BSC 512: Ecological Genetics – Fall 2024

Web Based Course

Instructor Information:
Bjorn Schmidt
Office: STC 212
Email: bjorn.schmidt@tamuc.edu
Preferred contact: email
Virtual office hours: scheduled by appointment through email

Reference Textbooks

No required textbooks; all class material will be presented in powerpoints

*Some materials for powerpoints will use information from the following reference texts which have sections on landscape genetics/molecular ecology

1) Evolution, 5th ed. 2022. Futuyma, Douglas J. & Kirkpatrick, M.

2) Conservation and the Genomics of Populations, 3rd edition. 2022. Allendorf, Fred W., Funk, W. Chris, Aitken, Sally N., Byrne, Margaret, & Luitkart, Gordan.

3) Landscape Genetics: Concepts, Methods, Applications. 2016. Balkenhol, Niko, Cushman, Samuel A., Storfer, Andrew T., & Waits, Lisette P. (eds).

4) A Primer of Ecological Genetics. 2004. Conner, Jeffrey K. & Hartl, Daniel L

5) Population Genetics and Microevolutionary Theory, 2nd ed. 2021. Templeton, Alan.

6) Essentials of Landscape Ecology. 2019. With, Kimberly

Course Description
Ecological genetics is a hybrid field used to describe ecological influences on genetic variation within and between populations. Ecological genetics is comprised of aspects from the fields of spatial ecology, population genetics, and evolution. Ecological genetics primarily investigates

drivers and interactions of short-term genetic change in variation in populations (microevolution). The course will encompass background reviews of mendelian and population genetics, patterns of phenotypic and genetic variation, genetic mutation, genetic drift, gene flow, genetic differentiation and population structure, natural selection, quantitative genetics, artificial selection, and patterns and techniques of landscape genetics. Ecological genetics is primarily a research field, so a component of the class will be spent examining how concepts detailed in the course are applied in peer-reviewed literature provided by the instructor.

Student Learning Outcomes

- Students will understand the sources, implications of, and influences on genetic variation in natural populations
- Students will be able to conceptualize microevolutionary processes through a population genetics framework
- Students will understand the four microevolutionary forces that cause genetic change in populations, their effects, and their interactions
- Studies will understand patterns and differences in selection patterns on genotypes and quantitative phenotypic traits
- Students will understand research applications of ecological genetics and know common genetic measurements of populations and measurements of gene flow between populations
- Students will understand how ecological factors promote or restrict gene flow between populations in plants, terrestrial animals, and aquatic organisms

Course Materials and Online Presentation

All course materials will be presented through d2l. The class format will be asynchronous, following the schedule that appears later in the syllabus. Lecture videos and corresponding powerpoint slides will be uploaded to d2l. Virtual office hours for the course are available by appointment for opportunities to ask questions about the course or topics covered in the course. Questions will also be responded to promptly through email (within 48 hours).

Course Evaluations

Tests: There will be four exams (including final) throughout the semester.
Quizzes: There will be eight quizzes throughout the semester (10 questions, multiple choice).
Term Paper: Students will select a topic related to ecological genetics and write a term paper that will be due the last day of finals week. Students will need to prepare periodic summaries of scientific articles related to their topic that will be due at different points in the semester. More details about selecting a topic and requirements for the paper will be given in d2l.
Video Summary: Students will need to upload into d2l a video presentation (~10 minutes) of their term paper. The video could include a powerpoint presentation, or could include the student speaking directly to a phone or other recorder. The student should discuss and summarize the main points of their term paper. More details for this video will be given in d2l.
Paper Summaries: Students will write ~two page summaries of peer-review articles related to their term paper topic. More detailed instructions for these assignments, including format and grading rubric for the summaries will be given in d2l.

Evaluation Points
Four Tests - 320 points (80 points each)
Eight Quizzes – 80 points (10 points each)
Three Paper Summaries – 60 points (20 points each)
Term Paper – 100 points
Video Summary of Term Paper – 20 points

Total points = 580

Grading
A: 89.96-100%
B: 79.96-89.95%
C: 69.96-79.95%
D: 59.96-69.95%
F: <59.96%

Online Attendance: You are expected to keep up with all of the online course materials provided each week. Attendance will be assessed each week through logging onto d2l and interacting with powerpoints, videos, and quizzes/exams.

General Makeup Policy: The student is responsible for requesting a makeup when they are unable to submit the regularly scheduled assessment and must schedule the makeup within **2 days** after the due date. If the assessment is not made-up, the student will receive a zero for that item.

General Course Outline

-Lecture slides and videos for topics will be uploaded each week in d2l under the content tab

-Quizzes and Tests will be posted on days indicated in the schedule, with due dates also indicated in the schedule. Quizzes will be short and multiple choice (10 questions); Tests will be a mix of multiple choice, short answer, and longer paragraph style questions with longer time limits.

-There are also specific dates in the schedule related to selecting a term paper topic and uploading scientific article summaries

-The term paper and video summary are due on the last day of finals week (Thursday, July 6th at 11:59 pm)

Tentative Course Schedule (subject to change)**:**

Numbered topics are used to reference content for quizzes/exams

Week 1 – 08/26/24

Syllabus/Welcome

1) What is Ecological Genetics?

2) Genetics Overview/Review

Fri – Quiz 1 (topics 1-2) – due W 09/04/24 at 11:59 pm

Week 2 – 09/02/24

materials uploaded Tuesday this week because of Labor Day

3) Patterns of Phenotypic Variation

4) Patterns of Genetic Variation; Molecular Markers

Fri – Quiz 2 (topics 3-4) – due W 09/11/24 at 11:59 pm

Week 3 – 09/09/24

5) Genetic Diversity

6) DNA Sampling, PCR, Sequencing, DNA Barcoding

Week 4 – 09/16/24

Mon – Test 1 (topics 1-6) – due 09/22/24 at 11:59pm

7) Hardy Weinberg Equilibrium

Fri – term paper topics due by this date (sent/discussed with instructor by email)

Week 5 – 09/23/24

8) Non-Random Mating

9) Inbreeding

Fri – Quiz 3 (topics 7-9) – due W 10/02/24 at 11:59 pm

Week 6 – 09/30/24

10) Microevolutionary Forces Overview

11) Genetic Drift

Fri – Quiz 4 (topics 10-11) – due W 10/09/24 at 11:59 pm

Week 7 – 10/07/24

12) Mutation

Fri – Test 2 (topics 7-12) – due 10/17/24 at 11:59 pm

Fri – Paper Summary One due at 11:59 pm

Week 8 – 10/14/24

13) Natural Selection – Single Locus Models

14) Genetic Correlations, Indirect Selection

Fri – Quiz 5 (topics 13-14) – due W 10/23/24 at 11:59 pm

Week 9 – 10/21/24

15) Selective Sweeps, Balancing Selection, Historical Contingency

16) Movement and Dispersal

Fri – Quiz 6 (topics 15-16) – due W 10/30/24 at 11:59 pm

Week 10 – 10/28/24

17) Gene Flow

18) Metapopulations

19) Microevolution synthesis – competing forces; balance equations

Fri – Paper Summary Two due at 11:50 pm

Week 11 – 11/04/24

Mon – Test 3 (topics 13-19) – due 11/11/24 at 11:59 pm

20) Natural Selection: Phenotypic Models

21) Quantitative Genetics

Week 12 – 11/11/24

22) Artificial Selection

23) Landscape Genetics Overview; Population subdivision and F-statistics

Fri – Quiz 7 (topics 20-22) – due W 11/20/24 at 11:59 pm

Week 13 – 11/18/24

24) Panmixia, Genetic cluster analysis, & Isolation by Distance

25) Isolation by Resistance; Least Cost Paths and Circuit Theory

Week 14 – 11/25/24

26) Isolation by Environment

Wed – Quiz 8 (topics 23-26) – due W 12/04/24 at 11:59 pm

Thanksgiving Break – Thu-Fri

Week 15 – 12/02/24

27) Landscape Genetic Patterns for Terrestrial Animals

28) Landscape Genetic Patterns for Plants

29) Landscape Genetic Patterns for Aquatic Animals

Fri – Paper Summary Three due at 11:59 pm

Week 16 – 12/09/24

Mon – Test 4 (topics 20-30) **-** due Thursday Dec. 12 at 11:59 pm

Term Paper and Video Summary - due Friday Dec. 13 at 11:59 pm

Technology Requirements:

LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the *my*LEO Online Learning Management System (LMS). Below are technical requirements:

LMS Requirements:

https://community.brightspace.com/s/article/Brightspace-Platform-Requirements

LMS Browser Support:
https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.ht m

Access and Navigation

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu

Communication and Support

If you have any questions or are having difficulties with the course material, please contact your Instructor.

Technical Support

If you are having technical difficulty with any part of *Brightspace*, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

https://community.brightspace.com/support/s/contactsupport

Interaction with Instructor Statement

Response time to any questions sent by email regarding the course will be answered within 72 hours. However, students are encouraged to interact with the instructor directly during the class time and office hours, if necessary. Exceptions such as widespread internet outage apply.

Counseling Services Statement

The Counseling Center at A&M-Commerce, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit www.tamuc.edu/counsel

Course and University Procedures/Policies:

Course Specific Procedures/Policies:
You are expected to check your TAMUC email and d2l every day to check for any announcements. Additional information about all course assessment components is provided under "Course Evaluations". Please do not attend class if feeling ill, if an illness occurs during a course assessment, please see the "General Makeup Policy" section above for guidance.

University Specific Procedures:

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the Student Guidebook. http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebo o k.aspx

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum: Netiquette http://www.albion.com/netiquette/corerules.html

TAMUC Attendance

For more information about the attendance policy please visit the Attendance webpage and Procedure 13.99.99.R0.01.

http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf

Academic Integrity

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

Undergraduate Academic Dishonesty 13.99.99.R0.03

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf

AI Statement

Texas A&M University-Commerce acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

13.99.99.R0.03 Undergraduate Academic Dishonesty
https://inside.tamuc.edu/aboutus/policiesproceduresstandardsstatements/rulesprocedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf

Students with Disabilities – ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services
Texas A&M University-Commerce

Gee Library- Room 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: studentdisabilityservices@tamuc.edu

Website: Office of Student Disability Resources and Services
http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/

Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&MCommerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the Carrying Concealed Handguns On Campus document and/or consult your event organizer.

Web url:
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1. at 903-886-5868 or 9-1-1.