

AM 1201B – Calculus & Probability with Biological Applications Summer 2023 Course Outline

1. Course Information

Course Name: Calculus & Probability with Biological Applications
Course Number: AM 1201A
Academic Term: SU23

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 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 instructor and put “AM1201A” in the subject line and their name, student number, and section number in the body of the message. Feedback should be sought through student hours, in class, or via the math help centre. Remember to check announcements on our OWL page before contacting your instructor. We will endeavour 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 Staff:

Dr. James Uren
[coordinator]
Program Coordinator
Dept. of Mathematics
Email: juren2@uwo.ca

Student hours: Each week you will have an opportunity to drop in (virtually or in person) for questions about course material or general course support. A schedule of hours will be available on OWL following a student poll of preferred times.

Section	Dates	Time	Room	Professor
LEC 001	W	7pm – 10pm	Online	J. Uren

Extra Help: The Mathematics Department runs a free virtual help centre each Monday through Thursday during the summer semester, tentatively starting on May 15th. These help centre is staffed by graduate student teaching assistants and all first-year summer 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.

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	10-May	Course Outline, What is a model?	1.1
		Models from Simple Shapes. Scaling and Allometry	1.2
2	17-May	Recursive Modelling	1.2
		Recursive Modelling	1.2
3	24-May	What is a Differential Equation? Classifying and Solving DEs	2.1
		Linear Differential Equations	2.2
4	31-May	Applications of Linear Differential Equations	2.3
		Applications of Linear Differential Equations	2.3
5	07-Jun	Logistic Growth and Bernoulli Substitution	2.3
		Phase-line plots	3.1
6	14-Jun	Intro to Probability	4.1, 4.2
		Intro to Probability	4.2
7	21-Jun	What is a Random Variable?	5.1,5.2
		Pseudorandom variables and simulation	5.3
8	28-Jun	Expectation and variance	5.4
		Working with data	5.5
9	05-Jul	Functions of Vectors	6.3
		Functions of Vectors (including age-structured popns)	6.3
10	12-Jul	Eigenvalues and Eigenvectors	7.1
		Eigenvalues and Eigenvectors	7.2
11	19-Jul	Applications to age-structured populations	7.3
		Systems of differential equations	8.1
12	26-Jul	Systems of differential equations	8.2
		Systems of differential equations	8.2

Other Important Dates

First online lecture: May 10, 2023.

Last day to drop this course without penalty: June 12, 2023.

Classes end: July 28, 2023.

Examinations: July 31 – Aug 3, 2023.

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

Quizzes will be written on the WeBWork platform. This is free for all students in the course, and instructions regarding setup (which is minimal) will be available on OWL in advance of the first quiz.

Gradescope (<https://www.gradescope.ca/>) will be used as a testing/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. 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).
- Access to the free student iClicker app.
- 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.

Tests and the final exam will be conducted using the remote proctoring service **Proctortrack**. 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 that the session will be recorded.

More information about this remote proctoring service is available at <https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>. Information about the technical requirements are available at <https://www.proctortrack.com/tech-requirements/>

5. Methods of Evaluation

Applied Math 1201A is an online course with synchronous delivery of lecture material (online, via Zoom) and course content. Supplementary course material, including the course text, will be hosted on our course OWL site. Students are expected to attend lectures each week and complete various related activities posted on OWL— although you are permitted to schedule these additional activities during a given week in a way that is personally optimal. A list of suggested exercises from the text will be provided to supplement the weekly lessons. All of the evaluations (quizzes, assignments, the test, and exam) for Applied Math 1201A are based on the course material distributed in lecture and on our OWL site.

Additionally, your instructor will host virtual student office hours each week to give you a chance to review and expand on the lesson(s). You are strongly encouraged to make an attempt to visit with your instructor during their office hours, especially when you have questions or concerns about the course material.

The overall course grade will be calculated as listed below:

Assessment	Format	Weighting	Date
Assignments	Submitted Online via Gradescope	Two equally weighted assignments, each worth 7% of final grade	Assignment 1: June 2 nd at 11:59pm (tentative.) Assignment 2: July 14 th at 11:59pm (tentative.)
Quizzes	Online via WeBWork	Best five of six equally weighted assessments totaling 10% of final grade	Schedule of quizzes will be posted on the OWL site for the course.
Midterm Test	Online via Gradescope	36%	Tentatively scheduled for June 9 th , 7pm until 9pm
Final Exam	Online via Gradescope	40%	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. The midterm will take place on Gradescope using Proctortrack. *This will be a closed book test. No notes, calculators, or other aids will be permitted.*
- The make-up midterm is tentatively scheduled for June 15, 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. The final exam will take place on Gradescope using Proctortrack. *This will be a closed book exam. No notes, calculators, or other aids will be permitted.*

Class Participation Bonus: each week in class a period of time will be devoted specifically to problem solving and review, and students will have the opportunity to contribute to the online discussion via iClicker (or other similar means.) Credit for participation is given regardless of correctness, and students who participate in at least 50% of these class activities can replace their worst overall quiz score with a perfect score before the overall best five of six quiz grades are selected.

Academic Integrity: While we strongly encourage peer discussion of the course material and related problems, *students are expected to complete all assessments in this course individually.* It is not permitted to submit work taken from an external source without proper citation, *and it is not permitted in any circumstance to submit work generated by another intelligence (human or artificial) as your own.*

6. Student Absences

Academic Consideration for 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 through the following routes:

- (i) For work worth less than 10% of the total course grade (a homework assignment, 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 in a timely manner.
- (ii) For medical absences, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to the Academic Counselling office of their Faculty of Registration.
- (iii) Submitting appropriate documentation for non-medical absences to the Academic Counselling office in their Faculty of Registration.
- (iv) 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.

Students should also 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. **All documentation required for absences must be submitted to the Academic Counselling office of a student's Home Faculty.**

Accommodated Evaluations

Missing a test or the due date of a submitted homework assessment or quiz will result in a grade of zero unless appropriate permission is sought and granted. In the case of homework assignments and quizzes your mark will be re-weighted to exclude the missed assessment. In the case of a missed midterm, a common makeup test will be arranged. If a student misses a term test and the corresponding makeup test 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://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.

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 his/her official university address is attended to in a timely manner.

The use of calculators and other electronic devices during the term test or final exam is prohibited.

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.

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

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 your 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/>.