

Proposal
Animal Nutrition Minor
College of Food, Agricultural, and Environmental Sciences

Introduction:

Animal Nutrition embodies fundamental concepts in biology, chemistry, genetics, physiology, and biochemistry. It involves an in-depth examination of the cellular and molecular mechanisms responsible for regulation of nutrient transport and metabolism, encompasses comparative digestive physiology between animals that occupy different dietary niches, and applies practical knowledge on feeding strategies for optimizing animal health and well being. Nutritional knowledge prepares students for numerous career opportunities in a growing field. Animal nutritionists will serve as leaders in increasing the nutritive value of meat, milk, and eggs through improved animal nutrition to promote human health. As consumer interest in the relationship between diet and health increases, the role of animal nutritionists will be expanded in research, development and promotion of functional foods i.e., foods enhanced to provide a health benefit beyond basic nutrition. In cattle, swine, sheep, and horses, nutritional support for the neonate in reducing incidence of morbidity and mortality will continue to be an important area of study that has implications for both animal and human populations. An increased demand for animal nutritionists is also related to recent lifestyle changes of companion animals which has promoted increased incidences of obesity and other nutritional disorders (e.g. diabetes). In addition, there is a need for nutritionists to evaluate the chemical and nutritional value of food, formulate diets to maximize growth and well being, reproduction and performance and minimize impacts of animal systems on the environment, consult with producers and clients, and direct dietary management of animals maintained in zoological and wildlife centers. According to the United States Department of Agriculture employment opportunities for U.S college graduates with expertise in the food, agriculture, and natural resources system are projected to remain strong with expertise in nutrition listed as providing one of the best opportunities for new graduates.

Rationale:

The provision of an Animal Nutrition minor provides students the opportunity to develop a foundation in the role of diet and animal well being. In addition to the career opportunities available for students with nutrition knowledge, increased recognition of the importance of nutrition is supported by the recommendation or requirement of lower division nutrition courses for admittance into select veterinary schools. The Animal Sciences department provides strong leadership in nutrition education for students within the department. An Animal Nutrition minor would allow for this same leadership and nutritional knowledge to be disseminated to a greater population of students that recognize the importance of this field of study. Although a Human Nutrition minor is currently available, students in the Biology and Zoology departments have inquired about the possibilities of pursuing an Animal Nutrition minor, which more closely meets their needs for pursuing animal related careers.

In addition, The Ohio State University is centrally located in Columbus and provides possible internship opportunities with Ross Laboratories and Nestle, leading manufacturers of human food products, as well as regional opportunities with IAMS, a manufacturer of dog and cat food products. Other nutrition related employers have included : Akey Nutrition, Cargill Animal

Nutrition, Partners Advantage/Agrilience, Purina Mills, Renaissance Nutrition, Premium Standard Farms, Omaha's Henry Doorly Zoo, ADM Alliance Nutrition, Pierre Foods, and Leprino Foods. These internship opportunities provide students hands-on learning opportunities for the application of classroom centered learning.

Purpose:

The purpose of an Animal Nutrition Minor is to increase student knowledge of the principles of nutritional physiology and fundamentals of nutrition and how to apply basic concepts learned to the management of animals. Nutrition integrates the disciplines of biology, chemistry, and genetics and is complementary to many additional science based degree programs, allowing for the application of these sciences in a biological system. Accordingly, knowledge in this field will further prepare students for a competitive job market or post-graduate training.

Benefits for Students:

The benefits have been described in the previous sections. In summary, this minor would prepare students for a competitive job market or post-graduate training as it embodies the fundamentals of biology, chemistry, and genetics and applies basic concepts in these disciplines to biological systems. Due to the well publicized impact of nutrition on performance, morbidity, and mortality of animals, humans included, there is a growing interest in nutritional sciences. This minor would allow further exploration into this field of study. As human-animal interactions are significant in today's society, knowledge in the nutritional sciences would provide students a greater understanding of how dietary decisions they make with regards to their animals impact the well-being of these animals.

Curriculum:

Animal Nutrition Minor

College of Food, Agricultural
And Environmental Sciences
The Ohio State University

Pasha A Lyvers Peffer
201 Plumb Hall
2027 Coffey Rd.
292-3896
lyvers-peffer.1@osu.edu

A minor in animal nutrition is for students who wish to develop a greater understanding of nutritional physiology and fundamentals of nutrition and how to apply basic concepts learned to the management of animals. This minor will be beneficial to students considering a career in nutrition consulting, education, and research. Topics covered emphasize physiology, nutrient requirements and function, and diet formulation.

The minor in Animal Nutrition consists of 20 hours selected as follows:

Required:		Credit Hours
ANIM SCI 330	Principles of Animal Nutrition	5
ANIM SCI 310	Principles of Animal Systems Physiology	5
Electives:		
ANIM SCI 331	Practical Horse Feeding	4
ANIM SCI 630.01	Ruminant Nutrition	5
ANIM SCI 630.02	Non-Ruminant Nutrition	5
ANIM SCI 630.03	Feeding Management and Records Analysis for Dairy Cattle	5

Restrictions and General Information

1. This minor is not available to students majoring in Animal Sciences or Human Nutrition.
2. A minimum overall CPHR for courses comprising the minor shall be 2.0.
3. A minor should be declared at the time a student accumulates 90 hours.
4. A maximum of five credit hours may overlap between the minor and the GEC (foundation, natural sciences, arts and humanities and social sciences).
5. Courses taken on a pass/non pass basis may not be applied to the minor.

Recruiting of Students:

The minor will be advertised via the departmental web-page and list serve. It will be advertised to students within the college as well as other disciplines including biology and zoology. In addition, the minor will be advertised at recruitment and orientation venues.

Enrollment Anticipated:

An initial enrollment of 10 is anticipated based on current student interest. With proper advertising, this number is expected to increase gradually.

The Ohio State University
College of Food, Agricultural, and Environmental Sciences
Approval by Colleges of the Arts and Sciences Pending

Animal Nutrition Minor (ANMLNTRT, 726)

Minor Coordinator: Pasha Lyvers-Peffer, 201
Plumb Hall, 2027 Coffey Rd., 292-3896,
lyvers-peffer.1@osu.edu)

A minor in Animal Nutrition is for students who wish to develop a greater understanding of nutritional physiology and fundamentals of nutrition and how to apply basic concepts learned to the management of animals. This minor will be beneficial to students considering a career in nutrition consulting, education, and research. Topics covered emphasize physiology, nutrient requirements and function, and diet formulation.

The minor in Animal Nutrition consists of 20 credit hours selected as follows:

Required courses (10 credit hours)

Anim Sci 310—Principles of Animal Physiology (5)
Anim Sci 330—Principles of Animal Nutrition (5)

Choose at least two courses from these electives (10 credit hours)

Anim Sci 331—Practical Horse Feeding (4)
Anim Sci 630.01—Ruminant Nutrition (5)
Anim Sci 630.02—Non-Ruminant Nutrition (5)
Anim Sci 630.03—Feeding Management and Records Analysis for Dairy Cattle (5)

Arts and Sciences minor program guidelines

The following guidelines govern minors.

Required for graduation No

Credit hours required A minimum of 20 (some minors require more)

Transfer credit hours allowed A maximum of 10

Overlap with the GEC Permitted, unless specifically disallowed by an individual minor program.

Overlap with the major Not allowed and

- The minor must be in a different subject than the major.
- The same courses cannot count on the minor and on the major.

Overlap between minors Each minor completed must contain 20 unique hours.

Grades required

- Minimum C- for a course to be listed on the minor.
- Minimum 2.00 cumulative point-hour ratio required for the minor.
- Course work graded Pass/Non-Pass cannot count on the minor.

Approval required The minor program description sheet indicates if the minor course work must be approved by:

- The academic unit offering the minor, or
- A college/school counselor.

Filing the minor program form The minor program form must be filed at least by the time the graduation application is submitted to a college/school counselor.

Changing the minor Once the minor program is filed in the college office, any changes must be approved by:

- The academic unit offering the minor, or
- A college/school counselor (depending on the minor).

ASC Curriculum and Assessment Office
<http://artsandsciences.osu.edu>
The Ohio State University
4132 Smith Laboratory, 174 W. 18 Ave.

From: Jeanne Osborne [osborne.2@osu.edu]
Sent: Wednesday, July 30, 2008 2:53 PM
To: pfister.1@osu.edu
Cc: zerby.8@osu.edu; lyvers-peffer.1@osu.edu
Subject: Fwd: RE: Request - Letter of Concurrence
Jill,

See the concurrence from the Department of Human Nutrition below. All should be in order except the syllabi which Pasha is collecting for you at this time.

Jeanne

Original-recipient: rfc822;osborne.2@osu.edu
Subject: RE: Request - Letter of Concurrence
Date: Wed, 30 Jul 2008 13:35:20 -0400
Thread-topic: Request - Letter of Concurrence
From: Earl Harrison <eharrison@ehe.osu.edu>
To: "Dr. James E. Kinder" <kinder.15@osu.edu>
Cc: osborne.2@osu.edu

Jim,

Forgive me for not getting back to you on this; I was out of the country when your first email arrived and it got "lost" when I returned. Our department is supportive of your new Animal Nutrition major and we look forward to future collaborative efforts in teaching, research, and graduate education in the nutritional sciences.

With best wishes & regards,

Earl

Earl H. Harrison, PhD
Dean's Distinguished Professor & Chair
Department of Human Nutrition
The Ohio State University
325 Campbell Hall
1787 Neil Avenue
Columbus, OH 43210
614-292-8189 (phone)
614-292-8880 (fax)
harrison.304@osu.edu

From: Dr. James E. Kinder [<mailto:kinder.15@osu.edu>]
Sent: Wednesday, July 30, 2008 1:28 PM
To: Earl Harrison
Cc: osborne.2@osu.edu
Subject: Fwd: Request - Letter of Concurrence

Earl,

Having not heard anything from you on this matter, I assume the Department of Human Nutrition is supportive of the Department of Animal Sciences developing an Animal Nutrition minor. Thanks for any feedback and cheers for now.

Jim

Date: Thu, 03 Jul 2008 10:03:11 -0400
To: eharrison@ehe.osu.edu
From: "Dr. James E. Kinder" <kinder.15@osu.edu>
Subject: Request - Letter of Concurrence
Cc: lyvers-peffer.1@osu.edu, osborne.2@osu.edu

Dear Earl,

Attached please find the curriculum for a new Animal Nutrition minor that is being proposed in the Department of Animal Sciences. As your Department has a related interest, we are seeking a letter of concurrence to be relayed to the Academic Affairs committee of the College of Food, Agricultural, and Environmental Sciences. The purpose of an Animal Nutrition Minor is to accommodate student interest in the principles of nutritional physiology, fundamentals of nutrition, and application of basic nutrition concepts learned to the management of animals.

We look forward to obtaining your letter of concurrence in the near future to meet the deadlines of our College Academic Affairs committee. I would appreciate it very much if I could have a response from you by the end of this month.

If you have any questions regarding this minor, or would like to discuss it further, please feel free to contact Dr. Pasha Lyvers-Peffer (lyvers-peffer.1@osu.edu). Thank you for any help in this regard. Take care and cheers for now.

Jim

Dr. James E. Kinder
Professor and Chair
Department of Animal Sciences
The Ohio State University
2029 Fyffe Road / Room 110B
Columbus OH 43210-1095
Phone: (614) 292-3232
Fax: (614) 292-2929
e-mail: kinder.15@osu.edu

From: Jeanne Osborne [osborne.2@osu.edu]
Sent: Wednesday, July 30, 2008 2:51 PM
To: pfister.1@osu.edu
Cc: zerby.8@osu.edu; lyvers-peffer.1@osu.edu
Subject: Fwd: Concurrence for Animal Science Nutrition Minor
Jill,

See the concurrence from FST below.

Thanks,

Jeanne

X-Authentication-warning: defang20.it.ohio-state.edu: defang set sender to
<culbertson.34@osu.edu> using -f
From: Jeff Culbertson <culbertson.34@osu.edu>
To: kinder.15@osu.edu
Cc: 'Jill Pfister' <pfister.1@osu.edu>, 'Denise Smith' <smith.5732@osu.edu>
Subject: Concurrence for Animal Science Nutrition Minor
Date: Wed, 30 Jul 2008 12:36:34 -0400

Dr. Kinder:

As Chair of the Academic Affairs Committee in Food Science and Technology, I would like to report that the committee has reviewed the documentation for the proposed Animal Science Nutrition Minor. We have no concerns and would concur with its approval.

Sincerely,

Jeff Culbertson, PhD
Professor: Food Science and Technology
The Ohio State University
315 Parker 2015 Fyffe Road
Columbus, OH 43210-1007
614-688-4219

Dr. James E. Kinder
Professor and Chair
Department of Animal Sciences
The Ohio State University
2029 Fyffe Road / Room 110B
Columbus OH 43210-1095
Phone: (614) 292-3232
Fax: (614) 292-2929
e-mail: kinder.15@osu.edu

PRINCIPLES OF ANIMAL SYSTEMS PHYSIOLOGY
Dr. Bill Pope, 329 Plumb Hall

pope.2@osu.edu or 292-3943 (for appointment), always available for short consultation
just before or after each class

TOPICAL SYLLABUS

Week 1:	M	INTRODUCTION - orientations
	T	tissues/organs/systems, germ layers
	W	layering of tissues in the body, body cavities, epithelial nomenclature
	R	INTEGUMENT SYSTEM - epithelia/skin
	F	modified epithelium/epidermis: hoof
Week 2:	M	horns/antlers, teeth
	T	NERVOUS SYSTEM – neurons, synapse,
	W	spinal nerves, reflex arc
	R	cranial nerves, general divisions of the ANS
	F	EXAM I
Week 3:	M	CIRCULATORY SYSTEM – General function, cellular components
	T	cells (continued), RBC/hemoglobin, plasma proteins, iron transport
	W	Hb breakdown, capillary function (filtration, reabsorption)
	R	coagulation, arteries, atherosclerosis
	F	capillaries and veins, sampling animals (venipuncture)
Week 4:	M	cardiac anatomy, cardiac cycle
	T	control – flow and contraction sequence
	W	portal circulation, lymphatics
	R	immune glands
	F	EXAM II
Week 5:	M	PHARMACOKINETIC SYSTEM - intro
	T	drug distribution, elimination, half life
	W	dose - response curves, ED50, LD50
	R	EXCRETORY SYSTEM - gross anatomy
	F	nephron anatomy and function
Week 6:	M	interrelationships with blood volume
	T	ENDOCRINE SYSTEM – Hypothalamo-pituitary axis
	W	thyroid, parathyroid
	R	adrenal, pancreas, fat
	F	EXAM III

Week 7:	M	REPRODUCTIVE SYSTEM - female anatomy
	T	oviduct function, uterus; structures-cyclicality
	W	estrous cycle – hormones. sequential control
	R	”Day” of the cycle, control of estrus/ovulation
	F	embryonic development, embryo transfers
Week 8:	M	REPRODUCTIVE SYSTEM - male anatomy
	T	male anatomy (continued)
	W	sperm physiology
	R	male hormones
	F	EXAM IV
Week 9:	M	SKELETAL SYSTEM - Anatomy, osteocytes
	T	fractures, joints
	W	MUSCULAR SYSTEM - Kinds of muscle, anatomy
	R	muscle terminology, sliding filaments
	F	sarcotubular network, control of muscle contraction
Week 10:	M	HOLIDAY
	T	muscle damage, RESPIRATORY SYSTEM - Anatomy
	W	gas exchange and transport
	R	DIGESTIVE SYSTEM - Liver anatomy and function
	F	EXAM V

Principles of Animal Nutrition

Animal Sciences 330

Instructor: Dr. David Latshaw
230 D Plumb Hall
(614) 688-3238
latshaw.1@osu.edu

Academic Misconduct

Each student must do his/her own work on quizzes, examinations, and homework unless indicated otherwise by the instructor. Failure to follow this rule is academic misconduct and subjects the student to disciplinary action by OSU.

Disability Statement

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in room 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities.

COURSE OBJECTIVES

Students who successfully complete this course will be able to:

1. Identify parts of the digestive system.
2. Classify an animal as minimum fermenter, hindgut fermenter or pregastric fermenter based on anatomy of the digestive system.
3. List the components of the proximate analysis.
4. Understand how the components of the proximate analysis are determined.
5. Select the appropriate feedstuffs based on an animal's digestive system.
6. Explain the digestion of feedstuffs in each kind of digestive system.
7. List the nutrients required by each animal.
8. Understand the consequences of a nutrient deficiency.
9. Combine feedstuffs to meet an animal's nutrient needs.
10. Explain how to determine the amount of nutrient that is required in the diet.

Principles of Animal Nutrition

Order of Topics	Textbook Reading*
1. Introduction and expectations	
2. Separation of a diet into parts of the proximate analysis	15 – 20
3. Digestive systems in animals	25 – 33
4. Water – functions, requirements, quality	61 – 72
5. Carbohydrates:	
Kinds of carbohydrates	73 – 77
Digestion in minimum fermenters	37-38, 76-80
Digestion and fermentation in hindgut and pregastric fermenters	33 – 36, 78
6. Fats or lipids	
Kinds of lipids	91 – 96
Digestion and absorption	38, 98 - 101
7. Proteins and amino acids	
Amino acids	113 – 119
Proteins	120
Digestion	38, 39, 123-126
Use of amino acids for protein synthesis	126 – 132
Meeting amino acid needs	133 – 141
8. Metabolic problems and special problems related to carbohydrate, fat or protein	85, 97, 106-109
9. Using energy and amino acids for maintenance or production	81-85, 103-105, 130-132
10. Macro Minerals	
Calcium, phosphorus, magnesium, potassium, sodium, chloride, sulfur	163 – 183
11. Trace minerals	
Cobalt, copper, iodine, iron, manganese, selenium, zinc	184 – 216
12. Toxic elements	
F. Se, Mo, NO ₃ Pb	217 – 227
13. Fat soluble vitamins	
A, D, E, K	229 – 249

Principles of Animal Nutrition

Order of Topics	Textbook Reading*
14. Water soluble vitamins Thiamin, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folic acid, B ₁₂ , choline, ascorbic acid	251 – 273
15. Non-nutritive feed additives	354 –365
16. Physiological functions and nutrient needs	145-161, 310-314

*Basic Animal Nutrition and Feeding, Pond, Church, Pond and Schoknecht, 5th Edition

LABORATORY (8-10; 10-12; 111S Animal Science or 107 Plumb Hall)

Mar	29	Demonstration of gastrointestinal tracts.
April	4	No lab
	11	Video on hay and silage. Identification of concentrates and forages (Pages 321 – 343 in book).
	18	Grind laboratory samples. Characteristics of proximate components and digestion products. (Exercise – 10 points).
	25	Quiz over previous labs (20 points). Continue with proximate analysis. Feed formulation with concentrates (Exercise – 10 points).
May	2	Acid detergent fiber determination (8 –10 lab). Feed formulation with forages and concentrates (10-12 lab; exercise – 10 points).
	9	Feed formulation with forages and concentrates (8-10 lab; exercise – 10 points) Acid detergent fiber determination (10-12 lab).
	16	Blood components.
	23	Practice feed formulation. Energy systems. Total digestible nutrient calculations.
	30	Quiz over laboratories 5 – 9 (30 points). Results of sample analyzed in laboratory – 10 points.

GRADING

Your grade for the course will be based on results from 3 examinations and 9 quizzes in lecture and from 2 quizzes and 5 sets of exercises in laboratory.

Three exams	300
Quizzes	80
Laboratory	100

The first two exams will be announced one week prior to the exam and will be during the regular class hour. They will be at approximately week 4 and week 7 of the quarter. The last exam will be given during final exam week (Tuesday, June 3, 9:30 – 11:18 a.m.). It will not be comprehensive. A quiz will be given each week on Tuesday at the start of class. It will be worth 10 points and will require about 10 minutes. The information tested will have been presented since the previous quiz. The lowest quiz grade will be dropped.

Your final grade will be based on the following percentages:

100 – 93	A
92 – 90	A–
89 – 87	B+
86 – 83	B
82 – 80	B–
79 – 77	C+
76 – 73	C
72 – 70	C–
69 – 67	D+
66 – 63	D
62 – 60	D–
Below 60	E

LATE OR MISSING WORK

Homework assignments that are late may be submitted prior to the time the homework is graded and returned. After that, they will not be accepted. If you are going to miss a quiz or exam, let the instructor know prior to the scheduled time. It may be possible to reschedule if there was an unavoidable reason for missing class.

**ANIM SCI 331
EQUINE FEEDS AND FEEDING
WINTER 2009**

Instructor: Amber Moffett, MS (moffett.19)

Office: 222A Animal Science Building

Phone: 688-8109

Office Hours: By appointment (or just come by)

Lecture Meets: Monday, Tuesday, Wednesday and Friday, 1:00 - 2:00, AS 210

GENERAL SCOPE:

Study of anatomy and physiology of the digestive system and its role in digestion and utilization of feeds, with particular emphasis on the horse. Includes ration calculation and balancing with relation to nutrition and health.

COURSE OBJECTIVE:

Based on information provided in lecture, students will be able to 1.) explain the physiology of the digestive system and the process of digestion and absorption of nutrients; 2.) explain the biochemical utilization of nutrients; 3.) discuss the role of supplements in the horse's ration; 4.) relate health to nutrition; and 5.) develop rations from available feedstuffs.

COURSE FORMAT:

There will be 4 lecture/discussion periods each week. Exams and quizzes will cover material from the lecture and assigned readings. The questions on exams and quizzes will be multiple-choice, fill-in-the-blank and short answer. Quizzes will be given at the beginning of each specified class period. All assignments are due IN CLASS and late assignments will be deducted 30% of the overall grade for that assignment.

ATTENDANCE:

Attendance will be taken during each lecture and will count as part of the class participation portion of the quarter grade. Students are responsible for all work in the course. Authorization may be granted to make up missed work in the case of sickness, death in the family or other necessary circumstances, given that adequate documentation and notification is provided by the student.

GRADING POLICY:

Major Exams (2)	200 pts
Homework	300 pts
Quizzes	60 pts (drop lowest)
Attendance	195 pts
Final Exam	200 pts
Final Grade	955 pts **

Letter grades will be assigned according to the following standards:

A	95-100	B	83-85	C	73-76	D	60-66
A-	90-94	B-	80-82	C-	70-72	E	59 or less
B+	86-89	C+	77-79	D+	67-69		

Extra Credit: If for some reason the grade on Exam I or II is below the class average, students may write one referenced paper on a topic mutually agreed upon by the student and the instructor. The paper will be 10 type written pages, double spaced, 12 pt font with 1 inch margins and a minimum of 10 references. If satisfactory, the grade for that exam may be raised to the class average.

REQUIRED TEXT:

Lewis, Lon D. *Feeding and Care of the Horse*, 2nd Edition, 1996

OTHER REFERENCES:

Nutrient Requirements of Horses. 2007. 6th Edition Rev. National Research Council, National Academy Press. (can be ordered in its entirety or individual pages downloaded at www.nap.edu)

Basic Animal Nutrition and Feeding. 1995. 4th Edition by Pond, Church and Pond.

The Horse. 2nd Edition by Evans et al. Published by Freeman Co., 1991

Journal of Equine Veterinary Science

Journal of Animal Science

Other Scientific Journals

ACADEMIC MISCONDUCT:

Academic misconduct (plagiarism, cheating, and other forms of misconduct as defined by the university) will not be tolerated in this course. According to Faculty Rule 3335-31-02 academic Misconduct is defined as any activity which tends to compromise the academic integrity of the institution or subvert the educational process. Please see the Student Resource Guide or the instructor if you have questions about this policy.

DISABILITY STATEMENT:

Any student who feels she/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office for Disability Services at 614-292-3307 in room 150 Pomerene Hall to coordinate reasonable accommodations for students with documented disabilities.

IMPORTANT POINTS TO REMEMBER:

- 1. You are expected to participate in class discussion.**
Lecture outline/notes will be provided.
- 2. Exams will test your ability to apply knowledge to practical scenarios.**
- 3. Any information covered in class, whether handed out, written on board and/or discussed, will be covered on the exams.**
Take good notes.
Participate in class discussion
Attend class regularly.
Complete all homework assignments (journal review/ration formulations).

Expectations:

From me!

- I will attempt to share my passion of Equine Nutrition with you the best I can.
- I will treat you with the respect you deserve and will be patient and open to your ideas and opinions.
- I will give you feedback when possible and will work with you to help you improve when necessary.
- I will be available and supportive as an instructor.

From you!

- It is expected that you attend all lectures/labs. If you know in advance you can't make class, let me know! It is for your own benefit that you attend all classes.
- It is expected that the text be read on your own in accordance with our lecture topics for the week and be ready for discussion.
- All assignments are due **IN CLASS** and late assignments will be deducted 30% of the overall grade for that assignment. Death in the family or extreme illness (doctor's note required) will be the only excuses for late assignments or missed exams. If you email me an assignment, I will write you back to let you know I have received it. If your email doesn't send properly, it will still be considered late. Keep this in mind!
- Part of the university learning curve is planning – if you know you have 2 (or more) exams or assignments due on the same day – prepare in advance! Start studying or working on them sooner!
- I expect that you will give me the courtesy of all work being typed neatly and having been spell-checked.
- I hope you will also respect me and my efforts to you.

TENTATIVE LECTURES

Date	Topic	Suggested Reading
Jan 05 Jan 06 Jan 07 Jan 09	Introduction Anatomy & Physiology Anatomy & Physiology Quiz 1; Nutrients-Water	Fig. 1-1 pp. 3-8
Jan 12 Jan 13 Jan 14 Jan 16	Water; Proteins Proteins; Carbohydrates Carbohydrates Quiz 2; Lipids	pp. 12-16 pp. 16-18
Jan 19 Jan 20 Jan 21 Jan 23	NO CLASS – MARTIN LUTHER KING HOLIDAY Minerals Vitamins Exam 1	pp. 19-41 pp. 42-61
Jan 26 Jan 27 Jan 28 Jan 30	Vitamins Body Condition Score Pastures and Hays Quiz 3; Pastures and Hays	Tbl. 1-4 pp. 62-70, 103-11
Feb 02 Feb 03 Feb 04 Feb 06	Grains and Concentrates Grains and Concentrates By-product feeds, additives, supplements Quiz 4; By-product feeds, additives, supplements	pp. 70-80 pp. 81-102
Feb 09 Feb 10 Feb 11 Feb 13	Ration Formulation (general intro) General Feeding Considerations Feeding Idle Horses Exam 2	pp. 112-136 pp. 147-154, 370-379 pp. 186-102
Feb 16 Feb 17 Feb 18 Feb 20	Feeding Working Horses Feeding Working Horses Feeding Growing Horses Quiz 5; Feeding Growing Horses	pp. 193-223 pp. 264-276, 277-288
Feb 23 Feb 24 Feb 25 Feb 27	Feeding Breeding/Reproduction Horses Feeding Breeding/Reproduction Horses Rations for Working, Growth, Breeding Quiz 6;	pp. 224-227, 229-276
Mar 02 Mar 03 Mar 04 Mar 06	Feeding Horses with Health Problems Feeding Horses with Health Problems Feeding Horses with Health Problems Quiz 7; Poisonous Plants & Feed Related Poisonings	pp. 289-299 pp. 200-269
Mar 09 Mar 10 Mar 11 Mar 13	Review for Final	
March 18	FINAL EXAM at 11:30-1:18 (AS 210)	

COURSE SYLLABUS
Animal Sciences 630.01, Ruminant Nutrition

Instructors:	Dr. Jeffrey L. Firkins	Dr. Steven C. Loerch
	223 Animal Science Bldg.	114 Gerlaugh Hall
	2029 Fyffe Road	OARDC, Wooster
	614-688-3089	330-263-3908
	firkins.1@osu.edu	loerch.1@osu.edu

Course Rationale:

Principles of ruminant digestion, metabolism, fermentation, physiology, and nutrition will be emphasized. The proposed course is established to stimulate student awareness of nutrient metabolism systems and strategies to meet nutrient requirements to support various production situations. Computer formulations, spreadsheets and models will be used to acquire problem-solving skills. The knowledge gained in this course will be useful to students directed towards careers in livestock industries and/or engaging in a graduate nutrition program.

Learning Objectives:

1. To enhance student understanding of ruminant digestion and metabolism.
2. To make students aware of current research in ruminant nutrition and areas of future research needs.
3. To increase student appreciation for the uniqueness of ruminant digestion and its role in animal and food production.
4. To enhance student awareness of energy systems, protein systems, feeding systems and strategies to meet nutrient requirements of ruminants.
5. To increase student ability to solve practical problems encountered in the livestock industry. This will be reinforced through various writing experiences.

Course Schedule:

Lectures:	M-W-F	11:00 to 12:18
Offering:	Autumn Quarter	
Credit Hours:	5	
Prerequisites:	AS 330 or Graduate Standing	

Method of Evaluation:

3	Hour Exams	300 pts.
7	Assignments	100 pts.

Grading Scale:

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

Grading scale might be adjusted based on student performance.

Recommended Textbooks:

Van Soest, P.J. 1994. Nutritional ecology of the ruminant. Second Edition. Cornell Univ. Press, Ithaca, NY.
NRC. 2000. Nutrient Requirements of Beef Cattle. 7th revised ed.:Update 2000. National Academy Press. Washington, D.C.
NRC. 2001. Nutrient Requirements of Dairy Cattle. 7th ed. National Academy Press. Washington, D.C.

Course Outline:

	<u>Van Soest</u>	<u>NRC 2000</u>	<u>NRC 2001</u>
Anatomy and physiology of the ruminant stomach and intestines (week 1) - Firkins	Chap. 15 312-315		
Digestive physiology of pre-ruminant stomach			
Development to an adult ruminant			
Absorption of VFA, amino acids, and sugars			
Post-absorptive metabolism of VFA			
Motility of the stomach			
Forage and nonforage fiber sources (week 2) - Firkins	Chap. 14		
Forage quality	145-148		
maturity of forages and relationship to fiber analyses	150-152		
silage quality and additives	156-159		
processing (particle "size" vs. "length")	165-173		
Effective fiber and pH regulation	186-187		
Nonforage fiber to provide effective fiber and dilute starch	191-193		
First writing assignment on silage (15 pts.)			
Microbiology in the rumen (week 3) - Firkins	Chap. 16		
General aspects of protozoa, bacteria, and fungi			
Starch and sugar degradation by microbes			
Additives and feeding systems that shift VFA			
Degradability of protein and microbial protein synthesis (Beef and Dairy NRC)			
Re-write of first writing assignment (5 pts.)			
Lipids (week 4) - Firkins			
Inhibition of fiber digestibility and biohydrogenation	325-331		
Effects of microbial populations and flow to the duodenum			

Midterm 1 (100 points) on October 15

	<u>Van Soest</u>	<u>NRC 2000</u>	<u>NRC 2001</u>
Feed intake (week 4) - Loerch	Chaps. 21 and 22	Chap. 7	
Importance of feed intake to production			
Relationship between feed intake and concentration of nutrients			
Gut-fill regulation of feed intake			
Chemostatic (metabolic) regulation of feed intake			
Predicting intake			
Second writing assignment (15 pts.)			
Take-home FI problem set (10 pts.)			
Digestion (week 5) - Loerch			
Factors affecting digestibility			
Associative effects of digestion			
Determining diet digestibility			
Digestibility			
Rumen vs. intestinal digestion; rate of digestion and rate of passage			
Take-home Digestion problem set (10 pts.)			
Re-write of second writing assignment (5 pts.)			
Net energy system (week 6) – Loerch			
Partitioning energy intake			
Determining energy requirements for maintenance, gain, and lactation			
Take-home NE problem set (10 pts.)			Chaps. 1-4
Beef Cow Nutrition (week 7) - Loerch			
Introduction of Beef NRC			
Nutrition in early lactation (pre-breeding)			Chap. 4
Nutrition in late lactation (post-breeding)			
Nutrition post weaning			
Nutrition pre-calving			
Midterm 2 (100 pts.) on November 7			
Feedlot Nutrition (week 8) - Loerch			
Managing newly weaned calves			
Growing/finishing systems			
Nutrient requirements			Chap. 3
Managing feed intake			
Implants, additives, disorders and beef quality			
Applied Dairy Nutrition (using 2001 NRC)			
Overview - nutrients and systems			
Feeding the Calf (week 9) - Firkins			
Newborns and milk replacers			
Growing calf; evaluation of forage and a commercial concentrate			226-230 236-239

Dry Cow Feeding (week 10) - Firkins

Body condition score and ketosis	188-190
Prevention of milk fever; anionic salts	191-193
Ration evaluation and problem set (20 pts.)	

Lactating Cow Feeding (week 10) - Firkins

Evaluating a problematic ration	
reformulating the ration	199-200
relationship to causative factors	36-39
Minerals for dairy cattle	Scan chap 6
Metabolizable protein, protein quality, and balancing for amino acids for dairy	Scan chap 5
Feed Additives	201-205

In-class problem set (10 pts.)

**Midterm 3 (100 pts.) during Final Exam Week –
Thursday, December 6, 2006 7:30 – 9:18 AM**

Academic Misconduct:

Any form of academic dishonesty (e.g., plagiarism or cheating) by any student will be handled according to the Student Code of Conduct. The instructors reserve the right to ask for an electronic version of all submitted homework or papers.

AS 630.02 Non-Ruminant Nutrition

Winter, 2008

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office hours by individual arrangement

Course Information

Location: 333 Kottman Hall

Format: Three lectures, 10:30 – 11:48 AM, on Mon, Wed, and Fri

Credit: 5 hours

Course Objectives and Learning Expectations:

1. Gain appreciation for the unique physiology of the digestive tract and how this influences the entire digestive process.
2. Understand the coordinated physiologic events resulting in the digestion and utilization of different nutrients by non-ruminant animals
3. Increase understanding of how nutrition interacts with environmental and food safety concerns

Grading

Self-assessments (total of 10)	10%
Nutrient presentation	10%
Term Paper	20%
Midterm exam #1	20%
Midterm exam #2	20%
Final Exam	20%
TOTAL	100%



Grading Pattern (by %):

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
> 93	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	< 60

Nutrient presentation information

Students will be divided into groups of 3 people per group. Each group will choose a B-vitamin or other nutrient to present to the class. Each group will receive historical papers about their vitamin. The presentation will be 15 – 20 minutes in length, provide information about the history, physiological role, and current research issues about the chosen vitamin. The rest of the class will score each group member individually and the group as a whole. More details will be presented in class.

Term Paper information

Each student will pick a topic of interest – the topic to be cleared with the instructors before starting the paper. The paper will be at least 4 and no more than 6 pages in length, double spaced, typed, and 12-point font, with 1 inch margins all around. There will be at least 4 journal references used and cited – *web sites are not acceptable*. A rough draft will be due on Feb 6 to the instructors by e-mail, will be edited and a printed copy returned before the paper is due. The final corrected, completed paper will be due on Mar 1.

Academic misconduct

Any incidence of academic misconduct suspected will be reported to the University Committee on Academic Misconduct as required by University guidelines.

Cell phones

Cell phone tones and text messaging interrupt class and are disrespectful to the instructors and fellow students. Cell phones must be in “off” or “silent” mode during class unless there is an emergency situation – in this case an instructor must be made aware of the situation and the phone can be on “vibrate” mode. Misuse of cell phones in class will not be tolerated quietly.

Disability Assistance

If you need an accommodation based on the impact of a disability, you should contact me to arrange an appointment as soon as possible. At the appointment we can discuss the course format, anticipate your needs and explore potential accommodations. I rely on the Office For Disability Services for assistance in verifying the need for accommodations and developing accommodation strategies. If you have not previously contacted the Office for Disability Services, I encourage you to do so.

COURSE PLAN:

- Week 1**
- Lecture 1 Fri Jan 4 (Lilburn)**
Intro to Class, # exams, paper, schedule final exam
Comparative digestive systems – poultry, swine, ruminant
Structure of digestive system, neural, muscular
Stomach – Functions and acid secretion, feedback & control
Cellular components (parietal cells, enterochromafin-like cells)
- Week 2**
- Lecture 2 Mon Jan 7 (Hill)**
Stomach Cont'd - Function of mucus, acid protective mechanisms
Canine, feline, pseudo ruminant digestive systems
Vitamin B-12 and intrinsic factor, Helicobacter
- Lecture 3 Wed Jan 9 (Lilburn)**
Carbohydrate digestion in stomach (starch) – amylase secretion, starch composition (amylose, amylopectin), variability in starch structure between ingredients (importance in pelleting)
Begin protein digestion in stomach (candy protein chains)
Pepsin synthesis, secretion (concept of zymogen storage)
Self-assessment 1 available on CARMEN (wed 10 am – Fri 10 am)
- Lecture 4 Fri Jan 11 (Hill)**
****Pass out Nutrients papers****
Cephalic, neural, control of digestion (example: Pavlov dogs)
Canine, feline, other companion animals – species similarity, differences in upper digestive tract (dietary use of starch, complex proteins etc due to unique aspects of digestion within the stomach)
- Week 3**
- Lecture 5 Mon Jan 14 (Hill)**
Bruhner's glands, recognizing acidic digesta
Buffering requirements, species differences, bicarbonate secretion
Secretin – pancreas endocrine relationships
Cholecystokinin, gastrin – feedback on pancreas, gall bladder
Bile acid secretion, taurine issues
- Lecture 6 Wed Jan 16 (Lilburn)**
Small intestine- villus structure, lymphatic/arterial supply
Hyperplasia vs maturation (carbohydrase slide)
Intestinal development (poultry embryonic development vs. immediate post-hatch, early weaned pig delayed development)
Self-assessment 2 available on CARMEN (wed 10 am – Fri 10 am)
- Lecture 7 Fri Jan 18 (Lilburn)**
Pancreas – protein digestion, Enterokinase (trypsin, chymotrypsin, conversion), Trypsin inhibitor factor (soybean meal)
Mucus/mucin amino acid acid concentration (threonine, serine)

- Week 4** **Mon, Jan 21** **NO CLASS** **Martin Luther King HOLIDAY**
- Lecture 8** **Wed, Jan 23** ****Paper Topic Due****
MIDTERM EXAM # 1 in class
- Lecture 9** **Fri** **Jan 25** **(Lilburn)**
Commercial protein sources, variability and accounting for it
Protein quality bioassays
 In vivo – PER, amino acid digestibility (endogenous secretion)
 In vitro – pepsin digestibility, KOH solubility
 Phosphorus digestibility, availability
Self-assessment 3 available on CARMEN (fri 10 am – mon 10 am)
- Week 5**
- Lecture 10** **Mon** **Jan 28** **(Hill)**
Carbohydrate digestion, Carbohydrate metabolism – species traits
Glycemic index, diabetes, amylin, species differences
Sources, conventional assays, nutritional uses of fibers
Carnivore nutrition
Krebs cycle, Exogenous enzymes
- Lecture 11** **Wed** **Jan 30** **(Hill)**
Carbohydrate digestion continued (from Fri, Jan 25)
Self-assessment 4 available on CARMEN (wed 10 am – Fri 10 am)
- Lecture 12** **Fri** **Feb 1** **(Lilburn)**
Fat soluble vitamins A,E, K
- Week 6**
- Lecture 13** **Mon** **Feb 4** **(Lilburn)**
Digestion/absorption/function of minerals
Phosphorus functions, sources, phytate phosphorus
- Lecture 14** **Wed** **Feb 6** **(Lilburn)**
****Term paper rough draft DUE****
Calcium functions, bioavailability, locations (bone, muscle)
Calcium:phosphorus balance, Vitamin D interaction
Unique aspects of Ca metabolism (egg shells, lactation, PSE)
Self-assessment 5 available on CARMEN (wed 10 am – Fri 10 am)
- Lecture 15** **Fri** **Feb 8**
Nutrient presentations
- Week 7**
- Lecture 16** **Mon** **Feb 11**
Nutrient presentations

	Lecture 17	Wed	Feb 13	(Hill)
	Pancreas – lipid digestion (lipase) and small intestine processes Emulsification, micelle formation, chylomicrons, lipoproteins Dyslipoproteinemias, carnitine and fat metabolism <i>Self-assessment 6 available on CARMEN (wed 10 am – Fri 10 am)</i>			
	Lecture 18	Fri	Feb 15	(Lilburn)
	Practical nutrition, Quality control **Rough draft returned**			
Week 8	Lecture 19	Mon	Feb 18	(Lilburn)
	Practical poultry nutrition <u>TAKE HOME EXAM (midterm #2) handed out</u>			
	Lecture 20	Wed	Feb 20	(Mahan)
	Practical swine nutrition <i>Self-assessment 7 available on CARMEN (wed 10 am – Fri 10 am)</i>			
	Lecture 21	Fri	Feb 22	(Hill)
	Liver and hepatobiliary system <u>TAKE HOME EXAM DUE at start of class</u>			
Week 9	Lecture 22	Mon	Feb 25	(Hill)
	Electrolyte absorption, secretion – requirement for active transport of other nutrients, examples of electrolyte abnormalities			
	Lecture 23	Wednesday	Feb 27	(Hill)
	Practical aspects of canine/feline nutrition <i>Self-assessment 8 available on CARMEN (wed 10 am – Fri 10 am)</i>			
	Lecture 24	Fri	Feb 29	(Lilburn)
	Omega fatty acids, carnitine <u>**Term papers due**</u>			
Week 10	Lecture 25	Mon	March 3	(Hill)
	Gut immunity			
	Lecture 26	Wednesday	March 5	(Lilburn)
	Gut microbiology, probiotics, prebiotics <i>Self-assessment 9 available on CARMEN (wed 10 am – Fri 10 am)</i>			
	Lecture 27	Fri	March 7	(Hill)
	Volatile fatty acids, nitrogen trapping, colon physiology (brief) <i>Self-assessment 10 available on CARMEN (fri 10 am – final)</i>			
FINAL EXAM	Thursday	March 13	9:30 – 11:18 AM	

Course Outline
ANIM SCI 630.03 / VPM 796.13
2008 Winter Quarter

Day	Date	Topic	Instructor
F	Jan 4	Course Introduction & Grouping of Dairy Cows	Eastridge/Meiring
M	7	Herd Problem Investigations	Meiring
W	9	Visit to OSU Dairy Farm ¹	Eastridge/Meiring
F	11	Introduction to Record Analysis	Meiring
M	14	Introduction to Ration Computer Printouts and the NRC Computer Model	Eastridge
W	16	Analyzing Milk Production	Meiring
F	18	Analyzing Milk Production	Meiring
M	21	Martin Luther King Day observed (no classes)	
W	23	Understanding Feed Analytical Reports (Report #1)	Eastridge
F	25	EXAM	
M	28	Displaced Abomasum and Rumen Acidosis	Eastridge
W	30	Ketosis	Eastridge
F	Feb ² 1	Blood Profiling	Meiring
M	4	Case Study	Eastridge/Meiring
W	6	Analyzing Mastitis and Milk Quality	Meiring
F	8	Nutrition and Mammary Health	Weiss
M	11	Nutrition and Hoof Health (Report #2)	Weiss
W	13	EXAM	
F	15	Hypocalcemia and Hypomagnemia	Eastridge
M	18	Nutrition and Reproduction	Eastridge
W	20	Analyzing Reproduction	Meiring
F	22	Analyzing Reproduction	Meiring
M	25	Evaluating the Overall Ration	Eastridge
W	27	Case Study	Meiring
F	29	Economics of Feeding and Farm Nutrient Balance	Eastridge
S	Mar 1	Field Trip (Report #3, 30 pts)	Eastridge/Meiring
M	3	(no class)	
W	5	Analyzing Heifer Management and Culling	Meiring
F	7	Discuss Field Trip & Take Home FINAL EXAM	Eastridge/Meiring

¹Class meets from 7:00 to 8:50 a.m. this day.

²Ohio Veterinary Medical Association Annual Meeting, Feb. 21-24, 2008