

Medical Bioinformatics
Bioinformatics of Infectious Disease (MBI/MIMM 4750G)

Course Syllabus for Winter 2025



Western University is committed to a **thriving campus**; therefore, your health and wellness matter to us! The following link provides information about the resources available on and off campus to support students: <https://www.uwo.ca/health/> Your course coordinator can also **guide you** to resources and/or services should you need them.

1. Technical Requirements:



Stable internet connection



Laptop or computer

2. Important Dates:



Classes Begin	Reading Week	Classes End	Study day(s)	Exam Period
January 6	February 15–23	April 4	April 5–6	April 7–30

March 31, 2025: Last day to withdraw from second-term half course without academic penalty

3. Contact Information

Course Coordinator	Contact Information
Instructor(s) or Teaching Assistant(s)	

4. Course Description and Design

Delivery Mode: in-person

An overview of concepts and applications of techniques in bioinformatics for the study and clinical/public health management of infectious diseases. Students are introduced to the basic analysis of conventional and next-generation sequence data, principles of maximum likelihood and Bayesian inference, reconstructing epidemic and evolutionary histories, detecting adaptation, and molecular epidemiology.

Pre-requisites: Biology 2581A/B; and one of Biology 2244A/B, Statistical Sciences 2244A/B or Statistical Sciences 2858A/B

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Timetabled Sessions

Component	Date(s)	Time
Lecture		
Lab		

- Attendance at sessions is required

All course material will be posted to OWL: <https://westernu.brightspace.com/d2l/login>. Any changes will be indicated on the OWL site and discussed with the class.

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

Current versions of all popular browsers (e.g., Safari, Chrome, Edge, Firefox) are supported with OWL Brightspace; what is most important is that you update your browser frequently to ensure it is current. All JavaScript and cookies should be enabled.

5. Learning Outcomes

Upon successful completion of this course, students will be able to:

- Cluster pathogen sequences for classification and surveillance
- Build and interpret phylogenetic trees relating pathogen sequences
- Measure patterns of selection in related gene sequences
- Root and rescale phylogenies in time
- Use Bayesian methods to fit epidemic models to trees
- Understand the ethical issues in data sharing in the context of infectious disease

6. Course Content and Schedule

Week	Dates	Topic	Instructor
1		Introduction. Pathogen databases. Lab 1: Data collection Genetic distances	
2		Clustering for epidemiology <i>Lab 2: Clustering.</i> Distance-based trees	
3		Probability and maximum likelihood. <i>Data collection lab.</i> Substitution models.	
4		Maximum likelihood trees. <i>Lab 3: Tree building.</i> Detecting selection.	
5		Rooting trees. <i>Lab 4: dN/dS analysis.</i> Molecular clocks. DATA REPORT DEADLINE	
6		Ancestral Reconstruction. <i>Lab 5: Rooting trees.</i> Bayesian inference.	
7		Reading Week (starts February 15 th)	
8		Markov chain Monte Carlo. <i>Lab 6: Bayesian inference.</i> BEAST.	
9		The coalescent. <i>Lab 7: Intro to BEAST.</i> Demographic models.	
10		Compartmental models. <i>Lab 8: Bayesian skylines.</i> Birth-death models. Phylodynamics. DRAFT REPORT DEADLINE	
11		Model selection. <i>Data visualization lab.</i> Phylogeography.	
12		Discovery of novel pathogens. <i>Open lab.</i> Ethics of sharing data.	
13		Ethics of sharing resources. <i>Open lab.</i> Guest lecture FINAL REPORT DEADLINE	

7. Participation and Engagement

- ✓ Students are expected to participate and engage with content as much as possible
- ✓ Students can participate during both lab and lecture sessions
- ✓ Students can also participate by interacting in the forums with their peers and instructors

8. Assessment and Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

Assessment	Format	Weighting	Due Date	Flexibility
Lab assignments	Written	35%		72-hour no late penalty
Data report	Written	15%		72-hour no late penalty
Draft report	Written	15%		72-hour no late penalty
Final report	Written	30%		Not applicable
Quizzes	Written	5%		Not applicable

Data report (15%): Provide a written summary of the sequence data that you have obtained in preparation of your independent term project. This summary should include a description of the sequence metadata (e.g., sample collection dates) and results from quality control and pre-processing (e.g., discarding incomplete sequences). It should describe a tentative analysis proposal and explain how the data are appropriate for completing the proposed analysis.

Draft report (15%): Students will submit a preliminary draft of the final report on their independent project. This will provide an opportunity for students to “preview” how their final report will be evaluated, based on feedback from the instructor. The project does not need to be complete at this stage. However, you will be evaluated on your progress and quality of work to date.

Final report (30%): The primary evaluation of this essay course is the Final Report. In this written evaluation, you will describe the methods and results of a bioinformatic analysis that you have carried out on pathogen sequence data.

This report must reflect your own independent work. You are permitted to reproduce a bioinformatic analysis from a published research article using a selection of that study’s data, or similar data from another source. However, carrying out and interpreting this analysis must be your own work. You are required to perform all bioinformatic analyses using the course Linux server. We may inspect your user command history, contents of your filesystem and file modification dates to verify your reported work. (See statement on ChatGPT and similar AI tools below.)

The analysis should utilize some of the bioinformatic methods that we have covered in the course. You can reuse methods from the lab assignments. However, you will be expected to adapt those methods to your data set. You are welcome to incorporate computational methods not covered in this course, but you are not permitted to re-use assignments from another course.

There should be a coherent theme relating your methods. Do not throw together an assortment of methods without an overarching question in mind, or without considering how the results of one analysis inform another.

Quizzes (5%): There will be quizzes associated with some units in the Brightspace module for this course. These will generally be derived from the reading materials associated with each unit. Quizzes will be assessed by the end of the course as a measure of participation.

Designated Assessment: Instructors are permitted to designate one assessment per course per term as requiring supporting documentation to receive academic consideration. See below for information on academic consideration policy and missed course work. For this course the following assessment has been designated as requiring supporting documentation:

- Final report

Information about flexibility in assessment

- ☐ Flexibility in assessment has been applied to this course; therefore, academic consideration requests may be denied on the assessments where flexibility is included

General information about assessments

- ☐ All assignments are due at 11:59pm EST unless otherwise specified
- ☐ Students are responsible for ensuring that the correct file version is uploaded; incorrect submissions including corrupt files could be subject to late penalties (see below) or a 0
- ☐ Written assignments will be submitted to Turnitin (statement in policies below)
- ☐ Students will have limited submissions to Turnitin
- ☐ Rubrics will be used to evaluate assessments and will be posted with the instructions
- ☐ A student might not receive the same grade as their group members if it is determined that the distribution of work was not equal
- ☐ After an assessment is returned, students should wait 24 hours to digest feedback before contacting their evaluator; to ensure a timely response, reach out within 7 days
- ☐ Any grade appeals on assignments must be received within 3 weeks of the grade being posted.

Click [here](#) for a detailed and comprehensive set of policies and regulations concerning examinations and grading. The table below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

Information about late or missed assessments:

- ☐ Late assessments without academic consideration will be subject to a late penalty of 10% / day
- ☐ An assessment cannot be submitted after it has been returned to the class; it will receive a grade of 0%.
- ☐ The Final Report must be completed to pass the course. If this assessment is not completed by the deadline and the student has received academic consideration (see below), the student will receive an INC grade and will be required to submit a Final Report by the accommodated deadline.

INC (Incomplete Standing): If a student has been approved by the Academic Advising Office (in consultation with the instructor/department) to complete term work at a later date, an INC will be assigned. Students with INC will have their course load in subsequent terms reduced to allow them to complete outstanding course work. Students may request permission from Academic Advising to carry a full course load for the term the incomplete course work is scheduled.

9. Communication

- ☐ Students should check the OWL Brightspace site every 24–48 hours
- ☐ Students should email their instructor(s) and teaching assistant(s) using email.
- ☐ Emails will be monitored daily; students will receive a response in 24–48 hours
- ☐ This course will use discussions on Brightspace.
- ☐ Students should post all course-related queries on the discussion forum so that everyone can access the questions and responses

10. Office Hours

- ☐ Office hours will be booked
- ☐ Office hours will be individual or group

11. Resources

- ☐ All resources will be posted in OWL Brightspace

12. Professionalism & Privacy

Western students are expected to follow the [Student Code of Conduct](#). Additionally, the following expectations and professional conduct apply to this course:

- ☐ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared (e.g., Must Knows Facebook group, Course Hero, Chegg, etc.)
- ☐ Recordings are not permitted (audio or video) without explicit permission
- ☐ Permitted recordings are not to be distributed

Western is committed to providing a learning and working environment that is free of harassment and discrimination. All **students**, staff, and faculty have a role in this commitment and have a responsibility to ensure and promote a safe and respectful learning and working environment. Relevant policies include Western's [Non-Discrimination/Harassment Policy](#) (M.A.P.P. 1.35) and [Non-Discrimination/Harassment Policy – Administrative Procedures](#) (M.A.P.P. 1.35). Any **student**, staff, or faculty member who experiences or witnesses' behaviour that may be harassment or discrimination **must report the behaviour** to the Western's [Human Rights Office](#). Harassment and discrimination can be human rights-based, which is also known as EDI-based, (sexism, racism, transphobia, homophobia, islamophobia, xenophobia, antisemitism, and ableism) or non-human rights-based (personal harassment or workplace harassment).

13. How to Be Successful in this Class

Students enrolled in this class should understand the level of autonomy and self-discipline required to be successful.

1. The independent project is meant to span the entire term. Do not wait until the last minute to start your project.
2. Invest in a planner or application to keep track of your courses. Populate all your deadlines at the start of the term and schedule your time throughout the course.
3. Make it a daily habit to log onto OWL Brightspace to ensure you have seen everything posted to help you succeed in this class.
4. Follow checklists created on OWL Brightspace or create your own to help you stay on track.
5. Take notes as you go through the lesson material. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively than just reading or watching the videos.
6. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.
7. Do not be afraid to ask questions. If you are struggling with a topic, check the online discussion boards or contact your instructor(s) and or teaching assistant(s).
8. Reward yourself for successes. It seems easier to motivate ourselves knowing that there is something waiting for us at the end of the task.

14. Western Academic Policies and Statements

A. Absence from Course Commitments

Students must familiarize themselves with the Policy on [Academic Consideration – Undergraduate Students in First Entry Programs](#)

Students missing course work for medical, compassionate, or extenuating circumstances can request academic consideration by completing a request at the central academic consideration portal. Students are permitted one academic consideration request per course per term **without** supporting documentation. Note that supporting documentation is **always** required for academic consideration requests for examinations scheduled by the office of the registrar (e.g., December and April exams) and for practical laboratory and performance tests (typically scheduled during the last week of the term).

Students should also note that the instructor may **designate** one assessment per course per term that requires supporting documentation. This designated assessment is described elsewhere in this document. Academic consideration requests may be denied when flexibility in assessment has already been included. Examples of flexibility in assessment include when there are assessments not required for calculation of the final grade (e.g. 8 out of 10 quizzes) or there is flexibility in the submission timeframe (e.g. 72 hour no late penalty period).

Please note that any academic considerations granted in this course will be determined by the instructor of this course, in consultation with the academic advisors in your Faculty of Registration, in accordance with information presented in this course syllabus. Supporting documentation for academic considerations for absences due to illness should use the [Student Medical Certificate](#) or, where that is not possible, equivalent documentation by a health care practitioner.

Accommodation for Religious Holidays

Students should review the policy for [Accommodation for Religious Holidays](#). Where a student will be unable to write examinations and term tests due to a conflicting religious holiday, they should inform their instructors as soon as possible but not later than two weeks prior to writing the examination/term test. In the case of conflict with a midterm test, students should inform their instructor as soon as possible but not later than one week prior to the midterm.

Special Examinations

A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents. To provide an opportunity for students to recover from the circumstances resulting in a Special Examination, the University has implemented Special Examinations dates. These dates as well as other important information about examinations and academic standing can be found [here](#).

B. Academic Offenses

Scholastic offences are taken seriously, and students are directed [here](#) to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

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

C. Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Accessible Education (AE) at 661-2111 x 82147 for any specific question regarding an accommodation or review [The policy on Accommodation for Students with Disabilities](#)

D. Correspondence Statement

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 his/her official university address is attended to in a timely manner. You can read about the privacy and security of the UWO email accounts [here](#).

E. Discovery Credit Statement

Students are permitted to designate up to 1.0 Discovery Credit course (or equivalent) for pass/fail grading that can be counted toward the overall course credits required for their degree program. The details of this policy and the deadlines can be found [here](#).

F. Essay Course Guidelines

The guidelines for the minimum written assignments refer to the cumulative amount of written work in a course but excludes written work in examinations. You can read about essay course guidelines [here](#).

An essay course must normally involve total written assignments (essays or other appropriate prose composition, excluding examinations) as follows:

- Full course (1000 to 1999): at least 3000 words
- Half course (1000 to 1999): at least 1500 words
- Full course (2000 and above): at least 5000 words
- Half course (2000 and above): at least 2500 words

The structure of the essay course must be such that in order to pass the course, the student must exhibit some minimal level of competence in essay writing and the appropriate level of knowledge of the content of the course.

G. Turnitin and other similarity review software

All assignments will be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. Students will be able to view their results before the final submission. 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 Western University and [Turnitin.com](#).

15. BMSUE Academic Policies and Statements

Cell Phone and Electronic Device Policy (for in-person tests and exams)

The Schulich School of Medicine & Dentistry is committed to ensuring that testing and evaluation are undertaken fairly across all our departments and programs. For all tests and exams, it is the policy of the School that any electronic devices, e.g., cell phones, tablets, cameras, smart glasses, smart watch or iPod are strictly prohibited. These devices **MUST** be left either at home or with the student's bag/jacket at the front of the room and **MUST NOT** be at the test/exam desk or in the individual's pocket. Any student found with one of these prohibited devices will receive a grade of zero on the test or exam. Non-programmable calculators are only allowed when indicated by the instructor. The program is not responsible for stolen/lost or broken devices.

Copyright and Audio/Video Recording Statement

Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. You must always ask permission to record another individual and you should never share or distribute recordings.

Rounding of Marks Statement

Across the Basic Medical Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. **Final grades** on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.45 becomes 74, and 74.50 becomes 75. Marks **WILL NOT** be bumped to the next grade or GPA, e.g., a 79 will **NOT** be bumped up to an 80, an 84 **WILL NOT** be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

Statement on the use of Generative Artificial Intelligence (AI) Platforms

This is an essay course. Hence, the primary form of student evaluation in this course is a written report in the form of a short scientific paper. You are expected to do your own written work. We are aware that current AI text generators (such as ChatGPT) can produce documents that are difficult to differentiate from manually written texts.

To maintain academic integrity, we have made the following revisions to this written assessment:

- The introduction and discussion sections of the report will receive lower weights.
- "Quality of writing" has been removed from the grading rubric.
- The results section will be graded on the quality and accuracy of figures (data visualizations).
- Students will be required to perform all data analyses on the lab server. The contents and modification dates of files in a student's home directory will be used to verify the provenance of the reported work.

16. Support Services

- Students who are in emotional/mental distress should refer to Mental Health @Western Health <https://www.uwo.ca/health/> for a complete list of options about how to obtain help.
- To connect with a case manager or set up an appointment, please contact support@uwo.ca.
- Other important links:
 - [Academic Advising \(Science and Basic Medical Sciences\)](#)
 - [Appeal Procedures](#)
 - [Registrarial Services](#)
 - [Student Development Services](#)
 - [Student Health Services](#)

Statement on Gender-Based and Sexual Violence

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (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.