Quantitative Genetics Graduate Education Module - Spring 2020

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Contents

Chapter 1

Course Overview

This is the complete set of *course materials* for the *Quantitative Genetics Graduate Education Module (GEM)* at the University of Oregon for the Spring of 2020. It is written in **Markdown** so that it can be easily updated.

In book you will find nearly all the information you will need to complete the course.

Chapter 2

Introduction to the course

This is the main set of *course materials* for the *Quantitative Genetics Graduate Education Module (GEM)* at the University of Oregon for the Spring of 2020. It is written in **Markdown** so that it can be easily updated.

In this book you will find nearly all the information you will need to complete the course.

2.1 Instructor

Dr. Bill Cresko, wcresko@uoregon.edu

2.2 Course Information

Virtual Class Hours: M-W-F 11 to 12 (Zoom)
Virtual Office Hours: F 2 to 3 or by appointment (Zoom)
https://uoregon.zoom.us/j/99789831102

2.3 Software

- Latest version of R
- Latest version of RStudio

2.4 Inclusion and Accessibility

Please tell me your preferred pronouns and/or name, especially if it differs from the class roster. I take seriously my responsibility to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of

this course that result in barriers to your participation! You are also encouraged to contact the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.

I am committed to making this course an inclusive and respectful learning space. Being respectful includes using preferred pronouns for your classmates. Your classmates come from a diverse set of backgrounds and experiences; please avoid assumptions or stereotypes, and aim for inclusivity. Let us know if there are classroom dynamics that impede your (or someone else's) full engagement.

Because of the COVID-19 pandemic, this course is being delivered entirely remotely. I realize that this situation makes it difficult for some students to interact with the material, for a variety of reasons. I am committed to flexibility during this stressful time and emphasize that I will work with students to overcome difficult barriers as they arise.

Chapter 3

Course Schedule

3.1 Background Material

- Introduction to quantitative genetics
- Reading materials
- Introduction to R and RMarkdown

3.2 Heritability

- Genetic variation
- Parent-offspring regression
- Line means analysis
- Environmental variation and trait distributions
- Covariation among traits
- The G-matrix

3.3 Selection Analysis

- Calculating fitness
- Selection analysis
- Correlation among traits
- Normalization of traits
- Calculation of selection gradients
- Comparison of the pattern of selection across populations

3.4 Quantitative Genetic Mapping

- Basic phenotyping and mapping information

- Quantitative Trait Loci (QTL) mapping
- Epistasis
- Genome Wide Association Studies (GWAS)

Chapter 4

Phenotypic traits and values

4.1 Introduction

Many phenotypes of organisms are complex, meaning that they are the product of multiple loci interacting with one another and the environment to create smooth distributions.

Chapter 5

Phenotypic variance and heritability

5.1 Introduction