

## **Biology 3466B (Evolutionary Genetics) Course Outline**

### **1. Course Information**

**Evolutionary Genetics (Biology 3446B), Winter term of 2026:**

#### **List of Prerequisites**

One of Biology 2244A/B, Statistical Sciences 2244A/B, the former Psychology 2810; Biology 2581A/B; or permission of the Department.

Unless you have either the prerequisites for this course or written special permission from the Department of Biology to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

### **2. Instructor and TA Information**

<b>Instructors</b>	<b>Email</b>	<b>Office</b>	<b>Phone</b>	<b>Office Hours</b>
Dr. Nusha Keyghobadi (Instructor)	nkeyghob@uwo.ca	BGSB 2076	X80471	Thursdays, 11am-12pm
Madison Robinson (Graduate TA)	mrobi69@uwo.ca	Tutorial location		In tutorial or by appointment

Students must use their Western (@uwo.ca) email addresses when contacting their instructors. Emails originating from other email addresses will not be responded to.

Office hours are in-person.

### **3. Course Syllabus, Schedule, Delivery Mode**

**Course objectives**

BIO3466B provides an overview of evolutionary processes. It focuses on studying evolution in large and small, random and non-random mating populations, showing discrete and quantitative inheritance. This course covers the roles and importance of mutation, inbreeding, genetic drift, gene flow, selection, and linkage. Both quantitative and conceptual approaches to understanding concepts are used, and practical examples and simulations are provided in the tutorials to explore the theory behind key concepts. Tutorials involve take-home computer exercises and problem sets that allow explorations of theoretical concepts and analysis of population genetic data.

### **Learning outcomes**

- Understand and articulate key concepts and aspects of evolutionary genetics, such as general rules that govern population-level changes, measures of genetic variation, allele frequency changes and their effects, and fitness consequences at different levels, among others;
- Interpret and analyze simple population genetic data

### **Delivery mode**

All lectures and tutorials are in-person. Lecture slides will be posted to the OWL Brightspace prior to each lecture.

## Tentative lecture schedule

Date	Topic	Textbook readings
Jan 5	Theory and data in evolutionary genetics (history, role of theory, types of data)	
Jan 8	Basic sequence terminology, allele & genotype frequencies, and basics of probability	pg 1-3
Jan 12	Overview of evolutionary processes and models	
Jan 15	Genetic drift	pg 3-6
Jan 19	Effective population size	pg 6-7
Jan 22	Mutation	pg 7-11
Jan 26	Recombination and linkage disequilibrium	pg 11-12; 59-68
Jan 29	Natural selection	pg 12-14
Feb 2	Selection models (dominance, multiple loci)	
Feb 5	Gene flow	pg 14-17
Feb 9	Mating and Hardy-Weinberg equilibrium	pg 17-18
Feb 12	Neutral theory of molecular evolution	pg 18-23
Feb 16-20	Reading Week	
Feb 23	No class	
<b>Feb 26</b>	<b>MIDTERM TEST</b>	
Mar 2	Types of population genetic data	pg 25-42
Mar 5	Describing genetic diversity	pg 43-47
Mar 9	Population structure and the Wahlund effect	pg 79-81
Mar 12	Describing population structure	pg 81-89
Mar 16	Gene flow, drift, selection equilibrium	pg 91-97
Mar 19	Defining populations	pg 104-110
Mar 23	Introduction to coalescent	pg 111-124
Mar 26	Introduction to coalescent 2	pg 111-124
Mar 30	Demographic history	pg 203-214
Apr 2	Individual ID, paternity & kinship	
Apr 6	Conservation genetics	
Apr 9	TBD	

## Tentative tutorial schedule

Date	Day	Tutorial Topic	Cohorts
Jan 6	Tues	No tutorial	
Jan 7	Wed	No tutorial	
Jan 13	Tues	Orientation & intro to simulations	A+C
Jan 14	Wed	Orientation & intro to simulations	B+D
Jan 20	Tues	Genetic drift*	A
Jan 21	Wed	Genetic drift*	B
Jan 27	Tues	Genetic drift*	C
Jan 28	Wed	Genetic drift*	D
Feb 3	Tues	Selection and drift*	A
Feb 4	Wed	Selection and drift*	B
Feb 10	Tues	Selection and drift*	C
Feb 11	Wed	Selection and drift*	D
		READING WEEK	
Feb 24	Tues	No tutorial	
Feb 25	Wed	No tutorial	
Mar 3	Tues	No tutorial	
Mar 4	Wed	No tutorial	
Mar 10	Tues	Population structure*	A
Mar 11	Wed	Population structure*	B
Mar 17	Tues	Population structure*	C
Mar 18	Wed	Population structure*	D
Mar 24	Tues	Coalescent*	A
Mar 25	Wed	Coalescent*	B
Mar 31	Tues	Coalescent*	C
Apr 1	Wed	Coalescent*	D

### NOTES ABOUT THE TUTORIALS :

- Each tutorial section will be divided into two cohorts (cohorts A & C for the Tuesday section, and cohorts B & D for the Wednesday section). You will be assigned to your cohort at the first orientation session (Jan. 13 or 14). Depending on your cohort, you will then attend tutorials following the schedule above. Once the cohort is assigned, no switching between cohorts will be permitted.
- Tutorials marked with an asterisk (\*) will have an associated assignment, worth 8% each. **The assignment due date for your cohort will be exactly one week after your cohort's scheduled tutorial for that topic** (e.g., the 'Genetic Drift' assignment for Cohort A will be due on Tuesday, Jan. 27<sup>th</sup>, the 'Genetic Drift' assignment for Cohort B will be due on Wednesday, Jan. 28<sup>th</sup>, etc.). Late assignments will be deducted 10% of the value of the assignment per day.

## 4. Course Materials

### Required textbook

*Molecular Population Genetics*, by Matthew W. Hahn (First edition; 2019; Oxford University Press).

eBooks (\$75.00) will be available through the Book Store website: [https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2025B&courses%5B0%5D=001\\_UW/BIO3466B](https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2025B&courses%5B0%5D=001_UW/BIO3466B)

Students are welcome to purchase second-hand hard-copy editions of this textbook if they can find them.

All other course material will be posted to OWL Brightspace: <https://westernu.brightspace.com/>

### Technical requirements

Access to a laptop or computer with an internet browser and stable internet connection will be required to complete the tutorial exercises.

### OWL Brightspace

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

## 5. Methods of Evaluation

### Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Tutorial Assignments (4)	32%	Due dates vary; see tutorial schedule above
Midterm Test	24%	February 26 <sup>th</sup> , in class
Final Exam	44%	During official examination period

The Midterm Test and Final Exam will be closed book and include multiple choice, short answer, and problem-solving questions. All content from lectures, tutorials (including tutorial assignments), and assigned readings may be tested on the Midterm Test and Final Exam.

## Essential Learning Requirements

Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade:

- At least one lab assignment (out of four) must be completed;
- The final exam must be completed.

## Group work on tutorial assignments

You may consult with your colleagues on tutorial assignments. However, each student is expected to independently complete their own assignment for final submission. Turn-It-In will be used to assess independent completion of submitted tutorial assignments. Please note that the Midterm and Final Exam will also test your understanding of the tutorials and tutorial assignments.

## General information about missed coursework and Academic Consideration

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar:

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/academic\\_consideration\\_Sep24.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf),

This policy does not apply to requests for Academic Consideration submitted for attempted or completed work, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

[https://registrar.uwo.ca/academics/academic\\_considerations/](https://registrar.uwo.ca/academics/academic_considerations/)

**All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.**

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this and, therefore, **always require formal supporting documentation**:

- Examinations scheduled during official examination periods (Defined by policy)
- Midterm Test

When a student *mistakenly* submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above, the request cannot be recalled and reapplied. This privilege is forfeited.

## Evaluation Scheme for Missed Assessments – ONLY where Academic Consideration has been granted

- When a **tutorial assignment** is missed and Academic Consideration has been granted, the remaining completed tutorial assignments shall be re-weighted to provide the full 32% tutorial grade. Note that a minimum of one tutorial assignment must be completed to pass the course. Students are still responsible for all tutorial content, which is testable on the Midterm and Final Exam. The final date to submit any tutorial assignment, even with Academic Consideration, is April 12, 2026 (first day of examination period).
- If a student misses the **Midterm Exam** and Academic Consideration has been granted, a makeup exam will be held on another date. If the student cannot attend the makeup exam before the release of answers, their final exam will be reweighted to include the missed Midterm.
- When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

## 6. Additional Statements

### 6.1 Religious Accommodation

When a recognized religious holiday or observance conflicts with an examination, test, or other scheduled academic obligation, students must request accommodation via the University's Student Absence Portal (SAP). This request should identify the conflict and specify which course component(s) (e.g. test, midterm, exam) are affected.

Students are encouraged to submit the SAP request as early as possible, but no later than two weeks before any examination, or one week before any mid-term test or quiz, to allow sufficient time for adjustment.

The SAP request serves as official notification to both the course instructor and the Academic Advising Office, in accordance with University policy:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_religious.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf)

The Faculty of Science considers religious accommodations as scheduling conflicts. Instructors should provide either a make-up exam or an earlier sitting of the same exam to accommodate the student.

For more information on recognized religious holidays, please visit the Diversity Calendar posted on the Equity, Diversity & Inclusion website - <https://www.edi.uwo.ca>

### 6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Accommodation\\_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf).

### 6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

**Use of @uwo.ca email:** In accordance with policy, [https://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp113.pdf](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 email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

**Requests for Relief** (formally known as “appeals”)

Policy on Request for Relief from Academic Decision:

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/requests\\_for\\_relief\\_from\\_academic\\_decisions.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf)

Procedures on Request for Relief from Academic Decision (Undergraduate):

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/undergrad\\_requests\\_for\\_relief\\_procedure.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf)

### 6.4 Scholastic Offences

Policy on Scholastic Offences:

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_offences.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf)

Procedures on Scholastic Offences (Undergraduate):

[https://uwo.ca/univsec/pdf/academic\\_policies/appeals/undergrad\\_scholastic\\_offence\\_procedure.pdf](https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf)

### Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

### Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

## Plagiarism and Similarity Review software

All required papers (including tutorial assignments) may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

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.

## 6.5 Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, 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.

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts, at:

[https://www.uwo.ca/health/student\\_support/survivor\\_support/get-help.html](https://www.uwo.ca/health/student_support/survivor_support/get-help.html).

To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto:support@uwo.ca).

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.