

## **Human Genetics 544: Basic Concepts in Population and Statistical Genetics Fall 2019**

**Description:** This course, designed for students enrolled in degree-granting programs through the Department of Human Genetics, introduces concepts in approaches for studying genetic variation in natural populations with a focus on concepts relevant to human genetics. The course will be discussion based, with each class meeting focused on a chapter from the text book *Human Population Genetics* (John H. Relethford, 2012 ISBN 978-0-470-46467-0) and related primary research articles and reviews.

**Text book:**

*Human Population Genetics*

John H. Relethford

Wiley-Blackwell, 2012

An electronic version of this text can be accessed on campus at

<https://onlinelibrary.wiley.com/doi/pdf/10.1002/9781118181652>

Associated material will also be posted on the course Canvas page.

**Starting Date:** 3 September 2019

**Time:** Wednesdays, 1:30-3:20 pm

**Location:** Buhl 5915

**Credits:** 2 hours

**Instructors:**

Anthony Antonellis, Ph.D. ([antonell@umich.edu](mailto:antonell@umich.edu))

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**Office hours:** Given the diverse schedules of the enrolled students, identifying a set office hour time that works for everyone is challenging. We encourage individual or small group meetings with instructors which may be scheduled for convenient times. The groups assigned to be discussion leaders for each week are encouraged to meet with the instructors prior to class.

**Grading:** Final grades will be based on quizzes (50% of total), participation (10% of total) and two in-class exams based on analysis of published papers (20% each). Each course meeting will have an associated chapter assigned from the Relethford text. At the beginning of class a short, ~15 minute quiz primarily focused on key concepts from that chapter will be given. Although primarily focused on the chapter, key points from the associated paper may also be covered on the quiz. For each student, the scores from the two lowest quizzes may be dropped, including any quizzes missed due to absence. Following the quiz, the remaining class time will be spent discussing key concepts from the chapter and assigned research papers in small groups and as a whole. Each week, two groups will be assigned to serve as discussion leaders for the chapter and

the paper, respectively. These groups will be expected to identify particular points for further discussion, identify connections to other concepts, and to help clarify points in class. The two in-class exams will be given at the middle and end of the course. These exams will be focused on analysis of papers from the primary literature and will involve short written responses to three questions about each paper. Prior to the exam, the papers will be distributed to the class. The questions will focus on synthesis and interpretation of results, conclusions, background, and techniques as they relate to concepts covered in the course.

**Schedule:**

Quizzes will be based on the indicated chapters. Additional material for discussion will be posted on Canvas. Groups will be created and assigned to lead chapter and paper discussions for each week of the course. Note, that there will be a quiz in on September 4<sup>th</sup> covering the material from Chapter 1.

**1. 4 September (Antonellis)**

Chapter 1: Genetic, Mathematical, and Anthropological Background

**2. 11 September (Antonellis)**

Chapter 2: Hardy-Weinberg Equilibrium

**3. 18 September (Burke)**

Chapter 3: Inbreeding

**4. 25 September (Burke)**

Chapter 4: Mutation

**5. 2 October (Burke)**

Chapter 5: Genetic Drift

**6. 9 October**

Midterm exam: paper analysis relevant to Chapters 2-5

*16 October No Class – ASHG Meeting*

**7. 23 October (Mueller)**

Chapter 6: Models of Natural Selection

**8. 30 October (Robins)**

Chapter 7: Natural Selection in Human Populations

*6 November No Class – NSGC Meeting*

**9. 13 November (Kidd)**

Chapter 8: Gene Flow

**10. 20 November (Kidd)**

## Chapter 9: Human Population Structure and History

*27 November No Class – Thanksgiving break*

### ***11. 4 December Special Topic: functional characterization of alleles (Kitzman)***

Since there is no corresponding textbook chapter, a background paper will be distributed.

### ***12. 11 December***

Final exam: paper analysis relevant to Chapters 6-9 and Lecture 11