

AN SC 485 ANIMAL GENETICS AND BREEDING

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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Lab lecturer/TA:	Dr. Hongwei Li 2-21 General Services Building (GSB) E-mail: hongwei9@ualberta.ca
Office hours:	By appointment—send an e-mail to set up a time.
Lecture/Seminar:	Mon, Wed, Fri, 13:00 to 13:50 in GSB 5-11.
Lab:	See the lab schedule for dates of labs. When held, labs will be Fri, 14:00 to 15:50 in CL 1-30.
Lab time:	The lab period is intended to serve as a scheduled time for students to work on laboratory exercises or assignments including matrix algebra and BLUP using R and to have access to the instructors or teaching assistant for assistance. The instructors/lab lecturer/teaching assistant (TA) and students will not meet for all lab periods (see schedule below).
Prerequisites:	AN SC 384. Students seeking a prerequisite waiver must contact the ALES Undergraduate Student Services Office (USSO).
Calendar description:	<i>Application of genetic/genomic principles and methods to the improvement of livestock and poultry.</i>
Course materials:	Lecture materials and associated readings will be made available through the AN SC 485 eClass site. There is no required textbook for the course, however <i>Understanding Animal Breeding</i> , 2 nd edition by Richard Bourdon is recommended. Additional recommended references or readings will be added to eClass throughout the term.

Learning outcomes

Through successful completion of this course students will be able to:

- Define and explain genetics and genomics terms and concepts.
- Describe and interpret recent papers related to the discovery or application of gene function information in animals.

- Apply their knowledge of gene structure and function to predict the impacts of known and hypothetical DNA changes on phenotype.
- Build upon genomics and genetics concepts, tools, and knowledge to devise strategies for modifying animal traits.
- Be able to describe the principles of genetic evaluation and will be able to predict the genetic merit of breeding stocks using pedigree/phenotype/DNA marker data for quantitative traits.
- Be able to make genetic selection decisions based on single/multiple traits and will be able to predict and monitor genetic improvement rates.
- Be able to apply knowledge of non-additive genetic influence on performance traits to develop strategies to maximize animal performance.

Course overview

Students will learn about key concepts of genetics and genomics, particularly as they pertain to animal breeding and genome modification. Lectures will explore a variety of specific topics and will cover well-established as well as emerging technologies and techniques. Recent papers will be discussed to illustrate how knowledge of gene function can be acquired or applied. Assignments and labs will provide students with the opportunity to explore and apply concepts to real-world datasets. Students will be evaluated through assignments, a midterm exam, and a final exam.

Seminar and lab schedule (subject to change)

Date	Day	Lecture (M, W, F)	Lab (Friday)	Assignment
Jan 8	Mon	Introduction (Dr. Stothard)		
Jan 10	Wed	Gene structure and expression (Dr. Stothard)		
Jan 12	Fri	Gene structure and expression (Dr. Stothard)	No lab	
Jan 15	Mon	Analyzing genes and gene function (Dr. Stothard)		
Jan 17	Wed	Analyzing genes and gene function (Dr. Stothard)		
Jan 19	Fri	Analyzing genes and gene function (Dr. Stothard)	No lab	
Jan 22	Mon	Genome modification (Dr. Stothard)		Assignment 1 due
Jan 24	Wed	Genome modification (Dr. Stothard)		
Jan 26	Fri	Genome modification (Dr. Stothard)	No lab	
Jan 29	Mon	Recent research papers (Dr. Stothard)		
Jan 31	Wed	Recent research papers (Dr. Stothard)		
Feb 2	Fri	Recent research papers (Dr. Stothard)	No lab	Assignment 2 due
Feb 5	Mon	Recent research papers (Dr. Stothard)		
Feb 7	Wed	Recent research papers (Dr. Stothard)		
Feb 9	Fri	Recent research papers (Dr. Stothard)	No lab	
Feb 12	Mon	Recent research papers (Dr. Stothard)		
Feb 14	Wed	RStudio introduction (Dr. Stothard)		Assignment 3 due
Feb 16	Fri	Midterm	No lab	
Feb 19	Mon	Family Day, no lecture		
Feb 21	Wed	Winter Term Reading Week, no lecture		
Feb 23	Fri	Winter Term Reading Week, no lecture	No lab	
Feb 26	Mon	Partitioning of phenotype values and variation (Dr. Li)		
Feb 28	Wed	Partitioning of phenotype values and variation (Dr. Li)		
Mar 1	Fri	Partitioning of phenotype values and variation (Dr. Li)	No lab	
Mar 4	Mon	Genetic evaluation within herd (Dr. Li)		
Mar 6	Wed	Genetic evaluation within herd (Dr. Li)	Matrix algebra with R	
Mar 8	Fri	Genetic relationships among animals - review (Dr. Li)		
Mar 11	Mon	Best linear unbiased prediction (BLUP) (Dr. Li)		
Mar 13	Wed	Best linear unbiased prediction (BLUP) (Dr. Li)		
Mar 15	Fri	Best linear unbiased prediction (BLUP) (Dr. Li)	BLUP with R	

Date	Day	Lecture (M, W, F)	Lab (Friday)	Assignment
Mar 18	Mon	Best linear unbiased prediction (BLUP) (Dr. Li)	Lab - Work on assignment 5	
Mar 20	Wed	Introduction to genomic prediction (Dr. Li)		Assignment 4 due
Mar 22	Fri	Introduction to genomic prediction (Dr. Li)		
Mar 25	Mon	Introduction to genomic prediction (Dr. Li)	No lab	
Mar 27	Wed	Selection for more than one trait (Dr. Li)		
Mar 29	Fri	Good Friday, no lecture		
Apr 1	Mon	Easter Monday, no lecture	Lab - Work on assignment 5	
Apr 3	Wed	Selection for more than one trait (Dr. Li)		
Apr 5	Fri	Predicting genetic improvement rate (Dr. Li)		
Apr 8	Mon	Predicting genetic improvement rate (Dr. Li)	No lab	
Apr 10	Wed	Strategies to maximize animal performance (Dr. Li)		Assignment 5 due
Apr 12	Fri	Strategies to maximize animal performance (Dr. Li)		
Apr 19	Fri	-		Assignment 6 due

Course grading

Type	Date	Marks	Total
Assignments (6)	Jan 22	5	35
	Feb 2	5	
	Feb 14	5	
	Mar 20	5	
	Apr 10	10	
	Apr 19	5	
Midterm exam (1 hour)	Feb 16, 1:00 pm	25	25
Final exam (2 hours)	Apr 25, 9:00 am	40	40
Total			100

Assignments

- Unless otherwise specified, assignments are due **at 11 pm on the specified date**.
- All assignments must be uploaded to eClass. If there is a problem with eClass, send the assignment to the instructor by email.
- Late assignments will be downgraded 25% per day (or portion thereof).
- Posting content from an assignment to obtain answers from others is a violation of the student code of conduct—it is cheating, and it is mishandling of materials.
- Using assignment answers that have been posted online is cheating.
- Inadequate paraphrasing is plagiarism. Plagiarism is in violation of the Code of Student Behaviour.

Exams

- Exams will be completed in-person in the lecture room and will be closed-book exams.
- Mobile phones or other communication devices must be turned off and placed in a bag or pocket during examinations.
- Approved non-programmable calculators will be permitted for the final exam (calculators may be inspected prior to use in the exam).
- The final exam will focus on material taught after the midterm exam, i.e. the final exam is not cumulative. For the final exam a complete list of formulas from the lectures will be provided.

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 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 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.

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).