Schulich MEDICINE & DENTISTRY

Western Science

Bachelor of Medical Sciences (BMSc) Program

Microbiology & Immunology

Bioinformatics of Infectious Diseases (MIMM 4750G)

Course outline for 2020/2021

THRIVE together

Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the Digital Student Experience website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: https://www.uwo.ca/health/.

1. Technical Requirements:

- Stable internet connection
- Laptop or computer
- Working microphone
- Working webcam (suggested)

2. Course Overview and Important Dates:

Delivery Mode	Dates	Time
Online (synchronous lectures)	Mon & Fri	9:30am – 10:30am
Online (synchronous labs)	Wed	9:30am – 11:30am

*Details about design and delivery of the course are listed below in Section 4

Classes Start	Reading Weeks	Classes End	Study day(s)	Exam Period
January 11	February 13 - 21	April 12	April 13	April 14 - 30

*November 30, 2020: Last day to drop a full course and full-year half course without penalty

3. Contact Information

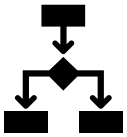
Course Coordinator	Contact Information
Dr. Art Poon (Instructor)	apoon42@uwo.ca

Instructor(s) or Teaching Assistant(s)	Contact Information
Laura Muñoz Baena (TA)	lmuoz@uwo.ca

4. Course Description and Design

Bioinformatics is a rapidly growing area in the modern biological and medical sciences that has been largely driven by the Human Genome Project and the subsequent pursuit of "the $1,000 genome". Many of the current innovations in infectious disease research have relied on the application of bioinformatics to the genetic diversity of viruses and bacteria. This course will provide a broad overview of the concepts and applications of techniques in bioinformatics for the study and clinical/public health management of infectious diseases. The course will introduce students 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.

This course does not require any previous training in computer science or any knowledge of programming. The course materials will emphasize gaining a sufficient understanding of the underlying models and methods to use open source bioinformatic software, to interpret the results and to incorporate these results into scientific publications. However, the practical lab component of the course will also train students to run programs through a command-line interface instead of graphical or web-based user interfaces. Although this course focuses on applications of bioinformatics to infectious diseases, it is also designed to provide a foundation for students who want to transition into a career in bioinformatics and data sciences.



Mode	Dates	Time	Frequency
Virtual synchronous lecture	Mon & Fri	9:30 – 10:30 AM	weekly
Virtual synchronous lab	Wed	9:30 – 11:30 AM	weekly

☐ Asynchronous pre-work must be completed [__ days] prior to synchronous sessions

☒ Attendance at synchronous sessions is required

☒ Missed work should be completed within 48 hours

☒ A recording will be provided for synchronous sessions

☐ Closed captioning will be provided on audio or video recordings

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:

- To be acquainted with a command-line (UNIX-like) computing environment.
- To use web-based APIs to query public sequence databases.
- To recognize and handle different genetic sequence data formats.
- To understand the principles of sequence alignment heuristics.
- To be able to define a genetic distance and how it is used for clustering.
- To reconstruct phylogenetic trees using distance- and likelihood-based methods.
- To identify targets of positive selection in protein-coding regions.
- To develop a basic understanding of Bayesian inference.
- To infer the dynamics of an epidemic in recent history from sequence variation.
- To understand the principles of mapping and de novo assembly methods for next-generation sequence data.

6. Course Content and Schedule

Week	Dates	Topic	Instructor
1	Jan 11 – 17, 2021	What is bioinformatics? How is it used for infectious disease research and management? Introduction to the command line. Sequence data formats.	Poon
2	Jan 18 – 24	Genbank and BioPython. BLAST.	Poon
3	Jan 25 – 31	Sequence alignment. Short read mapping.	Poon
4	Feb 1 – 7	De novo assembly. Pathogen discovery.	Poon
5	Feb 8 – 14	Genetic distances. Clustering. Virus nomenclature.	Poon
6	Feb 15 – 21	*Spring Reading Week*	
7	Feb 22 – 28	Building trees. Distance-based methods.	Poon
8	Mar 1 – 7	Rooting trees. Molecular clocks. Root-to-tip regression.	Poon
9	Mar 8 – 14	Maximum likelihood. Models of evolution.	Poon
10	Mar 15 – 21	Detecting positive selection. Ancestral reconstruction.	Poon
11	Mar 22 – 28	Bayesian inference. MCMC methods.	Poon
12	Mar 29 – Apr 4	The coalescent.	Poon
13	Apr 5 - Apr 11	Modeling epidemics. Compartmental models.	Poon
14	Apr 12	SARS-CoV-2: the current state of knowledge	Poon

7. Online Participation and Engagement

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

☒ Students can participate during live sessions or post on OWL after watching the recording if unable to attend

☒ Students can also participate by interacting in the forums with their peers and instructors

8. Evaluation

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

Assessment	Format	Weighting	Due Date
Lab assignments	Practical/written	50%	Weekly
Project proposal	Written	15%	February 19, 2021
Project final report	Written	35%	April 12, 2021

☒ All assignments are due at 11:55 pm EST unless otherwise specified

☐ Virtual proctoring will be used

☒ Written assignments will be submitted to Turnitin (statement in policies below)

☒ Students will have unlimited submissions to Turnitin

☒ Rubrics will be used to evaluate written assessments and will be posted with the instructions

☒ 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

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 evaluations:

☒ Late assessments without illness self-reports will be subject to a late penalty of 10%/day

☒ Late assessments with illness self-reports should be submitted within 24 hours of submission of the last illness self-report

☒ A lab assessment cannot be submitted after it has been returned to the class; in this situation, the weight will be transferred to the final grade

☒ If a make-up assessment is missed, the student will receive an INC and complete the task the next time the course is offered

9. Communication:

☒ Students should check the OWL site every 24 – 48 hours

☒ Emails will be monitored daily; students will receive a response in 24 – 48 hours

☒ This course will use Microsoft Teams for discussions during lab practicals

☒ This course will use the OWL forum for discussions

☒ Students should post all course-related content on the discussion forum so that everyone can access answers to questions

☒ The discussion forums will be monitored regularly by instructors or teaching assistants

10. Office Hours:

☒ Students will be able to sign up for an appointment using e-mail

11. Resources

☒ All resources will be posted in OWL

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:

☒ Students are expected to follow online etiquette expectations provided on OWL

☒ All course materials created by the instructor(s) are copyrighted and cannot be sold/shared

☒ Recordings are not permitted (audio or video) without explicit permission

☒ Permitted recordings are not to be distributed

☒ Students will be expected to take an academic integrity pledge before some assessments

☒ All recorded sessions will remain within the course site or unlisted if streamed

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 time at the start of each week to get organized and manage your time.
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. Treat this course as you would a face-

to-face course. 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

Policy on Academic Consideration for Student Absences

In the interest of the health and safety of students and health care providers, you are no longer required to seek a medical note for absences this term. If you are unable to meet a course requirement due to illness you should use the Illness Reporting Tool. This tool takes the place of the need to submit a medical note and the Self-Reported Absence System formally used by undergraduate students.

You are required to self-report every day that you are ill and unable to complete course commitments. Details about when you should submit missed work, the format of the missed work can be found in the Section 7. Evaluation above. Students should communicate promptly with their instructor and use this tool with integrity.

Accommodation for Religious Holidays

The policy on Accommodation for Religious Holidays can be viewed here.

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.

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

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., 74.4 becomes 74, and 74.5 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.

16. Support Services

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

Academic Counselling (Science and Basic Medical Sciences)

Appeal Procedures

Registrarial Services

Student Development Services

Student Health Services