VETERINARY DIAGNOSTIC AND PRODUCTION ANIMAL MEDICINE

Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine, see Veterinary Medicine, Curriculum (http://catalog.iastate.edu/previouscatalogs/2023-2024/collegeofveterinarymedicine/#curriculuminveterinarymedicine).

Courses in veterinary diagnostic and production animal medicine provide students with basic and advanced skills in diagnostics, reproduction, medicine, surgery, production, welfare, and health management of the major livestock species. Students in the fourth year of the curriculum in veterinary medicine may elect to take advanced courses in beef, dairy, swine, poultry or small ruminant production medicine. Elective courses may include preceptorships in private practices, at other veterinary schools, in research and disease control laboratories, or in related agribusinesses.

Production animal medicine emphasizes the integration of veterinary medicine with nutrition, genetics, economics, food safety, and other disciplines, enabling graduates to acquire and use a broad knowledge base to support the health and improve the production and efficiency of the food supply chain.

Graduate Study in Veterinary Preventive Medicine

Veterinary Preventive Medicine is a multidisciplinary program focused on the study of health and disease in populations. The various disciplines represented in the program are unified by a common approach based on the application of epidemiological methods to problem solving in populations. Through their research and course work, students will learn to understand and apply a variety of disciplines, principles, and techniques to population health issues involving environmental, ecological, nutritional, genetic, infectious, or non-infectious diseases.

Graduate study in Veterinary Preventive Medicine will provide valuable skills and experience to persons interested in public health, food safety, emerging infectious diseases, zoo or wildlife health, and livestock health. A degree in Veterinary Preventive Medicine may be valuable for individuals considering a future in the biological or pharmaceutical industries, government regulatory agencies, public veterinary practice, international service agencies responsible for population health or progressive private practice.

Veterinary Preventive Medicine is an interdepartmental major administered by the Department of Veterinary Diagnostic and Production Animal Medicine (VDPAM) with participating faculty from colleges and departments across the University and collaborators from the National Animal Disease Center (USDA:ARS) and the National Veterinary Services Laboratories (USDA:APHIS) located in Ames, Iowa.

Both thesis and non-thesis options are available and require the completion of a minimum of 30 graduate credits for thesis and 36 graduate credits for non-thesis and a final examination.

Program of Study: Master of Science in Veterinary Preventive Medicine (Thesis Option) 30 credits

STAT 587	Statistical Methods for Research Workers	4
VDPAM 527	Applied Statistical Methods in Population Studies	3
VDPAM 528	Principles of Epidemiology and Population Health	3
VDPAM 529	Epidemiological Methods in Population Research	3
VDPAM 699	Research	arr †
Research or Electives to total at least 17 additional credits		

† Arranged with instructor.

Program of Study: Master of Science in Veterinary Preventive Medicine (Non-Thesis Option) 36 Credits

STAT 587	Statistical Methods for Research Workers	4
VDPAM 527	Applied Statistical Methods in Population Studies	3
VDPAM 528	Principles of Epidemiology and Population Health	3
VDPAM 529	Epidemiological Methods in Population Research	3
VDPAM 590	Special Topics	3
One Additional STAT course from the following		3
STAT 571	Introduction to Experimental Design	
STAT 573	Introduction to Survey Sampling	
STAT 575	Introduction to Multivariate Data Analysis	
VDPAM 599	Creative Component	arr †
Creative Component and Electives to total 18 additional credits		

† Arranged with instructor.

Graduate Certificate in Veterinary Preventive Medicine

Veterinary Diagnostic and Production Animal Medicine offers a graduate certificate for DVMs, concurrent DVM students and non-DVMs in allied animal industries in Veterinary Preventive Medicine.

Students in this program are able to select courses that focus in areas of animal welfare, diagnostics, food safety, evidence-based medicine, surgery, pathology, microbiology, epidemiology, public health, statistics and production medicine.

The purpose of the graduate certificate in Veterinary Preventive Medicine for industry professionals is to address the continued and advanced needs of animal health professionals. The certificate enables professionals to gain recognition for a skill set that includes epidemiology, risk assessment, production medicine and animal welfare. A graduate certificate may be used to increase knowledge in a new or emerging area of interest to the candidate. As such, it may be used to formally gain recognition for retraining to meet the needs of today's food production systems.

The graduate certificate for concurrent DVM students is designed to give additional skills to students planning on working with populations of animals. Using a combination of on-line and dual listed graduate level courses, the program is designed to enable DVM students to complete the certificate while studying for their DVM degree. Students enrolled in any US-based DVM program are able to complete a graduate certificate at ISU using a combination of on-line and transfer graduate level courses.

The graduate certificate is an additional qualification awarded by Iowa State University after successful completion of 15 graduate level credits. A graduate certificate is different from continuing education as the certificate includes an academic transcript from Iowa State University. Students complete the same courses graduate students do with the the same expectations for all assignments and exams.

The program is available as a strictly on-line (off campus) delivery method or as a combination of classroom-based and on-line course offerings providing maximum flexibility in scheduling.

Program of Study: Graduate Certificate in Veterinary Preventive Medicine (15 credits)

Certificate required core courses		7
STAT 587	Statistical Methods for Research Workers	
VDPAM 528	Principles of Epidemiology and Population Health	
Remaining 3 core credits can be selected from		3
VDPAM 527	Applied Statistical Methods in Population Studies	
VDPAM 529	Epidemiological Methods in Population Research	
VDPAM 570	Risk Assessment for Food, Agriculture and Veterinary Medicine	
5 elective credits from any approved ISU graduate course		5
Total Credits		**15**

Courses primarily for professional curriculum students:

VDPAM 308: Spanish for Veterinarians
(2-0) Cr. 2. S.
Prereq: Classification in veterinary medicine and basic knowledge of Spanish
This course is designed to meet the needs of veterinary students who will practice in an environment in which the use of Spanish for accurate client communication is essential which includes much of our food animal industry in the state of Iowa. This is not a traditional Spanish language course. To be successful, students taking the course should have a basic knowledge of Spanish pronunciation, grammar and syntax.

VDPAM 309: Introduction to Production Animal Informatics
(1-0) Cr. 1. S.
The fundamentals of how clinical, diagnostic, production and financial information is obtained and used by production animal operations will be presented. Students will acquire skills to create and use spreadsheets for manipulating and summarizing data. They will also acquire knowledge of where to find inexpensive and readily available resources with information on how to use spreadsheets and other software. Students will also have the opportunity to work with record keeping programs used by food animal operations.

VDPAM 310: Introduction to Production Medicine
Cr. 2. S.
Prereq: Second or third year classification in veterinary medicine or permission of instructor
The role of the veterinarian in the management of animal health and production in populations including evaluation tools in dairy and beef cattle herds, beef feedlots and swine herds will be described. Provides veterinary students with a starting point to understand the principles and techniques that are the basis of food-animal population health diagnosis management programs. Course available on-line, attendance is not required.

VDPAM 312: Introduction to Animal Welfare
(1-0) Cr. 1. S.
Prereq: First-year classification in veterinary medicine
A continuation of the Veterinarian in Society series. The objective of this course is to develop knowledge of the fundamental principles of animal welfare, in terms of science, ethics and cultural components.

VDPAM 340: Clinical Foundations
(0-30) Cr. 1. S.
Prereq: Vet Med classification
One week, hands-on course at Iowa State University; introduction to food supply veterinary medicine covering overviews of major animal agriculture species (beef, dairy, swine, small ruminants, and camelid), production systems, behavior, welfare, handling and restraint, examination techniques, biosecurity, epidemiology and food safety. Students will visit farms owned by Iowa State University and private clients of Food Animal and Camelid Field Services to perform hands-on clinical skills. Attendance is mandatory. Biosecurity: All students must follow current college policies regarding animal contact following foreign travel. Additionally, no swine contact is allowed within 48 hours of the swine farm visit. Required equipment includes coveralls, rubber boots, thermometer and stethoscope.

VDPAM 351: Bovine Embryo Transfer and Related Technology
(2-0) Cr. 2. S.
Prereq: Vet Med 2 or 3 classification
This course will meet for two hours once each week of the Spring Semester. The first hour will be traditional lecture and the second hour will be a combination of student projects, labs and demonstrations of applied clinical procedures. Bovine embryo transfer and closely related topics such as: female reproductive physiology, estrus synchronization, semen sexing and reproductive disease will be emphasized. In addition, several class periods will be devoted to the use of ultrasound for diagnosis of reproductive and non-reproductive conditions.

VDPAM 365: Animal Welfare Judging and Assessment
Cr. 1. Repeatable. F.
Preparation for competition in the Intercollegiate Animal Welfare Judging Contest. Development of critical appraisal and oral communication skills in regard to animal welfare. Animal behavior, physiology, health and performance parameters, basic husbandry, housing and preventive care will be explored for select farmed, companion and exotic species. Optional field trips. Course is open to Vet Med, Undergraduate and Graduate students.

VDPAM 402: Advanced Dairy Production Informatics
(1-1) Cr. 2. Repeatable. F.S.
Prereq: VDPAM 309 or Permission of Instructor
Advanced coverage of concepts related to collection, manipulation, analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart as well as other dairy management and information software.

VDPAM 402A: Advanced Dairy Production Informatics: Lecture Series
(1-1) Cr. 2. S.
Prereq: Vet Med classification
Advanced coverage of concepts related to collection, manipulation, analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart as well as other dairy management and information software.

VDPAM 402B: Advanced Dairy Production Informatics: Experience I
(1-1) Cr. 2. F.S.
Prereq: VDPAM 402A
Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

VDPAM 402C: Advanced Dairy Production Informatics: Experience II
(1-1) Cr. 2. F.S.
Prereq: VDPAM 402A; VDPAM 402B
Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

VDPAM 402D: Advanced Dairy Production Informatics: Experience III
(1-1) Cr. 2. F.S.
Prereq: VDPAM 402A; VDPAM 402B; VDPAM 402C
Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

VDPAM 407: Evidence Based Clinical Decision Making
(Dual-listed with VDPAM 507). (1-0) Cr. 1. S.
Prereq: Permission of instructor
Discussion, lectures and laboratories to assess the quality and significance of medical evidence in making informed decisions about the treatment of individual animals and animal populations.

VDPAM 408: Poultry Diseases
(Dual-listed with VDPAM 508). (2-0) Cr. 2. Alt. S., offered even-numbered years.
Prereq: Second or third year classification in veterinary medicine or permission of instructor
Bacterial, viral, parasitic, and nutritional diseases of domestic poultry and gamebirds; biosecurity, immunization, and management procedures to prevent poultry diseases. This course includes wet labs. Additional assignments required for graduate level credit.

VDPAM 409: Veterinary Practice Management and Organization
(2-0) Cr. 2. F.
Prereq: Vet Med classification
An A to Z introduction to proven veterinary practice management methods and strategies. The student will follow a detailed hands-on workbook describing most of the processes and procedures of day to day veterinary practice. Class content will be deliver via online modules.

VDPAM 414: Veterinary Practice Entrepreneurship
(Dual-listed with VDPAM 514). Cr. 2-3. S.
Prereq: Vet Med classification or Graduate student
Formal exposure to the entrepreneurial and business skills necessary to own and operate a successful veterinary practice or other small business opportunity. Personal finance, marketing, human resource management, general accounting, site assessment, location demographics, practice valuation, and a host of other issues which must be considered when purchasing or starting a new business are covered. Class instruction will be delivered by successful practice and business owners with examples from real world experience.

VDPAM 416: Bovine Reproduction Evaluation Laboratory
(0-4) Cr. 1. F.S.
Prereq: Vet Med 3 classification
Bovine rectal palpation techniques will be repetitively taught in 7 four-hour sessions. Students will also learn techniques of epidural anesthesia, artificial insemination, pregnancy staging and ultrasonic imaging. University-owned cattle will be used. Spring semester only offered one section. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 419: Advanced Swine Production Informatics
(1-0) Cr. 1. F.
Prereq: VDPAM 309 or permission of instructor
Advanced coverage of concepts related to the collection, manipulation, analysis, and reporting of information used by swine production companies. A quick review of modern swine production and measures of productivity ensures students have a firm base for applying the informatics. This course introduces students to one of the most commonly used swine record-keeping systems in the industry and gives them access to actual production data with which to work. Students then learn how to generate and interpret regularly used reports and will use pivot tables and budgeting models in Excel®. The importance of data entry and validation and how to transform data into useful knowledge are then addressed. Fundamentals of financial information, cost-benefit analysis and using budgeting models to assess the economics of animal health interventions are then applied.

VDPAM 420: Applied Production Animal Medicine Preceptorship
(0-30) Cr. 1-6. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification
Advanced course in production animal medicine with emphasis on government, industry or veterinary practice settings. Requires 40 hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 420A: Applied Production Animal Medicine Preceptorship: Food Animal Emphasis
(0-30) Cr. 1-6. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification
Advanced course in mixed animal production medicine with a food animal emphasis in veterinary practice settings. Requires 40 hours of clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 420B: Applied Production Animal Medicine Preceptorship: General Mixed Animal Practice
(0-30) Cr. 1-6. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification
Advanced course in production animal medicine in general mixed animal veterinary practice settings. Requires forty hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 420C: Applied Production Animal Medicine Preceptorship: Government Agency or Food Processing Company
(0-30) Cr. 1-6. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification
Advanced course in production animal medicine with emphasis on government agency or food processing company in veterinary practice settings. Forty hours clinical experience per week. Assignments will be preceptorships with a governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 420P: Applied Poultry Production Medicine Preceptorship
Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.
Prereq: Fourth year classification in veterinary medicine required. VDPAM 408 and/or VDPAM 498 strongly recommended.
Unique, highly relevant, hands-on veterinary experience for participating students Development of poultry-specific practice skill sets Documented experience that is highly valued by future poultry employers Enhanced cultural and professional awareness for participating students through interaction with active poultry practitioners Exposure to diverse poultry practice and production environments. Up to 6 credits to count for graduation.

VDPAM 421: Great Plains Veterinary Educational Center
Cr. 1. F.S.SS.
Prereq: Vet Med 4 classification
The Great Plains Veterinary Educational Center (GPVEC), located on the US Meat Animal Research Center (USMARC) near Clay Center, Nebraska offers one week clinical training in production animal medicine species. All sections will be held at GPVEC. Student must be able to provide own transportation to each site.

VDPAM 421A: Great Plains Veterinary Educational Center: Calving
Cr. 1. S.
Prereq: Vet Med 4 classification
The Calving Elective provides an opportunity to expand knowledge and experience in all phases of calving management. The program is structured around normal calving operations at USMARC including emergency duties. Activities that take place during the Calving Elective including the diagnosis, treatment, and management of many commonly encountered conditions in the dam and calf, necropsies, and daily discussions. Participation in a caesarian section is not guaranteed. Student must be able to provide own transportation to each site.

VDPAM 421B: Great Plains Veterinary Educational Center: Bull Breeding Soundness
Cr. 1. S.
Prereq: Vet Med 4 classification
The Bull Breeding Soundness Examination Elective involves training in all phases of the bull fertility examination as recommended by the Society for Theriogenology. Chuteside, hand-on experience is the primary training technique for this elective with informal discussions held during the performance of breeding soundness examinations on 350 or more bulls. Student must be able to provide own transportation to each site.

VDPAM 421D: Great Plains Veterinary Educational Center: Feedlot Management
Cr. 1. F.SS.
Prereq: Vet Med 4 classification
Evaluation of production techniques and production efficiency including ration and feeding management, health management program development and evaluation, environmental management, quality assurance and field necropsy techniques. Exposure to marketing and economic considerations in feed yard decision making. A strong emphasis on population medicine, trouble shooting and problem-solving skills in the beef industry, with exposure to harvest/food safety considerations. Discussions on pharmaceutical and feed additive usage and legal implications in food supply veterinary medicine. Student must be able to provide own transportation to each site.

VDPAM 421E: Great Plains Veterinary Educational Center: Calf Weaning Management
Cr. 1. F.
Prereq: Vet Med 4 classification
This is a hands-on elective in which students participate in the weaning management at the USMARC. Students will be involved with processing, feeding, finding, and treating sick calves. Additionally, students will be introduced to developing weaning rations and managing feed delivery. Students will also learn how to develop vaccination and treatment protocols and each student will have as an objective the development of their own vaccination and treatment protocol template. As time allows, students will visit commercial feed yards and cover production management topics. Student must be able to provide own transportation to each site.

VDPAM 421F: Great Plains Veterinary Educational Center: Pregnancy Examination
Cr. 1. F.
Prereq: Vet Med 4 classification
The Pregnancy Examination Elective involves rectal examinations for pregnancy, chuteside data collection and data entry into a computer software program to evaluate the reproductive performance of the herd. This elective is designed for students who have some palpation experience and are interested in honing their skills. Pregnancy Examination occurs during yearly fall herd work at the USMARC, therefore, speed and accuracy will be stressed, rather than basic technique. Student must be able to provide own transportation to each site.

VDPAM 421J: Great Plains Veterinary Educational Center: Lambing
Cr. 1. S.
Prereq: Vet Med 4 classification
The Lambing Elective involves students working with the USMARC lambing crew and GPVEC faculty in observations, assistance with delivery when necessary, and routine lambing duties. Students will work with veterinary personnel in sheep necropsy and health surveillance. Self-study material will be provided covering topics such as pre-breeding and breeding, pregnancy diagnosis, pregnant ewe management, pre-lambing ewe/lambing management, feeder lamb health and nutrition management, and replacement ewe and ram management. Student must be able to provide own transportation to each site.

VDPAM 421K: Great Plains Veterinary Educational Center: Equine Dentistry
(20-20) Cr. 1. S.
Prereq: Vet Med 4 classification
The Equine Dentistry Elective provides the opportunity for students to expand their knowledge and experience related to equine dentistry. The rotation consists of lectures on topics relevant to equine dental care and hands-on laboratories during which students practice routine dental care procedures on USMARC horses. Equine Dentistry will involve both lecture and lab time at about equal shares. Student must be able to provide own transportation to each site.

VDPAM 421P: Great Plains Veterinary Educational Center: Bovine Surgery
Cr. 1. F.
Prereq: Vet Med 4 classification
The Bovine Surgery Elective is designed to give students interested in food animal surgery an opportunity to practice their surgical skills by performing penile translocations and epididymectomies on USMARC teaser bull candidates. Lectures specific to gomer bull surgery as well as other topics related to food animal surgery will be presented during this elective. Student must be able to provide own transportation to each site.

VDPAM 421Q: Great Plains Veterinary Educational Center: Swine Husbandry
Cr. 1. F.S.
Prereq: Vet Med 4 classification
This elective provides students the opportunity to gain hands-on experience related to the daily activities of an intensively managed confinement swine unit. Rotation participants will work closely with USMARC Swine Unit personnel as they complete their daily routines in the farrowing and breeding areas of the USMARC Swine Unit and will participate in piglet delivery, neonatal pig processing, artificial and natural breeding, necropsies, and other activities as they arise. Student must be able to provide own transportation to each site.

VDPAM 421R: Great Plains Veterinary Educational Center: Lamb Weaning Management
Cr. 1. SS.
Prereq: Vet Med 4 classificaiton
This elective provides the opportunity for students to develop their skills in the area of health and nutritional management of sheep immediately before and after weaning. The rotation consists of lectures on pre- and post-weaning nutrition, clinical parasitology, and prevention and control of common ovine infectious diseases. Hands-on experience during the week will take place at the USMARC Sheep Unit and will consist of walk-through and hand-on examinations of recently weaned lambs, treatment of sick lambs, inspection of weaning pen environment, investigation of herd outbreaks, and post mortem examination of all sheep mortalities. Student must be able to provide own transportation to each site.

VDPAM 421S: Great Plains Veterinary Educational Center: Ultrasound Pregnancy Examination
Cr. 1. SS.
Prereq: Vet Med 4 classification
The Ultrasound Pregnancy Examination Elective involves transrectal ultrasonographic examinations for pregnancy, chuteside data collection and data entry into a computer software program to evaluate the reproductive performance of the herd. This elective is designed for students who have some ultrasound experience and are interested in honing their skills. This elective occurs during yearly fall herd work at the USMARC, therefore, speed and accuracy will be stressed, rather than basic technique. Didactic instruction may include several topics in cow herd health, nutrition, management and reproductive decision making. Student must be able to provide own transportation to each site.

VDPAM 421T: Great Plains Veterinary Educational Center: Food Animal Clinical Care and Treatment (FACCT)
Cr. 1. F.S.
Prereq: Vet Med 4 classification
This course is designed to achieve hands-on and critical thinking skills necessary to provide clinical care to cattle and sheep. Student needs will be met through structured discussions and accompanying the veterinarians in daily care of the animals at USMARC. Student must be able to provide own transportation to each site.

VDPAM 421U: Great Plains Veterinary Educational Center: Necropsy and Diagnostic Investigations
Cr. 1. F.S.
Prereq: Vet Med 4 classification
This course is designed to develop diagnostic and critical thinking skills necessary to investigate disease outbreaks in a herd health setting. Student needs will be met through daily necropsy procedures, in depth discussions of case examples, and thorough exposure to diagnostic tests and sampling procedures. Student must be able to provide own transportation to each site.

VDPAM 422: Beef Cattle Calving
Cr. 2. Repeatable. F.S.SS.
Prereq: VDPAM 310; fourth year classification in veterinary medicine; permission of instructor
This elective provides students opportunity to assist cow-calf operations with calving in Nebraska, South Dakota or other locations. These operations typically calve 300-1,000 head each spring. Calving experience is not required, but a good understanding of working around cattle is necessary. Students will be actively participating in the day to day, normal calving routine including detecting and sorting off “springers”, calf “watch”, detecting when intervention is needed and assisting delivery, caring for and monitoring newborns and dams for good health and early disease detection, tagging/processing new calves, treating calves needing intervention and performing other routine calving chores. Students need to provide their own transportation to the site and overnight stays at or near the production sites are required. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 424: Preceptorship in Diagnostic Pathology.
Cr. 1-6. Repeatable. F.S.
Prereq: VDPAM 455
Advanced course in production animal medicine with emphasis on gross and diagnostic pathology. Forty hours clinical experience per week. Assignments will be preceptorships with a diagnostic laboratory, veterinary pathologist, governmental agency and/or production unit. Biosecurity policies require documentation of student’s presence in the USA 5 days immediately prior to the start of class.

VDPAM 426: Veterinary Toxicology
(Dual-listed with VDPAM 526). (Cross-listed with TOX). (3-0) Cr. 3. S.
Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree
Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

VDPAM 428: Principles of Epidemiology and Population Health
(Dual-listed with VDPAM 528). (Cross-listed with MICRO, V MPM). (3-0) Cr. 3. S.
Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

VDPAM 436: Beef Records Analysis
(0-30) Cr. 1. F.S.
Prereq: Vet Med 1, 2, or 3 classification
Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability. Each semester's content builds on the material from the previous semester. Enrolling in the class for multiple semesters will be encouraged.

VDPAM 436A: Beef Records Analysis: Introduction
(0-30) Cr. 1. Repeatable. F.
Prereq: Vet Med 1, 2, or 3 classification
Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to become Beef Quality Assurance (BQA) certified through the Iowa Beef Center.

VDPAM 436B: Beef Records Analysis: Herd Management
(0-30) Cr. 1. Repeatable. S.
Prereq: Vet Med 1, 2, or 3 classification; and VDPAM 436A
Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability.

VDPAM 436C: Beef Records Analysis: Cow/Calf Preventive Medicine
(0-30) Cr. 1. Repeatable. F.
Prereq: Vet Med 2 or 3 classification; and VDPAM 436A and VDPAM 436B
Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Emphasis will be on obtaining a better understanding of nutritional and reproductive management of cow herds. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability.

VDPAM 436D: Beef Records Analysis: Feedlot Production Medicine
(0-30) Cr. 1. Repeatable. S.
Prereq: Second or third year classification in veterinary medicine, or special permission of instructor
Lectures will emphasize current production and evaluation techniques for feedlot production and students will develop a standard treatment protocol book. Topics include respiratory disease, receiving programs, nutrition, cattle handling and environmental issues.

VDPAM 445: Production Animal Clinical Medicine
(3-0) Cr. 3. S.
Prereq: Vet Med 3 classification
Clinical diagnosis and treatment of diseases of swine, beef and dairy cattle, and small ruminants.

VDPAM 450: Disturbances of Reproduction
(4-0) Cr. 4. F.
Prereq: Vet Med 3 classification
General principles of normal reproductive functions in addition to environment, management and diseases causing disturbances in reproduction. Cattle, Swine, Equine, Small Ruminant, and Small Animal species will be covered.

VDPAM 451: Clinical Embryo Transfer
Cr. 2. F.S.SS.
Prereq: Vet Med 4 classification and VDPAM 351
Elective clinical assignment in techniques of embryo transfer. Primary species studied will be bovine but equine and small ruminant embryo transfer will be covered during discussions. Enrollment is limited to four students per two week session. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 455: Diagnostic Laboratory Practicum
Cr. 1. Repeatable. F.S.
Prereq: Vet Med 4 classification and VDPAM 310
Practical experience and training in necropsy, recognition of gross lesions, diagnostic sample collection and test selection for the diagnosis of infectious, toxic, nutritional and metabolic diseases through exposure to diagnostic cases submitted to the ISU Veterinary Diagnostic Laboratory. The VDL accepts cases from all species; however, this course predominantly consists of porcine and bovine cases.

VDPAM 456: Veterinary Diagnostic Lab Methods & Applications
(16-0) Cr. 1. F.
Prereq: Vet Med 2 or 3 classification
An introduction to diagnostic medicine including strengths and weaknesses of various testing technologies, how to choose appropriate tests and technologies, sampling strategies in diseased and non-diseased populations and interpretation and integration of results of tests to achieve an accurate diagnosis are discussed.

VDPAM 463: Feedlot Production Medicine
Cr. 1. S.
Prereq: VDPAM 310: concurrent enrollment in VDPAM 421D.
One-week VM4 elective focusing on Midwestern feedlot production. Addresses feedlot production practices common to Iowa and surrounding states, including feeding cattle on concrete or under roofs. Activities include participation and visitation to representative feedlots in Iowa.

VDPAM 465: Animal Welfare Clinical Rotation
Cr. 2. F.SS.
Prereq: Vet Med 4 classification
Two-week course for senior veterinary students to gain skills for collecting and interpreting animal welfare data, aid clients with identifying and achieving welfare goals, and assisting law enforcement with animal cruelty response. Field trips to food animal and companion animal facilities are mandatory.

VDPAM 471: Animal Reproduction
Cr. 2. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification
Elective clinical assignment in animal reproduction. Equine, Food Animal, Small Animal and Comparative reproduction only.

VDPAM 471C: Animal Reproduction: Comparative
Cr. 2. Repeatable, maximum of 4 credits. F.SS.
Prereq: Vet Med 4 classification
Elective comparative clinical assignment in Theriogenology with caseload management in Food Animal, Equine, Small Animal and Small Ruminants sections. Rotation through these different sections will depend on the caseload (by species) and include routine breeding management, semen collection and cryopreservation in different species, advanced laparoscopic and non-surgical procedures for insemination and embryo flushing/transfer, pregnancy diagnosis as well as management of reproductive emergencies.

VDPAM 471E: Animal Reproduction: Equine Reproduction
Cr. 2. Repeatable, maximum of 4 credits. S.SS.
Prereq: Vet Med 4 classification
Elective clinical assignment in Equine Theriogenology involving both mare and stallion breeding management, cool-shipped semen preparation and semen cryopreservation, embryo transfer, foaling of high-risk pregnant mares as well as normal mares, breeding soundness exams of the mare and stallion, treatment of retained fetal membranes and neonatal care.

VDPAM 471F: Animal Reproduction: Food Animal Reproduction
Cr. 2. Repeatable, maximum of 4 credits. S.SS.
Prereq: Vet Med 4 classification
Elective clinical assignment in Food Animal Theriogenology involving male and female breeding soundness exams, dystocia management, advanced diagnostic and surgical procedures, surgical and non-surgical insemination programs in small ruminants, and semen cryopreservation. Medical and surgical correction of reproductive disorders in cattle, swine and small ruminants. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 471S: Animal Reproduction: Small Animal Reproduction
Cr. 2. Repeatable, maximum of 4 credits. F.S.SS.
Prereq: Vet Med 4 classification
Primary reproductive management in the canine and feline involving breeding management of the bitch and stud dog, advanced surgical and non-surgical insemination using fresh, cooled or frozen semen, and infertility case management for the male and female. High risk pregnancy management, parturition and neonatal care of both canine and felines, as required.

VDPAM 476: Food Animal and Camelid Field Service
Cr. 1-2. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification and VDPAM 310
Students will assist university veterinarians in delivering individual animal health care and herd-based production management services to the ISU livestock farms and other livestock farms in the local area. Focus on the establishment of best practices for herd management of production systems at the university and in the region. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 477: Food Animal and Camelid Medicine and Surgery
Cr. 2. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification
Clinical assignment focused on the management of food animal and camelid medicine and surgery cases. Specific instruction in clinical evaluation of cases coupled with appropriate diagnostic testing and therapeutic intervention will be emphasized. Additional instruction will be provided in disease prevention, intensive care and management of food animal and camelid species. Particular emphasis will be placed on appropriate on-label and extra-label drug usage in food animal species. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 478A: Swine Medicine Education Center: Swine Production Management and Consultation
Cr. 2. Repeatable. F.S.
Prereq: VDPAM 310
Swine production management and consulting skills within a progressive swine production and management system. Time will be split approximately with half in-class discussion topics of finance and business of the swine industry and half on-farm learning opportunities where students will visit a breeding farm, nursery facility, finishing facility, wean-to-finish facility, gilt developer unit, and a truck wash facility.

VDPAM 478B: Swine Medicine Education Center: Swine Clinical Pharmacology and Treatment Management
Cr. 2. Repeatable. S.SS.
Prereq: VDPAM 310
Basic and applied information on swine treatment options, strategies to maximize efficacy, and skills to pursue judicious use of antimicrobials, reproductive interventions, and the entire spectrum of drug therapies. The course emphasizes case based application and decisions and is approximately 30% web-based and 70% on-site including farms of a variety of structures and functions. During the course, students prepare a thorough evaluation of the pharmacologic interventions that may occur on farms and then implement this evaluation in active production facilities to maximize efficacy, compliance and animal welfare as part of a comprehensive judicious use objective.

VDPAM 478C: Swine Medicine Education Center: Swine Emerging Diseases and Emergency Response Management
Cr. 2. Repeatable. F.S.
Prereq: VDPAM 310 VDPAM 480
Diagnostic tests, methods, approaches, analysis, and evaluation of emerging swine diseases and provide general knowledge of disease elimination and methods to manage herd losses and economic losses due to disease. Two-week, on-site module that combines structured site visits and classroom activities.

VDPAM 479: Applied Swine Production Medicine Preceptorship
(0-30) Cr. 1-6. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification and VDPAM 310
Preceptorship course in swine production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 480: Swine Production Medicine
(15-25) Cr. 2. Repeatable. F.S.SS.
Prereq: VDPAM 310; Fourth year classification in Veterinary Medicine or permission of instructor
Two week clinical rotation in swine production medicine. Students will be assigned to take the lead in investigating field based client cases with supervision of the instructors. Development of critical thinking skills that will allow students to apply concepts of herd management, production analysis, economic analysis, and disease prevention in addressing client cases. Variable amounts of travel to farm sites will be required with the potential for rare overnight stays. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 481: Advanced Cow/Calf Production Medicine
(Dual-listed with VDPAM 581). (20-20) Cr. 2. S.
Prereq: Completion of two semesters of VDPAM 436 or UNL equivalent (V MED 596 Cattle Production), fourth year classification in veterinary medicine
Two-week senior elective that will focus on the economics of animal disease in cow/calf operations. Evidence based medicine and epidemiological principles will be used in investigation of disease outbreaks. Extensive partial budgeting used. Students will complete at least two disease investigations involving outbreaks in commercial cow/calf operations and communicate their findings to the class, the herd owner, and local practitioner. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 482: Applied Beef Production Medicine Preceptorship
Cr. 1-6. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification and VDPAM 310
Advanced course in beef production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will include preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 483: Beef Production Medicine
(15-20) Cr. 2. F.
Prereq: Vet Med 4 classification and VDPAM 310
Two week advanced clinical rotation in beef production medicine. Fifteen hours recitation/discussion and 20 hours clinical experience per week. This course is designed to expose students to cow-calf and feedlot production concepts. The activities scheduled for the rotation depend greatly on the time of year. Whenever possible, the class incorporates field trips to better understand how commercial cow/calf and feedlots operate and the veterinarian's role in their management. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 484: Dairy Production Medicine
(15-20) Cr. 2. F.SS.
Prereq: Vet Med 4 classification and VDPAM 310
Two week course in dairy production medicine combining class time with multiple on-farm visits to learn various management aspects (DHIA, DC305 & PC Dart record analysis, calf rearing through lactating cows, reproduction programs, udder health and milk quality, biosecurity, welfare, nutrition and cow comfort) for a wide variety of dairy operations. Students will learn the latest in dairy management by reviewing current topic articles and gain experience in farm evaluation through a group project. Fifteen hours recitation/discussion and 20 hours clinical experience per week. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 485: Applied Dairy Production Medicine Preceptorship
(0-30) Cr. 1-6. Repeatable. F.S.SS.
Prereq: Vet Med 4 classification and VDPAM 310
Advanced course in dairy production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will include preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 486: Introduction to Small Ruminant Production Medicine
(15-0) Cr. 1. S.
Prereq: Vet Med 3 classification
Survey of small ruminant production systems, common management practices, and disease processes of small ruminants and camelids. This course is intended to give the student a background in small ruminant medicine. Herd health, disease monitoring and prevention, nutrition, and typical management systems will be emphasized in lecture.

VDPAM 487: Livestock Disease Prevention
(3-0) Cr. 3. F.
The course is designed for both the pre-veterinary and animal science majors who have an interest in production animal health, disease prevention methods, epidemiology of economically important agents, and the ecology of currently important pathogens found in North American livestock industries. It will focus on disease prevention principles for individuals and large production population systems.

VDPAM 488: Laboratory in Clinical Microbiology
Cr. 1. Repeatable. F.S.
Prereq: Vet Med 4 classification
Application of microbiological procedures to the diagnosis of infectious diseases.

VDPAM 489: Issues in Food Safety
(Cross-listed with AN S, FS HN, HSP M). (1-0) Cr. 1. S.
Prereq: Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)
Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

VDPAM 490: Independent Study
Cr. 1-5. Repeatable. F.S.SS.
Prereq: Permission of department chair

VDPAM 491: Advanced Ruminant Nutrition
(30-10) Cr. 2. F.
Focus on dairy nutrition and balancing rations from the calf to the adult, lactating cow. Introduction to different feedstuffs and forage varieties to determine those that are best suited to bovine diets. This course starts the week immediately prior to the start of the fall semester and continues throughout the fall semester. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 494: Advanced Dairy Production Medicine
(20-20) Cr. 2. S.
Prereq: VDPAM 484 or permission of instructor
Advanced course in investigating dairy herd problems relating to milk quality or nutrition. Milk quality and nutrition troubleshooting will be taught through the combination of lecture and on-farm investigations. Students will combine lecture knowledge, data acquired from on-farm investigations and record analysis to generate management plans. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 495: Advanced Small Ruminant Production Medicine
(15-20) Cr. 2. F.S.
Prereq: Vet Med 4 classification, VDPAM 486
Two week clinical rotation in small ruminant production medicine. Field trips (including overnight stays) will be incorporated when possible. Topics to be covered include small ruminant industries (milk, meat, and fiber), milk quality, nutrition, reproduction, and disease management of small ruminants. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 496: International Experience
(Dual-listed with VDPAM 596). Cr. 1-12. Repeatable. F.S.SS.
Prereq: Vet Med 2, 3, or 4 classification
International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

VDPAM 498: Poultry Medicine
Cr. 2. SS.
Prereq: Vet Med 4 classification
Two-week senior elective to introduce students into poultry production medicine in the Midwest. Students will participate in routine flock monitoring, biosecurity reviews, disease investigations involving outbreaks in commercial and backyard poultry operations, and have a basic understanding of the poultry industry and poultry diseases. Involves didactic lectures in the classroom, field trips to poultry farms, and necropsies.

Courses primarily for graduate students, open to qualified undergraduates:

VDPAM 507: Evidence Based Clinical Decision Making
(Dual-listed with VDPAM 407). (1-0) Cr. 1. S.
Prereq: Permission of instructor
Discussion, lectures and laboratories to assess the quality and significance of medical evidence in making informed decisions about the treatment of individual animals and animal populations.

VDPAM 508: Poultry Diseases
(Dual-listed with VDPAM 408). (2-0) Cr. 2. Alt. S., offered even-numbered years.
Prereq: Second or third year classification in veterinary medicine or permission of instructor
Bacterial, viral, parasitic, and nutritional diseases of domestic poultry and gamebirds; biosecurity, immunization, and management procedures to prevent poultry diseases. This course includes wet labs. Additional assignments required for graduate level credit.

VDPAM 514: Veterinary Practice Entrepreneurship
(Dual-listed with VDPAM 414). Cr. 2-3. S.
Prereq: Vet Med classification or Graduate student
Formal exposure to the entrepreneurial and business skills necessary to own and operate a successful veterinary practice or other small business opportunity. Personal finance, marketing, human resource management, general accounting, site assessment, location demographics, practice valuation, and a host of other issues which must be considered when purchasing or starting a new business are covered. Class instruction will be delivered by successful practice and business owners with examples from real world experience.

VDPAM 526: Veterinary Toxicology
(Dual-listed with VDPAM 426). (Cross-listed with TOX). (3-0) Cr. 3. S.
Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree
Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

VDPAM 527: Applied Statistical Methods in Population Studies
(3-0) Cr. 3. Alt. F., offered odd-numbered years.
Prereq: STAT 587
ANOVA, Linear Regression, Model Selection, Mixed Models, ANCOVA, Repeated Measurement Analysis, MANOVA, Nonparametric Methods, Diagnostic Test Evaluation, ROC Curve Analysis, Generalized Linear Models, Logistic Regression, Survival Analysis, Cox Proportional Hazards Regression, Count Data Analyses. This course is available on campus and by distance.

VDPAM 528: Principles of Epidemiology and Population Health
(Dual-listed with VDPAM 428). (Cross-listed with V MPM). (3-0) Cr. 3. S.
Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

VDPAM 529: Epidemiological Methods in Population Research
(3-0) Cr. 3. Alt. F., offered even-numbered years.
Prereq: STAT 587; VDPAM 528
Train students on selecting the proper statistical model to conduct statistical analysis in the context of epidemiological studies. Train students to report and interpret data collected from experimental (clinical trials), observational (cross-sectional, case-control, cohort) or field-based studies incorporating the information covered in previous epidemiology/biostatistics courses and this course, and how to communicate the findings with the end-users. Introduce other methods that can be used when analyzing epidemiological studies. This course is available on campus and by distance.

VDPAM 542: Introduction to Molecular Biology Techniques
(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.SS.
Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

VDPAM 542A: Introduction to Molecular Biology Techniques: DNA Techniques
(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.
Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

VDPAM 542B: Introduction to Molecular Biology Techniques: Protein
(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS). Cr. 1. Repeatable. S.SS.
Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

VDPAM 542C: Introduction to Molecular Biology Techniques: Cell Techniques
(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.
Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

VDPAM 542D: Introduction to Molecular Biology Techniques: Plant Transformation
(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. S.
Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of tranformants. Offered on a satisfactory-fail basis only.

VDPAM 542E: Introduction to Molecular Biology Techniques: Proteomics
(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.
Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

VDPAM 542F: Introduction to Molecular Biology Techniques: Metabolomics
(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.
Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

VDPAM 542G: Introduction to Molecular Biology Techniques: Genomic
(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. S.
Offered on a satisfactory-fail basis only.

VDPAM 546: Clinical and Diagnostic Toxicology
(Cross-listed with TOX). (0-3) Cr. 1-3. Repeatable. F.S.SS.
Prereq: D.V.M. degree or VDPAM 526
Advanced study of current problems and issues in veterinary toxicology. Emphasis on problem solving and interpreting clinical cases while utilizing clinical, epidemiological, and laboratory resources. Course consists highly of clinical case based material.

VDPAM 551: Advanced Veterinary Diagnostic Pathology
(0-3) Cr. 1-3. Repeatable. F.S.SS.
Prereq: VDPAM 455; VPTH 570; VPTH 571
Laboratory diagnosis of animal diseases with emphasis on gross and microscopic lesion description. Caseload is focused heavily on infectious diseases of food animals.

VDPAM 560: Ecology of Infectious Diseases
(3-0) Cr. 3. Alt. S., offered odd-numbered years.
Topics of applied ecology of infectious diseases. Specific objectives include: a) understanding dynamics of pathogen transmission within and between population; b) how to reduce risk of pathogen introduction in populations; c) how to early detect pathogens and classify herds according to disease status; d) how to quantify pathogen transmission and impact in animal populations; e) applying and measure the effect of interventions to manipulate disease transmission dynamics within and between populations. Develop skills to prevent, detect and/or significantly control/eliminate animal health issues from animal populations. Learn how to quantify health issues and estimate the value of interventions to influence and mitigate health problems.

VDPAM 564: Animal Welfare Science and Research
(3-0) Cr. 3. Alt. S., offered even-numbered years.
Animal welfare is increasingly a key component of societal decisions about animal use, sustainable development and human-animal relationships. Understanding animal welfare as a scientific discipline, with primary focus on veterinary, biomedical and animal science disciplines. Explore fundamental and applied approaches to animal welfare science, including experimental design, data analysis and interpretation of results. Topics selected will reflect student interests, and may include animal welfare assessment and assurance, animal cognition, pain assessment and mitigation, and animal models used in biomedical research.

VDPAM 570: Risk Assessment for Food, Agriculture and Veterinary Medicine
(Cross-listed with AGRON, TOX). (3-0) Cr. 3. Alt. F., offered odd-numbered years.
Prereq: Statistics 300-level or higher.
Risk assessment principles as applied to biological systems. Exposure and effects characterization in human and animal health and ecological risk assessment. Risk analysis frameworks and regulatory decision-making. Introduction to quantitative methods for risk assessment using epidemiological and distributional analysis. Uncertainty analysis.

VDPAM 581: Advanced Cow/Calf Production Medicine
(Dual-listed with VDPAM 481). (20-20) Cr. 2. S.
Prereq: Completion of two semesters of VDPAM 436 or UNL equivalent (V MED 596 Cattle Production), fourth year classification in veterinary medicine
Two-week senior elective that will focus on the economics of animal disease in cow/calf operations. Evidence based medicine and epidemiological principles will be used in investigation of disease outbreaks. Extensive partial budgeting used. Students will complete at least two disease investigations involving outbreaks in commercial cow/calf operations and communicate their findings to the class, the herd owner, and local practitioner. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

VDPAM 590: Special Topics
Cr. 1-3. Repeatable. F.S.SS.
Prereq: Permission of Instructor
Topics in medicine, surgery, theriogenology; beef, swine, dairy, or sheep production medicine.

VDPAM 596: International Experience
(Dual-listed with VDPAM 496). Cr. 1-12. Repeatable. F.S.SS.
Prereq: Vet Med 2, 3, or 4 classification
International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

VDPAM 599: Creative Component
Cr. arr. Repeatable. F.S.SS.
Prereq: Enrollment in nonthesis master's degree program

Courses for graduate students:

VDPAM 650: Swine Diagnostic Medicine

Cr. 4. F.

Prereq: Permission of Instructor

A detailed study of swine diseases emphasizing the pathogenesis and diagnosis of swine respiratory, enteric, reproduction, metabolic, and septicemic diseases. Course activities include interpretation of diagnostic case reports and development of diagnostic plans for specific disease objectives.

VDPAM 654: Comparative Antimicrobial Clinical Pharmacology

Cr. 2. Alt. F., offered odd-numbered years.

Prereq: Graduate student, resident, or intern in College of Veterinary Medicine

Initial antimicrobial selection for infectious diseases of domestic animals. The antimicrobial drug groups will be examined, stressing pharmacokinetics, minimal inhibitory concentrations, and the use of these parameters to select appropriate compounds and dosages for maximum efficacy.

VDPAM 655: Advanced Swine Production Medicine

Cr. 4. Alt. S., offered odd-numbered years.

Prereq: Permission of Instructor

Detailed overview of applied techniques used in swine production medicine; production modeling and record analysis, facility design and management, analysis of competing intervention options, design and evaluation of therapeutic and vaccination strategies, quality control procedures and food safety. Course activities include interpretation of diagnostic case reports and development of diagnostic plans for specific disease objectives.

VDPAM 699: Research

Cr. arr. Repeatable.