinship to assess genetic structure
Apr 19	RStudio practicum	• Timed exam where students will use R to analyze and interpret data	Assigned during regular class times
Apr 21	Review		
Apr 28	Final	Sections 08D2 & 08D4	
Apr 29	Final	Sections 08D1 & 08D3	

*Dates are subject to change.

The core objectives for students completing this course are:

- Determine and articulate ways in which genetics/genomics are applied to wildlife management and conservation.
- Understand how genetic variation arises; why it is important for organisms to change or adapt.
- Be able to articulate the significance of population size to conservation and management.
- Critically evaluate contemporary wildlife management issues involving genetics and genomics
- Become efficient with R and RStudio as tools for exploring genetic (and other types of) data.

Specific learning objectives will accompany each module. These will be clearly identified in eLearning.

Assignment types:

Lecture quizzes: These will consist of short (3-5 questions) quizzes that will be taken after viewing a lecture (or other select content). These are to test your comprehension of presented material. Completion of individual quizzes is required to move onto the

next item in the module. These queizzes are not graded but you will receive a point for attempting. Quizzes must be completed prior to the relevant meeting time (e.g., A lecture assigned to be viewed for a Monday class must be viewed and quiz take before the start of class. Quizzes will be available after such time but will be graded as a 0). This is to encourage you to keep up with the material.

Module quizzes: These quizzes cover the basic concepts learned in each module (lectures, readings, tutorials and discussions) and are open from Friday at 1:00 am to Sunday at 11:55pm at the completion of each module. **Once you begin the conceptual quiz, you have ~15-30 mins (depending on the number and type of questions) from that time to complete it.** These cannot be re-taken, so ensure that you have 30 mins of uninterrupted time.

Online discussion boards: Periodic discussion boards will be assigned to groups of students. We expect students to engage and provide meaningful contributions (posting questions, answers, or additional resources) to the weekly discussion boards. There will be minimal participation required for points. Participation in the discussion board will be factored into grading when students are on the cusp of a letter grade (e.g., B+). *Thus, the discussion board is an opportunity for you to help yourself but will not count against you in any way*.

Exercise assignments: You will be provided datasets to analyze and interpret based on the tutorials done during the Monday online synchronous sessions. These will be due by the end of the Friday that week (specific dates will be indicated in Canvas). You are encouraged to work with your assigned group to discuss, troubleshoot and peer-evaluate your analysis and interpretation. 99.9% of problems encountered with R should be solved within your group. In the off chance that no one in your group can solve your problem, email your T.A.

I do not grant extra credit assignments.

A Midterm exam will be held the week of March 10 and the final exam on the provost-assigned date for your section. These are taken online and are ‘open book’. These will consist of MC, matching, problems, and/or short answer questions.

Assessments: Quizzes and assignments may be worth different amounts from one to the next, but all point grades will be weighted to count for the following percent of the final grade:

Assessment	percentage of grade
Lecture/reading quizzes	5%
Attendance	5%
Module quizzes	15%
Midterm (Mar 10)	20%
Lab exercises	15%
Lab practicum (Apr 19)	25%
Final exam (see above)	15%
Total	100%

Grading Scale: A >= 94%, A- = 90 -92.99%, B+ = 86-89.99%, B = 83-85.99%, B- = 80-82.99%; C+ =76-79.99%, C =73- 75.99%, C- = 70-72.99%; D+ = 66-69.99%, D = 63-65.99%, D- =60-62.99%, E<=60%

Campus resources:

Resolving technical issues:

Canvas issues - e-Learning Support Services
E-mail: learning-support@ufl.edu
Phone: (352) 392-4357 -> option 2 (Students)

Problems with R:

99.9% of problems with R should be solved within your group. In the off chance that no one in your group can solve your problem, email your T.A.

Students should seek assistance with technical issues from the UFIT help desk at helpdesk.ufl.edu, 352-392-4357

Health and Wellness:

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit umatter.ufl.edu/ to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit counseling.ufl.edu/ or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit shcc.ufl.edu/.

University Police Department: Visit police.ufl.edu/ or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; ufhealth.org/emergency-room-trauma-center

Academic Resources:

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services career.ufl.edu/.

Library Support: cms.uflib.ufl.edu/ask various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring. teachingcenter.ufl.edu/

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. writing.ufl.edu/writing-studio/

Student Complaints On-Campus: sccr.dso.ufl.edu/policies/student-honor- codestudent-conduct-code/