

AM 1201B – Calculus & Probability with Biological Applications

Fall/Winter 2020-21

1. Course Information

Course Information

Course Name: [Calculus & Probability with Biological Applications](#)

Course Number: [AM 1201B](#)

Academic Term: [FW 2020-21](#)

Lecture Times: [Asynchronous, online](#)

Tutorials: [Synchronous, online](#)

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|-------------------------|-----------------------|--------------------------------------|-----------------------------|
| Sec 002 | M/W | 8:30 am to 9:20 am | Wild |
| Sec 003 | Tu/Th | 8:30 am to 9:20 am | Kharche |
| Sec 004 | W/F | 8:30 am to 9:20 am | Kharche |
| Sec 005 | M/W | 9:30 am to 10:20 am | Pattenden |
| Sec 006 | Tu/Th | 9:30 am to 10:20 am | Ghorbanpour |
| Sec 007 | Tu/F | 11:30 am to 12:20 pm | Pattenden |
| Sec 008 | Tu/F | 12:30 pm to 1:20 pm | Pattenden |
| Sec 009 | M/Th | 1:30pm to 2:20 pm | Pattenden |
| Sec 010 | Tu/Th | 7:00 pm to 7:50 pm | Ghorbanpour |

List of Prerequisites [One or more of Calculus 1000 A/B, Calculus 1500 A/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 “AM 1201B” in the subject line in addition to other identifiers. Email correspondence should be limited to “housekeeping” matters. Feedback on mathematics should be sought during office hours or through tutorials. It is best to consult the Forums and FAQs on OWL before contacting your instructor or the course coordinator. Issues related to the business of a given tutorial group should be addressed with the instructor associated with that tutorial before involving the coordinator. Instructors will endeavor to reply to queries from students within five business days, but response times may be longer depending on the volume of emails received.

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3. Course Syllabus, Schedule, Delivery Mode

Calendar Description

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.

Course-Level 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.

Activities

Each week AM 1201B students will complete some number of asynchronous lessons online (via OWL) and will participate in one problem session and one synchronous lab activity. Both problem sessions and lab activities will take place online and will occur (synchronously) during scheduled Tutorial times. Students may attend only the synchronous activities associated with their designated Tutorial group. Problem sessions will focus on solving exercises related to the past week's topics that have been either submitted by students or selected by instructors. Labs, on the other hand, will typically involve on a planned activity related to the topic of the week. Students will be required to prepare in advance for labs, by completing certain asynchronous lessons before Wednesday of each week.

Schedule of Activities

| Module 1 – Modelling and Differential Equations | | | | |
|---|--|--------------------------------|---|--|
| Week | Topic | Number of Asynchronous Lessons | Problem Session (1st Tutorial of the week) | Lab Activity (2nd Tutorial of the week) |
| 1 (01/11) | Ch 1, Modelling Basics | 2 + Intro to Python lesson | Problems submitted by students (recent material) | Allometry and Python activities |
| 2 (01/18) | Ch 2, Differential Equations | 3 | “ | A linear, first-order differential equation |
| 3 (01/25) | Ch 2, Nonlinear Differential Equations | 2 | “ | Population growth and Allee effects |
| 4 (02/01) | Ch 3, Numerical Methods for Differential Equations | 2 + Loops in Python lesson | “ | Implementing Euler's method in Python |
| Module 2 – Probability and Random Variables | | | | |
| Week | Topic | Number of Asynchronous Lessons | Problem Session (1st Tutorial of the week) | Lab Activity (2nd Tutorial of the week) |
| 5 (02/08) | Ch 4, Intro to Probability | 3 | Problems from previous weeks (1 st midterm prep) | Problems from previous weeks (1 st midterm prep). No planned activity |
| 6 (02/15) | Reading Break | | | |
| 7 (02/22) | Ch 5, Random Variables | 3 | Problems submitted by students (recent material) | Integration using random numbers |
| 8 (03/01) | Ch 5, Working with Data | 2 | “ | Estimating the probability of a type-II error |

| Module 3 – Vectors and Vector-Valued Functions | | | | |
|--|--|--------------------------------|---|--|
| Week | Topic | Number of Asynchronous Lessons | Problem Session (1st Tutorial of the week) | Lab Activity (2nd Tutorial of the week) |
| 9 (03/08) | Ch 6, Intro to vectors and vector-valued functions | TBA | Problems from previous weeks (2 nd midterm prep) | Problems from previous weeks (2 nd midterm prep) No planned Activity |
| 10 (03/15) | Ch 6, Eigenvalues and eigenvectors | TBA | Problems submitted by students (recent material) | Growth of an age-structured population |
| 11 (03/22) | Ch 7, Non-negative matrices | TBA | “ | Principal Components Analysis |
| 12 (03/29) (Good Fri) | Ch 8, Systems of Differential Equations | TBA | Problems from previous weeks (final exam prep) | Problems from previous weeks (final exam prep) No planned activity |
| 13 (04/05) | Wrap up Ch 8 and Review | | | |
| Classes End April 12 | | | | |

4. Course Materials

Course Text

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

Course Announcements

Students should check OWL (<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. Students are responsible for checking OWL on a regular basis.

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

If students need assistance, 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 the license is approximately 30 CAD. Purchases can be made through links provided in OWL. 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. Licenses cannot be purchased after April 11, 2021.

In addition, students will need:

- a reliable high-speed internet connection;
- a computer with working microphone and webcam;
- to have installed recent versions of Chrome AND Firefox browsers, a pdf reader, and Zoom on their computer;
- 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

| | | |
|---------------------|------|---------------------------------|
| Student Preparation | 20 % | |
| Lab Participation | 10 % | |
| Short Essay 1 | 5 % | Due Thurs Feb 11 at 11:59:59 pm |
| Short Essay 2 | 5 % | Due Thurs Apr 8 at 11:59:59 pm |
| Midterm Test 1 | 15 % | TBA |
| Midterm Test 2 | 15 % | TBA |
| Final Exam | 30 % | Scheduled by the Registrar |

Student Preparation 20 %

Following most lessons, students will be expected to complete a formative assessment (aka quiz) via Mobius. These quizzes are meant to test and develop understanding, but timely completion of quizzes is a must for good lab preparation and learning in general. **You must access quizzes through OWL** else your grades will not be recorded.

Students will have multiple opportunities to complete each quiz, but a time delay between distinct attempts may be imposed. To incentivize preparation for lab activities, the final for-credit attempt for the relevant quizzes must be *completed* before each Tuesday at 11:59:59 pm (specifics will be provided with each quiz). Each Wednesday at 00:00:00, the best score received on relevant quiz or quizzes will be recorded as the official grade for that quiz.

Only the best two-thirds of grades received on quizzes before Reading Break (rounded down to the nearest integer) and the best two-thirds of grades received on quizzes after Reading Break (again, rounded down to the nearest integer) will count toward a student's final grade. Students seeking accommodation beyond this *may* be given the opportunity to complete a 750-word essay related to the topic of a missed quiz. Each quiz grade counted will contribute equally to the overall evaluation of student preparation.

Lab Participation 10%

Active participation in lab activities supports learning. Attendance at labs in weeks where planned activities have been scheduled will serve as the key measure of student participation. Attendance will be recorded through Zoom and it is the student's responsibility to ensure their correct name is visible to an instructor. Students who arrive to a lab late or leave early may not be awarded a participation grade for the corresponding activity.

There are 8 planned lab activities throughout the term. A student's best 6 lab participation grades will count toward their participation grade. Students seeking accommodation beyond this *may* be given the opportunity to complete a 750-word essay related to the topic of a missed lab activity. Each participation grade counted will contribute equally to the overall evaluation of lab participation.

Short Essays 2 @ 5% each

Students will complete two short essay-style responses to assigned mathematical problems: one page, 1-inch margins, 1.5 spacing, 12pt Times New Roman font. Grades will be based on mathematical correctness, style, spelling, grammar, clarity, and organization.

Essay 1 is due on Thurs Feb 11 at 11:59:59 pm and Essay 2 is due on Thurs Apr 8 at 11:59:59 pm. Essays will be submitted through Turnitin. Late submissions will be penalized at a rate of 1% (out of the 5% available) per day.

Midterm Tests 2 @ 15 % each

Students will complete two Midterm Tests. Each test will be conducted using Mobius and will be supervised via Proctortrack. Midterm Tests will last about two-hours, individual questions will be time-limited, and students will be required to answer questions in a specified order.

Midterm Test 1 will take place on TBA and will cover Module 1. Midterm Test 2 will take place on TBA and will cover Module 2. Make-up tests for students with approved accommodations will occur about one week following the originally scheduled date.

It is the student's responsibility to complete the Proctortrack onboarding on or before January 31.

Final Exam 30%

The Final Exam will be conducted using Mobius and will be supervised via Proctortrack. The final exam will be cumulative, it will be three hours, individual questions will be time-limited, and students will be required to answer questions in a specified order.

Accommodated Evaluations

As explained above, students need not complete all quizzes to receive full credit for Preparation: only a certain number of quizzes needs to be completed during the term.

As explained above, students need not attend every lab activity to receive full credit for Participation: the best 6 of 8 grades count toward their overall evaluation.

As explained above, late essay submissions will be accepted but will be penalized at a rate of 1% (out of 5%) per day. Essay topics will be posted well in advance of the deadlines.

Accommodations may be made for internet outages, and ProctorTrack malfunctions. However, accommodation is at the discretion of the instructor and may not involve permission to sit a make-up evaluation.

Final course grades will not be rounded up. For example, instructors will not entertain requests to change an earned 64 to a 65, or increase an earned 79 to an 80.

6. 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 Academic Accommodation for Students with Disabilities policy can be found at: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the semester, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

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 policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs, see: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf and for the Student Medical Certificate (SMC), see: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the Western Multicultural Calendar:

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

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

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 Academic Calendar for details (under [Special Examinations](#)).

7. Academic Policies

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

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, 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.

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, all remaining 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.

All of the remote learning sessions for this course will be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

[Tests and Exams in this course will be “closed book.” Use of notes, texts, electronic devices, etc. will not be permitted during these evaluations.](#)

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.

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>).

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 the remote proctoring service, such as 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 the session will be **recorded**. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link: <https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>

Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements are available at the following link: <https://www.proctortrack.com/tech-requirements/>

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link: <https://support.zoom.us/hc/en-us>

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please provide this information to the instructor in advance of the test or examination.

8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop 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 Student Accessibility Services (SAS) 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/mental_health) 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>.