Cover Sheet: Request 10747

ANS3384 Genetic Improvement of Farm Animals

Info

Process	Course|Modify|Ugrad/Pro
Status	Pending
Submitter	Imler,Amie M amie.taylor@ufl.edu
Created	2/4/2016 3:42:30 PM
Updated	3/14/2016 4:38:41 PM
Description	Basic principles of Mendelian genetics and quantitative genetics as applied to improvement of farm animals. Selection, inbreeding and crossbreeding strategies for the improvement of cattle, swine, horses and poultry.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CALS - Animal Sciences 514909000	Tenbroeck, Saundra Hodge		2/4/2016
Deleted ANS 3384 Syllabus 2017.pdf					2/4/2016
College	Approved	CALS - College of Agricultural and Life Sciences	Brendemuhl, Joel H	Approved by CALS CC 2-12-16	2/19/2016
No document changes					
University Curriculum Committee	Comment	PV - University Curriculum Committee (UCC)	Case, Brandon	Added to the March agenda.	2/22/2016
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			2/22/2016
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|Modify for request 10747

Info

Request: ANS3384 Genetic Improvement of Farm Animals
Submitter: Imler,Amie M amie.taylor@ufl.edu
Created: 2/19/2016 3:44:16 PM
Form version: 3

Responses

Current Prefix
Enter the current three letter code (e.g., POS, ATR, ENC).

Response:
ANS

Course Level
Select the current one digit code preceding the course number that indicates the course level at which the course is taught (e.g., 1=freshman, 2=sophomore, etc.).

Response:
3

Number
Enter the current three digit code indicating the specific content of the course based on the SCNS taxonomy and course equivalency profiles.

Response:
384

Lab Code
Enter the current lab code. This code indicates whether the course is lecture only (None), lab only (L), or a combined lecture and lab (C).

Response:
None

Course Title
Enter the current title of the course as it appears in the Academic Catalog.

Response:
Genetic Improvement of Farm Animals

Effective Term
Select the requested term that the course change(s) will first be implemented. Selecting "Earliest" will allow the change to be effective in the earliest term after SCNS approval. If a specific term and year are selected, this should reflect the department's expectations. Courses cannot be changed

retroactively, and therefore the actual effective term cannot be prior to SCNS approval, which must be obtained prior to the first day of classes for the effective term. SCNS approval typically requires at least 6 weeks after approval of the course change at UF.

Response:
Summer

Effective Year
Select the requested year that the course change will first be implemented. See preceding item for further information.

Response:
2016

Requested Action
Indicate whether the change is for termination of the course or any other change. If the latter is selected, all of the following items must be completed for any requested change.

Response:
Other (selecting this option opens additional form fields below)

Change Course Prefix?

Response:
No

Change Course Level?
Note that a change in course level requires submission of a course syllabus.

Response:
No

Change Course Number?

Response:
No

Change Lab Code?
Note that a change in lab code requires submission of a course syllabus.

Response:

Yes

Current Lab Code

Response:
None

Proposed Lab Code

Response:
C

Change Course Title?

Response:
Yes

Current Course Title

Response:
Genetic Improvement of Farm Animals

Proposed Course Title

Response:
Genetics of Domestic Animals

Change Transcript Title?

Response:
Yes

Current Transcript Title

Response:
Genet Improv Farm Ani

Proposed Transcript Title (21 char. max)

Response:
Genetics Domest Anim

Change Credit Hours?
Note that a change in credit hours requires submission of a course syllabus.

Response:
No

Change Variable Credit?
Note that a change in variable credit status requires submission of a course syllabus.

Response:
No

Change S/U Only?

Response:
No

Change Contact Type?

Response:
No

Change Rotating Topic Designation?

Response:
No

Change Repeatable Credit?
Note that a change in repeatable credit status requires submission of a course syllabus.

Response:
No

Change Course Description?
Note that a change in course description requires submission of a course syllabus.

Response:
Yes

Current Course Description

Response:
Basic principles of Mendelian genetics and quantitative genetics as applied to improvement of farm animals. Selection, inbreeding and crossbreeding strategies for the improvement of cattle, swine, horses and poultry.

Proposed Course Description (50 words max)

Response:
Basic principles of Mendelian, population and quantitative genetics as applied to improvement of domestic animals. Selection, inbreeding and crossbreeding strategies for genetic improvement of livestock.

Change Prerequisites?

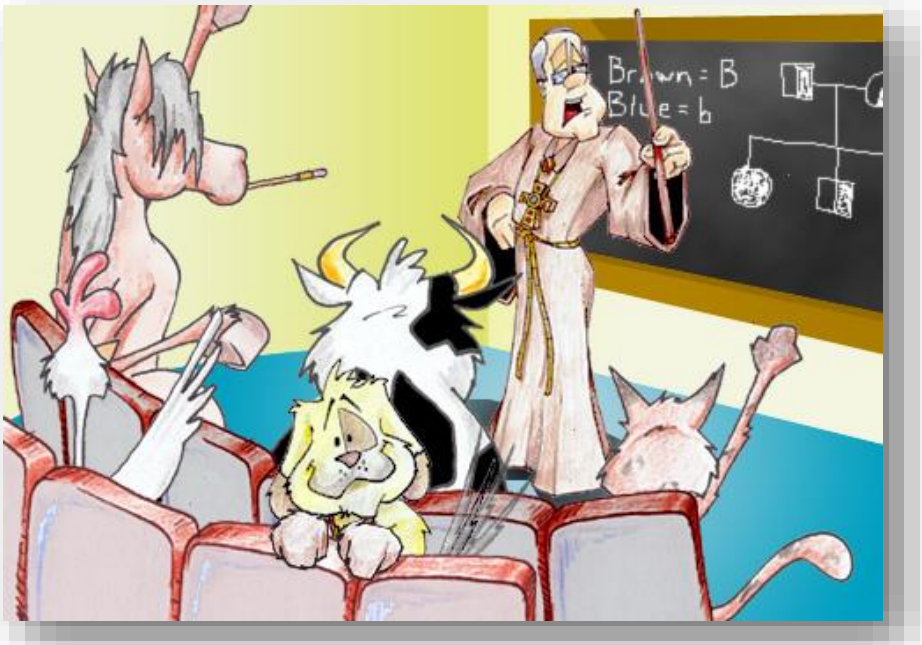
Response:
No

Change Co-requisites?

Response:
No

Rationale

Response:
Formerly, ANS 3384 did not have a lab component and students that were in the Food Animal specialization enrolled in a one credit lab (ANS 3383L - Applications of Genetic Evaluation in Livestock); this course has a new instructor and has been revised so that all Animal Sciences students will meet once per week for a two hour lab section in addition to the lecture portion of the course



Genetics of domestic animals

ANS 3384C

Lecture
Monday & **Wednesday**
9:35 – 10:25 AM
156 ANS

Lab
Section 1 (1D51)
Friday, 9:35 – 11:30 AM
151 ANS

Section 2 (1D54)
Friday, 11:45 – 1:40 PM
151 ANS

Instructor
Dr. **Raluca Mateescu**
Office: Room 202B, Animal Science – Bldg 459
Phone: (352) 392-2367
e-mail: raluca@ufl.edu

Teaching Assistants
Mesfin Gobena (graduate)
Katy Brinkley-Bissinger, Marianna Fernandez, Carly Fredericks, Sibyl Joseph, Natalie Obregon, Alexandra Swets

Office Hours
Monday, Wednesday
10:30 –11am; 202B ANS

OR by appointment -- contact Dr. Mateescu to set up an appointment

Course Objective
To understand the principles of animal breeding and genetics and their application in the improvement of animals.

Course Description:

Basic principles of Mendelian, population and quantitative genetics as applied to improvement of domestic animals. Selection, inbreeding and crossbreeding strategies for genetic improvement of livestock.

Course Objectives

To understand the principles of animal breeding and genetics and their application in the improvement of animals.

By the end of the semester, the student should be able to:

1. Be familiar with the principles of Mendelian inheritance;
2. Understand the principles of recombination, mutation, selection and non-random mating as they apply to the inheritance of simple traits and their effect on populations.
3. Comprehend the different breeding approaches for simple and polygenic traits;
4. Understand the genetic model for quantitative traits;
5. Apply statistics to the characterization of quantitative traits and genetic prediction;
6. Understand the nature and use of heritability and repeatability;
7. Comprehend the factors affecting the rate of genetic change;
8. Be familiar with the mechanisms of large-scale genetic evaluation;
9. Be familiar with mating systems and mating strategies;
10. Understand the concept of hybrid vigor as it relates to systems of crossbreeding;
11. Recognize applications of biotechnology to animal breeding.

Attendance Policy

All exam information will be covered during the course of the lectures. **Attendance is strongly encouraged and students are responsible for all material covered in lecture**. It is highly recommended that you attend class if you expect to obtain a satisfactory grade. Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Text

No formal text is required. Students will be provided handouts, which are current and relevant to topics discussed in class. Optional references include:
Buchanan, Clutter, Northcutt and Pomp. 1993. Animal Breeding: Principles and Applications
VanVleck, L.D., E.J. Pollak, E.A.B. Oltenacu. 1987. Genetics for the Animal Sciences

Quizzes

There will be 10 quizzes worth 10 points each. The quizzes will be available online on Canvas and will be taken online – they will be due **Friday before 9:00am**. They will consist of short questions from the lectures covered that particular week. Each quiz will be made available on **Wed. after class** and will remain open until Friday morning. However, you will have a limited time to take it once you start the quiz (10 minutes) – so it is important that you study the lectures before you start to take the quiz. Please try to take these quizzes before Friday and make sure you have a secure internet connection (if you lose the internet connection your quiz will end and you will not be allowed to take it again).

Problem Sets and Laboratory periods

The Friday morning periods constitute a two-hour laboratory. There will be 10 problem sets worth 20 points each to be completed during the laboratory period. The Problem Set will be handed out on Friday and the bulk of the work on problem sets should be accomplished

during the laboratory period. A Practice Problem set will be first discussed and instructions on how problems are to be approached and solved will be provided in this first part of the laboratory. Students will be allowed to work on the Problem set in groups, and the instructor and TAs will be available for questions and guidance. The completed Problem Sets could be handed out at the end of the laboratory period on Friday, or uploaded on Canvas before 5pm the following Monday.

Exams

There will be 4 exams worth 100 points each. The final exam is not comprehensive. The material covered in the exam will be detailed prior to each exam. (*see important dates*)

Grading Policy

4 Exams	400 pts	57%
10 Problem Sets	200 pts	29%
10 Quizzes	100 pts	14%
	700 pts	**100%**

Letter grades will be assigned based upon the following scale:

A 93-100%	**B- 80-82.9%**	**D+ 67-69.9%**
A- 90-92.9%	**C+ 77-79.9%**	**D 63-66.9%-**
B+ 87-89.9%	**C 73-76.9%**	**D- 60-62.9%-**
B 83-86.9%	**C- 70-72.9%**	**E 60% and Below**

The scale may be lowered but will not be raised.

Bonus (extra) Credit

You may earn a maximum of 50 bonus points in this category. These points will be derived from unannounced short quizzes during lectures and other opportunities to award extra points as appropriate. To receive bonus points, students have to be in the classroom for the entire lecture. **A sign-up sheet will be available before the lecture starts -- if a student is late and doesn't sign the sign-up sheet she/he will not receive any credit, even if they turn in a quiz during lecture.** There will be no "make-up" for extra credit.

Policy on Missed Examinations

Make-up examinations will be given **only** if arrangements are made **prior** to missing the exam (or right away in case of an unforeseen emergency). You must visit with Dr. Mateescu and provide a valid written excuse. It is the student's responsibility to schedule make-up exams to be taken no longer than **ONE** week after the original exam. Grades not made up within **ONE** week will be assigned a zero (exceptions will be granted for students in legitimate emergencies, please contact Dr. Mateescu as soon as possible).

Policy on Late Problem Sets

Lab exercises are due on Monday by 5pm. They may be handed in late (with no penalty) **only** if it is arranged with the instructor. Otherwise there will be a **4 point penalty** per day.

Use of Formulas During Exams

Students will be exposed to many formulas during this course. However, it is not terribly important that students memorize these formulas. All formulas that will be necessary for completion of a quiz or exam will be provided with the quiz or exam. It is important however that the students know which formulas to use and how to use them.

Your Responsibilities:

1. Show respect in the classroom to your classmates and teacher.
2. Be on schedule. You are expected to have done the assigned reading *before* class or lab.
3. Participate in class.
4. Write coherently – think before you write and read what you wrote afterwards to make sure it makes sense. Test will not be graded for writing, but poorly written answers inevitably receive worse scores than well written ones.
5. Be academically honest. Anything you submit must represent *your individual understanding*. Any material you submit must be *in your own words*.

Academic Honesty

On days when a quiz or an exam is completed, students will be required to exhibit behavior that leaves no question about their intent to be honest. For example, **no cell phone, books, papers or other items** will be allowed at students' desks during a class session when a test is administered. Students will be asked to **remove hats or caps** that cover/hide their eyes to ensure that there is no appearance of cheating.

The instructor will be available for students. Please make arrangements to visit at your convenience. If you call and I am not available, leave your name and telephone number or e-mail address and you will be contacted as soon as the message is received. **The best method to reach me is through e-mail. DO NOT WAIT UNTIL EXAMINATION TIME!**

Please ask questions in class and do not be apprehensive about concepts that might not be clear. It is important to keep up and not fall behind. Get started on the first day of class – do your homework on time – attend class – get help when you need it – and remember there is no substitute for **DAILY PREPARATION. It is much easier on all of us if you get answers to questions one or two days after class rather than one or two days before an exam.**

Lecture Schedule (Note: This schedule is subject to revision as the course progresses.)

Lecture 1	Intro to Anim. Genetics	Lecture 14	Regression
Lecture 2	Revisiting Mendel	Lecture 15	Heritability
Lecture 3	Probabilities	Lecture 16	Heritability & Repeatability
Lecture 4	Exceptions to Mendel's ratios	Lecture 17	Repeated Records
Lecture 5	Epistasis	Lecture 18	Relationships
Lecture 6	Hypothesis Testing	Lecture 19	Selection
Lecture 7	Linkage	Lecture 20	Accuracy
Lecture 8	Population Genetics	Lecture 21	Selection Response
Lecture 9	Mutation and Migration	Lecture 22	Correlated Response
Lecture 10	Non-random Mating	Lecture 23	Adjustment Factors
Lecture 11	Selection	Lecture 24	Mating Systems
Lecture 12	Quantitative Traits	Lecture 25	Crossbreeding
Lecture 13	Covariance and Correlation	Lecture 26	Captive Breeding Programs

The instructor reserves the right to modify the syllabus during the semester with verbal or written announcements in class. It is the student's responsibility to stay informed of such announcements.

Important Dates

No Classes on:
January 8 & 11: Travel conflict
January 18: MLK Day
Feb. 27 – March 6: Spring Break

Exams
Exam 1: Feb. 5
Exam 2: March 11
Exam 3: April 8
Exam 4 (Final): Wed, April 27, 7:30-9:30am

General information

Services for Students with Disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Grades and Grade Points

For information on current UF policies for assigning grade points, see
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Online course evaluation process

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate

Academic Honesty

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/
  Counseling Services, Groups and Workshops, Outreach and Consultation, Self-Help Library
  Wellness Coaching
- U Matter We Care, www.umatter.ufl.edu/
- Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/

Student Complaint Process

For information see https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

Equine Specialization:

Semester 1	Credits
BSC 2010 and 2010L Integrated Principles of Biology 1 (3) and Integrated Principles of Biology 1 Laboratory (1) (State Core GE-B/P)	**4**
MAC 1147 Precalculus: Algebra and Trigonometry (State Core GE-M)	**4**
ENC 1101 Expository and Argumentative Writing (State Core GE-C) (WR)	3
Humanities (State Core GE-H) (D)	3
Total	14

Semester 2	Credits
AEC 3030C Effective Oral Communication or SPC 2608 Introduction to Public Speaking	3
BSC 2011 and 2011L Integrated Principles of Biology 2 (3) and Integrated Principles of Biology 2 Laboratory (1) (GE-B)	**4**
ECO 2013 Principles of Macroeconomics (State Core GE-S)	**4**
ENC 1102 Argument and Persuasion (GE-C)	3
IUF 1000 What is the Good Life (GE-H)	3
Total	17

Semester 3	Credits
AEC 3033C Research and Business Writing in Agricultural and Life Sciences (WR) or ENC 2210 Technical Writing	3
CHM 2045 and 2045L General Chemistry 1 (3) and General Chemistry 1 Laboratory (1) (GE-B/P)	**4**
Electives	8
Total	15

Semester 4	Credits
MCB 2000 and 2000L Microbiology (3) and Microbiology Laboratory (1) (GE-B)	4
STA 2023 Introduction to Statistics (GE-M)	**3**
Electives	5
Social and Behavioral Sciences (GE-S)	3

Total	15

Semester 5	Credits
AEB 3133 Principles of Agribusiness Management	3
ANS 3006C Introduction to Animal Science	4
ANS 3217C Equine Health Management	2
ANS 3440 Principles of Animal Nutrition	4
ANS 3934 Careers in the Livestock Industry	2
Total	15

Semester 6	Credits
AGR 4231C Forage Science and Range Management	4
ANS 3319C Reproductive Physiology and Endocrinology in Domestic Animals	4
ANS 3384 Genetic Improvement of Farm Animals	3
Approved food and resource economics course	3
Total	14

Commented [TM1]: ANS3384C Genetics of Domestic Animals

Summer	Credits
ANS 4941 Full-Time Practical Work Experience in Animal Science	3-8
Total	3-8

Semester 7	Credits
ANS 3043 Growth and Development of Farm Animals	3
ANS 3405 Equine Nutrition and Feeding Management	2
Approved equine practicum elective	2
Approved food and resource economics course	3
Electives	4
Total	14

Semester 8	Credits
ANS 3079L Relationship of Form to Function in Horses	2

ANS 4234 Horse Enterprise Management	2
ANS 4931 Senior Seminar	1
Approved equine practicum elective	1
Electives	7
Total	13

Approved Equine Practicum Electives
Choose a minimum of two courses totaling at least three credits: ANS 3239L, ANS 4212L, ANS 4218L, ANS 4231, ANS 4241L, ANS 4605
Approved Food and Resource Economics Courses
Choose two: AEB 3122, AEB 3300, AEB 3341, AEB 3450, AEB 4085, AEB 4123, AEB 4124, AEB 4126, AEB 4136, AEB 4138, AEB 4242, AEB 4274, AEB 4342, AEB 4343, AEB 4424.

Food Animal Specialization:

Semester 1	Credits
BSC 2010 and 2010L Integrated Principles of Biology 1 (3) and Integrated Principles of Biology 1 Laboratory (1) (State Core GE-B/P)	**4**
ENC 1101 Expository and Argumentative Writing (State Core GE-C) (WR)	3
MAC 1147 Precalculus: Algebra and Trigonometry (State Core GE-M)	**4**
Humanities (State Core GE-H) (D)	3
Total	14

Semester 2	Credits
AEC 3030C Effective Oral Communication or SPC 2608 Introduction to Public Speaking	3
BSC 2011 and 2011L Integrated Principles of Biology 2 (3) and Integrated Principles of Biology 2 Laboratory (1) (GE-B)	**4**
ECO 2013 Principles of Macroeconomics (State Core GE-S)	**4**
ENC 1102 Argument and Persuasion (GE-C)	3
IUF 1000 What is the Good Life (GE-H)	3
Total	17

Semester 3	Credits

AEC 3033C Research and Business Writing in Agricultural and Life Sciences (WR) or ENC 2210 Technical Writing	3
CHM 2045 and 2045L General Chemistry 1 (3) and General Chemistry 1 Laboratory (1) (GE-P)	**4**
Electives	8
Total	15

Semester 4	**Credits**
MCB 2000 and 2000L Microbiology (3) and Microbiology Laboratory (1) (GE-B)	4
STA 2023 Introduction to Statistics 1 (GE-M)	**3**
Electives	3
Social and Behavioral Sciences (GE-S)	3
Total	13

Semester 5	**Credits**
AEB 3133 Principles of Agribusiness Management	3
ANS 3006C Introduction to Animal Science	4
ANS 3440 Principles of Animal Nutrition	4
ANS 3634C Meats	3
ANS 3934 Careers in the Livestock Industry	2
Total	16

Semester 6	**Credits**
AGR 4231C Forage Science and Range Management	4
ANS 3319C Reproductive Physiology and Endocrinology in Domestic Animals	4
ANS 3383L Application of Genetic Evaluation to the Livestock Industry	1
ANS 3384 Genetic Improvement of Farm Animals	3
ANS 3404C Food Animal Nutrition and Feeding	3
ANS 3613L Livestock and Meat Evaluation	2
Total	17

Summer	**Credits**

Commented [TM2]: ANS 3383L will be deleted from courses offered through Department

Commented [TM3]: ANS3384C Genetics of Domestic Animals

ANS 4941 Full-Time Practical Work Experience in Animal Science	3-8
Total	3-8

Semester 7	Credits
ANS 3043 Growth and Development of Farm Animals	3
Approved electives	6
Approved food and resource economics course	3
Total	12

Semester 8	Credits
ANS 4931 Senior Seminar	1
Approved electives	6
Approved food and resource economics course	3
Elective	3
Total	13

Approved Electives

Choose 12 credits: ANS 3246, ANS 3250L, ANS 3251, ANS 4243C, ANS 4245C, ANS 4604C, ANS 4605, ANS 4615, ANS 4635C, ANS 4905, ANS 5312C, FOS 4204, FOS 4222, FOS 4222L, FOS 4722C

Approved Food and Resource Economics Courses

Choose two: AEB 3122, AEB 3300, AEB 3315, AEB 3341, AEB 3450, AEB 4085, AEB 4123, AEB 4124, AEB 4126, AEB 4136, AEB 4138, AEB 4242, AEB 4274, AEB 4309, AEB 4342, AEB 4343, AEB 4424

COURSE SYLLABUS - ANS 3384
GENETIC IMPROVEMENT OF FARM ANIMALS
DEPARTMENT OF ANIMAL SCIENCES
UNIVERSITY OF FLORIDA

CREDIT HOURS: **3**

INSTRUCTOR: **Dr. Tim Olson, 202B Animal Science Building**
taolson@ufl.edu Phone Nos. (352)-392-2367 (office); (386)-418-4386 (home)
Office Hours: I am generally available **except from** 11:30AM to 1:30 PM daily, Wednesday afternoons and 4-5 PM on Thursdays.

DEPARTMENT CHAIR: **Dr. Geoff Dahl**, 392-1981, Room 100 - Building 499

COURSE DESCRIPTION: Basic principles of Mendelian and quantitative genetics as they apply to the improvement of farm animals. Selection, inbreeding, crossbreeding and their application to the improvement of beef cattle, dairy cattle, swine, horses and poultry as well as the genetic control of coloration and defects in cattle and horses are included.

TEXT: No text is required. Numerous handouts will be given out or available on the website throughout the course of the semester. Tests will include only information from the lectures, problem sets and handouts, however, the text should be helpful to those wanting greater information and/or an alternative presentation of the course material.

COURSE OBJECTIVES:

1. Understand the principles of Mendelian genetics, segregation, recombination and mutation as they apply to the inheritance of qualitative characters (coat colors and spotting patterns) and genetic defects in farm animals.

2. Understand the traits of importance to the livestock industry, and the concepts of the inheritance of these traits such as heritability, repeatability, estimation of breeding values (EPDs, PTAs), accuracy (reliability) of breeding values, response to selection, correlated response to selection.

3. Be able to understand the effects of inbreeding and crossbreeding on populations, to be able to calculate inbreeding coefficients from pedigrees, to evaluate expected heterosis from crossbreeding systems and to design effective crossbreeding systems.

4. Be able to evaluate genetic information from performance testing programs and beef and dairy cattle sire summaries and to explain the current genetic evaluation procedures used in the swine, poultry and equine industries.

Examinations and Grading Policy:

Examinations will include two midterm examinations, announced quizzes and a cumulative final examination. The lowest quiz grade will be dropped. Problem sets will be distributed and answers provided, but will not be graded. The course averages will be computed as follows:

Midterm Exams	45%
Quiz Average	25%
Final Exam	30%

Please note that the cumulative final exam for this class is scheduled for Thursday, April 29th from 12:30 until 2:30PM.

The averages below will assure the following grades:

92 – 100	A	79 – 81.9	B-	67 – 68.9	D+
89 – 91.9	A-	77 – 78.9	C+	60 – 66.9	D
87 – 88.9	B+	72 – 76.9	C	56 – 59.9	D-
82 – 86.9	B	69 – 71.9	C-	Below 56	E

Please refer to the UF undergraduate catalog website which specifies the current UF grading policies for assigning grade points based on this new system of grading:

http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html

COURSE WEBSITE: http://www.animal.ufl.edu/ans3384/

Software Use:
All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Students with Disabilities:
The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

0001 Reid Hall, 392-8565, www.dso.ufl.edu/drc/

Academic Honesty, Software Use, UF Counseling Services, Services for Students with Disabilities:
In 1995 the UF student body enacted a new honor code and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

In adopting this honor code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the university community. Students who enroll at the university commit to holding themselves and their peers to the high standard of honor required by the honor code. Any individual who becomes aware of a violation of the honor code is bound by honor to take corrective action. The quality of a University of Florida education is dependent upon community acceptance and enforcement of the honor code.

The Honor Code: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

On all work submitted for credit by students at the university, the following pledge is either required or implied: "**On my honor, I have neither given nor received unauthorized aid in doing this assignment."**

The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior.

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean or Student Honor Court.

(Source: 2008-2009 Undergraduate Catalog)

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor.

This policy will be vigorously upheld at all times in this course.

Campus Helping Resources
Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. Both the Counseling Center and Student Mental Health Services provide confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance. The Counseling Center is located at 301 Peabody Hall (next to Criser Hall). Student Mental Health Services is located on the second floor of the Student Health Care Center in the Infirmary.

- *University Counseling Center*, 301 Peabody Hall, 392-1575, www.counsel.ufl.edu
- *Career Resource Center,* CR-100 JWRU, 392-1602, www.crc.ufl.edu/
- *Student Mental Health Services,* Rm. 245 Student Health Care Center, 392-1171, www.shcc.ufl.edu/smhs/

Lecture 8

Population Genetics – Genes in populations

Population Genetics

- The study of populations over time with particular attention paid to the

Group of individuals of the same species that can interbreed

Gene and genotypic frequencies

Gene Frequency

- Gene frequency = of the total loci for a particular allelic series occupied by a particular
- The relative of an allele in a population as compared to the other alleles in that population.
- Also - the of any one gamete carrying a particular gene.

Example: gene frequency

Coat color in cattle

RR =	Red	R = r
Rr =		
rr =	White	

Gene Frequency

- The probability of drawing the gene at random from all possible genes at that locus in the population.
- Assume a herd of 500 Shorthorns:
  - 130 reds, 265 roans and 105 whites

How many total genes?

How many red alleles?

Freq. of the red allele =

Gene & Genotypic Frequencies

With

⇩

Easy to calculate frequencies (both gene and genotypic)

Both alleles in a heterozygote are fully expressed, with neither one being dominant or recessive to the other

Gene frequencies

f(R allele) = f(RR) + 1/2 f(Rr)

f(r allele) =

Dominance

Codominance:

- relationship between the phenotypes and genotypes
- of gene and genotypic frequencies.

Dominance:

- NOT a one to one relationship
- calculations of gene and genotypic frequencies is not straightforward

Dominance

Example -- Coloring in deer

D_ = natural color of deer D > d

dd = piebald

natural	9,900	(DD and Dd)
piebald	100	(dd)
	10,000	

(can't separate unless we evoke some assumptions)

Hardy-Weinberg Law: 1908

In a large, random mating population, in the absence of forces which change gene frequencies, both gene and genotypic frequencies remain constant from one generation to the next.

Population is said to be in

Hardy-Weinberg Law: 1908

Assumptions for this to be true:

A) Large population -- ensures limited change by chance alone

B) Random mating -- every individual has an of mating with another individual of the opposite sex. Defined by trait, not species.

C) No forces to change gene frequency

Forces that can change gene freq.

1) Mutation -- sudden
in genetic material.

2) Migration -- movement of
animals from one population to another.

3) Selection (artificial or natural) --
relative success in becoming a parent
based on

Nomenclature

- p = f(D)
- q = f(d)

p + q =

IF equilibrium:

Genotype	Frequency
DD	p^2
Dd	2pq
dd	q^2

natural 9,900 (DD and Dd)

piebald 100 (dd)

10,000

⇩

f(dd)

f(D_)

(assuming H-W equilibrium we can now press on)

If true:

f(D_) = $p^2 + 2pq$ = .99

f(dd) = q^2 = .01

⇩

q =

p =

⇩

f(DD) =

f(Dd) =

At Equilibrium

Within a generation:
there is a relationship between gene and genotypic frequencies such that if the f(A) is then f(AA) is .

Across generations:
gene and genotypic frequencies remain

At Equilibrium
(Autosomal Locus)

- f(A) = p
- f(a) = q

=>

- f(AA) = p^2
- f(Aa) = 2pq
- f(aa) = q^2

Within a Generation

Important to know when and if a population is in equilibrium!

Assume a population not in equilibrium begins to mate randomly.

How does this affect the gene and genotypic frequencies at autosomal loci?

Returning to Equilibrium

For any single autosomal locus, with any number of alleles, it takes just one generation of random mating for a population to return to equilibrium

IF the allele frequencies are the

Autosomal Locus: Returning to Equilibrium

When allele frequencies in males and females are not the same, returning to equilibrium requires of random mating:

1) In the , male and female gene frequencies become to the of the frequencies in the parents.
2) In the generation, the population

Autosomal Locus: Returning to Equilibrium

Generation 1

males \ females	f(A) = .6	f(a) = .4	
f(A) = .8	AA	Aa	f(AA) =
			f(Aa) =
f(a) = .2	Aa	aa	f(aa) =

f(A) = f(AA) + 1/2 f(Aa) =

-- Regardless of sex --

Autosomal Locus: Returning to Equilibrium

Generation 2

males \ females	f(A) = .7	f(a) = .3	
f(A) = .7	AA	Aa	f(AA) =
			f(Aa) =
f(a) = .3	Aa	aa	f(aa) =

Autosomal Locus: Returning to Equilibrium

Generation 2 (p = 0.7; q = 0.3)

f(AA) = .49

f(Aa) = .42

f(aa) = .09

Concepts of Population Genetics

A basic understanding of Population Genetics is desirable before trying to deal with the concepts of Animal Breeding. Most economically important traits in livestock are controlled by many pairs of genes. Each pair acts in exactly the same way that genes controlling simple traits, such as color, etc. The phenotype is the result of the cumulative effects of these many gene pairs. This information also has practical implications for traits such as color, horns and many of the genetic defects that afflict farm livestock. Traits such as these often have quite simple inheritance with only one or two pairs of genes.

Some definitions:

Population -- all the members of some specified group
Genotype -- the genetic makeup of an individual
Phenotype -- physical expression of a genotype
Gene frequency -- proportion of the loci in a population that are occupied by a specific allele
Genotypic frequency -- proportion of the individuals in a population that are a particular genotype
Phenotypic frequency -- proportion of the individuals in a population that are a particular phenotype
Random mating -- situation where each male in a population has an equal opportunity of mating with each female

Gene frequency when each animal's genotype is known. Each animal's genotype can be identified whenever the trait of interest is one where there is codominance. An example of such a trait is coat color in Shorthorn cattle where RR results in red, Rr results in roan and rr results in white. Each animal's genotype is known because each phenotype has a unique genotype.

Use of parental gene frequencies to predict the next generation. When the gene frequencies in the parents are known they can be used to predict genotypic frequencies in the next generation in the same manner as the Punnett Square procedure. The gene frequencies in the parents are also the gametic frequencies.

Gene Frequency when one allele is dominant. In traits where there is dominance the exact genotypic frequencies are not known since it is not possible to tell the homozygous dominant individuals from the heterozygotes. When this is the case the gene frequencies can be estimated if certain conditions exist. These conditions and the results of those conditions constitute what is known as the Hardy-Weinberg Law which is named for the two German scientists that discovered it during the first decade of the 20th century.

Hardy-Weinberg Law:

In a large random mating population, if there is no migration and mutation can be safely ignored, gene and genotypic frequencies are constant from generation to generation, and the genotypic frequencies are determined by the gene frequencies by the following formula:

$$(\text{parental gene frequency})^2 = \text{offspring gene frequency}$$

$$(p_A + q_a)^2 = p^2\ AA + 2pq\ Aa + q^2\ aa$$

The practical result of this law is that if a trait, or complex of traits, is ignored there should be no change over time in average genetic merit for that trait. This, of course, assumes that the selection that is practiced has no correlated effects on the trait in question. When a population meets the requirements of the Hardy-Weinberg Law (large, random mating population with no migration and little, if any, mutation) it is said to be in Hardy-Weinberg Equilibrium.

Forces that change gene frequency. Since superior herds and breeds of livestock arise from maximizing the frequency of desirable genes it is important to understand the various forces that alter gene frequency. Some of this is beyond the direct control of man while other forces can be used by man in a positive manner to improve livestock. Unfortunately, these forces can also result in poorer livestock if they are used unwisely. Four forces that change gene frequency are identified. These are mutation, migration, selection and genetic drift.

Mutations occur spontaneously as changes in the base sequence of DNA molecules. They are nearly always deleterious since any random change in the base sequence is very unlikely to make a change that is desirable. They are not often of much concern to livestock producers since the changes they cause in livestock herds are quite small. This is a result of their infrequent occurrence and the fact that they often result in the death of the organism, or at least impaired function, if they express themselves. Since the death will, in many cases, occur early in pregnancy the owner will never know anything is wrong except that the female did not retain her pregnancy. It should be remembered however, that mutations are the only manner by which new genes are generated. While usually deleterious, such things as the polled condition in several breeds of cattle are also the result of mutations that occurred sometime in the past.

Migration is the introduction of new individuals into a population from some other source. It can be a very powerful force in changing gene frequency. The classic example of migration is the introduction of new breeds of beef cattle from Europe. They changed the American beef industry from its traditional structure of mostly British breeds such as the Angus, Hereford and Shorthorn. That was certainly migration in a major sense and did alter the genetic makeup of the beef industry, especially for growth traits. However, migration can be as simple as the introduction of a new male into a herd.

Selection is allowing certain individuals more of a chance to reproduce than others. It can occur in both wild and managed populations. Natural selection is selection for fitness and occurs in all populations. Those individuals that are the most fit for reproductive purposes are the most likely to be the parents of the next generation. Artificial selection is that exercised by man and it means that those individuals that are thought to be "best" are those retained to be parents of the next generation. Each producer may have his own criteria for defining what is best. The general criteria for selection in farm livestock has undergone changes in the last 50 years so that progress has not been steady.

Genetic drift is change in gene frequency due to chance. Each time a gamete is produced the genetic makeup of that gamete is the result of random sampling of the genes the individual has at each locus. As a result, the offspring generation may not have the same gene frequencies as the parental generation. This is in opposition to the Hardy-Weinberg Law which states that the gene frequencies in the offspring will be identical to those in the parents if the conditions are met. The violation of a condition for Hardy-Weinberg Equilibrium that results in genetic drift is the condition of a large population. Changes in gene frequency due to chance are much more likely in small populations. Change in gene frequency due to chance is not predictable in direction and cannot be controlled by man except it can be kept quite small if fairly large herds are maintained.

ANSI 3384
PROBLEM SET 3
DUE 5PM ON MONDAY, FEBRUARY 1, 2016

- **Due to limited space on this handout, work out problems on a separate sheet of paper.**
- **A legible, organized and complete answer will be expected for full credit.**
- **Write your name on each page.**
- **Scan your work and upload it on Canvas, under Problem Set 3 - before 5pm Monday, February 1.**

Problem 1

The gene for manx tail in cats is an embryonic lethal in homozygous state, such that:

MM = lethal (progeny not observed at birth)
Mm = manx tail
mm = normal tail

Another trait in cats, the short hair (S) is dominant over long hair (s) so that:

S_ = short hair
ss = long hair

The two traits are controlled by genes that assort independently.

A) What is the genotypic and phenotypic distribution from an *inter se* mating?

B) What is the probability of a kitten with long hair **given** it has manx tail?

C) What is the probability that kittens in a litter are born in the following order: manx tail long hair, normal tail long hair, manx tail short hair?

D) What is the probability that in a litter of 7, 3 kittens will have manx tail.

Problem 2

You are working with two forms of progressive retinal atrophy (PRA) in dogs--one form in **Siberian Huskies**, which is a **sex-linked recessive** allele, and one form in **Labs**, which is an **autosomal recessive**. Each breed is normal for the disease allele in the other breed. Assume you mate a **Siberian male with the disorder** to a **female Lab with the disorder**. (Assume homozygosity for the normal allele.)

A) What is the phenotypic distribution of the progeny from this mating (include gender)?

B) What is the probability of a progeny with PRA from the ***inter se*** **mating** (both normal)?

C) From the results of the same ***inter se*** **mating**, what is the probability of having PRA **given** the pup is a male?

ANSI 3384
PROBLEM SET 3
ANSWERS

Problem 1

The gene for manx tail in cats is an embryonic lethal in homozygous state, such that:

MM = lethal (progeny not observed at birth)
Mm = manx tail
mm = normal tail

Another trait in cats, the short hair (S) is dominant over long hair (s) so that:

S_ = short hair
ss = long hair

The two traits are controlled by genes that assort independently.

A) What is the genotypic and phenotypic distribution from an *inter se* mating?

MmSs x MmSs (**Manx tail, short hair**)

2/3 Mm + 1/3 mm
3/4 S_ + 1/4 ss

⇨

(1/2)	**6/12**	**MmS_**	**manx, short**
(1/6)	**2/12**	**Mmss**	**manx, long**
(1/4)	**3/12**	**mmS_**	**normal, short**
(1/12)	**1/12**	**mmss**	**normal, long**

B). What is the probability of kitten with long hair **given** it has manx tail?

P(ss / Mm) = P(ss and Mm) / P(Mm) = (1/6) / (2/3) = **1/4**

C) What is the probability that kittens in a litter are born in the following order: manx tail long hair, normal tail long hair, manx tail short hair?

Independent events: = 1/6 x 1/12 x 1/2 = **1/144 = 0.0069**

D) What is the probability that in a litter of 7, 3 kittens will have manx tail.

N = total, M = manx, NT = normal tail
N = 7, M = 3, NT = 4

$$\frac{\mathbf{N!}}{\mathbf{M!\,T!}}[P(\mathrm{M})^3 \times P(\mathrm{T})^4] = \frac{\mathbf{7!}}{\mathbf{3!\,4!}}[(8/12)^3 \times (4/12)^4]$$

$$= \frac{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{(3 \times 2 \times 1) \times (4 \times 3 \times 2 \times 1)}[0.29 \times 0.01]$$

$$= 35 \times 0.29 \times 0.01 = 0.12$$

Problem 2

You are working with two forms of progressive retinal atrophy (PRA) in dogs--one form in **Siberian Huskies**, which is a **sex-linked recessive** allele, and one form in **Labs**, which is an **autosomal recessive**. Each breed is normal for the disease allele in the other breed. Assume you mate a **Siberian male with the disorder** to a **female Lab with the disorder**. (Assume homozygosity for the normal allele.)

PRA: Siberian Huskies = X^a, Labs = p

Siberian male with the disorder PPX^aY
female Lab with the disorder ppX^AX^A

$PPX^aY \times ppX^AX^A$

A) What is the phenotypic distribution of the progeny from this mating (include gender)?

½	PpX^AX^a	normal female
½	PpX^AY	normal male

B) What is the probability of a progeny from the ***inter se*** **mating** (both normal) having PRA?

$PpX^AX^a \times PpX^AY$

3/4 P_ + 1/4 pp
1/4 X^AX^A + 1/4 X^AX^a + 1/4 X^AY + 1/4 X^aY

3/16	P_ X^AX^A	normal female	1/16	pp X^AX^A	PRA female
3/16	P_ X^AX^a	normal female	1/16	pp X^AX^a	PRA female
3/16	P_ X^AY	normal male	1/16	pp X^AY	PRA male
3/16	P_ X^aY	PRA male	1/16	pp X^aY	PRA male

P(PRA) = 3/16 + 1/16 + 1/16 + 1/16 + 1/16 = 7/16 =0.44

C) From the results of the ***inter se*** **mating**, what is the probability of having PRA **given** the pup is a male?

P(PRA/male) = P(PRA and male) / P(male) = (5/16) / (8/16) = 5/ 8 = .625

P(PRA and male) = 3/16 + 1/16 + 1/16 = 5/16
P(male) = 3/16 + 3/16 + 1/16 +1/16 = 8/16 = ½

ANSI 3384
PRACTICE PROBLEM FOR PROBLEM SET 5

Problem 1

Assume you have a population in equilibrium, with 637 polled Hereford and 63 horned Hereford (polled is the dominant trait). Calculate the **gene and genotypic frequencies** in the progeny under **positive assortative mating**.

Polled: A_ = 637/700 = 0.91

Horned: aa = 63/700 = 0.09 = q^2 => q = 0.3

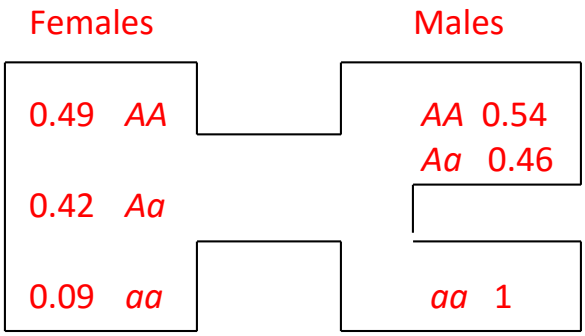
p = 0.7

Parental population – equilibrium, so:

f(*AA*) = p^2 = 0.49

f(*Aa*) = 2pq = 0.42

f(*aa*) = q^2 = 0.09



f(*AA* / A_) = 0.49 / 0.91 = 0.54

f(*Aa* / A_) = 0.42 / 0.91 = 0.46

f(*aa* / aa) = 1

Genotypes		Mating	Progeny		
Female	Male	frequency	AA	Aa	aa
AA	*AA*	0.49 x 0.54 = 0.26	1	--	--
AA	*Aa*	0.49 x 0.46 = 0.23	1/2	1/2	--
Aa	*AA*	0.42 x 0.54 = 0.23	1/2	1/2	--
Aa	*Aa*	0.42 x 0.46 = 0.19	1/4	1/2	1/4
aa	*aa*	0.09 x 1 = 0.09	--	--	1

f(*AA*) = (0.26)(1) + (0.23)(1/2) + (0.23)(1/2) + (0.19)(1/4) = **0.54**

f(*Aa*) = (0.23)(1/2) + (0.23)(1/2) + (0.19)(1/2) = **0.32**

f(*aa*) = (0.19)(1/4) + (0.09)(1) = **0.14**

} Genotypic Frequencies

f(*A*) = f(*AA*) + ½ f(*Aa*) = 0.54 + 0.16 = **0.7**

f(*a*) = f(*aa*) + ½ f(*Aa*) = 0.14 + 0.16 = **0.3**

} Gene Frequencies