Medical Bioinformatics / Microbiology and Immnuology
MBI 4750G / MIMM 4750G Bioinformatics of Infectious Diseases

Course Syllabus for Winter 2024

> **THRIVE together**
>
> 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 8	February 17-25	April 8	April 9-10	April 11–30

*March 7, 2024: Last day to drop a second term half course without academic penalty

3. Contact Information

| Course Coordinator	Contact Information

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.

Prerequisite(s): Biology 2581A/B; and one of Biology 2244A/B, Statistical Sciences 2244A/B or Statistical Sciences 2858A/B. Pre-or Corequisite(s): Microbiology and Immunology 2500A/B is recommended. (Note: MIMM4750G includes Biology 2290F/G OR Biochemistry 3383F/G as a prerequisite.)
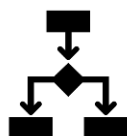
Timetabled Sessions

Component	Date(s)	Time
Lecture		
Lab		

- ☑ Attendance in <u>both lectures and labs</u> is required
- ☑ A recording will be provided in case of a missed lecture if the student has provided an approved Academic Accommodation.

All course material will be posted to OWL: http://owl.uwo.ca. 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 Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click here.

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 diseases

6. Course Content and Schedule

Week	Dates	Topic	Instructor
1	Jan 8–14	Introduction. Pathogen databases. *Lab 1: Data collection* Genetic distances.	
2	Jan 15-21	Clustering for epidemiology. *Lab 2: Clustering* Distance-based trees.	
3	Jan 22-28	Probability and maximum likelihood. ***Open lab (data collection).*** Substitution models.	
4	Jan 29–Feb 4	Maximum likelihood trees. *Lab 3: Tree building* Detecting selection. ~~**DATA REPORT DEADLINE (Feb 2).**~~	
5	Feb 5-11	Rooting trees. *Lab 4: Selection.* Molecular clocks. **DATA REPORT REVISED DEADLINE (Feb 9).**	
6	Feb 12–16	Ancestral reconstruction. *Lab 5: Rooting trees.* Bayesian inference.	
7	Feb 17-25	Reading Week	
8	Feb 26-Mar 3	Markov chain Monte Carlo. *Lab 6: Bayesian inference.* BEAST.	
9	Mar 4-10	The coalescent. *Lab 7: Intro to BEAST.* Demographic models.	
10	Mar 11–17	Compartmental models. *Lab 8: Bayesian skylines.* Birth death models. Phylodynamics.	
11	Mar 18–24	Model selection. ***Open lab.*** Phylogeography **DRAFT REPORT DEADLINE (Mar 24)**	
12	Mar 25–31	Discovery of novel pathogens. ***Open lab.*** ***University closed (March 29), no lecture***	
13	Apr 1-7	Ethics of sharing data. ***Open lab.*** Ethics of sharing resources.	
14	Apr 8	**FINAL REPORT DEADLINE (Apr 8)**	

7. Participation and Engagement

☑ Students are expected to participate and engage with content as much as possible.

☑ Students are expected to attend all lectures and lab sessions, except in occasional cases of illness or other circumstances requiring academic accommodation.

8. Evaluation

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

Assessment	Format	Weighting	Due Date
Lab assignments	Written	35%	
Data report	Written	15%	
Draft report	Written	15%	
Final report	Written	30%	
Participation	Digital	5%	

Data report (15%): Provide a written summary of the sequence data that you have obtained in preparation of your independent project (final report). This summary should include a description of sequence metadata (e.g., sample collection dates) and results from quality control and pre-processing (e.g., discarding incomplete sequences).

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(s) and/or TA(s). 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 of pathogen sequence data.

This report must reflect your own independent work. You are permitted to reproduce a bioinformatic analysis from a published research article. However, carrying out and interpreting the analysis must be your own work. You will be required to perform all bioinformatic analyses using the lab server. We may inspect your command history, file contents and modification dates to verify your reported work. (See statement on ChatGPT and similar AI tools below.)

The analysis should utilize the bioinformatic methods that we have covered in this course. You can reuse methods from lab assignments. However, you will be expected to adapt those methods to your data. You are welcome to incorporate 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.

Participation (5%): Students will be evaluated on their attendance and active participation in lectures and labs. The open lab sessions are provided for students to work on their independent projects with access to university computing resources and support from instructors and teaching assistants.

☑ All assignments are due at 11:55pm 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 a limited number of 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.

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

Information about late or missed evaluations:
- ☑ Late assessments without accommodation will be subject to a late penalty of 10%/day.
- ☑ In the case of missed work comprising less than 10% of the course evaluation (viz., a missed lab assignment), the student's lab grade (35%) will be calculated from the other lab assignments to a maximum of one missing assignment. Additional missing assignments will receive a mark of zero.
- ☑ A lab assignment cannot be submitted after it has been returned to the class; it will be handled as missed work (see above).
- ☑ The Final Report must be completed to pass the course. If this evaluation is missed, an incomplete (INC) code will be assigned if the student has obtained permission to complete the work at a later date (see below).

INC (Incomplete Standing): If a student has been approved by the Academic Counselling 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 Counselling to carry a full course load for the term the incomplete course work is scheduled.

9. Communication:

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

10. Office Hours:

☑ Office hours will be booked or drop in.

11. Resources

☑ All resources will be posted in OWL or made available online.

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. 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.
2. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.
3. Follow weekly checklists created on OWL or create your own to help you stay on track.
4. 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.
5. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.
6. 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).
7. 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

Absence from Course Commitments

A. Absence for medical illness:

Students must familiarize themselves with the Accommodation for Illness Policy.

A student seeking academic accommodation for any **work worth less than 10%** must contact the instructor or follow the appropriate Department or course specific instructions provided on the course outline. Instructors will use good judgment and ensure fair treatment for all students when considering these requests. You are not required to disclose details about your situation to your instructor; documentation is not required in this situation, and you should not send any pictures to your instructor.

If you are unable to meet a course requirement for any **work worth 10% or greater** due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Academic Counseling as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. Please note that the format of a make-up test, exam, or assignment is at the discretion of the course coordinator.

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found at: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

B. Absence for non-medical reasons:

Student absences might also be approved for non-medical reasons such as religious holidays and compassionate situations. Please review the policy on Accommodation for Religious Holidays. All non-medical requests must be processed by Academic Counselling. Not all absences will be approved; pay attention to the academic calendar and final exam period when booking any trips.

C. 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.

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.

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

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.

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.

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.

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 ChatGPT and other 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

The following links provide information about support services at Western University.

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.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Academic Counselling (Science and Basic Medical Sciences)

Appeal Procedures

Registrarial Services

Student Development Services

Student Health Services