Western Science

Department of Mathematics

AM 1201B – Calculus & Probability with Biological Applications
Fall/Winter 2023-2024
Course Outline

1. Course Information

Course Name: Calculus & Probability with Biological Applications
Course Number: AM 1201B
Academic Term: FW23

Prerequisites: One or more of Calculus 1000A/B, Calculus 1500A/B, Mathematics 1225A/B, Numerical and Mathematical Methods 1412A/B, or the former Applied Mathematics 1412A/B.

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Counselling) 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

Students must use their Western (@uwo.ca) email addresses when contacting their instructors and put "AM 1201B" in the subject line in addition to other identifiers. Feedback on this course should be sought through office hours, in lecture, or via the math help centre. Remember to check announcements on our OWL page before contacting your instructor or the course coordinator. Issues related to the business of a given lecture section should be directed to the instructor associated to that section before involving the course coordinator. Instructors will endeavor to reply to student queries within five business days, although response times may be longer depending on the volume of emails received. It is your responsibility to ensure you raise your concerns in a timely manner.

Course Professors:

Dr. Lyle Muller
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Course Coordinator:

Dr. James Uren
Program Coordinator
Dept. of Mathematics
Office: MC125
Ext: 86839
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Office hours: Each instructor will offer weekly in-person consultation time and the details can be located on the OWL page associated to our course. It is important that you check OWL regularly for updates/changes to the scheduling of these times.

Extra Help: The Mathematics Department runs free in-person and virtual help centres each weekday during the semester, starting Monday January 22nd. Our help centre is located in the Math-Physics Accelerator in PAB 48/49/26 (on the lower level of the Physics and Astronomy Building.) These help centres are staffed by graduate student teaching assistants and all first-year mathematics courses are supported. No appointments are necessary.

Information about our help centre and other departmental supports for students can be found at:

https://www.uwo.ca/math/undergraduate/current_students/Help%20Centre.html

3. Course Description

From the Academic Calendar: Applications of integration, integration using mathematical software packages. Scaling and allometry. Basic probability theory. Fundamentals of linear algebra: vectors, matrices, matrix algebra. Difference and differential equations. Each topic will be illustrated by examples and applications from the biological sciences, such as population growth, predator-prey dynamics, age-structured populations.

Section	Dates	Time	Room	Professor
LEC 001	M, W, Th, F	8:30am – 9:30am	NSC-1	L. Wahl
LEC 002	M, W, Th, F	12:30pm – 1:30pm	UCC-146	L. Muller

LEC 003	M, W, Th, F	9:30am – 10:30am	TC-141	G. Wild

Learning Outcomes

• Provide a definition of the term “mathematical model” and describe the limitations inherent to various mathematical models.
• Use written information to develop mathematical models of biological scenarios by reasoning both directly and indirectly (i.e. recursively and non-recursively).
• Identify and critically evaluate key assumptions on which a mathematical model relies.
• Derive support for a mathematical model and make recommendations for model improvement when support cannot be found.
• Use models to support the scientific process by finding support for (or against) claims based on data.
• Use a computer language to carry our calculations or other functions related to a given modelling problem.
• Communicate, in writing, the conclusions derived from a mathematical model and limitations one must place on these conclusions.

Tentative Course Content Schedule

Week	Date	Topics	Reading
1	8-Jan	Course Outline, What is a model?	1.1
		Models from Simple Shapes. Scaling and Allometry	1.2
2	15-Jan	Recursive Modelling	1.2
3	22-Jan	What is a Differential Equation? Classifying and Solving DEs	2.1
		Linear Differential Equations	2.2
4	29-Jan	Applications of Linear Differential Equations	2.3
5	05-Feb	Logistic Growth and Bernoulli Substittion	2.3
		Phase-line plots	3.1
6	12-Feb	Intro to Probability	4.1, 4.2
7	17-Feb to 25-Feb	Reading Break	
8	26-Feb	What is a Random Variable?	5.1,5.2
		Pseudorandom variables and simulation	5.3
9	04-Mar	Expectation and variance	5.4
		Working with data	5.5
10	11-Mar	Functions of Vectors	6.3

		Functions of Vectors (including age-structured popns)	6.3
11	18-Mar	Eigenvalues and Eigenvectors	7.1, 7.2
12	25-Mar	Applications to age-structured populations	7.3
		Systems of differential equations	8.1
13	01-Apr	Systems of differential equations	8.2

Other Important Dates:

Classes begin: January 8, 2024.
Reading Week: February 17–25, 2024.
Classes end: April 8, 2024.
Exam Period: April 11-30 2024.

Contingency Plan

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

4. Course Materials

Course Text

Course notes are available as a series of free pdfs on OWL: http://owl.uwo.ca

Course Announcements

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.

All course material will be posted to OWL: http://owl.uwo.ca.

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

Students will be required to purchase a license for the Mobius online assessment platform. The cost of this license is approximately 35 CAD. Purchases can be made through links provided in OWL. Deferred payment options may be available. Licences cannot be purchased after April 30, 2024.

Gradescope (https://www.gradescope.ca/) will be used as a grading platform for written work in the course. A free account will be created on your behalf, although you will be required to verify the account and change the password during the first week of class. Details regarding the set-up of your account and the submission requirements for your written work will be posted on OWL. It is the responsibility of the student to ensure their homework assignments are submitted in the correct format (PDF or PNG.) Submitting work in an improper format may result in your work not being graded, and this cannot form the basis of a regrade request. Additionally, the term test may be scanned by the course staff and uploaded to Gradescope for grading and viewing.

Additionally, students will need:

- a laptop or computer;
- a stable internet connection;
- a working microphone and webcam;
- to have installed recent versions of Chrome AND Firefox browsers, a pdf reader, and Zoom on their computer;
- a device for scanning (either a scanner or an app that can be used in conjunction with your device's camera).
- A google account in order to access and create Colab Notebooks through colab.research.google.com. Alternatively, a student may opt to use a local install of Jupyter Notebooks by downloading and installing the free Anaconda data-science package available at https://www.anaconda.com/products/individual. The course and its resources, however, will focus solely on Colab.

Students without reliable access to YouTube must install an mp4 player on their computer so they may view video lessons. An up-to-date browser like Chrome will likely satisfy this requirement.

5. Methods of Evaluation

Applied Math 1201B is an in-person lecture-based course. Students are expected to attend all classes. A list of suggested exercises from the course text will be provided in OWL to supplement the weekly lessons. All of the evaluations (homework, quizzes, the midterm test, and exam) for Applied Math 1201B are based on the course material covered in weekly lectures.

The overall course grade will be calculated as listed below:

Assessment	**Format**	**Weighting**	**Date**
Assignments	Submitted Online	Two equally weighted assignments, each worth 6% of final grade	Assignment 1: February 15th at 11:59pm Assignment 2: March 22nd at 11:59pm
Quizzes	Online via Mobius	Five equally weighted assessments totaling 5% of final grade	Schedule of quizzes will be posted on the OWL site for the course. The first quiz will take place during the week of Jan 22.
Midterm Test	In-person	38%	Scheduled for Feb 28, 7pm until 9pm
Final Exam	In-person	45%	TBA (3 Hours)

- The midterm test will be 120 minutes in duration and will consist of a mixture of short answer and multiple-choice-style questions, covering the course material from weeks 1-6, inclusive. *This will be a closed book test and no calculators, electronic devices, or aids of any other kind will be permitted.*

- The make-up midterm is tentatively scheduled for March 6, 7-9pm.

- The final exam will be cumulative, 180 minutes in duration, and will consist of a mixture of short answer and multiple-choice-style questions. *This will be a closed book exam. No caclulators, electronic devices, or aids of any other kind are permitted for use during the midterm or the final exam.*

6. Student Absences

Students who experience an extenuating circumstance (illness, injury or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration. 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:

For work worth less than 10% of the total course grade (a homework assignment or quiz, for example) your LEC instructor is empowered to grant academic considerations without the need to contact counselling. To seek accommodations for work totaling less than 10% of your course grade please send an email to your LEC instructor as soon as you are able to do so.

Please note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. If your request for considerations requires supporting documents, as in the case of medically-based requests, then **all documentation required must be submitted to the Academic Counselling office of your Home Faculty, regardless of the weight of the assessment.**

Missing the due date of a submitted homework assessment or quiz will result in a grade of zero unless appropriate permission is sought and granted. For a missed homework assignment or quiz, your other homework or quiz marks will be re-weighted to exclude the missed assessment.

Assessments 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/academic_consideration.pdf.

The Student Medical Certificate is available at

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

In the case of a missed midterm, a common makeup test will be arranged. If a student misses the midterm and the corresponding makeup midterm and has appropriate permission for both, then the final exam will be re-weighted to include the weight of the missed term test.

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

7. 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://ssocas.uwo.ca/cas/login?service=https%3a%2f%2fedi.uwo.ca%2fimg%2f3754-2024-Diversity-Calendar-PDF.pdf

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.

8. 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. No calculators, electronic devices, or aids of any other kind are permitted for use during the midterm or the final exam.

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 the event of a health lockdown or other circumstances that prevent in-person operations, tests and examinations in this course 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.

9. 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.

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.

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/.