UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Biological Sciences
BI 186
403 220-5261
biosci@ucalgary.ca

COURSE OUTLINE

1. **Course:** BIOL 315, Quantitative Biology I - Fall 2021

   Lecture 01: MWF 14:00 - 14:50 in ENA 103

Instructor	Email	Phone	Office	Hours
Dr Ariane Cantin	acantin@ucalgary.ca	NA	BI 446	Monday 2-3PM / 15 min after synchronous activities / By appointment

In Person Delivery Details:

There will be an **in person team lecture application activity** for each module (see schedule for exact dates). These sessions will not be recorded. Lab sections 1-3 will meet on Wednesdays, and lab sections 4-6 will meet on Fridays.

Labs will be in person following the registrar's schedule. Labs will not be recorded.

Re-Entry Protocol for Labs and Classrooms:

To limit the spread of COVID-19 on campus, the University of Calgary has implemented safety measures to ensure the campus is a safe and welcoming space for students, faculty and staff. The most current safety information for campus can be found here. **Online Delivery Details:**

Some aspects of this course are being offered in real-time via scheduled meeting times. For those aspects you are required to be online at the same time.

To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

Lecture material will be delivered asynchronously through recorded videos posted on D2L on the first Monday of each module (see schedule for exact dates).

Before each module quiz there will be a **synchronous review session on Zoom** (see schedule for exact dates). This session is not mandatory and will not be recorded.

Course Site:

D2L: BIOL 315 L01-(Fall 2021)-Quantitative Biology I

Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

   See section 3.5.C in the Faculty of Science section of the online Calendar.

   Prerequisite(s):
   Biology 241 and 243.

3. **Grading:**

   The University policy on grading and related matters is described in F.1 and F.2 of the online University Calendar.

   In determining the overall grade in the course the following weights will be used:

	Element	%
Individual	Quizzes (best 4 out of 5 quizzes, 4*12.5%)	50
	Final Portfolio - Individual Component	10
	Lab Assignments (5*5%)	25
	Peer Evaluations	0.75
Team*	Lecture Applications Activities (7*0.5%)	3.5
	Final Portfolio - Team Component	10
	Team Contract	0.75

See details about all elements on D2L.

Quiz Schedule

Quiz 1: Modules 1&2 – October 1st

Quiz 2: Module 3 – October 15th

Quiz 3: Module 4 – October 29th

Quiz 4: Module 5 – November 19th

Quiz 5: Modules 6&7 – December 8th

* At the end of the term, each student will evaluate the contributions of the other members of his/her/their team (peer evaluation). All team members will get a "peer score" based on the final peer evaluation. The peer score for a student is the average rating of the student, divided by the overall average rating for all members of the team. This provides a way to evaluate the relative contributions of each team member to the team's work. Each student's total teamwork mark will be multiplied by his/her/their peer score to determine his/her/their final mark for the teamwork component of the course (14.25% of final grade).

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

The University of Calgary offers a flexible grade option, Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade

4. **Missed Components Of Term Work:**

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, one possible arrangement is that the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

Lab assignments that are turned in up to 24 hours after the due date will receive 80% of the marks earned, unless an extension is granted. Lab assignments turned in more than 24 hours after the due date will receive no marks, unless an extension has been granted.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Required Textbook(s):

Michael Whitlock and Dolph Schluter, *The Analysis of Biological Data, 2nd or 3rd Edition*: Macmillan Learning.

Some teamwork resources are provided by ITP Metrics, a University of Calgary-based system of secure web-based tools for forming teams and doing peer evaluations. These tools are free to all students and are not dependent on prior access.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC ELearning online website.

7. **Examination Policy:**

Students' quiz grade will be based on their best 4 out of 5 quizzes (Quizzes: Modules 1&2, Module 3, Module 4, Module 5, Modules 6&7 - dates in schedule).

Quizzes will designed to take ~30 min to complete and students will have 60 min to complete each quiz to account for any technical issues. Quizzes will be available on D2L for a period of 24 hours.

Students may consult their notes, textbook, and other course materials during quizzes.

Students are prohibited from working with or contacting any other individuals while completing quizzes, including accessing internet resources such as shared documents (Google docs and other file sharing systems) or chat servers (Discord, WhatsApp, etc.). Violation of these rules is considered academic misconduct with penalties as described in the University Calendar section K.

Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section E.2 of the University Calendar.

10. **Human & Living Organism Studies Statements:**

Students will not participate as subjects or researchers in human studies.

See also Section E.5 of the University Calendar.

STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS. Students taking laboratory and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

Students are expected to be familiar with Section SC.4.1 of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See Section I.3 of the University Calendar.

a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections I.1 and I.2 of the University Calendar

b. **Final Exam:**The student shall submit the request to Enrolment Services. See Section I.3 of the University Calendar.

12. **Other Important Information For Students:**

a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).

b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.

c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at 403-220-2208. The complete University of Calgary policy on sexual violence can be viewed at (https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Sexual-and-Gender-Based-Violence-Policy.pdf)

d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional Code of Conduct and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

Student Handbook on Academic Integrity
Student Academic Misconduct Policy and Procedure
Research Integrity Policy

Additional information is available on the Student Success Centre Academic Integrity page

e. **Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the Request for Academic Accommodation Form and sending it to Lisa Gieg by email lmgieg@ucalgary.ca

preferably 10 business days before the due date of an assessment or scheduled absence.

f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see Legal Services website.

g. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: ombuds@ucalgary.ca.

h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction (USRI) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or non-academic misconduct, in addition to any other remedies available at law.

Module	Date		Class	Lab	Assignments Due
Introduction to the course	**Sept**	**8**	Synchronous Q&A with Instructor + *Introduction to the course videos posted on D2L - Asynchronous*	**No Lab**	**No assignment due**
		10	Practice Quiz - Available on D2L		
1: Descriptive Statistics and Estimating with Uncertainty		**13**	Module 1: *Lecture videos posted on D2L - Asynchronous*	**Lab 1:** Skills 1 - 2	**No assignment due**
		15	Module 1: In-person synchronous lecture team activity lab sections 1-3	**Orientation to the lab and R**	
		17	Module 1: In-person synchronous lecture team activity lab sections 4-6		
2: Hypothesis Testing & Statistical Inference & Experimental Design		**20**	Module 2: *Lecture videos posted on D2L - Asynchronous*	**Lab 2**: Skills 3 - 5	**Portfolio Individual Intro DUE: Sept 24 @ 4:30 pm**
		22	Module 2: In-person synchronous lecture team activity lab sections 1-3	**Descriptive Statistics & Importing data into R**	
		24	Module 2: In-person synchronous lecture team activity lab sections 4-6		
		27	No activity	**No Lab**	**No assignment due**
		29	Modules 1 & 2: Zoom synchronous review session		
	Oct	**1**	**Modules 1 & 2 Quiz - Available on D2L 24hrs**		
3: Proportions and Frequencies		**4**	Module 3: *Lecture videos posted on D2L - Asynchronous*	**Lab 3**: Skills 6 -10	**1: Summary Statistics & Visualization in R (5%) DUE: Oct 8 @ 4:30 pm**
		6	Module 3: In-person synchronous lecture team activity lab sections 1-3	**Data Visualization & Exploratory Data Analysis**	
		8	Module 3: In-person synchronous lecture team activity lab sections 4-6		
		11	**STAT**	**Lab 4**: Skills 11 -12	**No assignment due**
		13	Module 3: Zoom synchronous review session	**Analysis of Frequency Data**	
		15	**Module 3 Quiz - Available on D2L 24hrs**		
4: Comparing Numerical Variables		**18**	Module 4: *Lecture videos posted on D2L - Asynchronous*	**Portfolio & Assignment catch-up**	**2: Analysis of Frequency data (5%) + Wrapper 1 DUE: Oct 22 @ 4:30 pm**
		20	Module 4: In-person synchronous lecture team activity lab sections 1-3		
		22	Module 4: In-person synchronous lecture team activity lab sections 4-6		
		25	No activity	**Lab 5**: Skill 13-14 **t-tests: single, paired**	**No assignment due**
		27	Module 4: Zoom synchronous review session		
		29	**Module 4 Quiz - Available on D2L 24hrs**		
5: Comparing 2 or more Means	**Nov**	**1**	Module 5: *Lecture videos posted on D2L - Asynchronous*	**Lab 6**: Skills 15-17	**3: t-tests (5%) + Wrapper 2 DUE: Nov 5 @ 4:30 pm**
		3	Module 5: In-person synchronous lecture team activity lab sections 1-3	**ANOVA, Post-hoc Tukey's test & Assumptions**	
		5	Module 5: In-person synchronous lecture team activity lab sections 4-6		
		8	**Reading Week**	**No Lab**	**No assignment due**
		10			
		12			
		15	No activity	**Portfolio & Assignment catch-up**	**4: ANOVA, Tukey's HSD (5%) + Wrapper 3 DUE: Nov 19 @ 4:30 pm**
		17	Module 5: Zoom synchronous review session		
		19	**Module 5 Quiz - Available on D2L 24hrs**		
6: Regression and Correlation		**22**	Module 6: *Lecture videos posted on D2L - Asynchronous*	**Lab 7**: Skills 18- 21	**5: Regression & assumption violations (5%) DUE: Nov 26 @ 4:30 pm**
		24	Module 6: In-person synchronous lecture team activity lab sections 1-3	**Linear Regression & Assumption Violations**	
		26	Module 6: In-person synchronous lecture team activity lab sections 4-6		
7: Dealing with assumption violations: transformations & permutation tests		**29**	Module 7: *Lecture videos posted on D2L - Asynchronous*	**Portfolio catch-up**	**Wrapper 4 DUE: Dec 3 @ 4:30 pm**
		1	Module 7: In-person synchronous lecture team activity lab sections 1-3		
		3	Module 7: In-person synchronous lecture team activity lab sections 4-6		
	Dec	**6**	Modules 6 & 7: Zoom synchronous review session	**Lab 8:** All Skills	**Final Portfolio (20%) *Including Wrapper 5 DUE: Dec 9 @ 11:59 pm**
		8	**Modules 6 & 7 Quiz - Available on D2L 24hrs**	**Portfolio wrap-up**	

Course Outcomes:

- Describe and calculate basic descriptive statistics for measures of central tendency, distribution shape, and spread
- Describe the process of hypothesis testing and given a statement of a research question, construct an appropriate null and alternative hypothesis to use for hypothesis testing

- List biological variables that follow a binomial and Poisson distribution and use the binomial and Poisson probability equations to determine the probability of certain ‘events’
- Use the Poisson distribution to test a null hypothesis about the spatial distribution of rare, random ‘events’ and describe the properties of the Poisson distribution
- Describe and design experiments according to best practices for experimental design in terms of replication, balanced design, blinding, simultaneous control groups, blocking, random sampling, randomization of treatments
- Explain the approach of ANOVA for detecting differences between means by partitioning the total variation in all observations into the variation between treatments/groups and variation within treatments/groups and using the F test to assess whether the variance among treatment means is larger than would be expected given H0
- Describe the 4 conceptual steps involved in conducting a permutation test and appropriately conduct, interpret and report permutation tests and create a bootstrap SE and CI
- Analyze relationships between two continuously scaled variables using linear regression or correlation depending on whether causality can be assumed
- Use R to conduct and interpret the following statistical tests: Linear Regression, ANOVA, Single sample t-test, Paired sample t-test, Permutation (randomization test) and Bootstrapping, G-test as Goodness of Fit or Contingency Analysis, Detect deviations from normality using visual checks (QQ Plots) and formal tests (Shapiro Wilk), Detect deviations from homoscedasticity using visual checks (QQ plots) and formal tests (Bartlett’s test)

Electronically Approved - Sep 07 2021 15:03

Department Approval

Electronically Approved - Sep 07 2021 16:00

Associate Dean's Approval