

AM 1201B – Calculus & Probability with Biological Applications

Fall/Winter 2021-2022

Course Outline

1. Course Information

Course Name: Calculus & Probability with Biological Applications
Course Number: AM 1201B
Academic Term: FW21

Section	Dates	Time	Room	Professor
Lecture (LEC 200) ONLINE	Asynchronous	N/A	N/A	N/A
Tutorial (TUT 002)	M/W	8:30am – 9:30am	MC-105B**	X. Zou
Tutorial (TUT 003)	Tu/Th	8:30am – 9:30am	SSC-2028**	G. Wild
Tutorial (TUT 004)	W/F	8:30am – 9:30am	SSC-2029**	G. Wild
Tutorial (TUT 005)	M/W	9:30am – 10:30am	SSC-2024**	N. Kiriushcheva
Tutorial (TUT 006)	Tu/Th	9:30am – 10:30am	SSC-2024**	N. Kiriushcheva
Tutorial (TUT 007)	Tu/F	11:30am – 12:30pm	MC-105B**	L. Muller
Tutorial (TUT 008)	Tu/F	12:30pm – 1:30pm	NS-7**	B. Boudreaux
Tutorial (TUT 009)	M/Th	1:30pm – 2:30pm	SSC-2024**	B. Boudreaux
Tutorial (TUT 010)	Tu/Th	7:00pm – 8:00pm	SSC-2028**	L. Muller
Tutorial (TUT 011)	M/W	4:30pm – 5:30pm	SSC-2032**	X. Zou

****NOTE:** In accordance with university policy, the course meetings will be held online (using Zoom) beginning January 10th, 2022. Specific details for your professor's classes will be sent via OWL announcements and posted on the main OWL site for the course (APPLMATH 1201B 200 FW21.) Lectures will return to an in-person format as soon as it is permitted, but not before January 31st, 2022.

Prerequisites: One or more of Calculus 1000A/B, Calculus 1500A/B, or Mathematics 1225A/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 instructors and put “AM1201B” in the subject line and their name, student number, and section number in the body of the message. Feedback should be sought through office hours, in tutorial, or via the math help centre. Remember to check announcements on our OWL page before contacting your instructor. Instructors 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:

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Dr. James Uren
[coordinator]
Program Coordinator
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Office hours: Each instructor will offer some weekly consultation time and the details will be located on the OWL page for our class. These office hours will be online (Zoom/MS Teams) until January 31st, and it is important that you check OWL regularly for updates/changes to the scheduling of these times.

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 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.

Tentative Course Content Schedule

Week	Date	Tut	Topics	Reading
1	10-Jan	1	Course Outline, What is a model?	1.1
		2	Models from Simple Shapes. Scaling and Allometry	1.2
2	17-Jan	1	Recursive Modelling	1.2
		2	Recursive Modelling	1.2
3	24-Jan	1	What is a Differential Equation? Classifying and Solving DEs	2.1
		2	Linear Differential Equations	2.2
4	31-Jan	1	Applications of Linear Differential Equations	2.3
		2	Applications of Linear Differential Equations	2.3
5	07-Feb	1	Logistic Growth and Bernoulli Substitution	2.3
		2	Phase-line plots	3.1
6	14-Feb	1	Intro to Probability	4.1, 4.2
		2	Intro to Probability	4.2
7	21-Feb		READING BREAK	
8	28-Feb	1	What is a Random Variable?	5.1,5.2
		2	Pseudorandom variables and simulation	5.3
9	07-Mar	1	Expectation and variance	5.4
		2	Working with data	5.5
10	14-Mar	1	Functions of Vectors	6.3
		2	Functions of Vectors (including age-structured popns)	6.3
11	21-Mar	1	Eigenvalues and Eigenvectors	7.1
		2	Eigenvalues and Eigenvectors	7.2

12	28-Mar	1	Applications to age-structured populations	7.3
		2	Systems of differential equations	8.1
13	04-Apr	1	Systems of differential equations	8.2
		2	Systems of differential equations	8.2

Other Important Dates

Classes begin: January 10, 2022.

Reading Week: February 19–27, 2022.

Classes end: April 8, 2022.

Study Day: April 9, 2022.

Exam Period: April 10-30 2022.

COVID Contingency plan

In the event of a COVID-19 resurgence during the course that necessitates another delay to in-person classes, we will continue to deliver TUT sessions online via Zoom. The times for these synchronous meetings will coincide with those listed in the timetable. The nature of the quizzes and assignments will remain the same. The grading scheme will **not** change. Any remaining term tests will also be conducted online as determined by the course staff.

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 30 CAD. Purchases can be made through links provided in OWL. If you have an existing license that you used in Calculus 1000A FW21, then you do not need to purchase another one. When registering your license make sure to use your @uwo.ca email address and have your Student ID ready. Deferred payment options may be available. Licences cannot be purchased after April 30, 2021.

Gradescope (<https://www.gradescope.ca/>) may 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. 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 a blended course with asynchronous online delivery of lecture material and course content. Students are expected to attend lectures by completing various activities posted on OWL for a given week. although you are permitted to schedule these activities during a given week in a way that is personally optimal. A list of suggested exercises from the text will be provided in OWL to supplement the weekly lessons. All of the evaluations (homework, quizzes, tests, and exam) for Calculus 1000A are based on the course material distributed in this manner.

Additionally, your professor will host classes each week to review and expand on the lesson(s). These classes may take the form of a supplementary lecture, problem session, or a discussion, depending on the week, but will always be scheduled to conclude within your allotted tutorial time.

The overall course grade will be calculated as listed below:

Assessment	Format	Weighting	Date
Assignments	Submitted Online	Two equally weighted assignments, each worth 5% of final grade	Assignment 1: February 17 th at 11:59pm. Assignment 2: March 18 th at 11:59pm.
Quizzes	Online via Mobius	Five equally weighted assessments totaling 10% of final grade	Bi-Weekly (varies)
Midterm Test	In-person	35%	Tentatively scheduled for March 2, 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. *This will be a closed book test.*
- 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.*

Accommodated Evaluations

Missing a quiz, term test, the final exam, or the due date of a submitted homework assessment will result in a grade of zero unless appropriate permission is sought and granted (see section 6 below.) In the case of quizzes and homework assignments your mark will be re-weighted to exclude the missed assessment. In the case of a missed midterm test, a common makeup test will be arranged. If a student misses the midterm 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 midterm test.

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) Submitting a Self-Reported Absence (SRA) form provided that the conditions for submission are met. To be eligible for a Self-Reported Absence:
 - an absence must be no more than 48 hours
 - the assessments must be worth no more than 30% of the student's final grade
 - no more than two SRAs may be submitted during the Fall/Winter term
- (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.

Note that in all cases, students are required to contact their instructors within 24 hours of the end of the period covered, unless otherwise instructed in the course outline.

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 that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For the policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs, see:

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

and for the Student Medical Certificate (SMC), see:

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

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>.

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).

7. Accommodation and Accessibility

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD), 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 tests 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.

In the event of a health lock-down 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/>.

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 (519) 661-2147 if you have any questions regarding accommodations.

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/>.

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.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.

Students who are in emotional/mental distress should refer to Mental Health@Western (<http://www.health.uwo.ca/mentalhealth>) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.