ANS6447 RUMINANT NUTRITION
(Section No. 6447)

Academic Term: FALL 2020 – 4 credits
Class Periods: Mondays and Fridays, Periods 8 and 9 (15:00 to 16:55 h)
Location: All Lectures Online (Exams in person); Zoom Meeting ID: 649-065-6162

Course Coordinator:
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Instructor:
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Teaching Assistant:
Adeoye Oyebade, Department of Animal Sciences, L.E. "Red" Larson Building.
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Office Hours:
Online through Zoom Video Communication, meeting ID: 649-065-6162
Fridays from 14:00 to 15:00 h (*Let me know on the preceding Monday of each week if we need to have online office hours*).

Course Content/Description
An advanced course in ruminant nutrition 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 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.

Pre-Requisite

ANS 5446 Animal Nutrition or approval of the instructor (s). Please, be aware that this is an advanced course and it is expected that all enrolled students have a minimum background in nutrition and biochemistry.

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 a Power Point presentation.

Schedule and Critical Dates

Mondays and Fridays lectures online (Zoom Meeting ID: 649-065-6162), periods 8 and 9 (15:00 to 16:55). 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. The manuscripts will be provided concurrent with class notes. 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 taught by José Santos and Adeoye Oyebade will TA the course and assist with the lectures. Lectures will be the basis of instruction. Each lecture will have at least 1 or 2 scientific review articles that are required reading. Students are expected to study the assigned papers before class to encourage discussion during lectures. Assigned reading materials are part of the teaching materials and will be used to formulate exam questions.

Grading

For information on current UF policies for assigning grade points, see https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/.

Exams and points

	Percentage of final grade	Due Date/Date of Exam
1st Exam	20.0%	October 12
2nd Exam	20.0%	November 16
Feed additive presentation	10.0%	December 7
Ration formulation exercise	10.0%	December 7
Final cumulative exam	30.0%	December 14
Class participation	10.0%	Entire 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

Exams

There will be 3 exams worth 100 points each. The first 2 exams will represent each 20% of the final grade and the final exam, which is comprehensive, will represent 30% of the final grade. The material covered in the exam will be detailed prior to each exam. Exams will be in-presence in Animal Sciences room 156 (unless we have to change) from 15:00 to 18:00 h.

Feed additive presentation

See topics to be selected at the end of this syllabus. Details about the oral presentation will be discussed in class. Presentations are limited to 12 minutes to be able to accommodate everyone's presentation and limited time (Do not go over your time). There will be 3

minutes for questions and answers. The format is the same as that used for presentations during a scientific meeting.

Ration formulation exercise
We will have a lecture to show the mechanics to use a ration formulation software. See schedule of classes. A ration formulation exercise will be prepared and the deadline is depicted in the schedule of lectures.

Recording of Lectures
Our class sessions will NOT be audio or visually recorded. Students are expected to attend the lectures, unless a justifiable issue occur (illness, travel, etc). The lectures, chats or questions and answers will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited. Please contact the instructor ahead of time in case you cannot attend a lecture.

Attendance and Make-Up Work
Attendance will not be taken. You are expected to attend the lectures. 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. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at: https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at: https://gatorevals.aa.ufl.edu/public-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, https://disability.ufl.edu/

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**

Counseling Services
Groups and Workshops
Outreach and Consultation
Self-Help Library
Wellness Coaching

• U Matter We Care, **www.umatter.ufl.edu/**

• *Career Connections Center,* First Floor JWRU, 392-1601, https://career.ufl.edu/.

Student Complaints:
• Residential Course: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/.

• Online Course: http://www.distance.ufl.edu/student-complaint-process

Additional information

Class notes and reading materials will be forwarded to students before each lecture. Students are expected to attend the lectures and participate during discussions. Participation is encouraged and will be evaluated and awarded.

Students are expected to study the reading assignments to be able to actively engage in discussions. We will have a break half-way through each lecture. Please, do not use cell phones, email, or internet during lectures. You can do that during the break of after class. Please, do not hesitate to contact me if you are having problems during the course. I have reserved Fridays from 14 to 15 h for online office hours.

COVID-19 Safety Plan for In-Person Exams

Student Requirements:
Face Coverings: Face coverings are to be supplied by the student and worn throughout the duration of the exams, while on UF property. If the student forgets their face covering, then one may be provided by the instructors if available. If one is not available, then the student will be asked to leave and take the exam on another date.

Physical Distancing: A minimum physical distance of 6 feet between the student, their peers, instructors, and teaching assistants will be followed during the exam.

Hand Washing/Sanitizing: Immediately before entering the classroom for the exam, students will be required to wash their hands with soap and running water or use hand sanitizer.

Students will bring their own pens, pencils and calculators. No sharing of materials will be allowed.

Student Illness: If a student does not feel well and/or is running a fever or displaying any other symptoms of illness, they are NOT to attend the exam in-person and he/she will be offered the exam on a different day.

Instructor and Teaching Assistant Requirements:
Face Coverings: Instructor and teaching assistant will wear face covering throughout the duration of the in-person exam while on UF property.

Physical Distancing: Instructor and teaching assistant will follow the same guidelines of physical distance, a minimum of 6 feet from the next person.

Hand Washing/Sanitizing: The instructor and the teaching assistant will be required to wash their hands with soap and running water immediately before entering the classroom. Hand sanitizer will be supplied by the instructor for in class use during the exam.

Instructor or Teaching Assistant Illness: If an instructor or teaching assistant does not feel well and/or is running a fever or displaying other symptoms of illness, they will not attend the in-person exam and another person will be requested to proctor the exam.

Cleaning Procedures: The classrooms used for the exam will be cleaned by university custodial staff in the morning before each exam. The instructor will examine the classroom to ensure cleaning has occurred. Alcohol and wipes will be available to wipe desks before seating.

Limiting Seating:
The anticipated attendance for this course is 8 to 12 students. A classroom suitable for such occupancy will be identified to maintain the required physical distance with a capacity cap as determined by the university.

Ruminant Nutrition – 2020
Schedule of classes and topics

Week	Week Day	Date	Lecture	Topic	Instructor*
1	Monday	31-Aug-20	1	Introduction to course. Importance of the Ruminant Animal	JS
1	Friday	4-Sep-20	2	Anatomy of the digestive tract, motility, rumination and salivation	JS
2	Monday	7-Sep-20		***Holiday - No class (Labor Day)***	
2	Friday	11-Sep-20	3	Development of pre-stomach and calf nutrition	JS
3	Monday	14-Sep-20	4	Kinetics of digestion in the rumen	JS
3	Friday	18-Sep-20	5	Rumen microbes and rumen fermentation	AO
4	Monday	21-Sep-20	6	SCFA absorption, control of rumen fluid pH and osmolarity	JS
4	Friday	25-Sep-20	7	N requirements of rumen microbes and microbial efficiency	JS
5	Monday	28-Sep-20	8	Control of feed intake in ruminants	JS
5	Friday	2-Oct-20	9	Control of feed intake in ruminants	
6	Monday	5-Oct-20	10	Energetics	JS
6	Friday	9-Oct-20	11	Energetics	JS
7	Monday	12-Oct-20		**FIRST EXAM (on campus, face to face)**	JS
7	Friday	16-Oct-20	12	Structural carbohydrate digestion	JS
8	Monday	19-Oct-20	13	Nonstructural carbohydrate digestion	JS
8	Friday	23-Oct-20	14	Protein digestion and synergism between protein and CHO	JS
9	Monday	26-Oct-20	15	Lipid metabolism in the rumen	JS
9	Friday	30-Oct-20	16	Digestion, absorption, and metabolism of lipids	JS
10	Monday	2-Nov-20	17	Amino acid absorption and post-absorptive metabolism	JS
10	Friday	6-Nov-20	18	Post-absorptive metabolism of energy compounds	JS
11	Monday	9-Nov-20	19	Impacts of nutrition on milk composition	JS
11	Friday	13-Nov-20	20	Ration Formulation Software Laboratory (online)	JS
12	Monday	16-Nov-20		**SECOND EXAM (on campus, face to face)**	JS
12	Friday	20-Nov-20	21	Function, absorption and metabolism of macrominerals	JS
13	Monday	23-Nov-20	22	Disorders of mineral metabolism (Ca, P and Mg)	JS
13	Friday	27-Nov-20		***Holiday - No class (Thanksgiving)***	
14	Monday	30-Nov-20	23	Disorders of intermediary metabolism (ketosis and hepatic lipidosis)	JS
14	Friday	4-Dec-20	24	Disorders of carbohydrate digestion (acidosis, bloat, PEM, DA)	JS
15	Monday	7-Dec-20		*Feed additive presentation (Submit ration formulation exercise)*	JS
15	Friday	11-Dec-20		*No class (Reading Day)*	
16	Monday	14-Dec-20		**FINAL COMPREHENSIVE EXAM (on campus, face to face)**	JS

*Instructors: JS = José Santos; AO = Adeoye Oyebade

Faculty Course Evaluation Period: November 24 to December 11

Feed additive assignment topics

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	Not described	Omnigen-AF
Ionophore	Monensin or Lasalocid	Rumensin, Bovatec
Methane inhibitor	3-Nitrooxypropanol	Not commercialized yet (DSM)
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 – hydroxychloride minerals	Cu, Zn, Mn	IntelliBond
Nutrient - Selenized yeast	Se	Sellplex, Alkosel
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