

## Term Information

Effective Term Autumn 2019

## General Information

Course Bulletin Listing/Subject Area Evol, Ecology & Organismal Bio  
Fiscal Unit/Academic Org Evolution, Ecology & Org Bio - D0390  
College/Academic Group Arts and Sciences  
Level/Career Graduate, Undergraduate  
Course Number/Catalog 5330  
Course Title Population Genetics & Phylogeography  
Transcript Abbreviation Pop Gen Phylogeog  
Course Description An introduction to basic concepts in population genetics and phylogeography. Topics include genetic variation, mutation, equilibrium models, population structure, gene flow, natural selection, historical demography, quantitative genetics, and inbreeding depression.  
Semester Credit Hours/Units Fixed: 3

## Offering Information

Length Of Course 14 Week  
Flexibly Scheduled Course Never  
Does any section of this course have a distance education component? No  
Grading Basis Letter Grade  
Repeatable No  
Course Components Lecture  
Grade Roster Component Lecture  
Credit Available by Exam No  
Admission Condition Course No  
Off Campus Never  
Campus of Offering Columbus

## Prerequisites and Exclusions

Prerequisites/Corequisites EEOB 3310 or 3310.01 or 3310.02 or graduate standing  
Exclusions  
Electronically Enforced Yes

## Cross-Listings

Cross-Listings

## Subject/CIP Code

Subject/CIP Code 26.0801  
Subsidy Level Doctoral Course  
Intended Rank Junior, Senior, Masters, Doctoral

## Requirement/Elective Designation

The course is an elective (for this or other units) or is a service course for other units

## Course Details

### Course goals or learning objectives/outcomes

- Students will learn the mathematical theory of population genetics
- Students will explore applications of population genetic theory to the analysis of genetic data collected from model and non-model species
- Students will become accomplished at using R by doing exercises associated with each topic

### Content Topic List

- Hardy-Weinberg Equilibrium
- F-statistics
- Darwinian fitness and natural selection
- Mutation
- Outlier SNP detection
- Linkage disequilibrium and recombination
- Population genetic structure
- Genetic clustering methods
- Coalescent theory
- n-island and isolation with migration models
- demographic population size change
- approximate Bayesian computation
- phylogeographic hypothesis testing

### Sought Concurrence

Yes

## Attachments

- EEOB curriculum maps March 2018.xlsx: E&E and Zoology curriculum maps  
*(Other Supporting Documentation. Owner: Hamilton,Ian M)*
- Population Genetics Phylogeography EEOB 5330.docx  
*(Syllabus. Owner: Hamilton,Ian M)*
- EEOB 5330 concurrence list.docx  
*(List of Depts Concurrence Requested From. Owner: Hamilton,Ian M)*
- Anthropology concurrence 5330.pdf: Anthropology  
*(Concurrence. Owner: Hamilton,Ian M)*
- Concurrence\_Form\_5310\_Microbiology.pdf: Microbiology  
*(Concurrence. Owner: Hamilton,Ian M)*
- Concurrence\_Form\_5330\_SENR.pdf: SENR  
*(Concurrence. Owner: Hamilton,Ian M)*

## Comments

- 4/13/18: Note that the curriculum map identifies this course as 5310. *(by Haddad,Deborah Moore on 04/13/2018 02:42 PM)*
- Note that the file name for some concurrence requests incorrectly states '5310' as the number. The signed forms, however, have the correct number. *(by Hamilton,Ian M on 04/12/2018 12:58 PM)*

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Hamilton,Ian M	04/13/2018 12:16 PM	Submitted for Approval
Approved	Hamilton,Ian M	04/13/2018 12:16 PM	Unit Approval
Approved	Haddad,Deborah Moore	04/13/2018 02:42 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	04/13/2018 02:42 PM	ASCCAO Approval

**Population Genetics & Phylogeography**  
**EEOB 5330**  
**Autumn 2019**

**3 credit hours**

**Time : TBD**

**Place: TBD**

**Course overview**

The course serves as an introduction to the genetics of populations. Students will learn the mathematical theory behind major concepts in population genetics, as well as the application of this theory to the analysis of genetic data.

**Course Objectives**

- Students will learn the mathematical theory of population genetics
- Students will explore applications of population genetic theory to the analysis of genetic data collected from model and non-model species
- Students will become accomplished at using R by doing homework exercises associated with each topic

**Instructor**

Dr. Bryan C. Carstens  
[carstens.12@osu.edu](mailto:carstens.12@osu.edu)

482 Aronoff Labs  
(614) 292-6587

**Meeting Times (Lecture)**

*MW, 90 minutes.*

*Office hours: TBD*

**Prerequisites**

Students are required to have successfully completed one of EEOB 3310, EEOB 3310.01 or EEOB 3310.02. Exceptions to this will be granted at the discretion of the instructors.

**Required Text**

Gillespie, John. (2004) Population Genetics: A Concise Guide (2nd Ed). Johns Hopkins University Press, Baltimore, MD. (ISBN-13: 978-0801880094; ISBN-10: 0801880092)

Assigned readings (available as PDFs posted to Carmen)

**Grading:** The total grade has components:

- 1 Lecture exam consisting of multiple population genetic problems as well as some short answer / multiple choice questions (45 %)
- Final project – students will be asked to analyze genetic data from their (or another) system and present their results in both written and oral form (45%)
- Class preparation and participation – students will be expected to participate in class discussions and to come to class after completing a careful study of the assigned readings (10%)

Grades will be assigned based on percentage of points earned: A (93-100); A- (90-92.9); B+ (87-89.9); B (83-86.9); B- (80-82.9); C+ (77-79.9); C (73-76.9); C- (70-72.9); D+ (67-69.9); D (60-66.9); E (59.9-0).

### ***Class organization***

Lecture material will be presented during class, largely via whiteboard. Classes will include time for student discussion and worked example problems.

### ***Statement on Disabilities and Accommodation***

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on a disability (including mental health, chronic or temporary medical conditions), please let us know immediately so that we can privately discuss options. To establish reasonable accommodations, we may request that you register with Student Life Disability Services. After registration, make arrangements with us as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

**SLDS contact information:** [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.

### ***Academic Misconduct***

The Ohio State University's Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying work of another student, possession of unauthorized materials during an examination. Ignorance of the University's Code of Student Conduct is never considered an "excuse" for academic misconduct. If we suspect that a student has committed academic misconduct in this course, we are obligated by University Rules to report our suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's Code of Student Conduct, the sanctions for the misconduct could include a failing grade in this course and/or suspension or dismissal from the University. For additional information, see the Code of Student Conduct ([http://studentaffairs.osu.edu/info\\_for\\_students/csc.asp](http://studentaffairs.osu.edu/info_for_students/csc.asp)).

### ***Grievances and Solving Problems***

According to University Policies (available from the Division of Student Affairs), if you have a problem with this class, you should seek to resolve a grievance concerning a grade or academic practice by speaking first with the professor. Then, if necessary, with the department chairperson, college dean, and provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23, which is available from the Office of Student Life, 208 Ohio Union.

***Statement on Diversity***

The Department of Evolution, Ecology, and Organismal Biology Ecology affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. Discrimination against any individual based on protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited. If you experience or witness discrimination, you are encouraged to report it to the instructors so that they can address unacceptable behavior or remediate unacceptable situations.

***Sexual misconduct/relationship violence***

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at [titleix@osu.edu](mailto:titleix@osu.edu)

**Schedule of Topics & Readings**

*Week 1 Genetic Variation & Genetic Drift*

Reading Gillespie Chapter 1 (1-18) & Chapter 2 (21-56)

*Week 2 Natural Selection*

Reading Gillespie Chapter 3 (57-98)

*Week 3 Multilocus Dynamics*

Reading Gillespie Chapter 4, pages 101-116, Hill and Robertson 1968, Reich et al. 2001, Gazal et al. 2017

*Week 4 Nonrandom Mating*

Reading Gillespie Chapter 5 (119-136), Wright 1949, Wright 1965, Weir and Cockerham 1984

*Week 5 Quantitative Genetics*

Reading Gillespie Chapter 6 (139-168), Wilson et al. 2007, Mackay 2014

*Week 6 The Coalescent*

Reading Kingman 1982, Nordberg 2000

*Week 7 Recombination*

Reading Gillespie Chapter 7 (169-183)

*Week 8 Inferring population genetic structure*

Readings Excoffier et al. 1992, Pritchard et al. 2000

*Week 9 Inferring Natural Selection*

Readings Nielson 2005, Karlson et al 2014, Reid et al 2016

*Week 10 Inferring Gene Flow*

Berli and Felsenstein 2001, Beerli and Palczewski 2010, Nielsen and Wakeley 2001, Hey and Nielsen 2004

*Week 11 Inferring Demographic History I – Genetic expansion and bottlenecks*

Rogers and Harpending 1992, Menotti-Raymond and O'Brien 1993, Barnett et al. 2009, Smith et al. 2009

*Week 12 Inferring demographic history II – Comparison of demographic models*

Pritchard et al. 1999, Csillery et al. 2010, Gutenkunst et al. 2009, Excoffier et al. 2013, Thomé and Carstens 2016

*Week 13 Inferring species boundaries*

Pons et al. 2006, Carstens and Knowles 2007, Yang and Rannala 2010, Sukumaran and Knowles 2017

*Week 14 Student projects will be presented.*

EEOB 5330, Population Ecology & Phylogeography

On March 27, 2018, concurrence was requested from the following units. Units were requested to respond by April 11, 2018.

Anthropology

Molecular Genetics

Microbiology

Environment and Natural Resources



## Hamilton, Ian

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**From:** McGraw, Scott  
**Sent:** Wednesday, March 28, 2018 2:02 PM  
**To:** Hamilton, Ian  
**Subject:** RE: Concurrence Request EEOB 5330: Population Genetics and Phylogeography

Hi Ian,

The Department of Anthropology is happy to support your new course: we concur! Looks great.

Best of luck,  
Scott

W. Scott McGraw, PhD  
Professor  
Department of Anthropology  
The Ohio State University  
4064 Smith Laboratory  
174 West 18th Avenue  
Columbus, OH 43210-1106

Phone: (614) 688-3794  
Fax: (614) 292-4155  
Email: [mcgraw.43@osu.edu](mailto:mcgraw.43@osu.edu)

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**From:** Hamilton, Ian  
**Sent:** Tuesday, March 27, 2018 3:14 PM  
**To:** McGraw, Scott <[mcgraw.43@osu.edu](mailto:mcgraw.43@osu.edu)>  
**Subject:** Concurrence Request EEOB 5330: Population Genetics and Phylogeography

Dear Scott,

The Department of Evolution, Ecology and Organismal Biology is proposing a new course, EEOB 5330: Population Genetics and Phylogeography for Autumn Semester 2019. Please review the attached syllabus and indicate (via the attached concurrence form or an email) your unit's position on the new course proposal by April 11, 2018. Please let me know if you have any questions whatsoever.

Thanks!  
Ian

Ian M Hamilton  
Associate Professor  
Department of Evolution, Ecology and Organismal Biology  
Department of Mathematics  
Vice Chair of Undergraduate Studies, Evolution, Ecology and Organismal Biology  
The Ohio State University