Math 4958 Course Outline

1. Course Information

Math 4958B: Special Topics in Mathematics, Disease Modelling
Winter 2022
Tuesdays 9:30-11:30am, Thursdays 9:30-10:30am, both in UC1110

List of Prerequisites
AM 2402A/B, one of Calculus 2302A, 2402A, 2502A and one of Math 1600A/B or AM 1411A/B. AM3615A/B is recommended.

Unless you have either the prerequisites 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.

2. Instructor Information

Lindi Wahl, lwahl@uwo.ca, Middlesex 267, x88795
Office Hours TBD after consultation with the class.
A mix of in-person and online office hours will be offered.

3. Course Syllabus, Schedule, Delivery Mode

Classes begin: January 9, 2023
Reading Week: February 18 – 26, 2023
Classes end: April 10, 2023
Exam period: April 13 – 30, 2023

Participation and Engagement

☒ Students are expected to participate and engage with content, with each other, and with the professor as much as possible

☒ Students are expected to attend in-person classes and work together.

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

Course Content and Proposed Schedule

Dates	Tues (2 hours)	Thurs (1 hour)	Assessments/Homework
Jan 10, 12	Welcome and introduction, Input on course design	Active learning podcast and discussion	Input to OWL forum on course design
Jan 17, 19	Finalize course design, practice using WALS tech; systems of ODES	Lecture on basic SIR modelling, equilibria. EXTRA (matlab) HELP tutorial TBD if needed	Numerically integrate a system of ODEs, upload to OWL. You can use excel, maple, python, etc. Extra help will be available, showing how to do it with matlab.
Jan 24, 26	Stability and R0 active learning.	Lecture and active learning on R0.	Assignment 1 due (ODEs, equilibria, 10%) Input to forum on COVID models in the literature and news (next 3 weeks)
Jan 31, Feb 2	Models and data: active learning.	Lecture on parameter reduction	Assignment 2 open (stability, R0, 10%)
Feb 7, 9	Parameter fitting: active learning.	Lecture/active learning indentifiability and over-fitting	Assignment 2 due, Ass't 3 open (comparing models to data, 10%)
Feb 14, 16	COVID models: literature search and compare. How to judge quality of a research paper.	COVID models: non-autonomous ODEs	Ass't 3 due, Assignment 4 open (parameter fitting, individual, 10%)
Reading Week			
Feb 28, Mar 2	Active learning: Sensitivity analysis lab.	Midterm review and problem-solving session	Prepare for midterm exam, Tues Mar 7 (20%)
Mar 7, 9	Midterm exam	COVID modelling: group workshop, datathon details.	Take a break! :)
Mar 14, 16	Active learning: TBD	Guest speaker: COVID-19 task force project	Working on group project: preparing for COVID datathon
Mar 21, 23	COVID datathon: testing your model!	Active learning: how to give an awesome project presentation	Assignment 4 due
Mar 28, 30	Active learning: scientific writing.	Guest speaker: former AM3615 student now working in public health/modelling	Working on group project: presentation and write-up
Apr 4, 6	Project presentations (4)	Project presentations (2)	Project presentations (10%)
Apr 10			Project write-up,Mon Apr 10, (20%)

Learning Outcomes
> **What will I be able to do after taking this course?**

> 1. You will be able to interpret and critically evaluate mathematical models of infectious disease spread. In particular, you will be able to explain each term in the system of ordinary differential equations that comprises a model, articulate the assumptions underlying each term, and assess the validity of those assumptions.

> 2. You will be able to explain the meaning and importance of the fundamental parameter R_0, and you will be able to determine mathematical expressions for R_0 from simple compartmental models of disease spread.

> 3. You will have the mathematical tools and modelling experience to create a new mathematical model for a novel infectious disease.

> 4. You will be able to use a mathematical model, in particular one of your own design, to make predictions about the spread and impact of an epidemic or pandemic.

> 5. You will be able to critically compare the predictions of a mathematical model to data from public health agencies. You will understand techniques for assessing which model best fits the data and standard methods for quantifying the degree to which a model is or is not in agreement with the data.

> 6. You will be able to fit a mathematical model to data in order to obtain quantitative estimates of unknown parameters, such as R_0, from disease incidence data.

Contingency plan for an in-person class pivoting to 100% online learning
In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

4. Course Materials

There are no required materials for this course; all course material will be posted to OWL: http://owl.uwo.ca.

Students are responsible for checking the course OWL site (http://owl.uwo.ca) on a regular basis 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 Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements
In the event that the course moves online, a stable internet connection and a computer with working microphone and webcam will be required.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Assignments   40%   (4 @10%, pdf uploaded to OWL/Gradescope)
Midterm Test   20%   (2 hours in class, closed book, March 7)
Project presentation   10%   (20 minute group presentation)
Datathon   5%   (modelling and group summary, March 21)
Research project write-up 20%   (individual write-up of project, April 10)
Engagement   5%

Engagement will include: regular contributions to active learning activities, articulating your perspective in group discussions, contributions on the OWL forum, contributions to the group project as assessed anonymously by your peers, and other components as communicated through the term.

In order to receive a grade higher than 45% in the course, students must acheive a grade of at least 50% in the research project write-up.

All assignments are due at 11:55 pm EST unless otherwise specified. For Assignments 1-3, students will have the choice of working individually or in randomly assigned groups of 2-3. Assignment 4 will be completed individually.

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

When rubrics are used to evaluate written assessments, they will be posted along with the assignment.

Information about late or missed evaluations:

Late assessments <u>without special consideration</u> will be subject to a late penalty of 10% / day.

An assessment cannot be submitted after it has been returned to the class; the weight will be transferred to the midterm test if due before the midterm, and to the final project write-up if due after the midterm exam.

Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade (the datathon):
If the datathon is missed, the weight will be distributed among the other individual-work components of the course.

All other assessments are worth 10% or more of the overall course grade:
For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

The Student Medical Certificate is available at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

When academic consideration is granted as outlined above, for assignments and the research project write-up, extensions will be granted. If the group project presentation is missed, the weight will be transfered to the project write-up. A make-up will not be offered for the midterm test. If the midterm is missed, the weight will be distributed among the other individual-work components of the course.

6. Accommodation and Accessibility

Religious Accommodation
When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

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.

7. Academic Policies

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with policy,

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 e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

The midterm will be closed-book with no notes or electronic devices of any kind.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

In particular, any use of online sources for solutions to assignments strictly prohibited. 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 The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Only in the event of a switch to online learning, the midterm test will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

8. Support Services

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

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (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.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital/.
Additional student-run support services are offered by the USC, https://westernusc.ca/services/.