

## **BIOL5380.001 Topics in Advanced Biology (Molecular Ecology)**

Spring 2024

**Instructor Information:** Dr. Katrin Kellner, Associate Professor

Department of Biology

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**Office hours:** M, 4:00 – 5:00 pm; F, 10:00am-12:00pm, or by appointment

**Course hours:** Mondays, 5:00 pm – 7:45 pm

**Location:** HPR 252 (BEP 129)

**Course Description:** An introduction to the field of Molecular Ecology. The course will emphasize how molecular methods are used to investigate ecological and evolutionary processes, mating biology, and interactions and diversity in natural populations. Specific topics include detection of genetic variation within and among populations, speciation, environmental DNA (eDNA) assays and conservation genetics.

### **Learning Outcomes:**

Students successful in completing this course will be able to

- 1) Identify and differentiate the different types of molecular markers and analyses used to address ecological questions**
- 2) Describe the research questions that can be asked in molecular ecology and predict which molecular method (s) can be used to examine these questions**
- 3) Analyze and interpret data from analyses in primary literature**
- 4) Effectively communicate and interpret the significance of research findings**
- 5) Discuss and evaluate conclusions reached in the molecular ecology literature based on proposed hypothesis and presented results.**
- 6) Have a basic overview of molecular wet lab workflows (DNA extractions, PCRs, agarose gel electrophoresis, sequencing) used in Molecular Ecology studies**

**Textbook:** Molecular Ecology. 3<sup>rd</sup> edition, Freeland, Kirk, Petersen; Wiley-Blackwell;

Other assigned readings and laboratory protocols will be distributed through Canvas.

**Evaluation and Grading:**

Grades will be assessed by in-class participation via paper discussions (student lead), a mid-term and one final exam. Grade distribution is as follows.

- 1) Attendance and Participation – 10%
- 2) Paper presentation/discussion leader – 50%
- 3) Mid-term exam – 20%
- 4) Final Exam – 20%

90-100% A

80-89% B

70-79% C

60-69% D

<60% F

Tentative Schedule (Subject to change)

Week	Topic	Textbook chapter	Lab topic	
01/15 MLK	No class; read through Syllabus and Ch 1	Chapter 1		
01/22	Molecular Markers	Chapter 2	Sampling strategies in the field; do's and don'ts eDNA sampling	

01/29	Molecular Markers	Chapter 2	DNA extractions protocols (eDNA, specimen)	Presentation 1
02/05	Species Concepts/Barcoding	Chapter 3	DNA quality & quantity control (agarose gel electrophoresis, nano drop, Qbit)	Presentation 2
02/12	Species Concept/Metabarcoding	Chapter 3	Primers and PCRs	Presentation 3
02/19	Phylogeography/ Trees	Chapter 4	Gel electrophoresis	Presentation 4
02/26	Phylogeography/Invasive Species	Chapter 4	Sequencing techniques	Presentation 5
03/04	Mid-term exam			
03/11	SPRINGBREAK!			
03/18	Genetic Analysis of Single Populations	Chapter 5	Alignments/Tree building	Presentation 6
03/25	Multiple Populations/Differentiation	Chapter 6	Geneflow and Isolation by distance tests	Presentation 7
04/01	BehavEco: Mating Systems	Chapter 7	Fragment Analyses	Presentation 8
04/08	Conservation Genetics	Chapter 8		Presentation 9
04/15	Genomics in Ecology and conservation			Presentation 10
04/22	Catch up week			
04/29	Finals Week	Final Exam		

#### Attendance & Participation:

Attendance and participation are required in this course and will be part of your grade. You are expected to come prepared to class and engage in discussions, ask questions etc. Part of this course is a hands-on lab. You can miss class with the usual, documented excuses (illness, family emergency, religious event, sporting event, etc.) but you are expected to catch up with any missed material and need to plan for your lab work.

#### Make-up policy:

This course has two exams, one mid-term and one final exam. If you miss an exam for an excused reason, you need to make arrangements for a make-up exam. Unexcused and unexplained missed work results in 0 points for that work.

#### Laboratory Safety:

Please follow all safety rules. There will be a lab safety introduction within the first weeks of class. Absolutely no eating and drinking in BEP129. You are also required to take the Biological Safety quiz through Canvas.

#### University Policies

#### Student Resources