Medical Bioinformatics
Bioinformatics of Infectious Disease - MBI 4750G

Course Outline for Winter 2026

This course takes place at Western University, which is located on the traditional territories 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.

**Students who are in emotional and/or mental distress should refer to
https://www.uwo.ca/health/ for a complete list of options about how to obtain help.**

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1. Technical Requirements:

None. Computers will be provided for the practical computing lab component of the course. While you are welcome to bring your own laptop, most lab assignments will require programs that have been pre-installed on the GenLab computers or the MBI Linux server - the latter can be accessed remotely. In addition, you are required to carry out all data analyses for your independent project on the MBI Linux server.

2. Important Dates:

Classes Begin	Reading Week	Classes End	Study day(s)	Exam Period
January 5	February 14–22	April 9	April 10, 11	April 12–30

January 13, 2026: Last day to add or drop a Winter 12-week course
March 30, 2026: Last day to withdraw from a Winter 12-week course without academic penalty

3. Contact Information

Course Coordinator	Contact Information
Dr. Art Poon	

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

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.

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	M/F	9:30am - 10:20am
Lab	W	9:30am - 11:20am

❑ Attendance at sessions is required.

All course material will be posted to OWL Brightspace: https://westernu.brightspace.com/d2l/login. Any changes will be indicated on the OWL Brightspace 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	Jan 5–11	Introduction. Pathogen databases. *Lab 1: Data collection* Genetic distances	AP
2	Jan 12–18	Clustering for epidemiology *Lab 2: Clustering* Distance-based trees	AP
3	Jan 19–25	Probability and maximum likelihood *Data collection lab* Substitution models	AP
4	Jan 26–Feb 1	Maximum likelihood trees *Lab 3: Tree building* Detecting selection	AP
5	Feb 2–8	Rooting trees *Lab 4: dN/dS analysis* Molecular clocks **DATA REPORT DEADLINE (Feb 6)**	AP
6	Feb 9–15	Ancestral reconstruction *Lab 5: Rooting trees* Bayesian inference	AP
7	Feb 16–22	Reading Week (starts February 14th 12:01 AM)	N/A
8	Feb 23–Mar 1	Markov chain Monte Carlo *Lab 6: Bayesian inference* BEAST	AP
9	Mar 2–8	The coalescent *Lab 7: Intro to BEAST* Demographic models	AP
10	Mar 9–15	Compartmental models *Lab 8: Bayesian skylines* Birth-death models; phylodynamics **DRAFT REPORT DEADLINE (Mar 13)**	AP
11	Mar 16–22	Model selection *Lab 9: BDSIR* Phylogeography	AP
12	Mar 23–29	Discovery of novel pathogens *Open lab* Ethics of sharing data	AP
13	Mar 30–Apr 5	Ethics of sharing resources *Open lab* *No class Friday, Apr 3*	AP
14	Apr 6–9	**FINAL REPORT DEADLINE (Apr 6)**	

7. Participation and Engagement

- ❑ Students are expected to participate and engage with content as much as possible
- ❑ Students can participate during lecture sessions
- ❑ Students are expected to 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%	Ongoing	72-hour no late penalty
Data report	Written	15%	Feb 6, 2026	72-hour no late penalty
Draft report	Written	15%	Mar 13, 2026	72-hour no late penalty
Final report	Written	30%	Apr 6, 2026	72-hour no late penalty
Quizzes and participation	Mixed formats	5%	Ongoing	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 — a full citation of the original research article must be provided. If reproducing a published study, carrying out and interpreting the data analysis must be your own original work.

You are required to perform all bioinformatic analyses in your independent project using the course Linux server. We may inspect your user command history, contents of your filesystem and file modification dates to verify that your reported work is your own. (See statement on ChatGPT and similar AI tools below.)

Quizzes and participation (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. Students are encouraged to attempt each week's quiz in advance of the lecture on that topic. Quiz responses and attempt dates 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 no assessment has been designated as requiring supporting documentation.

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

❑ This course employs flexible deadlines for assignments and reports. These deadlines can be found above in the course outline. For each assessment, students are expected to submit the assignment or report by the deadline listed. Should illness or extenuating circumstances arise, students are permitted to submit their assignment up to 72 hours past the deadline without a late penalty. Should students submit their assessment beyond 72 hours past the deadline, a late penalty of 10% per day will be subtracted from the assessed grade. Requests for academic consideration supported by documentation must be submitted within 48 hours of the original deadline. The instructor reserves the right to deny such academic considerations, given the deadline flexibility provided. If you have a long-term academic consideration or an

accommodation for disability that allows greater flexibility than provided here, please reach out to your instructor at least one week prior to the posted deadline.

General information about assessments

- ❑ All assignments are due at 11:59 pm 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
- ❑ Assessment re-grading could result in the mark, increasing, decreasing, or remaining the same
- ❑ Prior to the filing of a written request for relief, students must attempt to resolve the concern regarding a mark or grade through informal consultation with the instructor. If the student is dissatisfied with the decision of the instructor or does not receive a decision from the instructor, a written request for relief must be submitted to the Department Chair within three (3) weeks from the date that the mark was issued.

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 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, which could impact program progression. 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 held in-person or remotely using Zoom
- ❑ Office hours will be booked
- ❑ Office hours will be individual or group

11. Course Materials
- ❑ All resources will be posted on 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/upload (e.g., Must Knows Facebook group, Course Hero, Chegg, ChatGPT, 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. Recommended readings are provided for every Unit in Brightspace. You are strongly encouraged to do the readings and attempt the associated quiz as preparation for the lectures in that Unit.
3. 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.
4. Make it a daily habit to log onto OWL Brightspace to ensure you have seen everything posted to help you succeed in this class.
5. Follow checklists created on OWL Brightspace or create your own to help you stay on track.
6. 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.
7. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.

8. 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).
9. 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/Procedures and Statements

A. Absence from Course Commitments

Medical, Compassionate, or Extenuating Circumstances

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.

Policy: Academic Consideration – Undergraduate Students in First Entry Programs
Procedures: Student Medical Certificate

Religious Holidays

Students should review the policy for Accommodation for Religious Holidays (Appendix 1). 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.

Policy: Accommodation for Religious Holidays

<u>Special Examinations</u>

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.

Policy: [Definitions of Types of Examinations](#)

B. Academic Appeals and Scholastic Offenses

Students can file a **request for relief from academic decisions** if the request is based on one or more grounds listed in the policy. Requests for relief generally fall into three categories, which are also listed in the policy. All requests for relief must be supported by evidence. A request for relief from academic decisions process was formally referred to as an appeal. Refer to the policy and procedures about further details and timelines.

Policy: [Requests for Relief from Academic Decisions](#)
Procedures: [Undergraduate Student Academic Requests for Relief](#)

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a scholastic offence.

Policy: [Scholastic Offences](#)
Procedures: [Undergraduate Scholastic Offences](#)

Students may **appeal** some academic and scholastic disciplinary decisions by a Dean or their designate, to the Senate Review Board Academic (SRBA).

Policy: [Senate Review Board Academic Appeals](#)
Procedures: [Senate Review Board Academic Appeals](#)

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.

Policy: [Academic 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.

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.

Policy: [Undergraduate Course Credit](#)
Procedures: [Discovery Credits](#)

F. Essay Course Guidelines

The guidelines for the minimum written assignments refer to the cumulative amount of written work, including examinations. An essay course must normally involve total written assignments (essays or other appropriate prose composition) 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

and must be so structured that the student is required to demonstrate competence in essay writing to pass the course. 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.

Policy: Course Numbering Policy, Essay Courses, and Hours of Instruction

G. Statement on the Use of Generative Artificial Intelligence (AI)

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 large language models such as ChatGPT are presently capable of producing texts that are difficult to differentiate from human-authored documents.

To maintain academic integrity and fair assessment of individual learning, the following stopgaps have been implemented in this course:
- The introduction and discussion sections of the written reports have lower weights for grading.
- "Quality of writing" has been removed from the grading rubric. However, students will continue to receive feedback on grammar and writing style.
- 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 course Linux server. The user command line history and the contents and modification dates of files in the student's home directory will be examined to verify the provenance of the reported work.

H. Turnitin and other similarity review software

All required papers 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 Western University and Turnitin.com.

15. BMSUE Academic Policies and Statements

A. 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 and this will be

documented as a Scholastic Offence. Non-programmable calculators are only allowed when indicated by the instructor. The program is not responsible for stolen/lost or broken devices.

B. Copyright and Audio/Video Recording Statement

Course materials produced by faculty are 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.

C. 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* in this course are rounded to the nearest whole number based on the first decimal place. For example, a grade of 74.49 or lower will be rounded to 74, whereas 74.50 or higher will be rounded to 75.

Marks WILL NOT be arbitrarily increased to the next grade or GPA, e.g., a 79 will NOT be increased to an 80, and 84 WILL NOT be increased to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for arbitrary mark increasing will be denied. Marks will be assigned based on assessments in the syllabus and no extra work or tasks will be assigned to increase a mark.

Course grade rounding provisions, as described above, differ from cumulative and term averages. Cumulative and term averages will be calculated to two decimal places and rounded to the nearest whole number with .45 rounded up, for the purposes of admission to and progression in modules, scholarship retention, and Dean's Honour List.

Policy: Marks/Grades; Definitions of Grades; Grading Scale for Undergraduate Students

16. Support Services

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

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 the following website:

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.

Other important links:
• Academic Advising (Science and Basic Medical Sciences)
• Learning Development and Success
• Office of the Registrar
• Wellness & Wellbeing
• Western USC Services

Appendix 1: Western University Academic Policies and Procedures

The policies and procedures listed in this syllabus are outlined in the table below. In some cases, a policy does not include an accompanied procedures document.

Academic Policy	Name of Policy/Procedure	Links
General Policy	Marks/Grades; Definitions of Grades; Grading Scale for Undergraduate Students	Policy
General Policy	Structure of the Academic Year	Policy
Registration, Progression, Graduation	Course Numbering Policy, Essay Courses, and Hours of Instruction	Policy
Registration, Progression, Graduation	Undergraduate Course Credit	Policy • Procedures
Examinations	Definitions of Types of Examinations	Policy
Examinations	Evaluation of Academic Performance	Policy
Examinations	Examination Conflicts	Policy
Rights and Responsibilities	Academic Accommodation for Students with Disabilities	Policy
Rights and Responsibilities	Accommodation for Religious Holidays	Policy
Rights and Responsibilities	Policy on Academic Consideration – Undergraduate Students in First Entry Programs	Policy • Procedures
Rights and Responsibilities	Requests for Relief from Academic Decisions (Undergraduate)	Policy • Procedures
Rights and Responsibilities	Requests for Relief from Academic Decisions (Graduate)	Policy • Procedures
Rights and Responsibilities	Scholastic Offences (Undergraduate)	Policy • Procedures
Rights and Responsibilities	Senate Review Board Academic Appeals	Policy • Procedures