

DEPARTMENT OF CLINICAL SCIENCES



Office in Veterinary Teaching Hospital, 300 West Drake Road, Room A201 (970) 297-1274

vetmedbiosci.colostate.edu/cs/ (<https://vetmedbiosci.colostate.edu/cs/>)

Dr. Khursheed Mama, Interim Department Head

Faculty in the Department of Clinical Sciences participate in training professional veterinary medical students and graduate students. For the veterinary medical student curriculum, students are instructed in the diagnosis, medical and surgical treatment, and prevention and management of domestic and exotic animal diseases. Through field service clinical experience, students receive on-the-farm training in livestock herd health management and production medicine. Our major clinical training center is the Veterinary Teaching Hospital, which operates state-of-the-art primary and referral services in all areas of small animal medicine and surgery, equine, and agricultural animal clinical care.

Undergraduate

No undergraduate major is offered.

Graduate

Graduate Programs in Clinical Sciences

Graduate programs offered in the department lead to Master of Science or Doctor of Philosophy degrees. Particular research focus areas within the department include epidemiology, musculoskeletal diseases, cancer biology, cardiovascular diseases, regenerative medicine, and infectious diseases of animals.

The department also offers a three-year combined master's degree and residency program in large and small animal surgery, anesthesiology, cardiology, dentistry, internal medicine, neurology, oncology, ophthalmology, dermatology, small and large animal sports medicine and rehabilitation, large and small animal theriogenology, and emergency and critical care medicine. These training programs partially fulfill requirements for board certification in these specialties. Students interested in graduate work should refer to the Graduate and Professional Bulletin (<https://catalog.colostate.edu/general-catalog/graduate-bulletin/>) and the Department of Clinical Sciences (<https://vetmedbiosci.colostate.edu/cs/>).

Graduate Certificates

- Essentials in Veterinary Medicine (<https://catalog.colostate.edu/general-catalog/colleges/veterinary-medicine-biomedical-sciences/clinical-sciences/graduate-certificate-essentials-veterinary-medicine/>)
- Foundations in Veterinary Clinical Care (<https://catalog.colostate.edu/general-catalog/colleges/veterinary-medicine-biomedical-sciences/clinical-sciences/graduate-certificate-foundations-veterinary-clinical-care/>)
- Fundamentals of Veterinary Clinical Care Diseases (<https://catalog.colostate.edu/general-catalog/colleges/veterinary-medicine-biomedical-sciences/clinical-sciences/graduate-certificate-fundamentals-veterinary-clinical-care/>)

Master's Programs

- Master of Science in Clinical Sciences (<https://catalog.colostate.edu/general-catalog/colleges/veterinary-medicine-biomedical-sciences/clinical-sciences/clinical-sciences-ms/>)
- Master of Science in Veterinary Clinical Care, Plan B (<https://catalog.colostate.edu/general-catalog/colleges/veterinary-medicine-biomedical-sciences/clinical-sciences/veterinary-clinical-care-ms-plan-b/>)

Ph.D.

- Ph.D. in Clinical Sciences*

* Please see department for program of study.

Courses

Clinical Sciences (VS)

VS 301 Human-Animal Interactions Credits: 3 (1-0-2)

Course Description: Explore various topics and current research related to human-animal interactions.

Prerequisite: None.

Registration Information: Completion of AUCC Category 2. Must register for lecture and recitation. Offered as an online course only. Credit not allowed for both VS 280A1 and VS 301.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 310 Communication Skills for Animal Professions Credits: 3 (3-0-0)

Course Description: Professional training and specifically tailored communication skills designed to meet the needs of animal professionals.

Prerequisite: None.

Registration Information: Sections may be offered: Online.

Terms Offered: Fall, Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 331 Histology Credits: 4 (3-2-0)

Course Description: Analysis of animal cells, tissues, and organs emphasizing light microscopy.

Prerequisite: LIFE 102.

Registration Information: Must register for lecture and laboratory. Credit not allowed for both VS 331 and BMS 330. Sections may be offered: Online.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 333 Domestic Animal Anatomy Credits: 4 (3-3-0)

Course Description: Comparative functional anatomy of the dog, horse, and cow.

Prerequisite: BZ 110 or LIFE 102.

Registration Information: Must register for lecture and laboratory. Credit not allowed for both VS 333 and BMS 305. Sections may be offered: Online.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 401 Human Animal Interactions Credits: 3 (3-0-0)

Course Description: Roles animals play in society, and the impact of human and animal relationships.

Prerequisite: None.

Registration Information: Completion of AUCC Category 2. Offered as an online course only.

Terms Offered: Fall, Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 410 Pets Forever – Supporting the Life-Long Bond Credits: 3 (1-4-0)

Course Description: Opportunity to engage with older adults and individuals with disabilities and their companion animals. Enrichment of students' experience through the opportunity to gain community service experience.

Prerequisite: HDFS 101 or PSY 100 or SOWK 110.

Registration Information: Must register for lecture and laboratory. Sections may be offered: Online.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 478 Biology and Behavior of Cats Credits: 3 (3-0-0)

Also Offered As: BZ 478.

Course Description: Comprehensive inquiry into how aspects of physiology, neurobiology, development and genetics influence the behavior of domestic cats. Evolution and domestication are explored as contextual reference for some behavior problems, and differentiated from true abnormal behavior. Emphasis is on interpreting scientific experiments in feline biology.

Prerequisite: BZ 220.

Restriction: Must not be a: Freshman, Sophomore.

Registration Information: Junior standing. Sections may be offered: Online. Credit not allowed for both BZ 478 and VS 478.

Terms Offered: Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 479 Biology and Behavior of Dogs Credits: 3 (3-0-0)

Also Offered As: BZ 479.

Course Description: Interactions of physiology, neurobiology, and genetics on behavior of domestic dogs, and how evolution and domestication influence behavioral traits.

Prerequisite: BZ 220.

Restriction: Must not be a: Freshman, Sophomore.

Registration Information: Junior standing. Sections may be offered: Online. Credit not allowed for both BZ 479 and VS 479.

Terms Offered: Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 495 Independent Study Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 501 Animal Behavior and Welfare Credits: 2 (2-0-0)

Course Description: Develop skills in ethics, animal welfare, and behavior within veterinary medicine. Develop the core skills necessary for involvement in patient care in veterinary medicine by providing opportunities for practice in these areas.

Prerequisite: VS 506, may be taken concurrently.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 502 Clinical Anatomy Credits: 2 (2-0-0)

Course Description: Clinical anatomy related to diseases and injuries seen by veterinary professionals. Develop the core knowledge necessary for basic surgical care in veterinary medicine.

Prerequisite: None.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Admission to the MS in Veterinary Clinical Care, Plan B, or the Graduate Certificate in Essentials in Veterinary Medicine required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 503 Principles of Radiology and Ultrasound Credits: 2 (2-0-0)

Course Description: Diagnostic imaging techniques, methods, and interpretation within veterinary medicine. Develop the core diagnostic imaging skills necessary for involvement in patient care in veterinary medicine by providing opportunities to practice in these areas.

Prerequisite: VS 502, may be taken concurrently.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 504 Infectious Pathogens and Parasites Credits: 3 (3-0-0)

Course Description: Description of bacterial, fungal, viral, and parasitic diseases commonly affecting dogs and cats. Develop the core skills necessary for involvement in patient care with regards to animal diseases in the field of veterinary medicine, by providing opportunities for assessment of cases in these areas.

Prerequisite: None.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Admission to the Master of Science in Veterinary Clinical Care, Plan B, Graduate Certificate in Essentials in Veterinary Medicine, or the Graduate Certificate in Fundamentals of Veterinary Clinical Care Diseases required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 506 Pathologic Basis of Disease Credits: 3 (3-0-0)

Course Description: Description of immunology, pathology, and the appearance and classification of microscopic and gross lesions relevant to canine and feline medicine. Develop the core understanding of clinical pathology necessary for the field of veterinary medicine.

Prerequisite: None.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Admission to the MS in Veterinary Clinical Care, Plan B, or the Graduate Certificate in Fundamentals of Veterinary Clinical Care Diseases required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 510 Cancer Biology Credits: 3 (3-0-0)

Also Offered As: ERHS 510.

Course Description: Cancer biology will address each of the hallmarks of cancer, including sustained proliferative signaling, evasion of growth suppression, invasion and metastasis, replicative immortality, angiogenesis, resisting cell death, genome instability and mutation, tumor promoting inflammation, deregulation of cellular energetics and avoidance of immune destruction. Lectures will integrate the biology behind these hallmarks with strategies for the treatment and prevention of cancer.

Prerequisite: BC 351 or BC 403, may be taken concurrently or BZ 310 or CM 501.

Registration Information: Credit not allowed for both ERHS 510 and VS 510.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 521 Nutrition and Metabolism Credits: 2 (2-0-0)

Course Description: Nutrition, metabolism, and diseases affected by and treated with nutrition and nutritional supplements commonly seen in veterinary medicine.

Prerequisite: VS 547, may be taken concurrently.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 522 Toxicology Credit: 1 (1-0-0)

Course Description: Clinical toxicology relevant to canine and feline medicine. Develop the core skills and knowledge with regards to houseplant toxins, poisonous plants, pesticides, herbicides, fungicides, envenomations, biological toxins, metal toxicities, feed and water contaminants, and pharmaceuticals involved in the field of veterinary medicine, by providing opportunities for practice in these areas.

Prerequisite: None.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Admission to the MS in Veterinary Clinical Care, Plan B, or the Graduate Certificate in Essentials in Veterinary Medicine required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 523 Clinical Pharmacology Credits: 3 (3-0-0)

Course Description: Pharmacology relevant to canine and feline medicine. Develop the core skills and knowledge with regards to pharmacology, pharmacokinetics, and pharmacodynamics involved in patient care in the field of veterinary medicine, by providing opportunities for practice in these areas.

Prerequisite: VS 504.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 526 Foundations I Credits: 2 (1-2-0)

Course Description: The skills in communication, history-taking, physical exam components, breed identification, clinical reasoning, and surgical skills related to canine and feline medicine. Develop the core skills necessary for involvement in patient care in the field of veterinary medicine, by providing opportunities for practice in these areas.

Prerequisite: None.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Admission to the MS in Veterinary Clinical Care, Plan B, or the Graduate Certificate in Foundations of Veterinary Clinical Care required. Must register for lecture and laboratory. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 527 Foundations II Credits: 2 (1-2-0)

Course Description: Develop skills in intermediate level communications, physical exam skills, surgical skills, and injection site techniques related to canine and feline medicine. Develop the core skills necessary for involvement in patient care in the field of veterinary medicine, by providing opportunities for practice in these areas.

Prerequisite: VS 501 and VS 526.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Students enrolled will either have been accepted into the Master's of Veterinary Clinical Care program or be accepted into the Foundations in Veterinary Clinical Care Graduate Certificate. Foundations I, II, and III are a series of courses that build on each other. Must register for lecture and laboratory. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 528 Foundations III Credits: 2 (1-2-0)

Course Description: Practice and refine skills in communications, physical exam, surgical, mentorship opportunities, and clinical settings related to canine and feline medicine. Develop the core skills necessary for involvement in patient care in the field of veterinary medicine, by providing opportunities for practice in these areas.

Prerequisite: VS 527.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Must register for lecture and laboratory. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 533 Epidemiology of Infectious Diseases/Zoonoses Credits: 3 (2-0-1)

Also Offered As: MIP 533.

Course Description: Epidemiologic features of infectious and parasitic diseases that have a major impact on community medicine.

Prerequisite: MIP 300.

Registration Information: Must register for lecture and recitation. Credit not allowed for both MIP 533 and VS 533.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 535 Practice Management and Team Leadership Credits: 2 (2-0-0)

Course Description: Practice management, professional development, finance, contract knowledge, income types, leadership, and team norms within the field of veterinary medicine. Develop the core skills necessary for involvement in career development, by providing opportunities for practice in these areas.

Prerequisite: VS 526.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 540 One Health in Public Health Credits: 3 (3-0-0)

Also Offered As: PBHL 540.

Course Description: Exploration of the interconnectedness of the environment and human and animal health. Topics will include national parks and public health, species reintroductions, zoonotic (animal-to-human) disease, the psychology of open space, bush-meat and ecological perturbation. Issues will be addressed from the perspective of public health, medicine, veterinary science, and ecology as well as their impact on health policy.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Graduate standing. Sections may be offered: Online. Credit not allowed for both PBHL 540 and VS 540.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

VS 541 Fundamentals of Shelter Medicine Credit: 1 (1-0-0)

Course Description: Canine and feline shelter medicine management. Develop an understanding for the unique circumstances surrounding shelter medicine, including disease management, population control, wellness medicine, various laws and guidelines, and ethical standards in the field of veterinary medicine.

Prerequisite: VS 547.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 542 Principles of Anesthesia Credits: 2 (2-0-0)

Course Description: The use of anesthesia in canine and feline veterinary patients, anesthetic equipment, and management of the anesthetized physiological states. Focus on application of anesthetic components in a clinical setting; availability of anesthetic and support drugs, case management; and improving patient comfort by minimizing acute postoperative pain.

Prerequisite: VS 523 and VS 547.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 543 Principles of Surgery Credits: 2 (2-0-0)

Course Description: Wound management, surgery, surgical technique, and aseptic technique within the field of veterinary medicine. Develop the core skills necessary for involvement in medical and surgical care in the field of veterinary medicine, by providing opportunities to practice in these areas.

Prerequisite: VS 527.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 544 Preventative Medicine Credits: 2 (2-0-0)

Course Description: Epidemiology, resource evaluation, medical errors, vaccine protocols, and other measures in small animal preventative medicine. Develop and apply the understanding of preventative care, treatments, clinical disease, and patient care in the field of veterinary medicine.

Prerequisite: VS 547.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 545 Issues in Veterinary Medicine Credit: 1 (1-0-0)

Course Description: Practice of professionalism, wellness, and standards of care surrounding euthanasia of companion animals in canine and feline medicine. Development of the professional skills necessary for involvement in the field of veterinary medicine, by providing opportunities for practice in these areas.

Prerequisite: VS 523.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 547 Common Diseases of Body Systems I Credits: 3 (3-0-0)

Course Description: Descriptions of gastrointestinal, reproductive, urogenital, integumentary, and hemolymphatic diseases commonly seen in canine and feline medicine. Develop the understanding of clinical disease and patient care in the field of veterinary medicine.

Prerequisite: VS 503 and VS 504 and VS 506.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 548 Common Diseases of Body Systems II Credits: 3 (3-0-0)

Course Description: Description and discussion of neoplastic, respiratory, cardiovascular, musculoskeletal, nervous, and hemolymphatic diseases relevant to canine and feline medicine. Development of the core skills necessary for involvement in patient care with regards to animal disease, by providing opportunities for assessment of cases in these areas.

Prerequisite: VS 547.

Restriction: Must be a: Graduate.

Registration Information: Bachelor's degree required. Offered as an online course only.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 562 Clinical Research Design and Data Analysis Credits: 3 (3-0-0)

Course Description: Data management, application and interpretation of statistical analysis, and reporting of results in health science fields.

Prerequisite: STAT 301 or STAT 307.

Restriction: Must be a: Graduate.

Registration Information: Graduate standing. Credit allowed for only one of the following: EDRM 606, PBHL 560, and VS 562.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 570 Issues in Animal Agriculture Credits: 2 (2-0-0)

Also Offered As: AGRI 570.

Course Description: Issues that have a major impact on the direction of changes in animal agriculture.

Prerequisite: None.

Registration Information: Credit not allowed for both VS 570 and AGRI 570.

Term Offered: Fall (even years).

Grade Mode: Traditional.

Special Course Fee: No.

VS 579 Applied Animal Behavior Credits: 4 (3-2-0)

Also Offered As: NSCI 579.

Course Description: How animals learn, perceive their work, and behave, and how all of those intersect to alter behavior in managed care.

Prerequisite: BZ 300 or BZ 478 or BZ 479.

Restriction: Must not be a: Freshman, Sophomore.

Registration Information: Junior standing. Must register for lecture and laboratory. Sections may be offered: Online. Credit not allowed for both NSCI 579 and VS 579.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

VS 600 Clinical Correlations in Large Animal Med Credit: 1 (1-0-0)

Course Description: Comprehensive review of selected medical diseases of both equine and livestock species in a case based format. Develop an advanced understanding of the pathophysiology, diagnosis, treatment and prevention of these diseases and become familiar with the pertinent primary literature of the last three years.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Sections may be offered: Online or Mixed Face-to-Face.

Terms Offered: Fall, Spring, Summer.

Grade Mode: S/U Sat/Unsat Only.

Special Course Fee: No.

VS 601 Physical Exam and Routine Care Lab Credits: 2 (0-4-0)

Course Description: Practice of palpation, restraint, physical exam techniques, and findings of various systems in dogs and cats. Develop the core skills necessary for involvement in patient care with regards to animal disease in the field of veterinary medicine, by providing opportunities for assessment of cases in these areas.

Prerequisite: VS 528.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 602 Scientific Evaluation of Medical Literature Credits: 2 (1-0-1)

Course Description: Method of evaluating scientific literature. Designed as a practical, rather than theoretical, approach to a literature search. Encourages research of scientific publications. The different sources of databases available and the methods of retrieving the literature are addressed.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must register for lecture and recitation.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

VS 603 Anesthesia Lab Credits: 2 (0-4-0)

Course Description: Anesthesia in canine and feline veterinary patients, anesthetic equipment, and management of the anesthetized physiological states. Application of anesthetic components; availability of anesthetic and support drugs, case management; and improving patient comfort by minimizing acute postoperative pain.

Prerequisite: VS 528 and VS 542.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 604 Diagnostics Lab Credits: 2 (0-4-0)

Course Description: Various laboratory modalities and the application of common diagnostic tools utilized within the field of veterinary medicine. Core skills necessary for involvement in patient care with regards to animal disease, by providing opportunities for assessment of cases in these areas.

Prerequisite: VS 528 and VS 548.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 605 Comparative Anesthesiology Credits: 2 (2-0-0)

Course Description: Techniques in anesthesia for large and small animals.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 606 Comparative Anesthesiology Laboratory Credit: 1 (0-3-0)

Course Description: Techniques in anesthesia for large and small animals.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must have concurrent registration in VS 605.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 607 Clinical Skills Lab Credits: 2 (0-4-0)

Course Description: Clinical skills related to canine and feline medicine: bandaging, diagnostic imaging, equipment use and care, euthanasia techniques, and systems diagnostics. Core skills necessary for involvement in patient care, by providing opportunities for assessment of cases in these areas.

Prerequisite: VS 528 and VS 545.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 608 Communications Lab Credit: 1 (0-2-0)

Course Description: Mastering skills in communication within the field of veterinary medicine. Skills necessary for involvement in professionalism, client interaction, teamwork, and patient care by providing opportunities for practice in these areas. Emphasis on role-play, client simulations, teamwork, and self-directed learning.

Prerequisite: VS 528 and VS 545.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required. This is a partial semester course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 609 Surgical Skills Lab Credits: 2 (0-4-0)

Course Description: Sterile techniques, suture pattern techniques, and surgical skills within a simulated environment. Core skills necessary for involvement in patient care with regards to animal disease in the field of veterinary medicine, by providing opportunities for assessment of cases in these areas.

Prerequisite: VS 528 and VS 543.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 610 Dentistry Skills Lab Credits: 2 (0-4-0)

Course Description: Dental examination, diagnostics, preventative care, and treatment in dogs and cats. Core skills necessary for involvement in patient care with regards to dental disease in the field of veterinary medicine, by providing opportunities for assessment of cases in these areas.

Prerequisite: VS 528 and VS 548.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 612 Plastic and Reconstructive Surgery Credits: 2 (2-0-0)

Course Description: Advances in surgical patient care, surgical instrumentation, and reconstruction.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: DVM degree or equivalent professional medicine degree.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

VS 613 Plastic and Reconstructive Surgery Laboratory Credit: 1 (0-3-0)

Course Description: Advances in surgical patient care, surgical instrumentation, and reconstruction.

Prerequisite: VM 786B.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

VS 626 Infertility and Genital Disease Credits: 2 (2-0-0)

Course Description: Infectious and noninfectious causes of reproductive failure in food animals.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 628 Physiology and Pathophysiology Credits: 3 (3-0-0)

Course Description: Overview of the normal physiology and pathophysiology of disease states of mammalian organ systems.

Prerequisite: BMS 500 and BMS 501.

Restriction: Must be a: Graduate, Professional.

Registration Information: Offered as Mixed Face-to-Face. DVM degree or equivalent professional medicine degree can substitute for BMS 500; BMS 501.

Term Offered: Fall (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

VS 630 Orthopedic Surgery Credits: 3 (3-0-0)

Course Description: Techniques, devices, and prosthetic materials in rehabilitating musculoskeletal problems.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 631 Orthopedic Surgery Laboratory Credit: 1 (0-3-0)

Course Description: Procedures applied to skeletal preparations and living animals.

Prerequisite: (VM 786A or VM 786B) and (VS 630, may be taken concurrently).

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 642 Ophthalmology Credits: 5 (4-2-0)

Course Description: Instrumentation, ocular therapeutics, and clinical ophthalmology.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must register for lecture and laboratory.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

VS 644 Principles of Theriogenology Credits: 2 (2-0-0)

Course Description: Provide basic and practical understanding of reproduction in domestic species. Including the anatomy and physiology of males and females, gamete development, fertilization, embryonic development, parturition and early neonatal care; focusing on domestic animals. In addition to basic normal physiology, characteristic disease states and potential treatments will be discussed, as well as methods for improving reproductive capabilities, such as artificial insemination and embryo transfer.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Written consent of instructor. Sections may be offered: Online.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 645 Surgery of the Eye Credits: 3 (2-3-0)

Course Description: Techniques, indications, and complications.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must register for lecture and laboratory.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 648 Food Animal Production and Food Safety Credits: 2 (2-0-0)

Also Offered As: VM 648.

Course Description: Basic orientation to food animal production units, herd health concepts, and issues of food safety from preharvest through processing and distribution.

Prerequisite: None.

Restriction: Must be a: Graduate, Graduate cooperative program, Professional.

Registration Information: Enrollment in Food Science/Safety Graduate Interdisciplinary Studies program required. Credit not allowed for both VS 648 and VM 648.

Term Offered: Spring.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 650 Comparative Abdominal Surgery Credits: 3 (3-0-0)

Course Description: New techniques in surgery of abdominal viscera.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 651 Comparative Abdominal Surgery Laboratory Credit: 1 (0-3-0)

Course Description: Reparative and reconstructive abdominal surgical procedures.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: DVM degree or equivalent professional medicine degree.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 655A Veterinary Echocardiography: Fundamentals Credits: 2 (1-3-0)

Course Description: Fundamentals of small animal veterinary echocardiographic skills and interpretation are covered.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Admission to professional curriculum in veterinary medicine. Must register for lecture and laboratory.

Term Offered: Fall (even years).

Grade Mode: Traditional.

Special Course Fee: No.

VS 655B Veterinary Echocardiography: Advanced Topics Credits: 3 (3-0-0)

Course Description: High level analysis of echocardiographic techniques and applications in the clinical setting.

Prerequisite: VS 655A.

Restriction: Must be a: Graduate, Professional.

Registration Information: Admission to professional curriculum in veterinary medicine.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

VS 660 Neurology and Neurosurgery Credits: 3 (3-0-0)

Course Description: Diagnostic and surgical techniques for the nervous system.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 661 Neurology and Neurosurgery Laboratory Credit: 1 (0-2-0)

Course Description: Laboratory practice of comparative neurology (large and small animal), neurosurgical techniques and procedures.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: This is a partial semester course. DVM degree or equivalent professional medicine degree required.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 665A Advanced Topics in Veterinary Cardiology: Cardiopulmonary Pathophysiology Credits: 3 (3-0-0)

Course Description: The pathobiology, advanced diagnostics, and treatment strategies for animals and humans with spontaneous cardiovascular disease.

Prerequisite: BMS 420.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 665B Advanced Topics in Veterinary Cardiology: Heart Failure and Cardiac Biomarkers Credits: 2 (2-0-0)

Course Description: Review of the pathophysiology of heart failure. Discuss the diagnostic and therapeutic approach to heart failure. Clinical trial design will be reviewed prior to summarizing recent clinical trial results in humans and dogs.

Prerequisite: BMS 420.

Restriction: Must be a: Graduate, Professional.

Registration Information: DVM degree or equivalent professional medicine degree required, or by instructor permission.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 665C Advanced Topics in Veterinary Cardiology: Invasive Catheterization & Hemodynamics Credits: 2 (2-0-0)

Course Description: Technical aspects of cardiac catheterization, focusing on pathophysiologic data that can be obtained during invasive catheterization procedures and interventional treatment options available.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 665D Advanced Topics in Veterinary Cardiology: Cardiac Electrophysiology & Arrhythmias Credits: 2 (2-0-0)

Course Description: Advanced review of cardiac electrophysiology including ion channels, action potentials, cardiac conduction, automaticity, and cellular mechanisms of arrhythmogenesis. Interpretation of electrocardiogram and cardiac arrhythmia diagnosis in animals and humans. Basic principles of treatment of cardiac interventions including electrophysiology studies and interventions.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Credit not allowed for both VS 665D and VS 680A1.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 665E Advanced Topics in Veterinary Cardiology: Cardiovascular Imaging Credits: 2 (2-0-0)

Course Description: Highlight the pathobiology, advanced diagnostics, and treatment strategies for animals with spontaneous cardiovascular disease.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: DVM degree or equivalent professional medicine degree required, or by instructor permission.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 665F Advanced Topics in Veterinary Cardiology: Congenital Heart Disease Credits: 2 (2-0-0)

Course Description: Overview and in-depth analysis of congenital malformations of the heart and great vessels in veterinary species, with comparison to the same diseases in humans. Complex lesions are emphasized, with a focus on pathophysiology, diagnostic findings, and therapeutic interventions.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 673 Thoracic and Cardiovascular Surgery Credits: 3 (3-0-0)

Course Description: Surgical approaches to the thorax and the central and peripheral cardiovascular system.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: DVM degree or equivalent professional medicine degree required.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 674 Thoracic and Cardiovascular Surgery Lab Credit: 1 (0-3-0)

Course Description: Surgical procedures applied to the chest, heart, and vessels.

Prerequisite: (VM 786A or VM 786B) and (VS 673, may be taken concurrently).

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 687 Clinical Internship Credits: 12 (0-0-36)

Course Description: Field placement in a previously approved clinical internship location and verifies clinical competencies outlined in the veterinary physician assistant program.

Prerequisite: VS 601 and VS 603 and VS 604 and VS 607 and VS 608 and VS 609 and VS 610.

Restriction: Must be a: Graduate, Professional.

Registration Information: Bachelor's degree required.

Terms Offered: Fall, Spring, Summer.

Grade Mode: S/U Sat/Unsat Only.

Special Course Fee: No.

VS 699 Thesis Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 701 Postgraduate Medicine I Credits: Var[1-3] (0-0-0)

Course Description: Comprehensive review, update of immunology, emergency medicine, dermatology, and endocrinology.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 702 Postgraduate Medicine II Credits: Var[1-3] (0-0-0)

Course Description: Comprehensive review, update of neurology, gastroenterology, and ophthalmology.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 703 Postgraduate Medicine III Credits: Var[1-3] (0-0-0)

Course Description: Comprehensive review, update of oncology, cardiology, reproduction, ophthalmology, and radiology.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Fall (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 704 Postgraduate Medicine IV Credits: Var[1-3] (0-0-0)

Course Description: Comprehensive review, update of hematology, nephrology, urology, respiratory, hepatic, and pancreatic.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring (every third year).

Grade Mode: Traditional.

Special Course Fee: No.

VS 716 Advanced Studies in Reproduction Credits: 2 (2-0-0)

Course Description: Biochemical and physiological basis for problems in reproduction.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Term Offered: Spring.

Grade Mode: Traditional.

Special Course Fee: No.

VS 718 Cancer Biology Clinical Practicum Credits: 2 (0-0-4)

Course Description: Exposes graduate students engaged in laboratory cancer research to cancer from a clinical perspective, through VTH clinical rotations.

Prerequisite: ERHS 510 or VS 510.

Restriction: Must be a: Graduate, Professional.

Term Offered: Summer.

Grade Mode: Traditional.

Special Course Fee: No.

VS 732 Veterinary Sports Medicine and Rehabilitation Credit: 1 (1-0-0)

Also Offered As: VM 732.

Course Description: An introduction to the principles and practice of sports medicine and rehabilitation in veterinary medicine.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: VM 732: Admission to professional curriculum in veterinary medicine. All courses must be taken in prescribed sequence in the PVM program. VS 732: DVM or equivalent professional degree or consent of instructor.

Term Offered: Fall.

Grade Mode: Traditional.

Special Course Fee: No.

VS 733 Advanced Veterinary Epidemiology Credits: 4 (4-0-0)

Course Description: Advanced epidemiological and statistical techniques for the design and analysis of research projects.

Prerequisite: (ERHS 532) and (ERHS 542 or ERHS 544 or STAR 511 or STAR 512 or VS 662).

Restriction: Must be a: Graduate, Graduate cooperative program, Professional.

Term Offered: Spring (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

VS 750 Clinical and Applied Pharmacology Credits: 2 (2-0-0)

Course Description: Factors involved in drug dosing and variability of drug response. Applications in veterinary and human medicine.

Prerequisite: BMS 450.

Restriction: Must be a: Graduate, Professional.

Registration Information: DVM degree or equivalent professional medicine degree can substitute for BMS 450.

Term Offered: Spring (even years).

Grade Mode: Traditional.

Special Course Fee: No.

VS 760 Methods in Orthopaedic Research Credits: 3 (2-0-1)

Course Description: Methods utilized in orthopaedic research will be presented by reviewing basic principles followed by examples of use in research projects.

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Must register for lecture and recitation.

Term Offered: Spring (odd years).

Grade Mode: Traditional.

Special Course Fee: No.

VS 784 Supervised College Teaching Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 792 Seminar Credits: Var[1-18] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795A Independent Study: Small Animal Medicine Credits:

Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Maximum of 5 credits allowed in course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795B Independent Study: Large Animal Medicine Credits:

Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Maximum of 5 credits allowed in course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795C Independent Study: Small Animal Surgery Credits:

Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Maximum of 5 credits allowed in course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795D Independent Study: Equine Surgery Credits: Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Maximum of 5 credits allowed in course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795G Independent Study: Equine Orthopedics Credits:

Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Maximum of 5 credits allowed in course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795H Independent Study: Large Animal Reproduction Credits:

Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Maximum of 5 credits allowed in course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795I Independent Study: Anesthesiology Credits: Var[1-5] (0-0-0)

Course Description:

Prerequisite: None.

Restriction: Must be a: Graduate, Professional.

Registration Information: Maximum of 5 credits allowed in course.

Terms Offered: Fall, Spring, Summer.

Grade Mode: Instructor Option.

Special Course Fee: No.

VS 795J Independent Study: Cardiology Credits: Var[1-5] (0-0-0)**Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795K Independent Study: Neurology Credits: Var[1-5] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795L Independent Study: Dermatology Credits: Var[1-5] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795N Independent Study: Ophthalmology Credits: Var[1-5] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795O Independent Study: Herd Health Management Credits: Var[1-5] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795P Independent Study: Equine Lameness Credits: Var[1-5] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795S Independent Study: Epidemiology Credits: Var[1-5] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Graduate cooperative program, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795T Independent Study: Human-Animal Bond Credits: Var[1-5] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Registration Information:** Maximum of 5 credits allowed in course.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 795U Independent Study: Oncology Credits: Var[1-10] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 796 Group Study-Medicine Credits: Var[1-18] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Graduate cooperative program, Professional.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 798 Research Credits: Var[1-18] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.**VS 799 Dissertation Credits: Var[1-18] (0-0-0)****Course Description:****Prerequisite:** None.**Restriction:** Must be a: Graduate, Professional.**Terms Offered:** Fall, Spring, Summer.**Grade Mode:** Instructor Option.**Special Course Fee:** No.