AN SC 384 PRINCIPLES OF ANIMAL GENETICS

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

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Office hours:	By appointment—send an e-mail to set up a time.
Lecture/Seminar:	AF 1-13, MWF, 08:00 to 08:50.
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 the AN SC 384 eClass site. There is no required textbook for the course.

Learning outcomes
Through 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.

Prerequisites
BIOL 207 and AN SC 101.

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).

Course grading

Type	Due date	Marks	Total
Assignments (5)			
	Sep 29	10	
	Oct 23	10	
	Nov 6	10	
	Nov 24	10	
	Dec 6	20	60
Midterm exam			
	Oct 20, in class	15	15
Final exam			
	Dec 19, 2:00 pm, location TBA	25	25
Total			**100**

Other dates to note
- Tues. Sept 5, 2023; Fall Term classes begin.
- Mon. Oct 9, 2023; Thanksgiving Day, no class.
- Mon. Nov 13, 2023; Remembrance Day holiday, no class.
- November 14-17, 2023; Fall Term Reading Week, no class.
- Fri. Dec 8, 2023; Last day of Fall Term Classes.

Assignment submission
- Unless stated otherwise in class, assignments are due at **11 pm on the specified date**.

- Assignments are to be submitted through eClass.
- Late assignments will be downgraded 50% per day (or portion thereof).

Electronic devices and exams
- Mobile phones or other communication devices must be turned off and placed in a bag or pocket during examinations.
- Approved non-programmable calculators are permitted (calculators may be inspected prior to use in the exam)**.**

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 to obtain an exam deferral, Science students go to 1-001 CCIS).

Final grade assessment
It is the responsibility of the instructor. Letter grades will be assigned only to the final distribution of aggregate raw scores. There will be no predetermined "curving" to assign final grades but instead cut-offs for different grades will be based on real breakpoints in the overall distribution of raw marks within a class for the current academic year.

Access to representative evaluative material
Students will be given access to representative evaluative materials through eClass.

Academic integrity
"The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.governance.ualberta.ca) and avoid any behavior which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University." (GFC 2003)

Code of student behavior
All students at the University of Alberta are subject to the Code of Student Behaviour, as outlined at: https://www.ualberta.ca/governance/resources/policies-standards-and-codes-of-conduct/code-of-student-behaviour. Please familiarize yourself with it and ensure that you do not participate in any inappropriate behavior as defined by the Code. Key components of the code include the following statements:

30.3.2(1) No Student shall submit the words, ideas, images or data of another person as the Student's own in any academic writing, essay, thesis, project, assignment, presentation or poster in a course or program of study.

30.3.2(2) c. No Student shall represent another's substantial editorial or compositional assistance on an assignment as the Student's own work.

COVID-19
If you experience flu-like or COVID-19 symptoms (e.g. fever, cough, shortness of breath, sore throat, etc.) during the term, follow Alberta Health's guidelines (available on the Alberta Health website) and self-isolate until symptoms have passed (always check the latest advice). You may contact the instructor via email to indicate that you are in self-isolation.

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).