

COLLEGE OF VETERINARY MEDICINE

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Alfonso Torres, associate dean for veterinary public policy and director, NYS Animal Health Diagnostic Laboratory

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Jai Sweet, director of student services and multicultural affairs

DEPARTMENT CHAIRS

Biomedical Sciences: M. Kotlikoff

Clinical Sciences: R. Hackett

Microbiology and Immunology: D. Russell

Molecular Medicine: G. Weiland

Population Medicine and Diagnostic Sciences: Y. Grohn

THE COLLEGE

The College of Veterinary Medicine offers a professional program that requires four years of full-time academic and clinical study of the normal and abnormal structure and function of the animal body and the diagnosis, treatment, and prevention of animal disease.

Graduates of the college receive the doctor of veterinary medicine (D.V.M.) degree, which is recognized by licensing boards throughout the world. Graduates generally enter private practice or academia, or become engaged in one of an increasing number of biomedical activities.

Admission requires a minimum of three years of college work, including specific prerequisite courses and experience.

Applications must be filed approximately one year before the proposed matriculation date. The competition for admission is keen, since there are many more qualified applicants than can be admitted.

Graduate programs in veterinary research and postdoctoral training in clinical specialties are open to doctors of veterinary medicine and some highly qualified holders of baccalaureate degrees and lead to the degree of master of science or doctor of philosophy.

More detailed information is available at the College of Veterinary Medicine web site, www.vet.cornell.edu/.

Note: 500- and 600-level courses are open only to veterinary students except by written permission from the instructor.

The College of Veterinary Medicine's professional curriculum comprises courses (designated with the prefix "VTMED") in two categories: foundation courses and distribution courses.

The Professional Curriculum

FOUNDATION COURSES

Foundation courses are interdisciplinary and represent approximately 70 percent of the professional curriculum. In Foundation courses I, III, and IV (VTMED 510, 530, 540), students work in small groups under the guidance of a faculty tutor. Case-based exercises are used to facilitate the understanding of basic science concepts within the context of clinical medicine. In some courses, three two-hour tutorial sessions are scheduled each week. These are complemented by lectures, laboratories, and discussion sessions or other organized learning opportunities specific to the individual course. Faculty are available to respond to questions that arise as a result of the case-based exercises.

Tutorial sessions and all other organized learning programs are scheduled primarily during the mornings, thereby reserving time in the afternoon for independent study. By learning in a clinical context, students are better able to integrate material from the basic and clinical sciences and are encouraged to develop an understanding of the clinical reasoning process from the beginning of the curriculum. The tutorial-based educational format creates an atmosphere that requires students to be involved actively in their learning and allows them to develop skills in communication, information retrieval, and analysis.

Note: Courses listed in brackets [] are approved courses that are not offered during the 2005–2006 academic year.

VTMED 510(5100) The Animal Body (Foundation Course I)

Fall. 12 credits. Prerequisite: first-year veterinary students. Letter grades only. A. J. Bezuidenhout and staff.

Designed to enable students to understand the principles of veterinary anatomy at the gross, microscopic, and ultrastructural levels. Emphasizes developmental anatomy to the extent that it reflects determination of adult form and species differences. Radiologic and related imaging techniques are used throughout the course to assist in the understanding of normal structural anatomy. Understanding of the anatomic basis of common surgical procedures is achieved during the various dissection procedures. The course is based on tutorials with significant emphasis on practical laboratories. Lectures and modules complement student learning.

VTMED 517(5701) Animals, Veterinarians, and Society: Part A (Foundation Course VIIa)

Fall. 1.5 credits. Prerequisite: first-year veterinary students. Letter grades only. Fee charged for course guide. Live animals used in course instruction. N. L. Irby. Complements and augments material learned in VTMED 510 (Foundation Course I—The Animal Body). The class is divided into small groups and each group meets for four to five hours each week during the first 11 weeks of the fall semester. Using live dogs, cats, horses, and cows as models for learning how to perform a physical examination, this laboratory course teaches the skills of observation, auscultation, palpation, and percussion as well as related basic diagnostic procedures. The body systems are examined sequentially and follow the order of study in Foundation Course I.

VTMED 520(5200) Cell Biology and Genetics (Foundation Course II)

Fall and spring. 8 credits. Prerequisite: first-year veterinary students; VTMED 510. Letter grades only. R. A. Levine and staff. Designed to develop an appreciation of the molecular and cellular basis of animal health and disease. Students gain an understanding of the molecular mechanisms that regulate cell function, the molecular signaling processes that form the basis of integrated function and the response to disease, and the mechanisms underlying inherited traits and genetic disease. Emphasis is placed on defining and characterizing normal cell function and on understanding how mutations in specific genes promote disease. Students become familiar with the common molecular procedures being used to develop new diagnostic and therapeutic tools to maintain health and combat disease. The course is divided into two parts separated by a midterm exam. The first part is made up of three sections: Principles of Cell Biology, Cell Signaling, and Medical Genetics. The second half builds on and expands these principles, using examples from veterinary medicine including wound repair and cancer. In both parts, clinical cases are used to illustrate the concepts presented.

VTMED 522(5220) Neuroanatomy

Spring. 1 credit. Prerequisite: first-year veterinary students. Letter grades only. Faculty TBA.

Designed to give students the necessary background for the understanding of neurophysiology and clinical neurology. Students will gain a basic understanding of the gross anatomy of the Central Nervous System (CNS), pathways involved in somatosensory and motor systems, as well as some exposure to modern imaging of the CNS (CT and MRI correlates with gross coronal sections of the CNS).

VTMED 527(5702) Animals, Veterinarians, and Society: Part B (Foundation Course VIIb)

Last part of fall semester through end of winter session. 1.5 credits. Prerequisite: first-year veterinary students; VTMED 517. Letter grades only. Fee charged for course guide. Lects average two hours each week; lab, 10 hours spread throughout course. Live animals used in course instruction.

N. L. Irby.

Consists of both lectures and laboratory sessions. Lectures partially complement materials learned in VTMED 520 (Foundation Course II—Cell Biology and Genetics) but for the most part focus primarily on veterinary medical ethical issues related to animal use, animal welfare, genetics counseling, and clinical day-to-day ethics. The laboratory reviews basic equine and bovine husbandry skills and the small-animal physical examination.

VTMED 530(5300) Function and Dysfunction: Part I (Foundation Course IIIa)

Spring. 9 credits. Prerequisite: first-year veterinary students; VTMED 520. Letter grades only. Live animals used on limited basis for demonstration or noninvasive procedures. R. Rawson and staff.

Designed to develop students' understanding of how an animal maintains itself as a functional organism; how the maintenance of function is achieved through the integration of different organ systems; how tissue structure relates to tissue function; how injury alters structure and leads to dysfunction, manifested as clinical signs; how organ function can be assessed; and how organ function can be modulated pharmacologically. The course incorporates aspects of physiology, biochemistry, cell biology, histology, pathology and histopathology, clinical pathology, and pharmacology.

VTMED 531(5310) Function and Dysfunction: Part II (Foundation Course IIIb)

Fall. 7 credits. Prerequisite: second-year veterinary students; VTMED 530. Letter grades only. R. Rawson and staff.

Continuation of VTMED 530 Function and Dysfunction: Part I.

VTMED 537(5703) Animals, Veterinarians, and Society: Part C (Foundation Course VIIc)

Spring. 1 credit. Prerequisite: first-year veterinary students; VTMED 527. Letter grades only. Fee charged for course guide. Live animals used in course instruction.

N. L. Irby.

Introduces students to medical record keeping and to the communication skills and techniques necessary for effective communication with clients. In addition, students are introduced to the human-animal bond and its implications for veterinary medicine, animal death, and grief counseling. This course gives students the opportunity to

practice interviewing clients while refreshing their physical exam skills. The opportunity to gain an appreciation of the role of animal husbandry in veterinary medicine is provided through a milking experience at the college's dairy barn.

VTMED 540(5400) Host, Agent, and Defense (Foundation Course IV)

Fall. 12 credits. Prerequisite: second-year veterinary students; VTMED 531. Letter grades only. D. Bowman (course leader) and others.

Divided into six sections: the host response, intracellular environment, extracellular environment, somatic environment, external environment, and surrounding environment. Using this approach, students develop an understanding of the host response to insult, a familiarity with groups of important pathogens, an understanding of how pathogens manipulate the host and how the host defends itself against attacks, and an understanding of the roles played by the external environment and human intervention in the epidemiology of infectious organisms.

VTMED 541(5410) Veterinary Parasitology

Spring. 2.5 credits. Prerequisite: second-year veterinary students. Letter grades only. D. D. Bowman.

Provides a basic introduction to animal parasites of veterinary importance, concentrating mainly on the biology, control, and diagnosis of protozoan and metazoan parasites. Emphasizes parasites representative of significant disease processes or of significant clinical importance to veterinarians. Elaborates on the biology and pathogenesis of these major pathogens with the ultimate goal being to maximize the recognition of the major disease manifestations induced by the different groups of organisms. Laboratories stress certain aspects of some important parasite groups.

VTMED 547(5704) Animals, Veterinarians, and Society: Part D (Foundation Course VIId)

Fall. 1 credit. Prerequisite: second-year veterinary students; VTMED 537. Letter grades only. Fee charged for course guide. Live animals used in course instruction.

N. L. Irby.

Complements and augments material learned in VTMED 540 (Foundation Course IV—Host, Agent, and Defense). Emphasizes veterinary public health. Topics include animal bites, routes of disease transmission, rabies control programs, zoonotic diseases, and preventive health care programs including vaccination protocols in large and small animals. One rotation in the Community Practice service and small group discussions are required of each student.

VTMED 550(5500) Animal Health and Disease: Part I (Foundation Course V)

Spring. 10 credits. Prerequisite: second-year veterinary students; VTMED 540. Letter grades only. R. Hackett.

Integrates the clinical sciences of medicine, surgery, anesthesiology, radiology, and theriogenology, which are themselves integrated subjects, with systems pathology and relevant aspects of applied pharmacology. The course is presented on a systems basis, moving from clinical signs of alteration in function, to pathophysiology of clinical signs, to strategies for diagnosis and treatment.

Specific examples are used to establish a cognitive framework and knowledge of the most important diseases. This course provides a sound foundation for clinical rotations in Foundation Course VI. It builds on the strengths developed in earlier courses by an increased exposure to case examples in a more directed way, taking advantage of the diversity of skills and special knowledge of both faculty and students. A variety of educational techniques are used, including lectures in which interaction is encouraged, laboratories, demonstrations, case discussions, and autotutorials.

VTMED 551(5510) Animal Health and Disease: Part II (Foundation Course V, continued)

Fall. 20 credits. Prerequisite: third-year veterinary students; VTMED 550. Letter grades only. R. Hackett and staff.

Continuation of VTMED 550 Animal Health and Disease: Part I.

VTMED 552(5520) Veterinary Clinical Oncology

Spring. 1 credit. Prerequisite: VTMED 540; third- and fourth-year veterinary students. Letter grades only. K. M. Rassnick.

Presents the common cancers affecting small and large animals. Emphasizes biological behavior and patient management. Discusses surgery, chemotherapy, and radiation therapy as important methods to treat cancers in veterinary patients. Course format includes lectures. Attendance is required.

VTMED 553(5530) Veterinary Diagnostic Imaging

Spring. 1.5 credits. Prerequisite: VTMED 540; third- and fourth-year veterinary students. Letter grades only. P. Scrivani.

Designed to emphasize the relevance of a solid foundation in veterinary anatomy as it is clinically applied to diagnostic imaging. Additionally, the course is designed to provide students with an understanding of the strengths and limitations of diagnostic imaging by discussing interpretation principles, pitfalls and interpretations, and measurements obtained through lectures, laboratory exercises, weekly quizzes, and reading assignments. Integration of these objectives culminates in weekly laboratory exercises where students must make or evaluate decisions regarding patient management based on evaluation of clinical signs and imaging examinations. The "Roentgen-Sign" approach to diagnostic imaging interpretation is used as a model.

VTMED 557(5705) Animals, Veterinarians, and Society: Part E (Foundation Course VIIe)

Spring. 1 credit. Prerequisite: second-year veterinary students; VTMED 547. Letter grades only. Fee charged for course guide. Live animals used in course instruction.

N. L. Irby.

Laboratory course that provides a basic instruction to clinical skills students will need when they start their clinical rotations in the Cornell University Hospital for Animals. Includes a brief review of the physical examination of the dog, horse, and cow. Clinical procedures include but are not limited to ear examination and treatment, IM and SQ injections, fluid administration, naso- and orogastric tube placement, urinary catheterization, and IV catheterization.

VTMED 558(5706) Animals, Veterinarians, and Society: Part F (Foundation Course VIII)

Fall. 1.5 credits. Prerequisite: third-year veterinary students; VTMED 557. Letter grades only. Fee charged for course guide. Live animals used in course instruction. N. L. Irby.

Complements material learned in VTMED 551 Foundation Course V—Animal Health and Disease. Examines governmental regulation of the veterinary profession, including proper drug usage, extra label drug use (FDA), controlled substances (DEA), professional liability and malpractice insurance, professional and unprofessional conduct, hazardous materials in the workplace (OSHA), and environmental issues (EPA). Also includes sessions relating to the control and prevention of the spread of animal diseases and the role of USDA and specifically APHIS in these regulatory functions. The laboratory component consists of one night in the Equine and Farm Animal Hospital and one independent study exercise.

VTMED 560(5600) Ambulatory and Production Medicine

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). First- and second-year veterinary students encouraged to take one week early if slots available; those who take two weeks total get at least one week at end of curriculum after large-animal classes. Letter grades only. M. E. White and staff.

Clinical service rotation in which students accompany ambulatory clinicians on farm and stable calls and learn the skills and procedures necessary for operation of a modern veterinary practice offering primary care to large animal clients. Routine herd health visits are conducted for cattle, horses, sheep, goats, and swine. Reproductive evaluations (including pregnancy and fertility examinations), nutritional evaluation, and disease prevention are stressed. Herd health programs also include vaccinations, parasite control, mastitis prevention, and routine procedures. With appropriate herds, analysis of computerized performance data is conducted and discussed with the owner. In addition to assisting with routine scheduled work, students participate in diagnosis and medical or surgical treatment of ill or injured animals. This includes rotating assignments for night and weekend duty.

VTMED 561(5601) Community Practice Service: Medicine

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. W. E. Hornbuckle and staff.

Structured to provide supervised clinical experience in the practice of companion small-animal medicine. The course is conducted in the Companion Animal Hospital of the Cornell University Hospital for Animals. Students interact directly with clients presenting their pets for primary medical care. Under the supervision of the clinical faculty and staff, the students are expected to formulate and carry out plans for the diagnostic evaluation and medical management of these patients. After review, students explain their plans to the clients and provide follow-up care and management of these patients.

VTMED 563(5602) Small-Animal Medicine

Fall, spring, winter, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. S. C. Barr, S. A. Center, J. F. Randolph, K. W. Simpson, and R. Goldstein.

Structured to provide supervised clinical experience in the practice of companion small-animal medicine. The course is conducted in the Companion Animal Hospital of the Cornell University Hospital for Animals. Students interact directly with clients presenting their pets for primary or referral medical care. Under the supervision of the clinical faculty and staff, the students are expected to formulate and carry out plans for the diagnostic evaluation and medical management of these patients.

VTMED 564(5603) Small-Animal Soft Tissue Surgery Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. H. J. Harvey and small-animal surgery faculty.

Clinical service rotation that exposes the student to the practice of surgery under hospital conditions. Students participate in the diagnostic techniques; planning of therapy; and daily care of dogs, cats, and exotic species under the direction of a faculty veterinarian. Students assist experienced surgeons in the operating room and, with house-officer supervision, are responsible for patients undergoing elective ovariohysterectomy or castration. Client communications and the basics of efficient practice are emphasized.

VTMED 564(5611) Small Animal Orthopedic Surgery Service

Fall, winter, spring, and summer. 2 credits. Letter grades only. E. Trotter and small animal surgery faculty.

Clinical service rotation that exposes the student to the practice of surgery under hospital conditions. Students participate in the diagnostic techniques; planning of therapy; and daily care of dogs, cats, and exotic species under the direction of a faculty veterinarian. Students assist experienced surgeons in the operating room and, with house-officer supervision, are responsible for patients undergoing elective ovariohysterectomy or castration. Client communications and the basics of efficient practice are emphasized.

VTMED 566(5604) Large-Animal Medicine Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. D. Ainsworth, T. Divers, G. Perkins, and M. Flaminio.

Students assigned to this service assist the faculty, technicians, and residents of the Large-Animal Medicine Service in the diagnosis and care of patients. The goal of this course is for students working on this service to acquire knowledge and skills in history taking, physical examination, election and completion of appropriate ancillary tests, diagnosis, treatment, and patient care. Daily rounds and discussions are used to monitor patient progress and further educate students. If time allows, sit-down rounds to discuss medical disorders are provided.

VTMED 567(5605) Large-Animal Soft Tissue Surgery Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. A. J. Nixon and staff.

Clinical rotation structured to provide supervised clinical experience in the practice of large-animal surgery. Under the direction of faculty and house staff, students participate in the diagnosis, surgical treatment, and care of patients presented to the Equine and Farm Animal Hospital. Training through patient care is supplemented by formal rounds and didactic instruction.

VTMED 567(5612) Large-Animal Orthopedic Surgery Service

Fall, winter, spring, and summer. 2 credits. Letter grades only. N. Ducharme, A. Nixon, L. Fortier, and staff.

Clinical rotation structured to provide supervised clinical experience in the practice of large animal surgery. Under the direction of faculty and house staff, students participate in the diagnosis, surgical treatment, and care of patients presented to the Equine and Farm Animal Hospital. Training through patient care is supplemented by formal rounds and didactic instruction.

VTMED 568(5606) Anesthesiology Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. R. D. Gleed, J. W. Ludders, L. P. Posner, A. A. Smith, and staff.

Designed to provide clinical experience in the use of anesthetics in small companion animals, horses, and some food animals. Students participate in selecting suitable anesthetic techniques for patients in the Cornell University Hospital for Animals and then implement those techniques under the supervision of faculty and residents. The goal is for students to learn the skills and thought processes necessary to perform safe anesthesia in a modern veterinary practice.

VTMED 569(5607) Dermatology Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. W. H. Miller and D. W. Scott.

During this clinical rotation, students participate in the diagnosis and management of skin disorders in small and large animals. Patients are examined by appointment and through consultation with other hospital services.

VTMED 570(5608) Ophthalmology Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. R. C. Riis, T. Kern, and N. Irby.

Combines clinical experience with beginning skills in diagnostic ophthalmology. Students learn how to apply the ophthalmic diagnostic tests. A competent ocular examination is the goal of this rotation. Confidence in using direct and indirect ophthalmoscopes, slit lamps, tonometers, gonioscopes, conjunctival cytology, and surgery comes with the practice provided by this rotation. Students are required to review the introductory orientation videotapes in the autotutorial center titled *Ocular Examination I and II* before the start of the rotation. This rotation provides surgical experience and consultations. A high percentage of the consultations are referral

cases that usually challenge the service. Adequate routine case material is presented to prepare most students for practice.

VTMED 571(5609) Pathology Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. S. P. McDonough and staff.

Involves the hands-on diagnostic necropsies of a wide variety of mammalian species that are presented to the Section of Anatomic Pathology necropsy service. Students work in groups of three to five for the two-week rotation. Necropsies are performed under the guidance of pathology faculty and residents. Students prepare written reports of necropsies performed, review microscopic hematology and cytology slides, perform urinalyses, and discuss case studies.

VTMED 572(5610) Radiology Service

Fall, winter, spring, and summer. 2 credits. Required component of Clinical Rotations (Foundation Course VI). Letter grades only. N. L. Dykes and staff.

Two-week clinical experience in the imaging section of the Cornell University Hospital for Animals. Students use radiographic, ultrasonographic, CT, MRI, and nuclear medicine imaging techniques to evaluate animal patients under treatment in the Cornell University Hospital for Animals. Students obtain and interpret radiographic studies with guidance from radiology faculty and technical staff. Autotutorial teaching films are used to familiarize students with radiographic examples of common diseases of large- and small-animal species. Small-group discussions are scheduled to present and discuss the teaching files and current cases. The safe use of X-ray-producing equipment and radioisotopes is discussed.

VTMED 573(5612) Fourth-Year Seminar

Fall and spring. 1 credit. Required component of Clinical Rotations (Foundation Course VI). First-, second-, and third-year students and all staff members also invited and encouraged to attend. S-U grades only. F. H. Fox, chair of Senior Seminar Committee.

Gives the student the responsibility and opportunity of selecting and studying disease entity on the basis of a case or series of cases, or to conduct a short-term, clinically oriented research project under the direction of a faculty member. In either case, an oral report is presented at a weekly seminar. A written report is also submitted at the time of the seminar. All participants are encouraged to foster an atmosphere in which discussion, exchange of ideas, and the airing of controversial opinions might flourish.

DISTRIBUTION COURSES

Distribution courses comprise 30 percent of the curriculum and are usually scheduled during the first half of each spring semester. During the first two years, many of the distribution courses are oriented to the basic sciences. During years three and four, students have additional distribution course offerings from which to choose. Some emphasize clinical specialties, whereas others integrate basic science disciplines with clinical medicine and are co-taught by faculty representing both areas. Students from different classes have the

opportunity to take many of these courses together.

Grading options for distribution courses are either letter or S-U.

VTMED 601(6100) Anatomy of the Carnivore

Spring. 3 credits. Prerequisite: VTMED 510 or permission of instructor; first-, second-, third-, and fourth-year veterinary students or permission of instructor. Letter grades only. P. S. Maza.

Studies carnivore anatomy by detailed systematic and regional dissection of the cat, with comparison to the dog. Student dissection is supplemented with prosections, radiographs, palpation of live cats, and exercises focusing on surgical approaches. There are opportunities to dissect other carnivores, such as the ferret and the fox, depending on availability of specimens. The lectures augment the laboratory dissection and introduce the student to functional morphological comparative features in the Order Carnivore. Students do an independent project on the carnivore species of their choice and give an oral presentation on this to the class.

VTMED 602(6101) Anatomy of the Horse

Spring. 3 credits. Prerequisite: VTMED 510; first-, second-, third-, and fourth-year veterinary students or permission of instructor. Letter grades only. A. J. Bezuidenhout.

Organized as a traditional anatomy course that relies primarily on students learning the anatomy of horses through hands-on dissection laboratories augmented by lectures and highlighted by clinical correlations. An understanding of anatomy that provides the foundation for surgery and is directly relevant to clinical practice is emphasized in the regional approach to dissection. Most lectures emphasize structural-functional correlations that are unique or important in the horse. Microscopic anatomy is integrated into the course in selected areas to lay a foundation for the later study of pathology or when it reinforces concepts of structure and function that are difficult to understand by a study of the gross anatomy alone (i.e., hoof). Student dissection cadavers are supplemented by skeletal materials, radiographs, models, preserved predissected specimens, and fresh specimens when available.

VTMED 603(6102) Anatomy of the Ruminant

Spring. 3 credits. Prerequisite: VTMED 510 or permission of instructor; first-, second-, third-, and fourth-year veterinary students or permission of instructor. Letter grades only. L. A. Mizer.

Covers the regional anatomy of several ruminant species using dissection laboratories, lectures, and large-group discussions. Emphasizes the functional consequences of structural modifications and anatomical features relevant to clinical practice. Correlates microscopic anatomy with gross anatomy when appropriate to relate structure to function and to provide a foundation for later study in pathology. Student dissection material is supplemented by skeletal materials, radiographs, models, predissected specimens, and postmortem specimens. Students are required to complete an independent study project on a relevant subject of their choice. Assessment includes written and practical exam.

VTMED 605(6103) Comparative Anatomy: Pattern and Function

Spring. 3 credits. Prerequisite: VTMED 510; first-, second-, third-, and fourth-year veterinary students or permission of instructor. Letter grades only.

J. Hermanson.

The goal of this course is to study anatomical variability among amniote (mammals, birds, and reptiles) and anamniote (amphibian and fish) species. This is accomplished by relating the anatomy of major organ systems in each species to a common basic pattern and considering the differences in a functional perspective. Five major systems are explored (integumentary, locomotory, cardiorespiratory, digestive, and urogenital) in a variety of species as available.

[VTMED 606(6520) Advanced Clinical Neurology

Spring. 1 credit. Prerequisite: VTMED 521; third- and fourth-year veterinary students. Letter grades only.

Further the experience and confidence of the student in the diagnosis and understanding of clinical neurological disorders. Continues the student's correlation of anatomy, physiology, and pathology in the diagnosis of diseases of the nervous system and the understanding of their pathogenesis. Neurological disorders that are not covered in the foundation course are considered here. The course is based entirely on case examples presented on videotapes and slides.]

[VTMED 607(6720) The Literature and Subject Matter of Natural History

Spring. 1 credit. Minimum enrollment 10; maximum 30. Prerequisite: third- and fourth-year veterinary students. S-U grades only. H. E. Evans.

Introduces natural history literature. Shows and discusses materials relating to the earth sciences and the biology of plants and animals from around the world. Students are required to show and discuss a book that concerns natural history in a country of their choice and submit a one-page book report for duplication. (A recommended reference text is *The Cambridge Illustrated Dictionary of Natural History* by R. J. Lincoln and G. A. Boxshall, 1990.) Golden Guides for mammals, birds, reptiles, fishes, insects, and plants are given to participants.]

VTMED 609(6120) Anatomy and Histology of Fish

Spring. 2 credits. Minimum enrollment 4; maximum 6. Prerequisite: first-, second-, third-, and fourth-year veterinary students or written permission of instructor. S-U grades optional. P. R. Bowser.

Provides an overview of the diversity of anatomy and histology of fish. Students participate in lecture, discussion, and laboratory exercises to review the major organ systems. Extensive use of library resources for assigned readings is expected. Each student prepares a term project and makes one oral presentation.

VTMED 610(6721) Veterinary Aspects of Avian Biology

Spring. 1.5 credits. Minimum enrollment 10; maximum 60. Prerequisite: first-, second-, third-, and fourth-year veterinary students or permission of instructor. Letter grades only. G. V. Kollias.

Introduction to avian biology for veterinary students. Includes lectures and laboratories involving avian anatomy, physiology, and

natural history. One laboratory involves live birds to demonstrate physical examination. The course emphasizes the development of a strong foundation in avian biology that is applied in VTMED 616 Diseases of Birds and VTMED 652 Avian Medicine and Surgery.

**VTMED 613(6722) AQUAVET I:
Introduction to Aquatic Veterinary
Medicine**

Four weeks of full-time instruction at Woods Hole, Mass., immediately after spring semester. 4 credits. Maximum enrollment 24 students from Cornell U., the U. of Pennsylvania, and other U.S. colleges and schools of veterinary medicine. Available, by competitive application process, to veterinary and graduate students. S-U grades only. Fee charged. P. R. Bowser.

Sponsored by Cornell U., the U. of Pennsylvania, and three marine-science institutions at Woods Hole: the Marine Biological Laboratory, Woods Hole Oceanographic Institution, and Northeast Center of the National Marine Fisheries Service. Introduces veterinary students to aquatic-animal medicine. The marine environment is described and visited on field trips in the Woods Hole area. Specific aspects of the comparative anatomy, physiology, nutrition, microbiology, pathology, and medicine of a variety of marine and freshwater species are discussed. Some emphasis is placed on systems of aquaculture. The specific diseases of a few selected species are presented as examples. The course is taught by an invited faculty of 35 individuals who are leaders in their respective fields of aquatic-animal medicine. Students present seminars on appropriate topics.

**VTMED 614(6521) AQUAVET II:
Comparative Pathology of
Aquatic Animals**

Two weeks of full-time instruction at Woods Hole, Mass., immediately after spring semester. 2 credits. Maximum enrollment 18. Prerequisites: formal course work in diseases of aquatic animals or appropriate experience and permission of instructor. S-U grades optional. Fee charged. Available, by competitive application process, to veterinary and graduate students. P. R. Bowser.

Advanced course (sponsored by Cornell U., the U. of Pennsylvania, and three marine-science institutes at Woods Hole: the Marine Biological Laboratory, Woods Hole Oceanographic Institution, and Northeast Center of the National Marine Fisheries Service) covering the comparative pathology of aquatic invertebrates and vertebrates commonly used as laboratory animals. The material presented consists of discussions of the diseases of aquatic animals as well as extensive use of the microscope to examine the histopathology associated with these diseases. The course is taught by an invited faculty of 12 individuals who are leaders in their respective fields of aquatic-animal medicine.

**VTMED 615(6723) Veterinary Medicine in
Developing Nations**

Spring. 2 credits. Maximum enrollment 20. Prerequisite: first-, second-, third-, and fourth-year veterinary students or permission of instructor. S-U grades only. Offered even-numbered years. K. A. Schat.

Veterinary medicine has an important role to play in developing nations in developing and providing economical sources of animal proteins for human consumption and protecting ecological resources. This seminar course provides interested veterinary students with information on and insight into the multitude of complex issues facing U.S. veterinarians working in developing nations.

VTMED 616(6522) Diseases of Birds

Spring. 2 credits. Minimum enrollment 10; maximum 80. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. G. V. Kollias and staff.

Designed to introduce second-, third-, and fourth-year veterinary students to a basic and practical knowledge of the most common infectious and noninfectious diseases affecting a variety of avian species. Emphasizes the latest diagnostic and control approaches. The course format is a combination of didactic lectures and discussions.

**[VTMED 617(6523) Basic Nutrition for
Veterinary Students**

Fall. 1 credit. Prerequisite: Foundation Course III (VTMED 531). S-U grades only. F. A. Kallfelz, J. J. Wakshlag, and K. J. Hurley.

Introduction to nutrition, including basic concepts of the need for and metabolism of energy, protein, minerals, and vitamins in domestic animals. Discusses the functions of essential nutrients, including differences between nutrients needed in herbivores, carnivores, and omnivores. Includes identification and use of various forages and concentrates for large animal feeding.]

**VTMED 622(6420) Foreign Infectious
Diseases of Animals**

Spring. 1 credit. Minimum enrollment 20. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. A. Torres.

Describes the etiology, pathogenesis, clinical signs, gross pathology, differential diagnosis, methods of spread, reservoir hosts, and control of foreign animal diseases that present serious economic threats to the United States. The format is student-seminar presentations with each student responsible for presenting one seminar or writing a paper on the outcome of a foreign animal disease outbreak. The spread of FMD, avian flu virus, and BSE emphasizes the importance of these diseases to producers, consumers, and practicing veterinarians. Several foreign animal diseases are also important zoonosis affecting public health.

**VTMED 624(6524) Feline Infectious
Diseases**

Spring. 1 credit, two 50-min. lec each week for eight weeks. Minimum enrollment 10; maximum 80. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. S. C. Barr.

Emphasizes the clinical aspects of feline infectious diseases common to cats in North America and complements knowledge acquired in Foundation Courses IV and V. The overall objective is to provide details about specific infectious diseases a future small-animal practitioner may need to know to effectively diagnose and treat diseases. Etiology, epidemiology (prevalence and transmission), pathogenesis, clinical findings, diagnosis, pathologic findings, therapy prevention, and public health considerations are emphasized. Most lectures are presented

from a clinician's point of view, and therefore the material is oriented toward practical skills in managing clinical cases. Grades are based entirely on the result of a written exam (usually multiple-choice format) given in the final period.

VTMED 625(6525) Osteoarthritis

Spring. 1 credit. Minimum enrollment 8; maximum 30. Prerequisite: graduate and second-, third-, and fourth-year veterinary students. Letter grades only. G. Lust.

Provides a basis at the molecular, cellular, and tissue levels for understanding the function of mammalian diarthrodial joints. Includes a description of a diarthrodial joint and the composition and metabolism of articular cartilage, subchondral bone, ligaments, meniscus, capsule, and synovium. Considers the interrelationships of synovium, synovial fluid, articular cartilage, joint lubrication, biomechanical considerations, and enervation are considered. Canine hip dysplasia is a focus during the early class sessions. The osteoarthritis associated with canine hip dysplasia serves as a basis for discussion of the etiopathogenesis of the disease. Canine osteoarthritis is emphasized, but the disease in animal models such as mice, guinea pigs, rabbits, and sheep is mentioned. Therapies such as nonsteroidal anti-inflammatory drugs, glucocorticoids, and others may be discussed.

**VTMED 626(6421) Epidemiology of
Infectious Diseases**

Spring. 1 credit. Maximum enrollment 8. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. H. Mohammed and staff.

Introduces the epidemiologic methods used in infectious disease investigations. Also discusses the importance of surveillance systems in detecting modern epidemics and in the development of effective disease prevention and control strategies. Emphasizes understanding the relationships between the host, the agent, and the environment as they relate to disease causation. Explores contemporary epidemiologic methods applicable to old diseases that remain real or potential problems, newly emerging infectious diseases, and nosocomial infections. Selected diseases are discussed to clarify the role of epidemiology in understanding the pathogenesis of infectious processes in individuals and groups of animals. Students have the opportunity to apply the methods learned to actual disease problems and write an epidemiologic report that might lead to a publication in a peer-reviewed scientific journal.

VTMED 628(6320) Clinical Pathology

Spring. 2 credits. Minimum enrollment 25; maximum 75. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. T. Stokol and T. W. French.

Addresses a range of issues related to laboratory medicine and interpretation of laboratory results. General topic areas include hematology, clinical chemistry and immunology, and urinalysis. The primary mode of instruction is student-driven small-group (untutored) exploration of case materials followed by faculty-moderated large-group discussions. Selected lectures and laboratory sessions supplement and expand on issues generated by the case discussions. This course builds on concepts previously addressed in Foundation Courses III and IV and provides additional experiences in

practical clinical pathology procedures and microscopy.

VTMED 630(6422) Clinical Biostatistics for Journal Readers

Spring. 1 credit. Minimum enrollment 3; maximum 12. Prerequisite: first-, second-, third-, and fourth-year veterinary students or permission of instructor. Letter grades. H. N. Erb.

Students become familiar with the statistical methods commonly used in veterinary clinical articles, learn to recognize obvious misuse of those methods, and become able to interpret the statistical results.

VTMED 631(6423) Clinical Diagnostic Parasitology

Fall and spring. 0.5 credits for attending eight one-hour parasitology sessions; student usually can easily obtain 2 hours on each of the five participating rotations (Ambulatory, Community Practice Service, Dermatology, Pathology, and Wildlife). Prerequisite: VTMED 551; third- and fourth-year veterinary students. S-U grades only. Times TBA. M. K. Frongillo and D. D. Bowman.

Gives students experience in diagnosing parasitic infections. Students perform appropriate parasitological testing methods on clinical samples from patients on their rotation. They also evaluate the test results in terms of treatment or management of the infections. If clinical specimens are not available, appropriate materials are provided for study and evaluation. Ambulatory students typically do qualitative and quantitative flotations on samples from large animal cases they have encountered that week. In CPS, one hour is spent testing samples from current dog and cat patients, while a second hour is devoted to a discussion of the treatment of common endo- and ecto-parasites. Pathology students typically examine and identify intact parasites they retrieved from various organs at necropsy. This course is considered to be a logical extension to Foundation Course IV, Host, Agent, and Defense, and is expected to build on the didactic material presented in Large and Small Animal Parasitology.

VTMED 632(6724) Senior Seminar

Fall and spring. 1 credit. Does *not* fulfill 1-credit Set VII minimum. Prerequisite: first-, second-, and third-year veterinary students. Must be completed in two consecutive semesters (either fall to spring or spring to fall). S-U grades only. R. O. Gilbert.

Attendance at 14 of the senior seminar sessions presented during the academic year constitutes acceptable completion of this course.

VTMED 635(6726) Introduction to the Professional Literature

Spring. 1 credit. Minimum enrollment 6; maximum 20. Prerequisite: first-, second-, third-, and fourth-year veterinary students. Letter grades only. S. Whitaker.

Introduces veterinary students to the professional and biomedical literature, including development of critical reading skills. Students become familiar with the broad range of professional and biomedical literature and are encouraged to develop a rigorous approach to journal and scientific article review. Secondary emphasis is on developing skills in library and bibliographic search techniques and strategies for personal information management, as well as

exploring the use of veterinary-related online information.

VTMED 637(6727) Introduction to Community Practice Service

Fall, winter, spring, and summer. 1 credit. Prerequisite: first- and second-year veterinary students, permission of instructor. S-U grades optional. W. E. Hornbuckle.

Introduces veterinary students to primary care small-animal clinical practice through direct exposure to the Community Practice Service of the Cornell University Hospital for Animals. Students observe and assist with restraint, examination, and routine treatment of pets and communication with clients. Successful completion requires satisfactory participation during 10 half-days of clinical service.

VTMED 638(6526) Veterinary Nutrition

Spring. 2 credits. Minimum enrollment 10; maximum 90. Prerequisite: second- and third-year veterinary students or permission of instructor. Recommended for second- and third-year veterinary students. Letter grades only. F. A. Kallfelz.

The first half of this course provides information on the requirements for and metabolic uses of the essential nutrients of large and small animals as well as on formulation and evaluation of practical rations for species of veterinary interest. These concepts are applied in discussion of life stage nutritional needs, including growth, adult maintenance, gestation, lactation, aging, performance, and production. The second half covers clinically relevant diseases of nutritional deficiency and excess, including obesity, as well as the role of nutrition in the management of diseases of the various organ systems—e.g., renal, lower urinary tract, cardiac, G-I, hepatic, and musculoskeletal system disease. Other topics include the role of nutrition in managing cancer and hypersensitivity disorders and in critical care, including enteral and parenteral nutrition. The course also includes an introduction to nutrition for exotic and zoo animals.

VTMED 640(6527) Veterinary Aspects of Captive Wildlife Management

Spring. 2 credits. Minimum enrollment 10; maximum 40. Prerequisite: first-, second-, third-, and fourth-year veterinary students. Letter grades only. G. V. Kollias.

Concentrates on principles of captive wildlife management, both clinical and nonclinical. Students are challenged to learn and integrate a variety of disciplines that are essential to managing wildlife successfully in a captive or semi-free-ranging environment. These disciplines include but are not limited to species-specific (1) behavior and behavioral requirements, (2) nutritional requirements and problems, (3) natural history, (4) zoonotic and toxicological problems, (5) manual restraint and anesthesia, (6) preventive medicine, and (7) medical and legal ethics. In even-numbered years the course emphasizes non-North American wildlife species (e.g., African, Asian, Australian, and Central and South American species), and in odd-numbered years it focuses more on the North American (native) wildlife species.

VTMED 641(6424) Approaches to Problems in Canine Infectious Diseases

Spring. 1 credit. Minimum enrollment 10; maximum 80. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. S. C. Barr.

Emphasizes the clinical aspects of the more common canine infectious diseases. The overall objective is to provide details about specific infectious diseases a future small-animal practitioner may need to know to effectively diagnose and treat these diseases. Clinical signs, presentation, clinicopathologic data, diagnostic choices, treatment plans, and prevention are emphasized. Most lectures are presented by clinical faculty and therefore the material is oriented toward practical skills in managing clinical cases. Grading is based entirely on the result of a written exam (usually multiple-choice format) given in the final period.

VTMED 642(6321) Management of Fluid and Electrolyte Disorders

Spring. 2 credits. Minimum enrollment 20; maximum 80. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. R. Rawson.

Students focus on clinical manifestations and the pathophysiologic mechanisms associated with fluid, electrolyte, and metabolic acid-base disturbances in domestic animals. The course is divided into segments dealing with salt and water imbalances, potassium abnormalities, metabolic acidosis, metabolic alkalosis, and mixed acid-base disturbances.

VTMED 644(6528) Equine Surgical and Anesthetic Techniques

Winter, one-week period over winter intersession. 1 credit. Minimum enrollment 3; maximum 21. Enrollment by lottery. Prerequisite: VTMED 602; third- and fourth-year veterinary students. S-U grades only. S. Fubini (coordinator) and other large-animal surgeons.

Consists of five laboratories performing surgical procedures on ponies and cadaver specimens. It is the intent of this course not to make the students proficient in these procedures but to familiarize them with some specialized surgical techniques and to make them more enlightened referring practitioners. The course, therefore, is intended for students anticipating equine practice after graduation.

VTMED 645(6529) Food-Animal Surgical and Anesthetic Techniques

Winter, one-week period over winter intersession. 1 credit. Minimum enrollment 6; maximum 21. Enrollment by lottery. Prerequisite: VTMED 603; third- and fourth-year veterinary students. S-U grades only. S. Fubini and other large-animal surgeons.

Consists of five laboratories performing surgical procedures on sheep, calves, cadaver specimens, and adult cattle. It is the intent of this course not to make the students proficient in these procedures but to familiarize them with surgical techniques and to make them more enlightened referring practitioners. The course, therefore, is intended for students anticipating food-animal practice after graduation.

VTMED 646(6530) Llama Tutorial

Fall, spring, summer. 1 credit. Prerequisite: VTMED 540; second-semester second-, third-, and fourth-year veterinary students. S-U grades only. Independent study. M. C. Smith.

Autotutorial or group tutorial course covering common problems of llamas and alpacas. Participants are provided with study guides consisting of brief case descriptions and sample study questions. Reference is made to textbooks, journal articles, videotapes, and (if available) a teaching llama or alpaca to assist students in finding the answers to the questions efficiently. Grading is based on an oral exam.

VTMED 647(6531) Poisonous Plants

Fall. 1 credit. Prerequisite: first-, second-, third-, and fourth-year veterinary students or permission of instructor. S-U grades only. M. C. Smith.

Field trips demonstrate toxic plants growing in natural or cultivated settings. Lectures address economically important poisonous plants native to the United States. Information presented includes plant identification, natural habitat, toxic principles, clinical signs of toxicity, and treatment and prevention of poisoning in animals. Some of the major toxic principles found in plants and considered in detail in the course are nitrates, cyanide, oxalates, photodynamic agents, alkaloids, and mycotoxins.

VTMED 648(6728) Clinical Management of Native Wildlife

Fall, spring, summer (credit given in fall). 1 credit. Maximum enrollment 30 students per semester. Prerequisite: first-, second-, third-, and fourth-year veterinary students. Letter grades only. G. V. Kollias and staff.

Introduces veterinary students to primary care for native wildlife and to wildlife issues that practicing veterinarians face on a daily basis. Students are responsible for the assessment, physical examination, and medical care of native wildlife presented to the Cornell University Hospital for Animals by the public and local wildlife rehabilitators. Student activities are directly supervised and assessed by faculty and residents on a daily basis. Successful completion of the course requires 40 hours of satisfactory supervised participation per semester in the clinic. Clinic times are appropriately scheduled throughout the semester. Students are required to submit two case summaries, or alternatives approved by the course leader, before the end of the semester and a log of their clinical hours.

VTMED 649(6729) Introduction to Equine Practice

Spring. 0.5 credit. Maximum enrollment 30. Prerequisite: first- and second-year veterinary students. Intended for students with little or no experience working with horses. Letter grades only. R. Hackett and C. Collyer.

Introductory course in equine husbandry. Lecture topics include horse breeds and colors, housing facilities and fencing, and overview discussions of the racing, showing, and breeding industries. Laboratories emphasize basic equine handling and restraint as well as feeds and bedding.

VTMED 652(6532) Avian Medicine and Surgery

Spring. 2 credits. Minimum enrollment 20; maximum 40. Prerequisite: third- and fourth-year veterinary students. Letter grades only. Live birds used in some laboratories. G. V. Kollias and staff.

Designed to introduce third- and fourth-year veterinary students to the principles and practice of clinical avian medicine and surgery. The course is taught in a basic didactic lecture and discussion format with laboratories that reinforce concepts presented in the lectures.

VTMED 653(6533) Advanced Equine Lameness

Spring. 1.5 credits. Minimum enrollment 7; maximum 21. Enrollment by lottery.

Prerequisite: third- and fourth-year veterinary students. Letter grades. Live animals used for learning. N. Ducharme, A. Nixon, A. Yeager, D. Dykes, and staff.

Designed to teach students the methodology of equine lameness diagnosis. Places a strong emphasis on a hands-on approach to learning and is primarily laboratory-based. During laboratories, students work in small groups on live horses to diagnose the cause of their lameness. To this end, students learn both the practical skills, such as perineural and intra-articular blocks, as well as the methodology necessary to systematically work up a lameness case. Laboratories also provide students with the opportunity to practice field radiography and gain ultrasound skills as they pertain to equine lameness. Additionally, students have the opportunity to practice basic farrier skills. Lecture topics are intended to round out the students' understanding of lameness by providing them with a knowledge base of the common causes of lameness, organized by response to local anesthesia. Radiographic interpretation is emphasized through case discussions. The course is recommended for students anticipating entry into equine practice. Students seeking hands-on experience with horses are also welcome.

VTMED 654(6534 lec, 6535 lab) Equine Theriogenology

Spring. Lec, 1 credit; lab, 0.5 credit. Minimum lab enrollment 12; maximum 24. Lab enrollment by lottery. Prerequisite: third- and fourth-year veterinary students. Lab co-requisite: enrollment in lec. Letter grades only. D. H. Volkmann.

Covers advanced aspects of equine reproductive physiology. Discusses reproductive management of mares and stallions using natural and artificial breeding strategies. Stresses diagnosis, treatment, and prevention of common reproductive disorders. The laboratory component builds on skills acquired during foundation courses and provides experience in techniques important in equine theriogenology.

VTMED 655(6536 lec, 6537 lab) Dairy Cow Theriogenology

Spring. Lec, 1 credit; lab, 1 credit. Minimum lab enrollment 12; maximum 24. Lab enrollment by lottery. Prerequisite: third- and fourth-year veterinary students. Lab co-requisite: enrollment in lec. Letter grades only. D. Volkmann and R. Gilbert.

Offers lectures and labs that provide both theoretical and practical training in current approaches to the veterinary aspects of dairy-cow reproductive care and management. The

aim is to empower the student with entry-level, current knowledge and skills for the reproductive aspects of any modern dairy practice.

VTMED 656(6538) Special Problems in Equine Medicine

Spring. 1.5 credits. Minimum enrollment 10; maximum 30. Enrollment by lottery. Prerequisite: third- and fourth-year veterinary students. S-U grades only. T. Divers and staff.

Intended for students anticipating equine practice. In-depth study of important diseases, review of recent literature, health management, and hands-on procedures or demonstrations are the core of this course.

VTMED 657(6539) Disorders of Large-Animal Neonates

Spring. 1 credit. Minimum enrollment 10; maximum 100. Prerequisite: first-, second-, third-, and fourth-year veterinary students. Letter grades only. G. Perkins.

Introductory neonatology course. The emphasis is on the medical and surgical problems of foals in the early neonatal period with some information presented about calves, small ruminants, and camelid neonates. Students also spend several hours in the neonatal intensive care unit providing medical care of hospitalized patients under staff supervision.

VTMED 659(6540) Equine Soft-Tissue Surgery

Spring. 1 credit. Minimum enrollment 6; maximum 24. Enrollment by lottery. Prerequisite: third- and fourth-year veterinary students. Letter grades only. R. Hackett and staff.

Intended for students anticipating equine practice after graduation. Builds on material presented in the foundation courses to provide supplemental instruction in surgical disorders of the horse. Lectures are case based and emphasize disorders likely to be encountered in equine practice (colic, traumatic injuries, upper respiratory tract disorders, prepurchase examination). Laboratories emphasize diagnostic and therapeutic procedures in which an entry-level equine practitioner should be competent.

VTMED 661(6541) Surgical Pathology

Spring, summer, fall. 1-2 credits, variable; one or two weeks, approx. eight hours per day for 1 credit per week. Prerequisite: second-, third-, and fourth-year veterinary students by permission of instructor. Letter grades only. S. McDonough.

Provides hands-on experience in the Surgical Pathology Service of the Department of Biomedical Sciences. Working with the attending pathologist, students examine tissue specimens histologically, propose diagnoses, and discuss their interpretations. Students may enroll in this course only through the Office of Student Records *within the official add/drop period*. All requests to enroll must be accompanied by the Supplemental Enrollment Form indicating Dr. McDonough's approval of the enrollment and the amount of credit to be awarded. *Second-year students* should not enroll for any term other than summer *unless* they have actually reserved a January or spring-break slot through Dr. McDonough.

VTMED 665(6542) Medical and Surgical Problems of Dairy Cattle: Emphasis on the Individual Animal

Spring. 1.5 credits. Minimum enrollment 6; maximum 28. Prerequisite: third- and fourth-year veterinary students. Letter grades only. S. Fubini and staff.

Provides students who have a special interest in dairy practice the opportunity for in-depth discussions of special problems in bovine medicine and surgery. Emphasizes case discussions, physical examination techniques, and ethical and practical matters. Emphasizes individual cow treatment.

VTMED 667(6543) Special Problems in Small-Animal Medicine

Spring. 1 credit. Minimum enrollment 10; maximum 40. Prerequisite: third- and fourth-year veterinary students. S-U grades only. K. Simpson (coordinator) and staff.

Students work through selected problems in small-animal medicine in two-hour weekly seminars. The focus is on the medical problems associated with cases using historic, clinical, clinical pathologic, and pathologic findings to elucidate basic pathophysiologic principles of disease. The overall objective is to give future small-animal practitioners skills in the approach to clinical problems with specific emphasis placed on history taking, clinical signs and examination skills, assessment of clinical pathology data and diagnostic materials (radiographs, ultrasounds), treatment plans, and prevention. The course expands knowledge gained in Foundation Course V and, under the instruction of a clinical faculty member, is aimed at facilitating the use of that knowledge into the practical skills of managing clinical cases.

VTMED 668(6544) Practice Management

Spring. 2 credits. Prerequisite: second-, third-, and fourth-year veterinary students. S-U grades only. M. Kraus, J. Ludders, J. Morrissey, and K. Cummings.

Professional practice and financial managers teach veterinary medical students the essential elements of a successful practice, concentrating on management and organizational skills. Topics include basic practice organization, leadership styles, career planning, communication skills, facility management, human resource management, marketing, building and maintaining clients, practice growth, personal finances, money management, insurance, animals and the law, malpractice, medical records, inventory and pharmacy management, and contracts.

VTMED 669(6545 lec, 6546 lab) Sheep and Goat Medicine

Spring. Lec, 1 credit; lab, 0.5 credit. Prerequisite: third- and fourth-year veterinary students. Lab co-requisite: Sheep and Goat Medicine lec. S-U grades only. M. C. Smith.

Discusses diagnosis, treatment, and prevention of medical and surgical problems of individual small ruminants and of sheep and goat herds. Basic information on breeds, behavior, nutritional requirements, and management systems is supplied. Economically important contagious or metabolic diseases are discussed in depth. The diagnostic evaluation and differential diagnoses for common clinical presentations such as skin disease, neurologic disease, lameness, and mastitis are considered. Herd monitoring of economically important parameters and necropsy diagnosis of

abortions and neonatal losses are addressed. Breeding systems, pregnancy diagnosis methods, correction of dystocias, and common surgical procedures are discussed and demonstrated in laboratory sessions.

VTMED 672(6324) Antimicrobial Drug Therapy in Veterinary Medicine

Spring. 1 credit. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. W. S. Schwark.

Familiarizes students with antimicrobial drugs used in veterinary practice. Builds on fundamental pharmacological and microbiological principles covered in Foundation Courses III and IV and considers antibacterial, antifungal, antiparasitic, and anticancer drugs from the point of view of unique pharmacokinetic properties, indications for clinical use, and potential toxicities as the basis for rational use.

VTMED 676(6547) Clinical Ophthalmology

Spring. 0.5 credit. Prerequisite: third- and fourth-year veterinary students. S-U grades only. R. Riis, N. Irby, and T. Kern.

The principles and practice of entry-level veterinary ophthalmology introduced in Foundation Course V, Introduction to Veterinary Ophthalmology, are supplemented by lectures and discussions that emphasize species differences, basic surgical decision-making, and recognition of ocular conditions appropriate for referral. One of the four class periods is devoted to ocular surgical techniques performed on cadaver tissues.

VTMED 677(6548) Dairy Production Medicine

Fall. 2 credits. Minimum enrollment 6; maximum 14. Prerequisite: third- and fourth-year veterinary students. S-U grades only. C. Guard.

Intermediate course in techniques and procedures used by veterinarians in modern dairy practice. Many of these activities fall outside the traditional boundaries of medicine, surgery, and theriogenology and might include housing, facilities, manure management, and employee education. Data analysis, disease and productivity monitoring, and evaluation of deviations from targeted performance are used to plan cost-effective interventions or corrections, followed by continued surveillance to monitor their effect. Students are introduced to the dominant software currently used in dairy management. Local dairy herds serve as additional laboratories for class projects.

VTMED 678(6549) Small-Animal Theriogenology

Spring. 1 credit. Minimum enrollment 6; maximum 100. Prerequisite: third- and fourth-year veterinary students. Letter grades only. D. H. Volkmann.

Distribution course in a lecture-based format designed to complement the knowledge gained in the theriogenology component of Foundation Course V, Animal Health and Disease. Content includes discussion of breeding management, infectious and noninfectious causes of infertility, and pathology of the male and female reproductive tracts, their diagnosis, and management. The course emphasizes conditions affecting dogs and cats.

VTMED 679(6550) Clinical Pharmacology

Spring. 0.5 credit. Prerequisite: third- and fourth-year veterinary students. S-U grades only. W. S. Schwark.

Offered after Foundation Courses I-V and formal exposure to pharmacology course work is completed. The course is designed to familiarize students with drug use in the clinical setting and uses ongoing cases in the Cornell University Hospital for Animals as a teaching tool. Pharmacological concepts are emphasized, with a focus on the rationale for drug choice, alternative drug choices available, pharmacokinetic considerations, and potential drug interactions/toxicities. This course is offered at the time students are about to embark on their clinical rotations. It is designed to emphasize practical aspects of pharmacology in the clinical setting, using basic concepts obtained during formal course work. The onus is placed on the student to explain/rationalize drugs employed in clinical cases in the teaching hospital.

VTMED 680(6730) Behavior Problems of Horses

Spring. 1 credit. Prerequisite: one semester of veterinary curriculum; first-, second-, third-, and fourth-year veterinary students. S-U grades only. K. A. Houpt.

The goal of this course is to give veterinary students the ability to treat the behavior problems of horses. History-taking, counseling, diagnostic tests, follow-up, the importance of cooperation with the referring veterinarian, prevention of behavior problems, training techniques of value to the practitioner, and socialization of foals are presented.

VTMED 681(6731) Behavior Problems of Small Animals

Spring. 1 credit. Minimum enrollment 10. Prerequisite: one semester of veterinary curriculum; first-, second-, third-, and fourth-year veterinary students. S-U grades only. K. A. Houpt.

The goal of this course is to give veterinary students the ability to treat the behavior problems of cats and dogs. History-taking, counseling, and follow-up methods are presented. Each student has the opportunity to participate in three cases. Behavioral and pharmacological treatments for behavior problems are presented.

VTMED 692(6327) Current Concepts in Reproductive Biology (also BIOAP 757[7570])

Fall. 3 credits. Minimum enrollment 6. Prerequisite: first-, second-, and third-year veterinary students and appropriate undergraduate/graduate training. Letter grades only. Offered odd-numbered years. J. Fortune, W. R. Butler, and staff.

Team-taught survey course in reproductive physiology/endocrinology. Lectures are given by a number of reproductive biologists on various aspects of male reproductive function (endocrine regulation, testis function, spermatogenesis, and sperm physiology/function); female reproductive function (endocrinology, ovarian development and function, oocyte physiology/function); fertilization and early embryo development; pregnancy; parturition; puberty; and reproductive technology. Students participate in the form of discussions and/or presentations.

[VTMED 695(6221) Genetic Basis of Eye Diseases]

Spring. 1 credit. Minimum enrollment 6; maximum 14. Prerequisite: first-, second-, third-, and fourth-year veterinary students. Letter grades only. G. Aguirre.

Covers the molecular and genetic basis of inherited eye diseases in domestic and laboratory animals. It is aimed at the professional student in the veterinary curriculum but is open to graduate-level students. The course is given in a combination lecture/seminar format, with students leading and actively participating in discussions. The students are expected to do assigned and independent outside research, both for class discussions and the paper.]

[VTMED 696(6552) Fundamental Principles and Techniques of Small-Animal Anesthesia: Dogs, Cats, and Birds]

Spring. 1 credit. Minimum enrollment 15. Prerequisite: third- and fourth-year veterinary medical students. J. W. Ludders, R. D. Gleed, and L. P. Posner.

Designed for the veterinary student interested in small-animal practice. Consists of lectures, case discussions, and development of anesthetic protocols for routine and complicated cases. Subjects include anesthetic management for elective and emergency surgery, management of the high-risk patient, fluid therapy, drug interactions, pain management, and the management of anesthesia-related complications, cardiopulmonary resuscitation, and post-anesthetic management. While fundamental concepts and recent advances in anesthesia are discussed, the practical application of anesthetic principles and techniques are a major objective of the course.]

[VTMED 697(6553) Fundamental Principles of Large-Animal Anesthesia: Equine and Mixed Animal Practice]

Spring. 1 credit. Minimum enrollment 15. Prerequisite: third- and fourth-year veterinary medical students. R. D. Gleed, J. W. Ludders, and L. P. Posner.

Designed for the veterinary student interested in equine or mixed-animal practice. Consists of lectures, case discussions, and development of anesthetic protocols for routine and complicated cases. Subjects include anesthetic management for elective surgery, field anesthesia, management of the high-risk patient, fluid therapy, drug interactions, pain management, and the management of anesthesia-related complications, cardiopulmonary resuscitation, and post-anesthetic management. While fundamental concepts and recent advances in anesthesia are discussed, the practical application of anesthetic principles and techniques is a major objective of the course.]

[VTMED 698(6798) Special Projects in Veterinary Medicine]

Fall, winter, spring, summer. 1-4 credits, variable. TBA with College of Veterinary Medicine tenure-track faculty member. S-U grades optional.

Provides students the opportunity to work individually with a faculty member to pursue an area of particular interest and, typically, not part of the established curriculum. Specific course objectives and course content are flexible and reflect the scope and academic expertise of the faculty.

[VTMED 699(6199, 6299, 6399, 6499, 6599) Research Opportunities in Veterinary Medicine]

Fall, winter, spring, summer. 1-4 credits, variable. TBA with College of Veterinary Medicine tenure-track faculty member. S-U grades optional.

Provides students the opportunity to work in the research environment of faculty involved in veterinary or biomedical research. Specific course objectives and course content are flexible and reflect the specific research environment. Research projects may be arranged to accumulate credit toward requirements in Distribution Sets I, II, III, IV, and V.

[VTMED 700(6600) Theriogenology Service]

Spring. 2 or 4 credits. Maximum enrollment 5 per rotation. Prerequisite: VTMED 551; third- and fourth-year veterinary students. Letter grades only. D. H. Volkmann and staff.

Exposure to clinical procedures in theriogenology as provided by Cornell University Hospital for Animals patient load and augmented by teaching herd animals.

[VTMED 701(6601) Cardiology Service]

Fall and spring. 2 credits. Minimum enrollment 1 per rotation; maximum 2. Prerequisite: VTMED 551; third- and fourth-year veterinary students. Letter grades only. S. Moise.

Provides students with the opportunity to put into practice what they have learned in the foundation years. The management of the most common cardiac diseases is emphasized, including congestive heart failure, arrhythmias, and secondary cardiac diseases. All species are examined, large and small, although the majority are small animals. Diagnostics, including cardiovascular physical examination, electrocardiography, radiography, and echocardiography, are taught. The rotation includes clinical work, didactic teaching, and self-initiated digging for information.

[VTMED 702(6602) Laboratory-Animal Medicine]

Fall and spring. 2 credits. Maximum enrollment 2 per rotation. Prerequisite: VTMED 551; third- and fourth-year veterinary students. Letter grades only. M. Bailey and staff.

The practice of laboratory animal medicine requires a combination of preventive programs, clinical skills, knowledge of various species' biologies, familiarity with research methodology, and acquaintance with state and federal regulations. This course is an introduction to that specialty. Students accompany laboratory-animal veterinarians on clinical rounds of Cornell's research-animal housing and participate in laboratory diagnostic work. Review sessions are conducted on the biology, medicine, pathology, and husbandry of rodents, rabbits, and primates and on current legislation regulating the care and use of research animals. The course may include field trips to other institutions.

[VTMED 703(6603) Clinical Wildlife-, Exotic-, and Zoo-Animal Medicine]

Fall, winter, spring, summer. 2 credits. Maximum enrollment 3 per rotation (plus one intern or extern). Prerequisite: VTMED 551; third- and fourth-year veterinary students. Letter grades only. G. V. Kollias and staff.

Introduces students to primary medical care of nontraditional pet species, zoo animals, and native wildlife. Students, directly supervised by the attending clinician, are responsible for the assessment, physical examination, and medical management of exotic animal species presented to the Cornell University Hospital for Animals. Other opportunities available to assist in the development of clinical skills in wildlife-, zoo-, and exotic-animal medicine include the wildlife clinic cases, ongoing wildlife research and service projects, and trips to the Rosamond Gifford Zoo. Successful completion of the course requires satisfactory performance during this 14-day clinical rotation.

[VTMED 704(6604) Quality Milk]

Fall or spring. 2 credits. Prerequisite: VTMED 551; third- and fourth-year veterinary students. Letter grades only. R. Gonzalez and QMPS staff.

Covers the causes, diagnosis, treatment, and prevention of bovine mastitis. Stresses the role of management practices. Includes lectures, readings, discussions, laboratory exercises, and farm visits as part of the Quality Milk Production Services. Participants are expected to complete a case study on a dairy farm with udder-health problems and present their findings to the producer and farm personnel. Grading is on performance during the course and a final exam.

[VTMED 705(6605) Special Opportunities in Clinical Veterinary Medicine]

Fall, spring, and summer. Prerequisite: VTMED 551; third- and fourth-year veterinary students. S-U grades only. W. Miller and N. Ducharme.

Provides opportunities for students finished with Foundation Course V to explore professional areas not available through the regular curriculum. Blocks of two to four weeks are usually spent at other teaching hospitals, research laboratories, or zoological facilities. Student proposals are submitted to the assistant dean for learning and instruction for review and approval. On-site supervisors of the block are required to evaluate each student formally.

[VTMED 707(6607) Poultry Medicine and Production Rotation]

Fall, two-week rotation that takes place at University of St. Hyacinthe or University of Guelph in alternating years. 2 credits.

Prerequisite: VTMED 551; third- and fourth-year veterinary students.

Recommended: VTMED 616. K. A. Schat.

Provides an introduction in practical poultry medicine by a combination of lectures, discussions, and laboratory sessions including postmortem examinations. Students also visit hatcheries, broiler, layer, and turkey farms.

[VTMED 708(6608) Clinical Oncology]

Fall and spring. 2 credits. Maximum enrollment 4 per rotation. Prerequisite: VTMED 551; third- and fourth-year veterinary students. Letter grades only. K. M. Rassnick.

Management and prevention of cancer in companion animals represents a significant component of the practice of veterinary medicine. The focus of this clinical rotation is the development of a comprehensive set of skills necessary for a veterinarian to become an advocate for the client/patient with cancer. These skills include appropriate initial evaluation of animals with cancer; sensitive and effective client and referring-veterinarian

communication; ability to access relevant information from numerous sources related to cancer management; and ability to understand and apply principles of surgical, medical, and radiation oncology as well as techniques specifically related to minimize pain and treatment-related effects in cancer patients.

VTMED 709 (5611) Small-Animal Clinical Emergency and Critical Care Medicine

Fall, winter, spring, and summer. 2 credits. Prerequisite: third- and fourth-year veterinary students. S-U grades only. N. Dhupa.

Management of both emergent and critical cases represents a significant component of the practice of veterinary medicine. The focus of this clinical rotation is the development of a knowledge base and a comprehensive set of skills necessary for a veterinarian to perform adequately in these areas, within a structured format. These skills include the appropriate evaluate (triage) and stabilization of emergency patients, the management of post-operative and other critical patients, and sensitive and effective client communication. Participants access relevant information from various sources related to emergency and critical care medicine and understand and apply these principles to clinical cases. Participants have patient care responsibilities in the Intensive Care and Intermediate Care units and work closely with technicians and clinicians to develop familiarity with technical and nursing procedures. Students also participate in the management of incoming emergency cases. The clinical emergency and critical care medicine rotation are primarily an overnight rotation.

VTMED 710(6609) Animal Behavior Clinic

Fall, winter, spring, and summer. 2 credits. Maximum enrollment 2 per rotation. Prerequisite: VTMED 681; third- and fourth-year veterinary students. S-U grades only. K. A. Houpt.

Students participate fully in the Animal Behavior Clinic: answering telephone, mail, and e-mail inquiries, observing and taking charge of behavior cases. To answer inquiries, the student is expected to consult several behavioral textbooks or other sources. Taking charge of the cases includes reading the entire behavioral history, interviewing the owner, forming a diagnosis, conferring with Dr. Houpt or a behavioral resident as to the proper behavioral and pharmacological treatment, demonstrating behavior-modification techniques and writing a letter to the client. Follow-up calls to earlier cases may be made.

VTMED 711(6610) Herd Health and Biosecurity Risk Evaluation Using the NYS Cattle Health Assurance Program (NYSCHAP) Model

Summer, fall. 2 credits. Minimum enrollment 5. Prerequisites: VTMED 540 and 743; third- and fourth-year veterinary students or permission of instructor. Letter grades only. K. Kaufman, F. L. Welcome, D. V. Nydam, and Diagnostic Lab faculty.

Introduces students to the identification of disease risk and the evaluation of cattle operations, focusing on animal health, food safety, and the environment. The course combines information on risk assessment, creation of herd plans, biosecurity, Johne's disease, standard operating procedures, global trade, and environmental issues. Additionally, two local farms are visited to give students the

opportunity to implement knowledge gained in lectures.

VTMED 712(6613) Equine Specialty Rotation

Fall. 2 credits. Minimum enrollment 5; maximum 10. Prerequisite: VTMED 551. Priority given to fourth-year veterinary students in equine pathway. Letter grades only. Live animals used for learning. N. G. Ducharme, G. Perkins, and S. Fubini.

The objective of the rotation is to teach students basic diagnostic recognition and clinical skills for those interested in equine practice. These skills prepare students to respond on equine-related calls on their first day of work. The Cornell horse population is used to teach these practical skills. The emphasis of this elective is hands-on with discussion, rounds and lectures. The rotation includes lectures and corresponding discussion groups to cover the scientific basis, controversies, industry specific state of the art and clinical indications, contraindications, and potential complications of the various modalities.

VTMED 713 Large-Animal Clinical Emergency and Critical Care

Summer and spring. 2 credits. Prerequisite: third- and fourth-year veterinary students. S-U grades only. F. Caldwell.

The evaluation and management of the critical patient represent a significant component of the practice of veterinary medicine. As emergency cases will routinely be presented to the large animal practitioner, it is imperative that they be adequately prepared. The focus of this clinical rotation is the development of a knowledge base and a comprehensive set of skills necessary for a veterinarian to perform adequately in these areas, within a structured format. These skills include the appropriate evaluation and stabilization of emergency patients, and the management of post-operative cases and other critical patients. Participants access relevant information from various sources related to emergency and critical care medicine and understand and apply these principles to clinical cases. Participants primarily have patient care responsibilities in the Large Animal Care Unit of the Cornell University Hospital for Animals and work closely with technicians and clinicians to develop familiarity with technical and nursing procedures. The clinical emergency and critical care medicine rotation are primarily an after-hours rotation.

VTMED 720(6425) Issues and Preventive Medicine in Animal Shelters

Spring. 1 credit. Minimum enrollment 5; maximum 40. Prerequisite: VTMED 540; third- and fourth-year veterinary students. Letter grades only. J. M. Scarlett and staff from American Society for Prevention of Cruelty to Animals.

Veterinarians often work for or with animal shelters, serve on shelter boards of directors, act as community resources for issues relating to companion animal welfare, participate in spay and neuter programs, and influence the quality of the human-animal bond. This course addresses the history of the humane movement, role of the veterinarian in relation to shelters, preventive and palliative health management, issues surrounding euthanasia, reasons for relinquishment, programs for behavior modification, and the legal concerns of shelters. These issues are addressed using lectures and large-group discussions.

VTMED 721(6426) Timely Topics in Veterinary Parasitology: Large-Animal

Spring. 0.5 credit. Minimum enrollment 2. Prerequisite: third- and fourth-year veterinary students. S-U grades only. D. D. Bowman.

In-depth look at one or a few parasites of special interest relative to large-animal medicine. Presents details of taxonomy, biology, epidemiology, clinical presentation, and preventive and curative treatment. Efforts are made to discuss those aspects of the disease as it relates to the practical control of these and in-depth coverage of primary literature relating to the parasite being discussed. Topics vary annually. The course is presented in a lecture/discussion format.

VTMED 722(6427) Timely Topics in Veterinary Parasitology: Small-Animal

Spring. 0.5 credit. Minimum enrollment 2. Prerequisite: third- and fourth-year veterinary students. S-U grades only. D. D. Bowman.

In-depth look at one or a few parasites of special interest relative to small-animal medicine. Presents details of taxonomy, biology, epidemiology, clinical presentation, and preventive and curative treatment. Efforts are made to discuss those aspects of the disease as it relates to the practical control of these and in-depth coverage of primary literature relating to the parasite being discussed. Topics vary annually. The course is presented in a lecture/discussion format.

VTMED 726(6554) Reptile Medicine and Surgery

Spring. 1 credit. Minimum enrollment 10; maximum 40. Prerequisite: third- and fourth-year veterinary students. Letter grades only. G. V. Kollias.

Designed to introduce third- and potentially fourth-year veterinary students to the principles and practice of reptile medicine and surgery. Taught in a basic lecture and discussion format.

[VTMED 730(6428) Vaccines: Theory and Practice

Spring. 1 credit. Minimum enrollment 10; maximum 40. Prerequisite: introductory immunology course or VTMED 540 or VETMI 315; second-, third-, and fourth-year veterinary students and graduate students or others by permission of instructor. Letter grades only. Offered odd-numbered years. T. Clark.

Provides an overview of vaccines used in clinical practice as well as an in-depth look at vaccine development. Emphasizes the most recent advances in vaccine design and delivery, including the use of recombinant DNA techniques for targeting specific immunological responses. Lectures touch on vaccines commonly used in veterinary practice and address in detail the use of carriers, adjuvants, and immunostimulants; attenuated pathogens; recombinant subunit vaccines; viral and bacterial vectors for vaccine delivery; synthetic antibodies; and genetic immunization with "naked" DNA. Grades based on final exam and one term report.]

VTMED 732(6438) Veterinary Clinical Toxicology

Spring. 1.5 credits. Prerequisite: second-, third-, and fourth-year veterinary students. S-U grades optional. K. Bischoff.

Provides veterinary students with a solid introduction to concepts and principles of toxicology and how they are applied in the clinical setting. Students learn about specific common toxicants, clinical signs in affected animals, and treatment protocols for the toxicants in question. Students also gain an understanding of the clinical approach to suspected or unknown toxicoses, sample collection and handling, and resources available for clinical toxicologic problems. The course is conducted with two one-hour lectures per week and one hour-long large-group discussion per week. Grades are based on weekly homework assignments, a midterm, and a final exam.

VTMED 733(6429) Selected Infectious Diseases of Swine

Spring. 1.5 credits. Minimum enrollment 6; maximum 80. Prerequisite: second-, third-, and fourth-year veterinary students. S-U grades optional. K. Earnest-Koons.

Provides veterinary students with a solid introduction to concepts and principles of swine infectious diseases and how they are treated in the clinical setting. Students learn about specific infectious diseases, clinical signs in affected animals, and treatment protocols for the diseases in question. Students also gain an understanding of the clinical approach to suspected or unknown infectious agents, sample collection and handling, and resources available for infectious disease diagnosis. The course is conducted with two one-hour lectures per week and one hour-long large-group discussion per week. Meets three days per week for one hour each. Grades are based on weekly quizzes, a final exam, a short paper and/or oral presentation.

VTMED 735(6614) Special Topics in Ambulatory and Production-Animal Medicine

Fall, winter, spring, and summer. 1-2 credits, variable. Prerequisite: second-, third-, and fourth-year veterinary students; VTMED 560 and permission of instructor. Letter grades only. M. E. White and staff.

Provides specialized experiences in the Ambulatory and Production Medicine Service. Consists of participation in scheduled and emergency farm calls and completion of projects designed to provide experience in herd problem solving, records analysis, and implementing herd-health programs. Clinical service assignments are planned to meet individual student goals. Examples of focus areas available include livestock production medicine, dairy reproductive examinations, small-ruminant medicine, and equine ambulatory practice.

[VTMED 737(6239) Principles of Pathology

Spring. 1.5 credits. Minimum enrollment 6; maximum 40. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. S. McDonough.

Intended for students who wish to strengthen and broaden their knowledge of the pathologic basis of disease. Fundamental biologic processes as revealed by gross and microscopic pathologic changes are emphasized. Molecular mechanisms are integrated into the discussion where appropriate. General pathologic processes are organized into a logical and uniform system to facilitate comprehension and learning with particular attention paid to definition and proper usage of terminology. The course

includes two lectures per week and a one-hour large-group discussion. The large-group discussion allows students to apply general knowledge gained in lecture to a specific problem.]

VTMED 740(6430) Veterinary Perspectives on Pathogen Control in Animal Manure

Spring. 2 credits. Prerequisite: third- and fourth-year veterinary students. Letter grades only. D. D. Bowman.

In-depth look at the management of pathogens in animal manures. Reviews the pathogens involved, the role of governing agencies, the survival of pathogens in the field, and methods of pathogen destruction. Discusses commercial methods of manure processing for the control of these pathogens for the protection of other animals and the human population. Concludes with class discussions with major stakeholders representing the dairy, beef, pork, and poultry industries and their understanding of the problem as it relates to veterinary students.

VTMED 741(6431) Microbial Safety of Animal-Based Foods

Spring. 1 credit. Minimum enrollment 10; maximum 20. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. B. L. Njaa and M. Wiedmann.

In the first two weeks, the instructor provides an overview of food-safety issues relevant to the veterinary profession. The following four weeks are dedicated to student presentations on selected food-borne pathogens and food-safety issues. In the final two weeks, lectures and discussion led by the instructors focus on emerging new issues in food safety and on farm-to-table technologies and approaches that can be used to assure the safety of animal-based foods.

VTMED 742(6555) Dairy Business Management and Health Economics

Spring. 2 credits. Minimum enrollment 5; maximum 15. Prerequisite: second-, third-, and fourth-year veterinary students. Letter grades only. L. Warnick and C. Guard.

Helps veterinary students understand basic principles of dairy economics and business management and develop specific skills used by veterinarians in health economic decision making. Covers three main topic areas: (1) overview of dairy economics from regional, national, and global perspectives; (2) the terminology and concepts used in dairy business financial analyses and economic decision making; (3) dairy health economics, including the application of economic tools to decisions related to disease treatment, health maintenance, and productivity.

VTMED 743(6732) Interaction with the Animal Health Diagnostic Laboratory for Investigating Herd Problems

Spring. 1 credit. Minimum enrollment 5. Prerequisite: third- and fourth-year veterinary students or permission of instructor. Letter grades only. D. V. Nydam and others.

This seminar course uses an interactive format and multiple experts from their fields to introduce future veterinarians how best to use the services of a diagnostic laboratory when investigating herd problems. The course combines logistical and factual matters such as appropriate sample submission, tests available for various pathogens, and relative test interpretation with practical case-based discussion of the various diagnostic

modalities. Topics include virology (e.g., BVD), bacteriology (e.g., *Salmonella*), parasitology (e.g., *Cryptosporidium*), serology (e.g., Johnes Disease), molecular techniques (e.g., *E. coli*), herd-level test interpretation, and outbreak investigation.

VTMED 744(6733) Veterinarians and Food-Animal Production Systems: An Introduction

Spring. 1 credit. Minimum enrollment 5. Prerequisite: first- and second-year veterinary students or permission of instructor. Letter grades only. D. V. Nydam and invited speakers.

This seminar course uses an interactive format and multiple experts from their fields to introduce future veterinarians to various food-animal production systems, how veterinarians interact with them, and the synergy between these systems and veterinarians in society. Each week the production structure of the dairy, beef, swine, poultry, or aquaculture industry, veterinarians' role in them, and career opportunities and expectations are discussed. The offering is intended for first- or second-year students so that they can plan appropriately to take additional courses or set up externships in the following years.

VTMED 745(6556) Dynamics of Dairy Herd Health and Management

Spring. 1 credit. Prerequisite: third- and fourth-year veterinary students. Letter grades only. L. D. Warnick, D. V. Nydam, and Y. T. Grohn.

Veterinarians are increasingly asked to advise dairy producers on productivity and management decision making. This course addresses the relationships of dairy cattle diseases with herd-performance parameters. Through a combination of lectures and laboratory exercises, students learn analytic techniques and computer software skills to evaluate dairy herd disease and production problems. Topics include: (1) how often production diseases occur and when, (2) how they are interrelated, (3) the impact of disease on milk production, reproductive performances, and risk of culling, and (4) how to use this information in production medicine.

VTMED 746(6432) Fish Health Management

Spring. 1.5 credit. Minimum enrollment 8; maximum 16. Prerequisite: first-, second-, third-, and fourth-year veterinary students or written permission of instructor. S-U grades optional. P. R. Bowser.

Lecture and laboratory course providing an overview of the aquatic environment and the important infectious and noninfectious diseases of fish. Covers important diseases encountered in commercial aquaculture, aquarium systems, and natural waters. The laboratory is designed to provide students with a knowledge base and hands-on diagnostic experience in diseases of fish. Students also maintain and manage aquarium systems during the course to gain an appreciation for the science behind the operation of those systems. The laboratory requires time outside the normal scheduled class sessions (to be scheduled by the students) for management of the aquarium systems. Each student also makes a presentation on a topic in aquatic animal health during the course.

VTMED 747(6557) Exotic Small Mammals as Pets

Spring. 1.5 credits. Maximum enrollment 80. Prerequisite: third- and fourth-year veterinary students and graduate students. Students enrolled in VTMED 703 encouraged to enroll. Letter grades only. J. K. Morrisey.

Concentrates on the husbandry, clinical presentation, diagnosis, and treatment of common diseases of nontraditional small mammals that are kept as pets. These species include ferrets, rabbits, guinea pigs, chinchillas, rats, mice, hamsters, gerbils, hedgehogs, sugar gliders, and other animals. Grading is based on a midterm and final exam.

VTMED 748(6222) Canine and Feline Medical Genetics

Spring. 2 credits. Minimum enrollment 10; maximum 40. Prerequisites: VTMED 520, 530, and 531. S-U grades optional. V. N. Meyers-Wallen.

Covers the genetic and pathophysiologic mechanisms underlying inherited diseases in dogs and cats that may be encountered in small-animal practice. Specific disorders of clinical importance are presented in a lecture format to illustrate the distribution, diagnosis, and control of inherited diseases in individuals and populations. Ethical considerations regarding treatment, prevention, and control measures are discussed.

VTMED 749(6433) Anaerobic Infections of Animals

Spring. 1 credit. Minimum enrollment 10; maximum 80. Prerequisite: VTMED 540. S-U grades only. P. L. McDonough and staff.

Presents anaerobic infections in clinical context as an adjunct to the material covered in Foundation Course IV. Students gain an understanding of the diversity and biology of anaerobic bacteria and the niches that they occupy in the animal and avian body. A basic, clinically oriented taxonomy is presented, and students learn about the virulence and pathogenesis of the major anaerobes that they will encounter in clinical practice. The clinical signs of anaerobic infections, laboratory identification and susceptibility testing, and the use of specimen transport media are also covered. Treatment of common infections, including wound care, is covered and vaccines currently available are discussed in detail. In the second four weeks of the course, students learn about the major clinical syndromes caused by anaerobes. Course format consists of two one-hour lectures per week for eight weeks.

VTMED 750(6434) Managing Infectious Diseases in Small Animal Populations

Spring. 1 credit. Minimum enrollment 3; maximum 20. Prerequisite: third- and fourth-year veterinary students. Highly recommended: VTMED 720. Letter grades only. J. M. Scarlett.

Intended as a sequel to the Issues and Preventive Medicine in Animal Shelters course offered in the C Distribution block. In light of the time constraints in the Issues course, the principles of prevention and control to specific diseases (e.g., ringworm, kennel cough) commonly encountered in small animal populations are not discussed. This course encourages students to apply principles of infectious disease, epidemiology,

and preventive medicine to infectious disease problems in small animal populations, with a particular emphasis on disease problems in shelters. Mention of modification to fit other small animal populations (e.g., catteries, kennels) is made.

VTMED 751(6558) Applied Dairy Nutrition for Practitioners

Spring. 2 credits. Minimum enrollment 5; maximum 25. Prerequisite: veterinary students or permission of instructor. S-U grades only. T. Overton, D. Nydam, and others.

Provides a foundation in the principles of dairy cattle nutrition for veterinary students interested in dairy production medicine. Emphasizes integration of the principles of dairy cattle nutrition with practical rational formulation with troubleshooting on dairy farms, both preventive and curative.

VTMED 752(6558) Advanced Small Animal Clinical Oncology

Spring. 1 credit. Minimum enrollment 10. Prerequisite: VTMED 552. Letter grades only. K. M. Rassnick.

Elective course designed to complement the required course VTMED 552 Veterinary Clinical Oncology. Cancer is among the leading causes of death in dogs and cats and remains the number one concern of pet owners. Management and prevention of cancer in companion animals represents a significant component of the practice of small animal veterinary medicine. This advanced course emphasizes the biologic behavior and patient management of cancers in dogs and cats more thoroughly than addressed in VTMED 552. Additionally, molecular and cytogenetic methodologies that are likely to affect cancer diagnosis and management in the future are discussed. Finally, students are provided with the skills necessary to critically read and evaluate clinically based publications in the professional literature.

Biomedical Sciences**VTBMS 346(3460) Introductory Animal Physiology (also BIOAP 311[3110]) (Undergraduate)**

Fall. 3 credits. Prerequisites: BIOG 105, 106, or 101, 102, 103, 104, 107, 108; CHEM 207, 208, or 206, or 215, 216; MATH 106, 111 or 191 or AP credit for any of the above; or one year college-level biology, chemistry, and math. S-U grades optional. E. R. Loew.

General course in animal physiology emphasizing principles of operation, regulation, and integration common to a broad range of living systems from the cellular to the organismal level. Structure-function relationships are stressed along with underlying physical-chemical mechanisms.

VTBMS 400(4000) A Genomic Approach to Studying Life

Fall. 3 credits. Prerequisites: one year introductory biology or equivalent plus BIOGD 281 or BIOBM 330 or 333 or 331/332 or permission of instructor. Letter grades only. J. Schimenti.

Introduction to principles underlying the organization or genomes and the methods of studying them, emphasizing genome-wide approaches to research. Covers the application of genomics methodologies for addressing issues including evolution, complex systems, genetic and gene:phenotype relationships.

Includes periodic, in-depth discussions of landmark or timely genomic papers.

VTBMS 401(4010) Genomics Analysis

Spring. 3 credits. Prerequisites: upper-level undergraduates and graduate students; BIOGD/VTBMS 400 or equivalent by permission of instructor. Letter grades only. T. O'Brien.

Overview of approaches and tools used in genomic research. Covers experimental and computational technologies as well as theoretical concepts important for the study of genomes and their function. Topics include high-throughput DNA sequencing and genotyping, genetic mapping of simple and complex traits, RNA expression profiling, proteomics, genome modification and transgenesis, and computational genomics.

VTBMS 600(6000) Special Projects in Anatomy

Fall, spring. 1 credit per 2.5-hour period. Prerequisite: permission of instructor. S-U grades only. Biomedical science staff.

VTBMS 610(6100) Genomes as Chromosomes

Fall. 1 credit. Prerequisites: upper-level undergraduates and graduate students; others by permission of instructor or BIOGD 281 and BIOBM 332. Letter grades only. T. O'Brien and P. Cohen.

The eukaryotic genome is partitioned into discrete structural units, the chromosomes. This course examines how chromosomes organization is related to chromatin structure, gene expression, DNA replication, repair and stability. Special emphasis is placed on how the linear arrangement of sequence features along the chromosome, such as genes and regulatory modules, relate to the functional organization of the genome in the nucleus. Experimental and computational approaches used to address chromosome structure and function are studied.

VTBMS 611(6110) Genomes Maintenance Mechanisms

Fall. 1 credit. Prerequisites: upper-level undergraduates and graduate students. BIOGD 281, BIOBM 330, or 333, or 331/332 or equivalents. S-U grades optional. R. Weiss.

Focuses on the molecular mechanisms used by eukaryotic cells to preserve genomic integrity. Topics include endogenous and exogenous sources of mutation, DNA repair pathways, and cell cycle checkpoint mechanisms. Also addresses how genome maintenance impacts genome plasticity and evolution, as well as the relationship between genomic instability and disease, including cancer.

VTBMS 612(6120) Overview of Model Genetic Organisms

Spring. 1 credit. Prerequisites: upper-level undergraduates and graduate students; BIOGD 281, or BIOGD/VTBMS 400 or permission of instructor. S-U grades optional. J. Schimenti.

Presents the features of various model organisms and their relative merits for conducting various types of genomics/genetics research. Model systems discussed are: *Arabidopsis*, yeast, *Drosophila*, *C. Elegans*, zebrafish, and mice.

VTBMS 620(6200) Research Fellowship in Biomedical Sciences

Fall, spring. 1-12 credits. Cannot be used to fulfill formal course requirements for DVM curriculum. Prerequisite: permission of instructor. S-U grades only.

Offered by individual faculty members in the Department of Biomedical Sciences for DVM students undertaking research in research fellowship.

VTBMS 628(6280) Graduate Research in Animal Physiology (also BIOAP 719[7190]; Graduate)

Fall, spring. 1-3 credits. Prerequisite: written permission of department chairperson and faculty mentor who will supervise work and assign grade. S-U grades optional.

Similar to BIO G 499 but intended for graduate students who are working with faculty members on an individual basis.

VTBMS 700(7000) Predictions of Form or Phylogeny

Fall, 1 credit. Prerequisite: permission of instructor. S-U grades optional. J. W. Hermanson.

Form and function are often discussed as a correlated entity in biology. This seminar group starts with the question, Does form really predict function? This is addressed initially with respect to the analysis of paleobiology but then encompasses examples of experimental functional morphology. In particular, there is a growing body of experimental data demonstrating that diverse functions can be achieved with nearly identical morphologies, and that the functional diversity may better be explained by behavior or environmental factors. Might these observations refute current theories about the origin of flight in extinct organisms (i.e., the cursorial or ground-up theory of flight versus the arboreal gliding theory of flight evolution)? Specific topics pursued are selected by participants in this course. Participation is open to interested graduate students, advanced undergraduate students, and veterinary students.

VTBMS 701(7010) Mouse Pathology and Transgenesis (also TOX 701[7010])

Spring. 1 credit. Maximum enrollment 12 students. Priority given to graduate students, pathology residents, interns, and post-docs; third and fourth-year veterinary students may attend if space permits. Prerequisite: permission of instructor. Highly recommended: basic histology course (BIOAP 413) or equivalent. Letter grades only. A. Nikitin and staff.

Introductory course on contemporary mouse pathology explains principles and methods of pathology and transgenesis. In addition to covering development, anatomy, histology and pathology of organs and systems, the course focuses on systematic evaluation of new genetically modified mice, with particular attention to such topics as experimental design, validation of mouse models, and identification of novel phenotypes. This course includes supervised mouse necropsy.

VTBMS 713(7130) Cell Cycle Analysis

Spring. 1 credit. S-U grades only. A. Yen. Presents a brief historical review of the cell cycle; a summary of cell cycle regulatory processes; and practical methods for cell cycle analysis, including mathematical representations. Topics include growth control of bacterial cell cycle, including

chemostats, mammalian cell tissue culture, cell synchronization, flow cytometry, age-density representation, G1 regulation, labile regulatory protein models, cell transformation, regulation by growth factors and the cytoskeleton, cyclin/E2F/RB regulatory model, practical examples for analysis of cell cycle phase durations, cell cycle phase specific growth factor sensitivity, timing of RB protein phosphorylation within the cell cycle. The objective of the course is to present graduate students with methods for cell cycle analyses that will be used in their research.

VTBMS 720(7200) Special Problems in Physiology (Graduate)

Fall, spring. 1-3 credits. Prerequisite: permission of instructor. S-U grades optional.

Laboratory work, conferences, collateral readings, and reports. Adapted to the needs of students.

VTBMS 788(7880) Seminar in Surgical Pathology

Fall, spring. 1 credit. Intended for residents in anatomic pathology; third- and fourth-year veterinary students may attend. Letter grades only. B. A. Summers and staff.

The major objective of this discussion and seminar course is to introduce the residents to the discipline of surgical pathology. Selected material from the Surgical Pathology Service is prepared in advance for independent review by the residents. The material is presented in a slide-seminar format by the residents under the review of the faculty. Emphasis is placed on pathogenesis, etiology, and pathologic descriptions of the lesions. In addition, appropriate guest lecturers cover specific areas of interest and special topics not encountered in the departmental service programs.

Clinical Sciences**VETCS 299(2990) Research Opportunities in Clinical Sciences**

Summer, six-week session. 6 credits; minimum 120 hours lab time expected per 3 credits. Prerequisites: one year basic biology (scores of 5 on Biology Advanced Placement Examination of College Entrance Examination Board or BIO G 100 level). Letter grades only. Clinical science faculty.

Mentored research apprenticeship program designed to give laboratory experience to qualified unmatriculated high school students (participating in Cornell Summer College). Students are placed in a research laboratory with a designated project under the direct supervision of a research associate (upper-level graduate student, post-doc, or faculty member). Students are graded on preparation, participation in laboratory academic life, and appropriate acquisition of techniques. At the end of the session, students are expected to give brief (15- to 20-minute) oral presentations on their work and submit manuscripts in a form suitable for publication. The faculty director of the laboratory has ultimate responsibility for evaluating the student's work and assigning the grade.

[VETCS 700(7000) Pathophysiology of Gastrointestinal Surgery

Fall. 1.5 credits. S-U grades only. Offered every third year. S. L. Fubini.

Initially presents normal anatomy and physiology of the gastrointestinal system in carnivores, herbivores, and ruminants. This is followed by in-depth discussion of

the pathophysiological mechanisms and sequelae of gastrointestinal obstructions including reperfusion injury, peritonitis, adhesions, and short bowel syndrome. This course emphasizes development of an advanced understanding of surgically relevant gastrointestinal problems leading to appropriate decision making.]

[VETCS 701(7010) Pathophysiology of Orthopedic Surgery (Graduate)

Spring. 1.5 credits. Prerequisites: D.V.M., M.D., or equivalents or permission of instructor. S-U grades only. Offered every third year. A. J. Nixon.

Provides specialized training in the anatomic, physiologic, and pathologic process of musculoskeletal diseases in animals and humans, with special emphasis on surgical diseases of tendons, bones, and joints.]

VETCS 702(7020) Pathophysiology of Cardiopulmonary Surgery (Graduate)

Fall. 1.5 credits. Prerequisite: D.V.M. or equivalent. S-U grades only. Offered every third year. R. P. Hackett, S. L. Fubini, and N. G. Ducharme.

Using lectures and group discussions, the objective of this course is to explain the pathophysiology of various cardiovascular diseases (cardiac arrest, cardiac arrhythmia under anesthesia) and airway disease (thoracic and upper-airway disease). As a basis for these abnormalities, cardiopulmonary hemodynamics and biomechanical aspects of ventilation are reviewed. The emphasis is placed on understanding these mechanisms and outlining the surgeon's response to them.

VETCS 703(7030) Surgical Principles and Surgery of the Integumentary System (Graduate)

Spring. 1.5 credits. Prerequisite: graduate D.V.M.s or equivalent in residency or graduate training programs. S-U grades only. Offered every third year. S. Fubini.

Designed for surgery residents and graduate students. It is largely discussion format and examines surgical principles and surgery of the integumentary system.

[VETCS 704(7040) Pathophysiology of Urogenital Surgery (Graduate)

Fall. 1.5 credits. Prerequisite: graduate D.V.M.s or equivalent in residency or graduate training programs. S-U grades only. Offered every third year; next offered 2006. S. Fubini.

Designed to review and discuss urogenital surgical procedures in animals and the rational basis for them. Pathophysiology is stressed. Some classes consist of reprints with discussion.]

[VETCS 705(7050) Animal Pain and Its Control

Spring. 2 credits. Prerequisite: permission of instructor. Open to third- and fourth-year veterinary medical students, interns, residents, graduate students, and postdoctoral associates interested in fundamental and applied concepts of pain in animals. S-U grades optional. Offered odd-numbered years. R. D. Gleed, J. W. Ludders, P. F. Moon, and L. P. Posner.

Emphasizes the physiologic and pathophysiological mechanisms involved in pain perception by animals, their responses (physiological and behavioral) to pain, and the pharmacologic mechanisms underlying analgesic therapy. The subject material is presented through lectures, group discussions,

group readings, and group evaluation of analgesic protocols.]

[VETCS 706(7060) Pathophysiology of Neurologic Surgery (Graduate)]

Spring. 1.5 credits. Prerequisite: D.V.M.s, M.D.s, or equivalent or permission of instructor. S-U grades only. Offered every third year; next offered 2007. A. J. Nixon. Provides specialized training in neurosurgical techniques and application and discusses pathophysiologic implications of neurosurgical and neurologic diseases.]

VETCS 710(7100) Advanced Veterinary Anesthesiology I

Fall. 1 credit. Prerequisite: VTMED 568 or permission of instructor; third- and fourth-year veterinary students, graduate students, interns, and residents. S-U grades only. L. P. Posner, R. D. Gleed, and J. W. Ludders.

Designed to prepare students for the American College of Veterinary Anesthesiology examinations. Also suitable for interns and for residency training in other areas such as surgery and internal medicine. Speakers are from both inside and outside the college. Topics cover the basic sciences as they apply to anesthesiology such as physics and engineering, applied pharmacology, physiology, and pathology. Clinically oriented lectures are also given concerning specific anesthetic techniques and species-specific differences in response to anesthetic drugs.

VETCS 711(7110) Advanced Veterinary Anesthesiology II

Spring. 1 credit. Prerequisite: VTMED 568 or permission of instructor; third- and fourth-year veterinary students, graduate students, interns, and residents. S-U grades only. L. P. Posner, R. D. Gleed, and J. W. Ludders.

Designed to prepare students for the American College of Veterinary Anesthesiology examinations. Also suitable for interns and for residency training in other areas such as surgery and internal medicine. Speakers are from both inside and outside the college. Topics cover the basic sciences as they apply to anesthesiology such as physics and engineering, applied pharmacology, physiology, and pathology. Clinically oriented lectures are also given concerning specific anesthetic techniques and species-specific differences in response to anesthetic drugs.

Microbiology and Immunology

VETMI 299(2990) Research Opportunities in Microbiology and Immunology

Summer, six-week session. 6 credits; minimum 120 hours lab time expected per 3 credits. Prerequisites: one year of basic biology (scores of 5 on Biology Advanced Placement Examination of College Entrance Examination Board or BIO G 100 level). Letter grades only. Microbiology and Immunology faculty.

Mentored research apprenticeship program designed to give laboratory experience to qualified unmatriculated high school students (participating in Cornell Summer College). Students are placed in research laboratory with designated project under the direct supervision of a research associate (upper-level graduate student, post-doc, or faculty member). Students are graded on preparation, participation in laboratory academic life, and appropriate acquisition of techniques. At the end of the session, they are expected to give

brief (15- to 20-minute) oral presentations on their work and submit manuscripts in a form suitable for publication. The faculty director of the laboratory has ultimate responsibility for evaluating the student's work and assigning the grade.

VETMI 315(3150) Basic Immunology (also BIO G 305[3050]; Undergraduate)

Fall. 3 credits. Highly recommended: basic courses in microbiology, genetics, and biochemistry. S-U grades optional. J. A. Marsh.

Survey of immunology, with emphasis on the cellular and molecular bases of the immune response. More information is available at the BIOG 305 courseinfo web site.

VETMI 331(3310) General Parasitology (also BIOMI 331[3310]; Undergraduate)

Spring. 2 credits. Prerequisites: zoology or biology course; any of the following: BIOES 261, 264, 267, 274, 275, 278; BIOG 101, 102, 103, 104, 106, 107, 108, 109, 110, 170, 202, 207; BIOMI 192, 290, or equivalent courses. Letter grades only. D. D. Bowman.

Introduction to the basic animal parasites, stressing systematics, taxonomy, general biology, ecological interactions, and behavior of non-medically important groups. Also introduces the major animal parasites, protozoan, nematode, platyhelminth, acanthocephalan, annelid, and arthropod.

VETMI 404(4040) Pathogenic Bacteriology and Mycology (also BIOMI 404[4040])

Spring. 2 or 3 credits; 3 credits with lec and sem. Requirement for graduate students. Maximum enrollment for seminar portion 15. Prerequisites: BIOMI 290 and 291; open to undergraduates by permission of instructor. Letter grades only. D. P. Debbie.

Course in medical microbiology, presenting the major groups of bacterial and mycotic pathogens important to human and veterinary medicine. Emphasizes infection and disease pathogenesis. Topics include disease causality; interactions of host, pathogen, and environment, including immunity to bacteria and fungi; and principles of antimicrobial therapy and drug resistance. A companion seminar addresses the current and classic literature related to microbial pathophysiology on the cellular and molecular levels.

VETMI 409(4090) Principles of Virology

Fall. 3 credits. Prerequisites: BIOMI 290 and 291 or permission of instructor. Recommended: BIOMI 408, BIOMI 330-332, 432. G. Whittaker and S. Lazarowitz.

Covers the principles of virology, focusing mainly on animal viruses but also including plant viruses and bacteriophage. Topics include the classification of viruses, virus entry, genome replication and assembly, and virus pathogenesis. Particular emphasis is placed on virus-host cell interactions and common features between different viral families.

VETMI 431(4310) Medical Parasitology (also BIOMI 431[4310]; Undergraduate)

Fall. 2 credits. Prerequisites: zoology or biology course; any of the following: BIOEE 261, 263, 264, 267, 274, 275, 278; BIOG 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 170, 202, 207; BIOMI 192, 290, 398, or equivalent course. Letter grades only. D. D. Bowman.

Systematic study of arthropod, protozoan, and helminth parasites of public health importance, with emphasis on epidemiologic, clinical, and zoonotic aspects of these parasitisms.

VETMI 605(6050) Special Projects in Microbiology (Undergraduate)

Fall, spring. 1-3 credits. Prerequisite: permission of instructor; good background in microbiology or immunology. Recommended: background in pathogenic microbiology and immunology. S-U grades only. Microbiology staff.

Normally provides an opportunity for the student to work in a research laboratory or carry out a special project under supervision.

VETMI 620(6200) Research Fellowship in Microbiology and Immunology

Fall, spring. 1-12 credits. Cannot be used to fulfill formal course requirements for DVM curriculum. Prerequisite: permission of instructor. S-U grades only. Faculty TBA. Offered by individual faculty members in the Department of Microbiology and Immunology for DVM students undertaking research in Research Fellowship.

VETMI 700(7000) The Biology of Animal and Plant Viruses (Graduate and Upper-level Undergraduate)

Fall. 2 credits. Letter grades only. Offered odd-numbered years. C. R. Parrish and virology faculty.

Examines current topics in studies of animal viruses, including some comparisons with plant viruses where similar mechanisms apply. Selected topics are examined in depth, including the structures of viruses and their components, viral nucleic acids and replication strategies, details of the interactions between viruses and their host cell components and metabolism. Other topics include the evolution and selection of viruses, novel approaches to the prevention of virus infection, and methods for antiviral chemotherapy.

VETMI 705(7050) Advanced Immunology (also BIO G 705[7050]; Graduate)

Spring. 3 credits. Prerequisite: VETMI 315 or permission of instructor. Letter grades only. Offered even-numbered years. J. Marsh and staff.

Coverage at an advanced level of molecular and cellular immunology.

VETMI 707(7070) Advanced Work in Bacteriology, Virology, and Immunology (Graduate)

Fall, spring. 1-3 credits. Prerequisite: permission of instructor. S-U grades optional. Microbiology staff.

Designed primarily for graduate students with a good background in pathogenic microbiology and immunology. May be elected by veterinary students who are properly prepared.

VETMI 712(7120) Seminars in Infection and Immunity

Fall, spring. 1 credit. Requirement for graduate students in Department of Microbiology and Immunology and field of immunology. S-U grades only. D. Russell. Invited speakers in immunology and infection biology acquaint students with current advances in the field.

VETMI 713(7130) Biological and Biomedical Sciences Program—Teaching Experience

Fall, spring. 1 credit. Requirement for first-year graduate students. S-U grades only. D. G. Russell.

All graduate students who are a part of the Biological and Biomedical Sciences Program must complete this 1-credit teaching experience. The goal is for each graduate student to increase his or her knowledge in a biology area and simultaneously increase confidence in his or her teaching abilities. Specific teaching assignments are administered through the CVM's Office of Graduate Education. A faculty mentor provides ongoing feedback throughout the experience.

[VETMI 719(7190) Immunology of Infectious Diseases (also BIO G 706[7060]; Graduate)

Spring. 2 credits. Prerequisite: VETMI 315 or permission of instructor. S-U grades optional. Offered odd-numbered years. E. Y. Denkers and staff.

Focuses on molecular and cellular mechanisms underlying the immunity to infectious diseases caused by viral, bacterial, protozoan, and helminth pathogens. Topics include immune response initiation; antigen presentation pathways; Th1 and Th2 cytokines in protection and pathology; mechanisms of cytotoxicity; immune evasion strategies; vaccines. Lectures are based on recent advances in the field and are accompanied by relevant readings from the current literature.]

VETMI 723(7230) Current Topics in Immunology

Fall, spring. 1 credit. Registration each semester required of field of immunology graduate students. Prerequisite: graduate standing. S-U grades only. Immunology faculty.

Immunology discussion group in which students present research papers from the contemporary scientific literature.

VETMI 725(7250) Mechanisms of Microbial Pathogenesis (also BIOMI 725[7250])

Spring. 3 credits. Prerequisites: BIOMI 404, 409, 417 or equivalent course; written permission of instructor for undergraduates. Letter grades only. D. Debbie, M. Hesse, H. Marquis, J. Parker, M. Scidmore, and G. Whittaker.

Covers the mechanisms of pathogenesis of bacteria, fungi, parasites, and viruses. Addresses the need for a course covering the breadth of microbial pathogenesis. Emphasizes, at the molecular and cellular levels, the methods microbial pathogens use to enter, survive, and cause damage to their hosts. By studying the molecular mechanisms of all the major microbial pathogens together, students will be able to appreciate the commonality of pathogenic mechanisms as well as see the unique properties of each group of organisms. The contribution of the host response to the pathogenesis process will be covered, but in less detail as

this information is addressed in VETMI 719 Immunology of Infectious Diseases.

VETMI 737(7370) Advanced Work in Animal Parasitology (Graduate)

Fall, spring. 1–3 credits. Prerequisite: advanced undergraduate, graduate, and veterinary students. Letter grades only. D. D. Bowman and other faculty. Intended for advanced undergraduate, graduate and veterinary students with interests in parasitology research.

VETMI 770(7700) Advanced Work in Avian Diseases (Graduate)

Fall, spring. 1–3 credits. Letter grades only. Times TBA. K. A. Schat.

VETMI 772(7720) Advanced Work in Aquatic Animal Diseases (Graduate)

Fall, spring. 1–3 credits. S-U grades only. Times TBA. P. R. Bowser.

VETMI 773(7730) Advanced Work in Avian Immunology

Fall, spring. Variable credit. Letter grades only. K. A. Schat.

VETMI 783(7830) Seminars in Parasitology (Graduate)

Fall, spring. 1 credit. Prerequisite: veterinary or graduate students or permission of instructor. S-U grades only. D. D. Bowman.

Seminar series designed to acquaint students with current research in the field of parasitology. The range of topics is determined, in part, by the interests of those participating and may include such topics as the ecology of parasitism, parasite systematics, wildlife parasitology, and parasitic diseases of plants and animals, including humans.

Molecular Medicine**[VETMM 299(2990) Undergraduate Research in Pharmacology**

Summer, six-week session. 3 to 6 credits; minimum 120 hours of lab time expected per 3 credits. Prerequisites: one year basic biology (score of 5 on Biology Advanced Placement Examination of College Entrance Examination Board or BIO G 100 level). Letter grades only. R. A. Cerione.

Mentored research apprenticeship program designed to give laboratory experience to qualified unmatriculated high school students (participating in Cornell Summer College) or Cornell underclassmen. Students are placed in a research laboratory with a designated project under the direct supervision of a research associate (upper-level graduate student, post-doc, or faculty member). Students are graded on preparation, participation in laboratory academic life, and appropriate acquisition of techniques. At the end of the session, students are expected to give brief (15- to 20-minute) oral presentations of their work and submit a manuscript in a form suitable for publication. The faculty director of the laboratory has ultimate responsibility for evaluating the student's work and assigning the grade.]

VETMM 470(4700) Biophysical Methods (also AEP/BIOMB 470[4700])

Fall. 3 credits. Prerequisite: permission of instructor. Prerequisite: basic knowledge of physics and mathematics. Recommended: some knowledge of physical chemistry, molecular and cell biology, or neurobiology. Letter grades only. M. Lindau.

Overview of the diversity of modern biophysical experimental techniques used in the study of biological systems at the cellular and molecular level. Topics include light microscopy, fluorescence microscopy, Fourier optics and image processing, confocal and multiphoton microscopy, phase contrast, electron microscopy, X-ray diffraction and protein structure determination, multidimensional NMR, spectroscopy, calcium measurements, resonance energy transfer, membrane biophysics, electrophysiology, ion channels, action potentials, ligand-gated channels, fluctuation analysis, patch-clamp, molecular biology of ion channels, rapid kinetics, caged compounds, transmitter release, capacitance measurements, amperometry, optical traps, and molecular force measurements. The course is intended for students in the engineering, physics, chemistry, and biological disciplines who seek an introduction to modern biophysical experimental methods.

VETMM 571(5710) Biophysics Methods Advanced Laboratory (also AEP 571[5710])

Spring, taught daily during first three weeks of Jan. 3 credits. Prerequisites: VETMM 470. S-U grades optional. Times TBA. M. Lindau. For description, see AEP 571.

[VETMM 610(6100) Cellular and Molecular Pharmacology

Fall. 2 credits. Prerequisite: permission of instructors. S-U grades optional. Offered even-numbered years. C. M. S. Fewtrell and field of pharmacology faculty. Graduate-level course surveying the molecular and cellular aspects of receptor mechanisms, signaling pathways, and effector systems. Topics include drug-receptor interactions; ligand- and voltage-gated ion channels; G protein pathways; growth factor signaling; calcium; nutrient and nitric oxide signaling; mechanisms of receptor-mediated effects on neural excitability, electrical pacemakers, muscle contraction, gene expression; and chemotherapy, including antimicrobial agents and cancer chemotherapy.]

VETMM 611(6110) Systems Pharmacology

Spring. 2 credits. Prerequisite: permission of instructors. S-U grades optional. Offered even-numbered years. C. M. S. Fewtrell and field of pharmacology faculty. Graduate-level course surveying system- and organ-related aspects of pharmacology. Topics include drug disposition; pharmacokinetics; autonomic pharmacology; central nervous system pharmacology; pharmacology of inflammation, allergy, and platelet function; and cardiovascular, gastrointestinal, and endocrine pharmacology.

VETMM 700(7000) Calcium as a Second Messenger in Cell Activation

Spring. 2 credits. Prerequisite: permission of instructor. Lec-disc. S-U grades only. Offered even-numbered years. C. M. S. Fewtrell.

Focuses on regulation of intracellular calcium and techniques for studying calcium movements and distribution in cells. Topics include calcium channels and exchangers, calcium-binding proteins, and calcium stores; phosphatidylinositol turnover, release of calcium from intracellular stores, and activation of calcium influx; calcium gradients and oscillations; mechanisms of

exocytosis and the proteins involved. Each topic is introduced with a lecture followed by discussion of recent papers from the literature.

[VETMM 701(7010) Organ-System Toxicology]

Fall. 1 credit. Prerequisite: graduate students in environmental toxicology. S-U grades only. Offered even-numbered years. W. S. Schwark.

Minicourse on molecular mechanisms involved in chemical toxicity. Considers specific examples of toxicity in organ systems such as the nervous system, kidney, liver, respiratory tract, and cardiovascular system.]

[VETMM 703(7030) Receptor-Ligand Interactions]

Fall. 2 credits. Prerequisite: permission of instructors. S-U grades optional. Offered odd-numbered years. G. A. Weiland and R. E. Oswald.

Covers both the practical and theoretical tools for the study of ligand-receptor interactions, emphasizing the quantitative and physical chemical aspects of receptor theory. Topics discussed are basic methods of radioligand binding assays, including separation and measurement of bound and free ligand; characterization of receptor function; analysis of receptor structure; thermodynamic basis of the binding; methods of analyzing equilibrium binding; equilibrium binding for complex binding mechanisms; and kinetics of simple and complex binding mechanisms.

VETMM 704(7040) CNS Synaptic Transmission

Fall. 2 credits. Limited to 20 students. Prerequisite: senior or graduate standing; permission of instructor. S-U grades optional. Offered odd-numbered years. L. M. Nowak.

Survey course in vertebrate central nervous system physiology and pharmacology, that focuses on mechanisms of neuro-transmitter action at the membrane and cellular levels. Roles of selected neurotransmitters in normal brain and neurological disorders are covered. Topics are introduced in lectures and followed up by discussions of recent journal articles.

VETMM 705(7050) Chemistry of Signal Transduction

Fall. 2 credits. S-U grades optional. Offered odd-numbered years. R. A. Cerione.

Focuses on the mechanisms of action of GTP binding proteins. Examines several receptor-coupled signaling systems, including adenylyl cyclase, vertebrate vision, phosphatidylinositol lipid turnover, receptor systems regulating various ion channels, and receptors involved in cell growth regulation.

VETMM 706(7060) Growth Factor-Coupled Signaling (also BIOBM 734(7340))

Fall. 0.5 credit. Prerequisite: permission of instructor. S-U grades optional. Offered odd-numbered years. R. A. Cerione.

The general theme of this course is mitogenic signaling pathways. Receptor tyrosine kinases, src, ras, and ras-regulatory proteins are covered.

VETMM 707(7070) Protein NMR Spectroscopy (also BIOBM 730(7300))

Spring. 2 credits. Prerequisites: CHEM 389 and 390 or 287 and 288 or permission of instructor. S-U grades optional. Offered odd-numbered years. R. E. Oswald and L. K. Nicholson.

The student acquires the tools necessary for in-depth understanding of multidimensional, multinuclear NMR experiments. Schemes for magnetization transfer, selective excitation, water suppression, decoupling, and others are presented. The application of these techniques to proteins for resonance assignments, structure determination, and dynamics characterization is studied.

VETMM 709(7090) Topics in Cancer Cell Biology

Fall and spring. 0.5-1 credit per sec. Prerequisite: graduate standing. S-U grades optional. Offered odd-numbered years. Students may select modules (sections) of interest to them. B. U. Pauli.

Sec 1—Cell Adhesion Molecules, Signaling, and Cancer

Spring. 0.5 credit. J. Guan.
Introduces the role of cell adhesion receptors in cancer. Emphasis is on the integrin and cadherin families of cell adhesion molecules and their roles in signal transduction and cancer. Topics include the structure and function of integrins, integrin interactions with cytoskeleton, intracellular signaling pathways in cell-matrix interactions, integrin-mediated signaling in cell migration, proliferation and survival, changes of integrins in tumors and metastasis, structure and function of cadherins, signaling mechanisms in cell-cell interactions in normal development and cancer.

Sec 2—Cell-Cycle Analysis

Fall and spring. 1 credit. A. Yen.
Presents graduate students with methods for cell-cycle analyses that will be useful in their research. Includes a brief historical review of the cell cycle; a summary of cell-cycle regulatory processes; and practical methods for cell-cycle analysis, including mathematical representations. Topics include growth control of bacterial cell cycle including chemostats, mammalian cell tissue culture, cell synchronization, flow cytometry, age-density representation, G1 regulation, labile regulatory protein models, cell transformation, regulation by growth factors and the cytoskeleton, cyclin/E2F/RB regulatory model, practical examples for analysis of cell-cycle phase durations, cell-cycle phase specific growth factor sensitivity, timing of RB protein phosphorylation within the cell cycle.

Sec 3—Principles of Metastasis

Fall or spring. 0.5 credit. B. U. Pauli.
Discusses the molecular basis of cancer progression leading to metastasis (clonal evolution of metastatically competent cancer cells: contribution of specific oncogenes and tumor suppressor genes); the routes of metastatic spread; the process of intravasation emphasizing the roles of matrix-degrading proteases and angiogenesis; host effect on circulating cancer cells: immunological and hemodynamic considerations; organ-preference of metastasis: the roles of tumor cell/endothelial cell adhesion receptor/ligand pairs; chemokines and chemokine receptors; extracellular matrix components; etc.; emergence of micrometastases: the roles of adhesion-and/or chemokine-mediated

signaling in intravascular growth promotion of arrested cancer cells; and, animal model of metastasis and anti-metastasis treatment strategies.

Sec 4—Angiogenesis in Normal Development, Cancer, and Other Diseases

Fall. 0.5 credit. B. U. Pauli.

Topics include vasculogenesis versus angiogenesis; tumor angiogenesis: the angiogenic switch; molecular and cellular principles of tumor vessel formation; structure and function of tumor vessels, e.g., chaotic architecture and blood flow; high vascular permeability; altered endothelial surface markers; paracrine- and perfusion-driven tumor growth stimulus; role of hematopoietic stem cells in promoting tumor angiogenesis; angiogenesis in non-neoplastic disease: hypoxia-driven pathological angiogenesis and vascular remodeling; inflammation-induced angiogenesis and vascular remodeling (special emphasis: wound healing); and therapeutical perspectives: promises and problems.

Sec 5—Current Topics in Oncogenic Viruses

Fall. J. Casey.

Sec 6—Growth Factor-Coupled Signaling (also VETMM 706(7060))

Fall. 0.5 credit. R. Cerione.

The general theme is mitogenic signaling pathways. Covers receptor tyrosine kinases, src, ras, and ras-regulatory proteins.

VETMM 720(7200) Patch-Clamp Techniques in Biology

Spring, daily during second and third weeks of Jan. 2 credits. S-U grades only. Times TBA. L. M. Nowak.

Students learn theoretical background for patch-clamp studies in morning lectures. The experimental techniques of conventional and permeabilized patch whole-cell recording and single-channel recordings in cell-attached and -excised membrane patches are taught in 15 hours of afternoon laboratory instruction per student. Lab training sessions are arranged individually throughout the spring semester.

VETMM 730(7300) Graduate Research in Pharmacology or Molecular Medicine

Fall, spring, and summer. 1-12 credits. May not be used to fulfill formal course requirements for field of pharmacology. Prerequisite: permission of instructor. S-U grades only.

Offered by individual faculty members in the Department of Molecular Medicine and the graduate field of pharmacology for graduate students undertaking research toward M.S. or Ph.D. degrees.

VETMM 740(7400) Special Projects and Research in Pharmacology

Fall, spring, and summer. 1-3 credits each topic. May not be used to fulfill formal course requirements for field of pharmacology. Letter or S-U grades. Times TBA. Field of pharmacology faculty.

Enables students to undertake research in an area related to the research interests of a faculty member in the graduate field of pharmacology. Topics include but are not limited to Mechanisms of Growth-Factor Action—R. A. Cerione; The Role of Calcium in Stimulus-Secretion Coupling—C. M. S. Fewtrell; Mechanisms of Neurotransmitter Release—M. Lindau; Central Nervous System Neurotransmitters—L. M. Nowak; Structure-Function of the Nicotinic Acetylcholine Receptor—R. E. Oswald.

VETMM 760(7600) Directed Readings in Pharmacology

Fall, spring, and summer. 1-3 credits each topic. Letter or S-U grades. Reading and disc. Times TBA. Field of pharmacology faculty.

Individual members of the graduate field of pharmacology offer directed readings and discussions on pharmacological topics to small groups or to individual students. Topics include but are not limited to Receptor Mechanisms—G. A. Weiland; Biochemical Neuropharmacology—G. A. Weiland; Amino Acid Neurotransmitters—L. M. Nowak; Stimulus-Secretion Coupling—C. M. S. Fewtrell; Cell Calcium—C. M. S. Fewtrell.

Population Medicine and Diagnostic Sciences**VTPMD 299(2990) Undergraduate Research in Epidemiology**

Fall, spring, and summer. 3 credits; minimum 120 hours of lab time expected per 3 credits. Prerequisite: undergraduate standing; one year of basic biology (score of 5 on Biology Advanced Placement Examination of College Entrance Examination Board or BIOG 100 level) or permission of instructor. J. Scarlett, H. Erb, Y. Grohn, L. Warnick, H. Mohammed, and Y. Schukken.

Mentored research apprenticeship program designed to give laboratory experience in applied epidemiology to qualified unmatriculated high school students (participating in Cornell Summer College) or Cornell underclassmen. Students are placed in a research laboratory with a designed project under the direct supervision of a research associate (upper-level graduate student, post-doc, or faculty member). Students are graded on preparation participation in laboratory academic life and appropriate acquisition of techniques. At the end of the six-week session, they are expected to give a brief (15- to 20-minute) oral presentation on their work and submit a manuscript in a form suitable for publication. The faculty director of the laboratory has ultimate responsibility for evaluating each student's work and assigning the grade.

VTPMD 664(6640) Introduction to Epidemiology (Graduate)

Fall. 3 credits. Co-requisite: BTRY 601 (College of Agriculture and Life Sciences) or permission of instructor. S-U grades optional. H. N. Erb.

Lectures and discussion deal with the fundamentals of epidemiology. Topics include outbreak investigation, causal association, data quality, the design and ethical constraints of clinical trials, and infectious-disease epidemiology.

VTPMD 665(6650) Study Designs (Graduate)

Spring. 2 credits. Prerequisites: VTPMD/VETCS 664 and BTRY 601 (College of Agriculture and Life Sciences). S-U grades optional. H. O. Mohammed.

Design and interpretation of cross-sectional, case-control, and cohort studies (including controlled clinical trial). Design issues include sample size, bias, and relative advantages and disadvantages. Course objectives are (1) to know the difference between different epidemiologic study designs and relative advantages and disadvantages of each; (2) given a problem (usually a field situation), be

able to design an appropriate epidemiologic study; (3) be able to effectively analyze and criticize published epidemiologic studies. Consists of lectures on the principles of epidemiologic study design and related issues (sample size calculations, validity and precision, and identification and minimizing of bias); basic analysis of epidemiologic data; and discussion of published epidemiologic studies. These studies include observational cohort studies (prospective and retrospective), cross-sectional studies, case-control studies, and hybrid studies (ambidirectional and other hybrid designs).

VTPMD 666(6660) Advanced Methods in Epidemiology (Graduate)

Fall. 3 credits. Prerequisites: VTPMD/VETCS 665 and BTRY 602 (College of Agriculture and Life Sciences). S-U grades optional. Y. T. Grohn.

Concepts introduced in VTPMD 664 and 665 are developed further, with emphasis on statistical methods. Topics include interaction, effect modification, stratified analysis, matching and multivariate (logistic regression) methods, survival analysis, and strategies for the analysis of epidemiologic data.

VTPMD 700(7000) Special Projects in Diagnostic Endocrinology

Fall, spring. 1-3 credits. Prerequisite: permission of instructor. Recommended: AN SC 427. Letter grades only. N. J. Place.

Independent study course. Students have the opportunity to research a particular topic in diagnostic/clinical endocrinology of animals.

VTPMD 701(7010) Special Projects in Infectious Diseases

Fall, spring. 1-3 credits. Prerequisite: permission of instructor. S-U grades optional. Diagnostic laboratory faculty.

Provides laboratory experience with attention to specific aspects of infectious disease problems.

VTPMD 702(7020) Special Topics in Infectious Diseases

Fall, spring. 1-3 credits. Prerequisite: permission of instructor. S-U grades optional. Diagnostic laboratory faculty.

Offers a broad exposure to various aspects of infectious diseases.

VTPMD 704(7040) Master's-Level Thesis Research (Graduate)

Fall, spring. 1-3 credits. Prerequisite: permission of instructor. S-U grades only. Diagnostic Laboratory faculty.

Research leading to an M.S. degree.

[VTPMD 707(7070) Clinical Biostatistics (Graduate)]

Spring. 2 credits. Minimum enrollment 2; maximum 15. Prerequisite: veterinary residents and graduate students. Letter grades only. Offered odd-numbered years. J. M. Scarlett, H. N. Erb and H. O. Mohammed.

Explains the theory behind and interpretation of parametric and nonparametric statistical techniques commonly used in research/clinical medicine. Students analyze small data sets using a commercial statistical-software package.]

VTPMD 708(7080) Epidemiology Seminar Series (Graduate)

Fall, spring. 1 credit. S-U grades only. Epidemiology faculty.

Discusses advanced theoretical and analytical epidemiologic concepts and techniques.

VTPMD 766(7660) Graduate Research (Graduate)

Fall, spring, summer. Credit and times TBA. Prerequisite: master's and Ph.D. students; permission of graduate faculty member concerned. S-U grades only. Epidemiology faculty.

Enables students outside the section of epidemiology to receive graduate research credits for projects with epidemiological components.

VTPMD 769(7690) Doctoral-Level Thesis Research

Fall, spring, and summer. Credits and times TBA. Prerequisite: master's and Ph.D. students in epidemiology. S-U grades only. Epidemiology faculty.

Enables students in the section of epidemiology to receive graduate research credits for their doctoral research.

VTPMD 799(7990) Independent Studies in Epidemiology

Fall, spring. 1-3 credits. H. N. Erb, Y. T. Grohn, H. O. Mohammed, and J. M. Scarlett.

The purpose of this course is to investigate an epidemiologic topic with one of the instructors. It provides experience in problem definition, research design, and the analysis of epidemiologic data.

FACULTY ROSTER

- Abou-Madi, Noha, D.V.M., U. of Montreal (Canada). Lec., Clinical Sciences
Ainsworth, Dorothy M., Ph.D., U. of Wisconsin, Madison. Prof., Clinical Sciences
Alcaraz, Ana, D.V.M., U. Autonomía Natl. de México. Lec., Biomedical Sciences
Antczak, Douglas F., Ph.D., U. of Cambridge (England). Dorothy Havemeyer McConville Professor of Equine Medicine, Microbiology, and Immunology
Appel, Max J., Ph.D., Cornell U. Prof. Emeritus, Microbiology and Immunology
Appleton, Judith A., Ph.D., U. of Georgia. Alfred H. Caspary Professor, Microbiology and Immunology
Baines, Joel, Ph.D., Cornell U. Prof., Microbiology and Immunology
Balkman, Cheryl, D.V.M., Cornell U. Lec., Clinical Sciences
Barr, Stephen C., Ph.D., Louisiana State U. Prof., Clinical Sciences
Bedford-Guaus, Sylvia J., LV (Vet Med Degree), U. Autonomía de Barcelona (Spain). Asst. Prof., Clinical Sciences
Behr, Melissa J., D.V.M., U. of Illinois. Prof., Population Medicine and Diagnostic Sciences
Beyenbach, Klaus, Ph.D., Washington State U. Prof., Biomedical Sciences
Bezuidenhout, Abraham J., D.V.M., U. of Pretoria (South Africa). Sr. Lec., Biomedical Sciences
Bischoff, Karyn L., D.V.M., U. of Illinois. Prof., Population Medicine and Diagnostic Sciences
Bloom, Stephen E., Ph.D., Pennsylvania State U. Prof., Microbiology and Immunology
Bowman, Dwight D., Ph.D., Tulane U. Prof., Microbiology and Immunology
Bowser, Paul R., Ph.D., Auburn U. Prof., Microbiology and Immunology
Buckles, Elizabeth L., D.V.M., Ohio State U. Asst. Prof., Biomedical Sciences

- Casey, James W., Ph.D., U. of Chicago. Assoc. Prof., Microbiology and Immunology Center, Sharon A., D.V.M., U. of California, Davis. Prof., Clinical Sciences
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