ANS6447 RUMINANT NUTRITION
(Section No. 17D3)
FALL 2018 – 4 credits

Course Content/Description

An advanced ruminant nutrition course designed to familiarize students with the anatomy and physiology of the ruminant digestive system as well as the digestion and metabolism of dietary nutrients for the purposes of growth, pregnancy, and lactation of ruminant animals, mainly bovine. Knowledge and application of information covered in lecture and in assigned readings will be evaluated during exams. Class-time discussion will be encouraged and rewarded. Students will use current software to formulate and evaluate ruminant diets. Commercial feed additives will be assigned to students who will evaluate and report (oral and written) their efficacy based upon the scientific literature.

Goals of This Course (Learning Objectives)

Upon completion of this course, students will have 1) a fundamental understanding and an in depth knowledge of ruminant nutrition and nutritional management of cattle, 2) developed critical thinking skills on experimental design and research techniques in ruminant nutrition, 3) an understanding of how dietary ingredients and nutrients are digested, absorbed, and metabolized in ruminants, 4) an understanding of the role of forestomach microbial fermentation and its implications to the provision of nutrients to the host animal, and 5) an understanding of the nutritional implications on animal health, growth, production, and reproduction. Completion of these goals will enable students to formulate viable hypotheses, plan/conduct experiments, and properly interpret results in ruminant nutrition. Diet formulation for ruminants is an expected outcome of the course.

Prerequisite

ANS 5446 Animal Nutrition or approval of the instructors.

Course Format

- Two two-period lectures per week.
- Many topics have a key scientific article to read prior to lecture.
- Students will select 1 commercially marketed feed additive to study from the scientific and commercial literature to summarize in written form & a PowerPoint presentation.

Course coordinator

José Eduardo P. Santos jepsantos@ufl.edu 294-6998
Department of Animal Sciences, L.E. “Red” Larson Building, Room 204

Instructors

José Eduardo P. Santos jepsantos@ufl.edu 294-6998
Luiz Ferraretto lferraretto@ufl.edu
Antonio Faciola afaciola@ufl.edu

Office Hours

Open door policy but it is better to call before visiting.

Schedule and Critical Dates

Monday and Friday in room 201 "Red" Larson Building, periods 8 and 9 (3:00 to 4:55). Weekly topics and critical dates are presented in table on the last page of the syllabus.

Membership

Students are strongly encouraged to join American Dairy Science Association (www.adsa.org) and/or American Society of Animal Science (www.asas.org). Cost is $10/year for graduate students.

Suggested Text and Readings

No textbook is required; however, the following books will be used as reference for some lectures:

The Ruminant Animal – Digestive Physiology and Nutrition. 1988. D.C. Church (Ed.), Prentice Hall, Englewood Cliffs, NJ.

Nutritional Ecology of the Ruminant. 1994. 2nd Edition. P.J. Van Soest, Cornell University Press, Ithaca, NY.

Rumen Microbiology and Its Role in Ruminant Nutrition. 2002. J.B. Russell. Cornell University. Ithaca, NY.

Nutrient Requirements of Beef Cattle. 2016. 8th Rev. Ed. National Research Council. National Academy Press. Washington, DC.

Nutrient Requirements of Dairy Cattle. 2001. 7th Rev. Ed., National Research Council. National Academy Press. Washington, DC.

The Veterinary Clinics of North America – Food Animal Practice: Metabolic Disorders of Ruminants. Vol 16, number 2, July 2000. W.B. Saunders, Philadelphia.

Selected scientific articles will be required reading throughout the semester. Examples include the following:

Allen and Bradford. 2012. Control of food intake by metabolism of fuels: a comparison across species. Proc. Nutr. Society 71:401-409.

Titgemeyer, E.C. 1997. Design and interpretation of nutrient digestion studies. J. Anim. Sci. 75:2235-2247.

Doreau, M. and A. Ferlay. 1994. Digestion and utilization of fatty acids by ruminants. Anim. Feed. Sci. Technol. 45:379-396.

Instructional Methods

This course will be team-taught by 3 faculty members and lectures will be the basis of instruction. Students are expected to read and study the assigned papers before class to encourage discussion during lectures.

Grading

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

Exams and points

	Percentage of final grade	Due Date/Date of Exam
1st Exam	15.0%	September 24
2nd Exam	15.0%	October 29
3rd Exam	15.0%	December 3
Final Cumulative Exam	25.0%	December 10
Feed additive presentation and paper	15.0%	November 16 and 19
Ration formulation	10.0%	November 30
Class participation	5.0%	All semester
Total	100%	

Grading scale (% total points)

A = 93-100	A- = 88-92.9	B+ = 85 to 87.9	B = 81-84.9	B- = 78-80.9	C+ = 75-77.9
C = 71-74.9	C- =68-70.9	D+ = 65-67.9	D = 61-64.9	D- = 58-60.9	E < 58

Attendance and Make-Up Work

Attendance will not be taken. 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.

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.

Online Course Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results.

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty*

and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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*."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

Services for 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. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation: 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

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
- *Career Resource Center,* First Floor JWRU, 392-1601, www.crc.ufl.edu/
- U Matter We Care, www.umatter.ufl.edu/

Tentative Schedule of Classes (changes might occur)				
Week	**Day**	**Date**	**Topic**	**Instructor***
1	Friday	24-Aug-18	Introduction to course. Importance of the Ruminant Animal	JS
2	Monday	27-Aug-18	Anatomy of the digestive tract	AF
2	Friday	31-Aug-18	Motility of the gastrointestinal tract, rumination, salivation	LF
3	Monday	3-Sep-18	*Holiday - No class*	
3	Friday	7-Sep-18	Development of pre-stomach and calf nutrition	JS
4	Monday	10-Sep-18	Kinetics of nutrient digestion in the rumen	JS
4	Friday	14-Sep-18	VFA absorption, control of rumen fluid pH and osmolarity	JS
5	Monday	17-Sep-18	N requirements of rumen microbes and microbial efficiency	AF
5	Friday	21-Sep-18	Protein digestion in forestomach; Synergism of protein and CHO	AF
6	Monday	24-Sep-18	**FIRST EXAM**	
6	Friday	28-Sep-18	Control of feed intake by ruminants	JS
7	Monday	1-Oct-18	Energetics	JS
7	Friday	5-Oct-18	Nonstructural carbohydrate digestion	JS
8	Monday	8-Oct-18	Structural carbohydrate digestion	LF
8	Friday	12-Oct-18	*Homecoming - No class*	
9	Monday	15-Oct-18	Lipid metabolism in the rumen	JS
9	Friday	19-Oct-18	Digestion, absorption, and metabolism of lipids	JS
10	Monday	22-Oct-18	Post-absorptive metabolism of energy compounds	JS
10	Friday	26-Oct-18	Amino acid absorption and post-absorptive metabolism	JS
11	Monday	29-Oct-18	**SECOND EXAM**	
11	Friday	2-Nov-18	Impacts of nutrition on milk composition	JS
12	Monday	5-Nov-18	Disorders of the intermediary metabolism (ketosis and hepatic lipidosis)	JS
12	Friday	9-Nov-18	Disorders of mineral metabolism (Ca, P and Mg)	JS
13	Monday	12-Nov-18	Disorders of mineral metabolism (Ca, P and Mg)	JS
13	Friday	16-Nov-18	*Feed additive assignment presentation*	JS
14	Monday	19-Nov-18	*Feed additive assignment presentation*	JS
14	Friday	23-Nov-18	*Holiday - No class*	
15	Monday	26-Nov-18	Ration Formulation Software Laboratory	JS
15	Friday	30-Nov-18	Disorders of carbohydrate digestion (acidosis, bloat, PEM, DA)	JS
16	Monday	3-Dec-18	**THIRD EXAM**	
16	Friday	7-Dec-18	*Reading day*	
17	Monday	10-Dec-18	**FINAL COMPREHENSIVE EXAM (10 AM)**	

*Instructors: JS = José Santos; LF = Luiz Ferraretto; AF = Antonio Faciola

Feed additive assignment

- Find a partner and each 2 of you will select one of the following options

Group	Active compound	Commercial product
Acidogenic products	Cl or S product	Bio-Chlor, SoyChlor, Animate
Beta-adrenergic receptor agonists	Zilpaterol or Ractopamine	Zilmax, Optaflexx
Dietary immune-stimulant		Omnigen-AF
Ionophore	Monensin or Lasalocid	Rumensin 90, Bovatec
Methane inhibitor	3-Nitrooxypropanol	Not commercialized yet
Nutrient - Biotin	Biotin	Rovimix biotin
Nutrient - Vitamin	Beta-carotene	Rovimix beta carotene
Nutrient - Rumen-protected choline	Choline chloride	Reashure, Jefo Choline
Nutrient – Protected amino acids	Lysine	Ajipro-L, AminoShure L
Nutrient – Protected amino acids	Methionine	Smartamine, Mepron
Nutrient – Protected amino acids	Methionine analog	Meta-Smart, Alimet
Nutrient – Encapsulated NPN	N	Optigen or Nitroshure
Nutrient – Rumen-protected niacin	Niacin	Niashure
Nutrient – Fermentation based product	Protein	Fermenten
Nutrient - Organic trace minerals	Zn, Cu, Mn, Co	Bioplex, Availa
Nutrient - Selenized yeast	Se	Sellplex or
Mycotoxin adsorbents	Silicate-based products	Mycofix, Novasil, etc
Mycotoxin adsorbents	Yeast-based products	Mycosorb A, Bio-Moss
Yeast culture or live yeast product	Saccharomyces cerevisiae	Diamond V, Levucell