1. Course Information

**Evolutionary Genetics - Biology 3466B**

The Winter 2024 edition of *Evolutionary Genetics* is an all-in-person course consisting of lectures and labs. I will post lecture slides twice per week to coincide with our Monday and Thursday lectures. The labs will likewise unfold each week but with some weeks being lab-free, according to a schedule. The labs complement the lecture material and develop simple mathematical models used to predict evolutionary change in populations.

2. Instructor Information

Professor Graham J Thompson

[Email address]

E-mail: gthomp6@uwo.ca or graham.thompson@uwo.ca (both go to the same inbox)

The best way to make contact is just before or after class. I usually come to the room ahead of time and am free immediately after, so we can have brief exchanges as we need to without the need for a scheduled appointment. You are welcome to reach out via e-mail, say Hi in the hall, and I will be happy to respond and connect in that way. Otherwise, my office hours are by appointment. E-mail me if you have an issue.

3. Course Description, Learning Outcomes, Schedule, Delivery Mode

This course provides an overview of evolutionary processes. Our lectures will convey mostly conceptual ideas needed to understand this process, which is so often misunderstood and misrepresented, even in science. This emphasis on conceptual understanding may render this course different from others that you have taken in that it does not emphasize content (things to memorize). Instead, *Evolutionary Genetics* encourages a more fundamental understanding of the basic relationship between alleles, genotypes, phenotypes and the living environment. From these fundamentals, we will be able to complete simple exercises in the labs that allow you to explore the properties of these variables and the functional relationships among them.

Some of the topics we cover include: the historical origin and development of evolutionary ideas and the people to whom these ideas are attributed, the modern synthetic theory of evolution, measures of genetic variation, the Hardy-Weinberg model and how populations may deviate from it, natural selection, direct and indirect fitness, organizational complexity and the levels of selection,
major evolutionary transitions, synonymous and nonsynonymous mutations, genetic load, migration, drift, the coalescent, inbreeding and outbreeding, the neutral theory of molecular evolution, quantitative genetics, genetic effects, broad and narrow sense heritability and, finally, phylogeny and genomics.

For background that may be useful to match the assumed knowledge of the course, you may consult the following texts at your own will.

  
  An excellent textbook in population genetics. Covers most aspects presented in Biology 3466B.

  
  A nice introduction to population genetics, with a palatable take on coalescent theory.

  
  In its fourth Edition, this book is rich in examples taken from the primary literature. A great section on variation is nature.

  
  Has a very brief section on population genetics of discrete traits. An authoritative reference on quantitative genetics.

  
  The closest thing to a comprehensive textbook in the field. Some bits are hard to follow.

  
  A classic in the field.

  
  A great general text on Evolution. The population genetics sections are good.

  
  Although not suitable as a text for this course, a must-read for anyone who wants a thorough understanding of selection as the driving principle of evolution.

This well-written softcover speaks well on the topic of kin theory and major evolutionary transitions.

The lecture content is grounded by a series of labs that are simple computer exercises requiring you to work your way through a guided tutorial to enter and analyse data, test straightforward predictions that sometimes require basic statistics, interpret your results to answer questions and, finally, present your effort and understanding by the **timely** hand-in of short lab reports that are each worth a small amount but add-up to substantial portion of your grade. *Please do not seek extensions on the lab report hand-ins.* The lecture material from the course draws from a textbook and from the labs.

**Course-Level Learning Outcomes**

As a result of actively viewing and thinking about the lectures, students should be able:

- To understand how allele frequencies change in living populations.
- To understand general rules that govern population-level change.
- To recognize the diagnostic features of populations that deviate from equilibrium.
- To appreciate the broader environmental context of microevolution.
- To recognize fitness consequences for genes, individuals, populations and species.
- To conceptualize evolutionary processes and relate these processes to the living world.

As a result of participating in on-line laboratory activities, students should be able:

- To recognize and measure genetic variation and genetic diversity.
- To generate and manage data spreadsheets.
- To choose and perform statistical analyses appropriate to the data at hand.
- To present and interpret results in written form using support from the primary literature.
**Lab session schedule and information.** Labs are assigned on Fridays, with TA-support on Tuesday and Wednesday (pick one), and the report is due the following Friday via the OWL Assignments tool. **Please do not ask for extensions.**

<table>
<thead>
<tr>
<th>Dates</th>
<th>Details</th>
<th>Due date</th>
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<tbody>
<tr>
<td>January 8-12</td>
<td>No lab</td>
<td></td>
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<tr>
<td>January 15-19</td>
<td><strong>Exercise #1:</strong> Getting acquainted with Excel and with the Hardy-Weinberg model</td>
<td>Jan 19th 2:30 pm</td>
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<tr>
<td>January 22-26</td>
<td><strong>Exercise #2:</strong> Hardy-Weinberg Disequilibrium and the Wahlund effect</td>
<td>Jan 26th 2:30 pm</td>
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<td>January 29-</td>
<td>No lab</td>
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<td>February 2</td>
<td><strong>Exercise #3:</strong> Testing HW equilibrium in finite populations</td>
<td>Feb 9th 2:30 pm</td>
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<td>February 12-16</td>
<td>No lab</td>
<td></td>
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<tr>
<td>February 19-23</td>
<td>No lab</td>
<td></td>
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<tr>
<td>February 26-</td>
<td><strong>Exercise #4:</strong> Demonstration of Fisher's Theorem with asexual organisms</td>
<td>Mar 1st 2:30 pm</td>
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<tr>
<td>March 1</td>
<td><strong>Exercise #5:</strong> Multiple alleles, overdominance, adaptive landscapes and mutation</td>
<td>Mar 8th 2:30 pm</td>
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<td>March 11-15</td>
<td>No lab</td>
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<tr>
<td>March 18-22</td>
<td><strong>Exercise #6:</strong> Random genetic drift; Nonrandom mating and inbreeding</td>
<td>Mar 22nd 2:30 pm</td>
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<td>April 1-5</td>
<td>No lab</td>
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### Lab drop-ins

<table>
<thead>
<tr>
<th>Lab drop-ins</th>
<th>Day(^1)</th>
<th>Time</th>
<th>Location</th>
<th>Teaching Assistant</th>
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\(^1\) Drop-ins will be held during the six weeks that we have a lab exercise, as noted in the schedule above.

#### Teaching Assistants

- Sarah Santos  
sdiasdos@uwo.ca
- Julia Lacika  
jlacika@uwo.ca

### 4. Course Materials

#### Required Texts


[https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2023B&courses%5B0%5D=001_UW/BIO3466B](https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2023B&courses%5B0%5D=001_UW/BIO3466B)

#### OWL

- Students should check OWL ([http://owl.uwo.ca](http://owl.uwo.ca)) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.
5. Methods of Evaluation

The overall course grade will be calculated as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Assignments (6)</td>
<td>24%</td>
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<tr>
<td>Lab Reports, 4% each</td>
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<tr>
<td>Midterm Exam (7-9 pm)</td>
<td>32%</td>
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<tr>
<td>Thursday 15th February</td>
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<tr>
<td>Final Exam</td>
<td>44%</td>
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Accommodated Evaluations

- **Midterm**: If students miss the Midterm for a Dean-approved reason their mark will be shifted to the Final Exam. If the scheduled midterm conflicts with another midterm that takes priority, then the student will write a make-up midterm that will be scheduled on a need-to basis. The re-scheduled midterm will be as close as possible to the original date, including, possibly, before the original date.

- **Lab Reports**: Make plans to hand-in reports on time. This is by far your best option. Handing in on time is good form and removes all doubt about penalties and saves everyone - you, me, your TA and your counselor - lots of emails and time. On-time hand-in also prevents any resentment that may arise about how your lateness is handled. Late reports will be deducted 10% up-front (i.e., at the exact deadline), with an additional 20% per day thereafter. Remember, there are only six labs, and there is lots of time to do them, provided you plan for it amongst your other responsibilities. Try to get it in, even if it is imperfect.

6. Student Absences

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam). You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

7. Accommodation and Accessibility

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University’s list of recognized religious holidays (updated annually) at https://multiculturalcalendar.com/ecal/index.php?s=c-ucwvo.
8. Academic Policies

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual’s official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Professionalism & Privacy:
Western students are expected to follow the Student Code of Conduct. Additionally, the following expectations and professional conduct apply to this course:

- Students are expected to follow online etiquette expectations provided on OWL
- All course materials created by the instructor(s) are copyrighted and cannot be sold/shared
- Recordings are not permitted (audio or video) without explicit permission
- Permitted recordings are not to be distributed
- Students will be expected to take an academic integrity pledge before some assessments
- All recorded sessions will remain within the course site or unlisted if streamed

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

http://academicsupport.uwo.ca/accessible_education/index.html
10. Equity, Diversity, Inclusion and Decolonization (EDID):

**Land Acknowledgement:** We acknowledge that Western University is located on the traditional lands of the Anishinaabek, Haudenosaunee, Lūnaapéewak, and Chonnonton Nations, on lands connected with the London Township and Sombra Treaties of 1796 and the Dish with One Spoon Covenant Wampum. This land continues to be home to diverse Indigenous peoples (First Nations, Métis and Inuit) whom we recognize as contemporary stewards of the land and vital contributors of our society. Throughout Canada, North America, and the world, Indigenous Peoples are vital contributors to their communities, and we greatly value their presence, knowledge, and wisdom.