ANIM SCI 2200.01: Introductory Animal Sciences
Fall Semester, 2012

Lecture: Monday, Wednesday and Friday; 11:30-12:25am, 103 Kottman Hall

Instructor: XXXXX, Department of Animal Sciences
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Prerequisites:

Text: Required: ANIMAL SCIENCES, Peffer and Day. Kendall Hunt Publishing; Dubuque, IA:2009; ISBN: 9780757563171.

Goals and Objectives: Introductory Animal Sciences is a Natural Science, general education, course that promotes an understanding of modern science through a biological systems based approach. Students learn of the relationship between science and technology, consider the implications of scientific discoveries, and acquire the knowledge and critical thinking skills required to evaluate the potential of science and technology to address problems from a global arena as they pertain to domestic animals used for human benefit.

Learning Objectives:

1. Students understand whole animal structure, form and function; growth and development of systems from the cellular level.
2. Students learn key concepts in genetics, nutrition, and reproduction as it applies to animal managements systems and the contributions of animals to humans.
3. Students contribute to respectful management of animals and the environment.
4. Students respect and appreciate diversity.
5. Students develop national and global awareness.
6. Students continue the pursuit of knowledge.
7. Communicate effectively, both orally and in writing.
8. Students identify and solve problems by integrating reliable knowledge, logic and experiences.
9. Students form and maintain working relationships and accept constructive criticism.
10. Students transform desires into rewarding opportunities.

How students meet objectives through this course: The course embodies fundamental concepts in areas of genetics, reproduction, nutrition, behavior, and biotechnology; and students are introduced to the molecular and cellular mechanisms that underscore the function of biological systems and how knowledge in this area is applicable toward appropriate management of domesticated animals. Students will consider how the study of animals has advanced from early scientific discoveries and through the study of animal systems from the local to global arena, students will appreciate the use of animals and their contributions across diverse populations and understand the local and global impacts of the application of new technologies to the animal industries.

Course Description: A study of the basic principles of genetics, breeding, reproduction, nutrition, behavior, and biotechnology as it applies to the molecular, cellular, and physical underpinnings of domesticated animal form and function.

Goals and Objectives of the GE Natural Science Category: Courses in natural sciences foster an understanding of the principles, theories and methods of modern sciences, the relationship between science and technology, and the effects of science and technology on the environment.

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students learn key events in the history of science.
3. Students provide examples of the inter-dependence of scientific and technological developments.
4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world

How students meet the GE Natural Science objectives through this course: Students will learn how systematic observations of the natural world have helped define current concepts of science and the role of controlled experimentation in support of early scientific theories through discussions of behavior. An understanding of the foundations of modern science will be acquired through discussions of cell theory, heredity, physiological ecology, energy transfer, and evolutionary strategies of todays domesticated species. Students will gain an appreciation of how human intervention has shaped animal form and function throughout history and the role of technology; addressing the implications of biotechnologies current and future applications.

Animal Sciences 2200.01 Learning Outcomes:

Successful students will:

1. Be familiar with the historical, social, and biological contexts that govern the study of animals.
2. Understand basic principles of genetics, breeding, reproduction, nutrition, behavior, and biotechnology.
3. Appreciate the molecular, cellular, and physical underpinnings of animal form and function.
4. Develop the ability to critically evaluate concepts in science as they are applied to the study of animals.
5. Construct innovative approaches to, and solutions of, problems encountered when maintaining animals for human benefit.
6. Appreciate the uses of animals and social attitudes regarding how animals are used.
7. Have a broad understanding of biotechnology and it's uses toward advancing the health and well-being of animals
8. Consider positive and negative implications of applying modern technology to animal systems.

Lecture and Reading Schedule

Week	Topic	Text
1	Process of domestication and a historical perspective of how animal sciences has evolved.	Chapter 1
2	Animal Behavior and Welfare	Chapter 2 and 15
3	Nutrition: nutrient requirements, physiology, and the importance of different digestive strategies.	Chapter 3
4	Organization of biological systems from molecular structures to physical features.	Chapter 4
5	Genetics & application of genetics for animal breeding: natural versus artificial selection.	Chapter 4
6	Biotechnology: progress, applications and limitations.	Chapter 4
7	Principles of reproduction and assisted reproductive technologies.	Chapter 5
8	Lactation strategies: Nutritional and immunological support of the young.	Chapter 6

9	Animal form and function: Ruminants	Chapter 7 and 8
10	Animal form and function: Small Ruminants & Pseudo-ruminants	Chapter 9 and 13
11	Animal form and function: Hind-gut fermenters	Chapter 12
12	Animal form and function: Simple nonruminants & Avians	Chapter 10 and 11
13	Animal form and function: Aquatics	Chapter 14
14	Global status of the animal industries	
	Final Exam	

Evaluation

Three exams will be given during the semester. Two lecture midterms worth 100 points each and a lecture final worth 150 points. Exams will be non-comprehensive and consist of mixed format questions. A total of four group mini-discussions will be prompted during the semester by introducing students to hypothetical scenarios and/or case studies that challenge learned concepts or require students to think critically about the application of science technology. In addition, students will reflect on previous course content by submitting weekly question(s)/comment(s).

Evaluation	**POINTS**
Exam I	100
Exam II	100
FINAL EXAM	150
Class discussion	50
Total	**500**

Exams will not be returned. You will be given an opportunity to review your exam in class or may make an appointment to view your exam in the instructor's office.

Grade Scale: Grades will be based on the total points earned as a percentage of total points possible and letter grades assigned as follows:

Percentage		Percentage	
93-100	A	73-76.9	C
90-92.9	A-	70-72.9	C-
87-89.9	B+	67-69.9	D+
83-86.9	B	60-66.9	D
80-82.9	B-	<60	E
77-79.9	C+		

Course Management System

This course uses Carmen (http://carmen.osu.edu) to manage course content and grades. Students are expected to check this site frequently to receive updates regarding the course. The following course information is available through Carmen:

Grades: Access grades as well as the class mean and standard deviation for completed assignments.

Content: Download and print a copy of the Power Point slides prior to attending class. Note that these slides do not contain a full copy of the lecture notes – but an abridged version to facilitate note taking by students during lectures. Students must attend lectures to obtain the material required to complement these slides.

Links: This section contains links to broader categories of information concerning the study of animals. Students are encouraged to explore these resources, however, the content of these websites is not endorsed by the course instructor.

Glossary: Includes a comprehensive list of commonly used class terms and their definition.

Course Policies

Attendance Policy: Attendance to lectures is ***mandatory***. Students will be unable to make-up missed activities. If an emergency should warrant that a lecture be missed, prior notification must be given to the instructor. In case of illness, the instructor must be contacted the day of the absence. You must be seen by and receive written documentation from a professional health care provider on the day of the absence in order to not be penalized for the absence.

E-Mail Etiquette: The use of e-mail has made the classroom professor more approachable and accessible to the student. However, students should realize that e-mail should not always be used as a casual form of communication and professional relationships should be maintained when using e-mail for a class. Below I have included guidelines you should follow when drafting your e-mail. I will not respond to e-mails that I consider inappropriate. I will respond to appropriate emails in a timely manner, do not expect an immediate reply. If you require an immediate response consider visiting with me in person.

DO

- Include a descriptive statement in the subject line.
- Use proper salutations when beginning an e-mail.
- Be concise in the body of the e-mail, use complete sentences and proper grammar.
- Use an appropriate closure at the end of each e-mail followed by your first and last name.
- If replying to an e-mail, reference the original e-mail and its content.
- Be selective of your choice of words. Emotions are difficult to convey in text and without the benefit of facial expressions your sentiment can be lost in the words you choose to write.

DON'T

- Use all capital letters; this conveys a tone of ANGER.
- Use e-mail as a format to criticize other individuals.
- Ask for your grade via e-mail. Grades will not be discussed by e-mail. If you need to discuss a graded item make an appointment to do so in my office.
- E-mail to inquire when grades will be posted. We will work toward submitting grades promptly, however, recognize that grading assignments and exams requires considerable time to ensure uniformity and fairness.
- Send an e-mail out of frustration or anger. Learn to save the e-mail as a draft and review at a later time when emotions are not directing the content.

Punctuality: Punctuality is a necessity as tardiness is disruptive to the entire class. Students who are repeatedly tardy are subject to a reduction in total points assessed toward the final grade.

Technology Devices: Interruptions are distractive to learning. All cell phones and related devices must be turned ***OFF*** or placed in ***Etiquette Mode*** and stored out of sight during class period. Text-messaging during class is unacceptable.

University Policies

Disability Services: Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http:/www.ods.ohio-state.edu/.

Academic Misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://www.studentaffairs.osu.edu/info_for_students/csc.asp).

Introductory Animal Science
Animal Sciences 2200.01
GE Natural Sciences Category
Biological Science course

I. Goals and Objectives:

A. The *Introductory Animal Sciences* course meets the general principles of the GE Model Curriculum and **Goals** of the Natural Science Biological Sciences course GE category as follows:

Courses in natural science foster student's understanding of the principles, theories, and methods of modern science, the relationship between science and technology, and the effects of science and technology on the environment.

- *Introductory Animal Sciences* uses a biological systems based approach to equip a broad range of students with the knowledge and critical thinking skills required to address questions concerning the evolution, survival, adaptation, and performance of domestic animals utilized for human benefit. Basic principles of animal biology including cell theory, heredity, physiological ecology, energy transfer, and evolutionary strategies and the molecular basis of form and function, and organ system integration are taught with an emphasis on food and fiber animals and equine. The contribution of animals toward advancements in agriculture and medical biotechnology are presented, as well as the local and global impacts of the application of new biotechnologies to the animal industries and the impacts of the animal industries on society and the environment.
- The study of Animal Sciences provides a logical framework for discussing the basic facts, principles, and theories in the Biological Science field. Current knowledge and understanding of animals is reliant upon a thorough understanding of basic biology. The study of animal systems allows exploration of key facets of basic biology including: 1) the role of evolution in shaping an organisms form and function and the morphological, physiological, and behavioral modifications that have accompanied this dynamic process; 2) the study of inheritance and its contribution to genetic variability observed in natural and artificial selection processes and the impact of inbreeding on organismal adaptability. Both natural and artificial selection result in gradual changes in observed phenotype (appearance; physical features); whereas natural selection is viewed in terms of survival advantages within an environment discussions of artificial selection provide a framework to consider how selection by humans opposes natural selection and may reduce survival advantages; 3) the interrelationships between animals and their environment and the biochemical and physiological processes animals use to cope, which is a cornerstone of their survival and well –being under human dominance; and 4) the role of the scientific method in our current understanding of systems biology by considering a historical perspective of early observations and discussions of how controlled experimentation dispelled original theory. Many aspects of basic biology advanced through the study of animal systems, which continue to contribute to novel theories in biology. From the basic studies of genetic research that began in rodents in 1902 to the more recent application of pig cells for the treatment of insulin deficient diabetes, an introduction into animal systems provides not only a tool to enhance understanding of basic biology, but to understand the relevant application of these basic concepts. As such, the course offers a unique opportunity for students to learn fundamental concepts in the biological sciences through animal systems that are often overlooked beyond their role in the global food supply and entertainment.

B. The proposed *Introductory Animal Sciences* course fulfills the **Learning Objectives** of the Natural Science GE category as follows:

1. Students understand the basic facts, principles, theories and methods of modern science.

- Introductory Animal Sciences embodies fundamental concepts in areas of genetics, reproduction, physiology, nutrition, behavior, and biotechnology as they apply to animals kept for human benefit. Students are introduced to the molecular and cellular mechanisms that underscore the function of biological systems and how knowledge in this area is applicable toward advancement of domestic animals.
- Introductory Animal Sciences will provide an understanding of the fundamental processes central to biological sciences. The course will explore how logical methods of science (ie controlled experimentation) and systematic observation have defined current concepts in science and continues to shape societies understanding of animal biology. The evolution of key scientific theories from Aristotle's ideas on preformation to modern epigenesis will be placed in perspective as students learn the roles of qualitative and quantitative observation in scientific discovery and advancement.
- Basic facts, principles and theories of biological sciences will be further explored through discussions concerning: 1) the evolution of animals. The evidence supporting evolution of an animal's form and function and the biological

modifications that accompanied their evolution will be highlighted. An emphasis will be placed on equids to discuss how climatic change served as a selection pressure that contributed to increased body size, change in dentition, lengthening of limbs, altered eye positioning, and altered digestive strategy from browser to grazer. In addition, the role of changing habitat on the evolution of ruminant and pseudo-ruminant digestive strategies will be used for comparison. Evolutionary theory also will be applied to discussions of placentation and lactation. The morphological, physiological, and behavioral adaptations of animals as a result of natural selection will be discussed and the influence of domestication and artificial pressure on changing phenotype will be evaluated; 2) the study of genes including: basic principles of heritability, as first evaluated in plants and subsequently applied to rodents; the role of DNA as the blue print of life underlying cellular function and the disease process; advancements in DNA technology that underscore concepts in biotechnology, transgenesis, and xenotransplantation; 3) the relation between animals and their environment. Students will explore how wild and captive environments have influenced animal diversity, from the cellular level to the functioning organism and shaped aspects of reproduction, nutrition, and behavior. The role of ecological underpinnings of an organisms success will be evaluated, for example many animals respond to photoperiod and adjust their dietary and reproductive habits in response to their climate; and 5) the symbiosis between organisims, such as that evidenced in ruminant animals that rely on microorganisms for digestive function, will be discussed and the influence of this symbiotic relationship on the animals footprint on the environment will be introduced. Each of these areas will be instrumental toward advancing students understanding of biological processes.

2. Students learn key events in the history of science.

- Basic concepts of modern science that are explored in *Introductory Animal Sciences* are presented in a historical context. Students are introduced to a timeline of early discoveries and influential men and women involved in the advancement of the field. For example, for students to appreciate the role of science and technology in advancing knowledge in assisted reproductive therapy, students are presented with key discoveries including the first visualization of sperm by Leeuwenhoek and Hamm in 1678. The importance of this discovery and its implications toward current methods of embryo transfer are highlighted. Similarly, the research of Hans Driesch in the 1800s as the first successful attempt of cloning (prior to even knowledge of DNA) serves as the foundation for a historical perspective into molecular genetics. This is chronologically followed to the current use of molecular genetics in the marketing of the first transgenic pet (GloFish™). A similar approach is used for each of the primary disciplines introduced in the course.

3. Students provide examples of the inter-dependence of scientific and technological developments.

- The role of scientific knowledge in improving technology for optimal performance of animals maintained in captivity is an important aspect of the course. Accordingly, students are introduced to the importance of biotechnology for advancing the health and well-being of animals, including humans. Transgenic practices and their application toward improving growth rate of animals (fish), pathogen resistant animals (Jersey cow resistant to mastitis), and environmentally "friendly" pigs (enviropig, which shows reduced phosphorus excretion) provides examples of the potential of science and technology. In addition, students will be aware of areas in which current technology is not sufficient (ie, aquaculture industry).

4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

- As students learn basic scientific concepts and discover the impact of rapid advancements in science on animal health and well-being, the impact of scientific discoveries in the context of social and ethical perceptions is explored. The role of social perception in scientific progress is highlighted as well as the role of an individual's ethics in guiding the acceptance or rejection of advancements in the field. As the course centers on the use of animals by humans, it considers the ethical implications faced by society when animals are used for human benefit.

II. Assessment Plan (see also separate ANIM SCI 2200.01 Assessment Plan – Course Learning Objectives Assessment Matrix)

Our goal is that students who satisfactorily complete this course will be knowledgeable, skilled, and reflective with an ability to critically evaluate concepts in science. Students will appreciate the molecular, cellular, and physical underpinnings of animal form and function and will be familiar with the historical, social, and biological contexts within which a framework for the study of animals has evolved. They will have the opportunity, through this course, to develop innovative approaches to, and solutions of, problems encountered when maintaining animals for human benefit.

Assessment will include students' knowledge and their ability to integrate that knowledge in problem solving. Through the use of examination, essay and monitored discussion (see below), instructors will be able to evaluate students' progress toward the goals outlined above and will adjust teaching tools and methods as needed during the course. In addition, the effectiveness of the instructors will be evaluated by peers experienced in educational pedagogy as well as by the students themselves (see below). Adjustments will be made as indicated by these sources of assessment to improve comprehension and achievement of learning objectives. Finally, the course content will be assessed before each offering to validate that it is current and applicable to the goals outlined above (see below).

1. Student Assessment:

- Students will be assessed for comprehension and application of the information base of the material through three examinations. Multiple choice and short answer questions will be used to evaluate students' understanding of fundamental principles and their ability to apply it to practical issues. Essay-type questions will assess the students' ability to integrate the knowledge acquired and apply it to appropriate issues, chosen from a selection of topics provided by the course instructor.
- Students will be assessed routinely for their comprehension of fundamental concepts and their ability to critically evaluate issues raised during the lectures through group activities. Hypothetical scenarios and case studies will be provided for student analysis and interpretation utilizing concepts learned in class. In addition, each week students will be required to submit a question or comment regarding lecture material covered during the previous week. Responses will be monitored for student understanding of key concepts. Ten percentage points of a student's final grade will be awarded for participation in these activities.

2. Course Instructor Assessment:
Through Peer Evaluation of Instruction by faculty members in the Department of Animal Sciences and utilization of the University Student Evaluation of Instruction (SEI) instrument, the instructors will be evaluated on an ongoing basis to assure that the goals of the course are met and that educational pedagogy is implemented.

3. Course Assessment:
By its nature, the content of this course will require ongoing evaluation and updates to keep current with rapidly advancing scientific fields. The reading list will be evaluated and new articles of interest will be added. In addition, the group exercises will be assessed for effectiveness in enhancing the students' integration of the course materials, and will be adjusted as needed.

C. Supplemental information

The following is a reading list that was used in the development of course material. The reading list is currently being expanded as the course moves from quarters to semesters; however, this is the list of source material that has been used in course development on a quarter system. Note, these readings are not required by students, but students are provided the original publications when inquired.

READING LIST

Adams, G.P., M.H. Ratto, W. Huanca, and J. Singh. 2005. Ovulation-inducing factor in the seminal plasma of alpacas and llamas. Biol. Reprod. 73:452-457.

Alaska Department of Fish and Game. Gaudet, D. 2002. Atlantic salmon: a white paper.

Albarella, U., K. Dobney, A. Ervynck, and P. Rowley-Conway. 2008. Pigs and humans: 10,000 years of interaction. Oxford; Oxford University Press.

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American Veterinary Medical Association. American College of Animal Welfare Organizing Committee. Animal Welfare. Retrieved from http://www.avma.org/issues/animal_welfare/default.asp.

Andersen, I.L., S. Berg, and K.E. Bøe. 2005. Crushing of piglets by the mother sow (*Sus scrofa*)-purely accidental or a poor mother? Appl. Anim. Behav. Sci. 93:229-243.

Bahr, J. 2008. The Chicken as a Model Organism. *From* the Sourcebook of Models for Biomedical Research. Totowa: Humana Press Inc.

Baldwin, J.M. 1896. Heredity and instinct (I). Science.

Barnett, J.L., P.H. Hemsworth, G.M. Cronin, E.C. Jongman, and G.D. Hutson. 2001. A review of the welfare issues for sows and piglets in relation to housing. Aust. J. Agric. Res. 52:1-28.

Baumans, V. 2004. Use of animals in experimental research: an ethical dilemma? Gene Therapy. 11:S64-S66.

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Bearden, H.J., J.W. Fuquay, and S.T. Willard. 2004. Applied animal reproduction. 6th ed. Upper Saddle River: Pearson Prentice Hall.

Beaumont, W. 1833. Experiments and observations on the gastric juice and the physiology of digestion. Pittsburgh: Allen.

Behringer, R.B. G.S. Eaking, and M.B. Renfree. 2006. Mammalian diversity: gametes, embryos, and reproduction. Reprod. Fertil. Dev. 18:99-107.

Bell, F.R. 1972. Sleep in the larger domesticated animals. Proc. Roy. Soc. Med. 65:176-177.

Belloc, H. 1957. Stories, essays, and poems. San Diego, CA: Dent.

Board on Agriculture and Natural Resources. 2008. Changes in the sheep industry in the United States. Making the transition from tradition. Washington, D.C: The National Academies Press.

Bradford, G.E. 1999. Contributions of animal agriculture to meeting global food demand. Livest. Prod. Sci. 59:95-112.

Brady, C. 2008. An illustrated guide to animal science terminology. Clifton Park: Thomson Delmar Learning.

Brillat-Savarin, J-A. 1985. The philosopher in the kitchen. Middlesex: Penguin Books.

Broom, D.M. 1986. Indicators of poor welfare. Br. Vet. J. 142:524-526.

Broom, D.M. 1988. The scientific assessment of animal welfare. Appl. Anim. Behav. Sci. 20:5-19.

Broom, D.M. 1991. Animal welfare: concepts and measurement. J. Anim. Sci. 69;4167-4175.

Bruford, M., D. Bradley, G. Luikart. 2003. DNA markers reveal the complexity of livestock domestication. Nature. 4:900-910.

Cain, K. and D. Garling. 1993. Trout culture in the north central region. North Central Regional Aquaculture Center. Fact Sheet 108.

Campbell, K.L. and J.R. Campbell. 2009. Companion animals: their biology, care, health, and management. 2nd ed. Upper Saddle River: Pearson Prentice Hall.

Campbell, J.R. and J.F. Lasley. 1969. The science of animals that serve mankind. New York: McGraw-Hill.

Capuco, A.V. and R.M. Akers. 2009. The origin and evolution of lactation. J. Biol. 8:37-40.

Carpenter, K.J. 2003. A short history of nutritional science: Part 1 (1785-1885). J. Nutr. 133:638-645.

Carpenter, K.J. 2003. A short history of nutritional science: Part 2 (1885-1912). J. Nutr. 133:975-984.

Carpenter, K.J. 2003. A short history of nutritional science: Part 3 (1912-1944). J. Nutr. 133:3023-3032.

Carpenter, K.J. 2003. A short history of nutritional science: Part 4 (1945-1985). J. Nutr. 133:3331-3342.

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Clarke, A.S. 1996. Maternal gestational stress alters adaptive and social behavior in adolescent rhesus monkey offspring. Infant Behav. Dev. 19:451-461.

Clauss, M., A. Schwarm, S. ortmann, D. Alber, E.J. Flach, R. Kühne, J. Hummel, W.J. Streich, and H. Hofer. 2004. Intake, ingesta retention, particle size distribtution and digestibility in the hippopotamidae. Comp. Biochem. Physiol. A. 139:449-459.

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Costa, D.A. and D.J. Reinemann. 2004. The purpose of the milking routine and comparative physiology of milk removal. Paper presented at the National Mastitis Council Meeting.

Crawford, R.D. 1990. Origin and history of poultry species. In: R.D. Crawford (Ed.) Poultry breeding and genetics. Amsterdam: Elsevier.

Cunningham, M., M.A. Latour, and D. Acker. 2005. Animal Science and Industry. 7th ed. Upper Saddle River: Pearson Education, Inc.

Damron, W.S. 2006. Introduction to Animal Science: Global, Biological, Social, and Industry Perspectives. 3rd ed. Upper Saddle River: Pearson Education Inc.

Darwin, C. 1872. The expression of the emotions in man and animals. London: John Murray.

Dehoux, J-P. and P. Gianello. 2007. The importance of large animal models in transplantation. Frontiers in Bioscience. 12:4864-4880.

Dekkers, J.C.M. 2004. Commercial application of marker- and gene-selected selection in livestock: strategies and lessons. J. Anim. Sci. 82:E313-E328.

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Drake, A., D. Fraser, D.M. Weary. 2008. Parent-offspring resource allocation in domestic pigs. Behav. Eco. Sociobiol. 62:309-319.

Dryden, G. McL. 2008. Animal Nutrition Science. Wallingford:CABI Publishing.

Duncan, I.J.H. 2005. Science-based assessment of animal welfare: farm animals. Rev. Sci. Tech. Off. Int. Epiz. 24:483-492.

Engle, C., G. Greaser, and J. Harper. 2000. Agriculture alternatives: Meat goat production. Pennsylvania State University Extension. ps37409.

Ensminger, M.E. and R.C. Perry. 1997. Beef cattle science. 7th ed. Danville: Interstate Publishers Inc.

Evans, J.P., A. Borton, H.F. Hintz, and L.D. van Vleck (Ed.). 1990. The Horse. 2nd ed. New York: W.H. Freeman and Co.

Evans, P. 2005. Equine vision and its effects on behavior. Utah State University Cooperative Extension Service. AG/Equine/2005-03.

Evershed, R.P., S. Payne, A.G. Sherratt, M.S. Copley, J. Coolidge, D. Urem-Kotsu, et. al. 2008. Earliest date for milk use in the Near East and southeastern Europe linked to cattle herding. Nature. 455:528-531.

Field, T.G. and R.E. Taylor. 2008. Scientific farm animal production: an introduction to animal science. 9th ed. Upper Saddle River: Pearson Prentice Hall.

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Food and Agriculture Organization of the United Nations, United Nations Development Program, Regional Small Scale -Coastal Fisheries Development Project. Rabanal, H. 1988. History of Aquaculture. ASEAN/SF/88/Tech.7.

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Animal Sciences 2200.01 Assessment Plan

Natural Science GEC Learning Objectives	Direct Methods	Indirect Methods
1. Students understand the basic facts, principles, theories and methods of modern science	Embedded short answer examination questions	ANIM SCI 2200.01 Learning Evaluation and Feedback
2. Students learn key events in history of science	Embedded short answer examination questions	ANIM SCI 2200.01 Learning Evaluation and Feedback
3. Students provide examples of the inter-dependence of scientific and technological developments	Embedded short answer examination questions	ANIM SCI 2200.01 Learning Evaluation and Feedback
4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world	Embedded short answer examination questions	ANIM SCI 2200.01 Learning Evaluation and Feedback

ANIM SCI 2200.01 Learning Evaluation and Feedback: During the final week of class there will be an opportunity for all students to complete a comprehensive feedback form about the 'Introductory Animal Sciences' course to evaluate students' perception of the course as well as whether students self assess that they have met the learning objectives for the course (using a Likert type scale ranging from 1 – strongly disagree to 5 – strongly agree).

All assessment data will be reviewed by the instructors and internal academic advisory personnel (which will consist of faculty who are members of the Departmental Academic Affairs Committee and faculty assigned by the chair to facilitate course and program reviews) and external academic advisory personnel (which will include a minimum of one person from the College Academic Affairs Committee or the Asst., Assoc., or Dean of Resident Education within CFAES); changes will be made to the course if data suggest any learning objectives are not being adequately addressed.

The expected level of achievement is:

80% of students will achieve competency on the written assignment sections that address the aforementioned GE Learning Objectives

At least 80% of students will demonstrate competency (75% or greater of potential points) on the embedded short answer examination questions