

AM 1201B – Calculus & Probability with Biological Applications

Fall/Winter 2024-2025

Course Outline

1. Course Information

Course Name: Calculus & Probability with Biological Applications
Course Number: AM 1201B
Academic Term: FW24

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.

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 20th. Our help centre is in the Math-Physics Accelerator in PAB 48/49 (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 Syllabus, Schedule, Delivery Mode

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

Upon successful completion of this course, students will be able to:

- 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 out 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.

Course Content Schedule

Week	Date	Topics	Reading
1	6-Jan	Course Outline, What is a model?	1.1
		Models from Simple Shapes. Scaling and Allometry	1.2
2	13-Jan	Recursive Modelling	1.2
3	20-Jan	What is a Differential Equation? Classifying and Solving DEs	2.1
		Linear Differential Equations	2.2
4	27-Jan	Applications of Linear Differential Equations	2.3
5	03-Feb	Logistic Growth and Bernoulli Substitution	2.3
		Phase-line plots	3.1
6	10-Feb	Intro to Probability	4.1, 4.2
7	15-Feb to 23-Feb	Reading Break	
8	24-Feb	What is a Random Variable?	5.1,5.2
		Pseudorandom variables and simulation	5.3
9	03-Mar	Expectation and variance	5.4
		Working with data	5.5
10	10-Mar	Functions of Vectors	6.3
		Functions of Vectors (including age-structured popns)	6.3
11	17-Mar	Eigenvalues and Eigenvectors	7.1, 7.2
12	24-Mar	Applications to age-structured populations	7.3
		Systems of differential equations	8.1
13	31-Mar	Systems of differential equations	8.2

**The above schedule is *tentative*, and minor adjustments may be made as the course progresses.

Classes begin: January 6, 2025

Spring Reading Week: February 15 – 23, 2025

Classes end: April 4, 2025

Exam period: April 7 – 30, 2025

4. Course Materials

Required Text:

Course notes are available as a series of free pdfs on OWL (<https://westernu.brightspace.com/>)

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly 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 Brightspace 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 during the second week of classes. Deferred payment options may be available. ***When registering your license make sure to use your @uwo.ca email address and have your Student ID ready.*** Licenses cannot be purchased after April 4, 2025.

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 documents to upload to Gradescope (either a scanner or an app that can be used in conjunction with your device's camera).

Students will need to create a free iClicker account using your Western email address. Please refer to the instructions at <https://presswestern.uwo.ca/> . If you already have an iClicker account, please go

into the settings and verify that it uses your uwo.ca email address. This software will be used during class lectures to gauge participation, solicit feedback, and for other Q and A.

All other course material will be posted to OWL: <https://westernu.brightspace.com/>

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
Submitted Homework	Online, asynchronous, via Gradescope	Two equally weighted written assignments totaling 12% of final grade.	The two assignments will be February 14 th and March 14 th , respectively
Quizzes	Online, asynchronous, via WebAssign	Best five of six equally weighted short assessments totaling 10% of final grade.	Due dates are posted on OWL, with the first quiz open during the week of Jan 20 th .
iClicker Lecture Questions	In Class, via iClicker	4%	
Midterm Test	In-person	34%	Thursday February 27 th , 7pm until 9pm.
Final Exam	In-person	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, 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 Thursday March 6th, 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 and no calculators, electronic devices, or aids of any other kind will be permitted.*

General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- The Final Exam (scheduled by the Office of the Registrar)
- The Midterm (tentatively scheduled for Feb 27, 7pm to 9pm)

When a student mistakenly submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

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.

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

Coursework with Assessment Flexibility

By policy, instructors may deny Academic Consideration requests for the following assessments with built-in flexibility:

Flexible Completion

Quizzes. This course has 6 quizzes, and the 5 quizzes with the highest marks are counted towards your final grade. Should extenuating circumstances arise, students do not need to request Academic Consideration for the first missed quiz. Academic consideration requests will be denied for the first missed quiz. Academic Consideration requests may be granted when students miss more than one quiz, and these additional (2nd, 3rd, 4th...) missed quizzes will be reweighted to the final exam.

Missed Lectures (iClicker Questions):

Students will be marked on participation only using iClicker. Your score is based on the % of questions you answer, not the % of questions you get correct:

At least 80% = 4/4; 70–79% = 3.2/4; 60–69% = 2.4/4; 50–59% = 2/4; 40–49% = 1.6/4; Less than 40% = 0

In order to receive any credit for the iClicker component, you must:

- Create a free iClicker account using your Western email address. Please refer to the instructions at <https://presswestern.uwo.ca/> . If you already have an iClicker account, please go into the settings and verify that it uses your uwo.ca email address.
- Attend, and answer iClicker questions at lectures.
- If your web-enabled device is not working properly, try refreshing the page or restarting the app. It is your responsibility to ensure that your device is working properly.

We understand that you will not be able to attend class from time to time. Therefore, the participation-based iClicker marking scheme was designed to take into account the occasional missed class. Accordingly, iClicker marks will not be adjusted for the occasional missed class. If you have a long-term absence (three or more consecutive classes) that is supported by academic consideration, then your iClicker marks will be adjusted to take your long absence into account.

Deadline with a No-Late-Penalty Period

Assignments. Students are expected to submit each of the assignments by the deadline listed. Should extenuating circumstances arise, students do not need to request Academic Consideration and they are permitted to submit their assignment up to 48 hours past the deadline without a late penalty. Should students submit their assessment beyond 48 hours past the deadline, a late penalty of 20% per day will be applied, although assignments submitted more than 96 hours past the deadline will not be accepted. Academic Consideration requests may be granted only for extenuating circumstances that started before the deadline and lasted longer than the No-Late-Penalty Period. Students who receive academic consideration lasting longer than the No-Late-Penalty Period will have the weight of the relevant assignment shifted to the final exam.

6. Additional Statements

Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

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.

Academic Policies

The website for Registrar Services is <https://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 electronic devices of any kind are permitted during the midterm test or final examination for this course.

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:

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

In the event of a health lockdown or any other university-declared emergency that requires some or all of the course to be delivered online, 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>.

Support Services

Please visit the Science & Basic Medical Sciences Academic Advising 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 Learning Development and Success (<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/>.