

AN SC 384 PRINCIPLES OF ANIMAL GENETICS

Fall 2025

College of Natural and Applied Sciences • Faculty of Agricultural, Life & Environmental Sciences • Department of Agricultural, Food & Nutritional Science • University of Alberta

Course at a Glance

Instructor	Dr. Paul Stothard (stothard@ualberta.ca, 2-31 GSB)
Teaching Assistants	Amir Behrouzi (behrouzi@ualberta.ca, 1-18 AF) Rui Liu (rliu10@ualberta.ca, 2-21 AF)
Office Hours	By appointment (send email for in-person or Zoom meeting)
Lectures	Asynchronous online via Canvas
Prerequisites	BIOL 207 and AN SC 101
Course Site	Canvas (assignments, readings, announcements)

Calendar Description: *An introduction to the basic principles of animal genetics and their practical application in selection strategies, breeding systems, and methods of improvement for domestic animals.*

Course Materials: Lecture materials and associated readings will be made available through Canvas. There is no required textbook for the course.

Learning Outcomes

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

- Describe the objectives, challenges, and strategies associated with animal genetic improvement.
- Explain the relationships between genes, alleles, proteins, Mendelian traits, and polygenic traits.
- Describe factors that change allele and genotype frequencies in populations over time.
- Devise strategies for selecting for simply inherited traits.
- Describe the genetic model for quantitative traits and related concepts.
- Calculate population measures commonly used in animal breeding.
- Define, explain the practical significance of, and calculate the heritability and repeatability of traits.
- Predict how various factors will affect the rate of genetic change.
- Describe the key sources of information used to estimate genetic merit and how they influence the accuracy of predictions.
- Describe approaches for characterizing and addressing genetic correlations.
- Describe and predict the effects of inbreeding, outbreeding, and heterosis.
- Design breeding and mating programs to improve animal performance.
- Describe how genome editing and reproductive technologies can enhance animal genetic improvement.

Course Overview

Animal genetics and selection has played a very important role in the improvement of the sustainability and competitiveness of the livestock industry. Large changes in the efficiency of production have been made in the last 50 years through the systematic application of quantitative genetics which together with improvements in nutrition, reproduction and animal health have meant that more meat, milk, and eggs are now produced with fewer inputs. These approaches have been enhanced in the last 15 years by an increased understanding of genome sequence and the function of genes and their variants. This has increased the rate of genetic improvement in some species and has also led to a greater understanding of the underlying biology of the traits of interest. Most recently, these technologies have been used to help us improve animal performance particularly for hard to measure traits as well as understand the domestication of animals and the role of genetic diversity in maintaining healthy populations. These aspects are generating tools that can also be applied in companion animal breeding—including the selection of service dogs and the identification and elimination of genetic defects.

This course will introduce animal breeding and enable students to understand the principles of animal genetics. Students will learn the basis of population, quantitative and molecular genetics and how these are applied in animal breeding programs to improve the performance of animals and ensure an optimum level of population genetic diversity. The course will provide the basis for further studies and the application of these approaches and is a prerequisite for AN SC 485 Animal Genetics and Breeding.

Course Format: The course consists of lectures on genetic/genomic principles and methods related to animal genetic improvement, assignments, and exams. Guest lectures on the application in animal breeding may be added (replacing other classes).

Assessment & Grading

Assessment Type	Date	Marks
Canvas quizzes	Dec 8	20
Assignment 1	Sep 26	10
Assignment 2	Oct 20	10
Assignment 3	Nov 10	10
Assignment 4	Dec 5	10
Midterm exam ¹	Oct 17	15
Final exam ²	Dec 16	25
Course Total		100

¹ Online exam, 8:00-9:00 am availability window, 50 minutes duration

² Online exam, 8:30-10:45 am availability window, 120 minutes duration

Key Policies

Assignment due time	11:00 pm on the specified date (unless otherwise noted)
Late penalty	-50% per day (or portion thereof)
Submission	Upload to Canvas

Canvas quizzes	Complete by 11:00 pm on Dec 8
Exams	Open book, online via Canvas; no monitoring software
AI tools	Not permitted on exams; use is academic misconduct
Exam content	Posting to social media/AI platforms is prohibited

Exam and Grading Details

Canvas Quizzes: Short quizzes completed within Canvas. Quizzes will be added throughout the term and can be completed as they become available (recommended), and up until 11:00 pm on Dec 8.

Midterm Exam: Online via Canvas, open book (students may consult course files and their own notes). No monitoring software will be used.

- **Date:** October 17, 2025
- **Start Time:** 8:00 am
- **Availability Window:** 8:00-9:00 am
- **Duration:** 50 minutes (time limit begins once exam is started)
- **Question Types:** Multiple choice, written answer, fill-in-the-blank, and other formats supported by Canvas
- **On-campus space (optional):** CSC B-10 (personal computer required)

Students with conflicts should contact the instructor to arrange an alternate time. Adjustments for accommodations will be made with assistance from Accommodation Services.

Students are expected to complete the exam based on information provided in the course. **The use of AI tools (including Generative AI and other AI-based applications) is not permitted. Students must complete the exam independently, without assistance from others or AI systems.** Responses will be reviewed for originality and consistency with course materials. Failure to follow these guidelines may be considered academic misconduct.

Posting of exam content (e.g., screenshots or text) on messaging, social media, AI, or other platforms is prohibited.

Final Exam: Online via Canvas, open book (students may consult course files and their own notes). No monitoring software will be used.

- **Date:** December 16, 2025
- **Start Time:** 8:30 am
- **Availability Window:** 8:30-10:45 am
- **Duration:** 120 minutes (time limit begins once exam is started)
- **Question Types:** Multiple choice, written answer, fill-in-the-blank, and other formats supported by Canvas
- **On-campus space (optional):** CSC B-10 (personal computer required)

Adjustments for accommodations will be made with assistance from Accommodation Services.

Students are expected to complete the exam based on information provided in the course. **The use of AI tools (including Generative AI and other AI-based applications) is not permitted. Students must complete the exam independently, without assistance from others or AI systems.** Responses will be reviewed for originality and consistency with course materials. Failure to follow these guidelines may be considered academic misconduct.

Posting of exam content (e.g., screenshots or text) on messaging, social media, AI, or other platforms is prohibited.

Missed Midterm Exam: A mark of zero will normally be given if a student misses the midterm examination. Whenever possible, students are expected to notify the instructor prior to missing the exam. In some circumstances, where there is an acceptable reason for missing the midterm, the value of the midterm exam will be moved to the final exam.

Missed Final Exam: The University policy on deferred exams can be found in Section 23.3.2 of the University Calendar. It includes specific instructions on how to obtain a deferral. The Instructors can neither give permission to a student to miss the final exam nor grant a request for a deferred final exam. Students are encouraged to check exam schedules prior to making travel or event plans. The decision to grant a deferred final exam can only be granted by their own Faculty (e.g., ALES students go to 206 Agriculture/Forestry Centre; Science students go to 1-001 CCIS).

Final Grade Assessment: Final grade assessment is the responsibility of the instructors. Letter grades will be assigned only to the final distribution of aggregate raw scores. There will be no predetermined “curving” to assign final grades; instead, cut-offs for different grades will be based on real breakpoints in the overall distribution of raw marks within the class for the current academic year.

Access to Representative Evaluative Material: Students will be given access to representative evaluative materials through Canvas.

Academic Integrity and Student Conduct

The University of Alberta is committed to the highest standards of academic integrity and honesty, as well as maintaining a learning environment that fosters the safety, security, and the inherent dignity of each member of the community, ensuring students conduct themselves accordingly. Students are expected to be familiar with the standards of academic honesty and appropriate student conduct, and to uphold the policies of the University in this respect.

Students are particularly urged to familiarize themselves with the provisions of the Student Academic Integrity Policy and the [Student Conduct Policy](#), and avoid any behaviour that could potentially result in suspicions of academic misconduct (e.g., cheating, plagiarism, misrepresentation of facts, participation in an offence) and non-academic misconduct (e.g., discrimination, harassment, physical assault). Academic and non-academic misconduct are taken very seriously and can result in suspension or expulsion from the University.

All students are expected to consult the [Academic Integrity website](#) for clarification on the various academic offences. All forms of academic dishonesty are unacceptable at the University. Unfamiliarity of the rules, procrastination or personal pressures are not acceptable excuses for committing an offence. Listen to your instructor, be a good person, ask for help when you need it, and do your own work—this will lead you toward a path to success.

Any academic integrity concern in this course will be reported to the College of Natural and Applied Sciences. Suspected cases of non-academic misconduct will be reported to the Dean of Students. The College, the Faculty, and the Dean of Students are committed to student rights and responsibilities, and adhere to due process and administrative fairness, as outlined in the [Student Academic Integrity Policy](#) and the [Student Conduct Policy](#).

The College of Natural and Applied Sciences (CNAS) has created an [Academic Integrity for CNAS Students](#) Canvas site. Students can self enroll and review the various resources provided, including the importance of academic integrity, examples of academic misconduct & possible sanctions, and the academic misconduct & appeal process.

“Integrity is doing the right thing, even when no one is watching.” – C.S. Lewis

Additional Information

Policy about course outlines can be found in Course Requirements, Evaluation Procedures and Grading of the University Calendar.

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).