Mizzou
University of Missouri

Veterinary Pathobiology (V_PBIO)

V_PBIO 1500: The Microbial World
This is a course for students who are not science majors. It is designed to acquaint students with some microbial activities which affect their lives. It includes the historical development of microbiology, structures of bacteria, viruses, and fungi, the basic principles of microbial growth, disinfection and sterilization, antibiotics and antibiotic resistance, infection, and immunity, probiotics and microbiomes, public health, and commercial, agricultural, and industrial uses of microorganisms. The lab covers basics of microscopy, culture and identification of bacteria, microbial ecology, and antibiotic resistance. Not open to students with any credit in microbiology.

Credit Hours: 5
Recommended: High School biology

V_PBIO 2010: Fundamentals of Microbiology
This course, which is designed for microbiology or life sciences majors, provides an overview of the classification, structure, metabolism, genetics, and isolation and identification of the principal groups of bacteria. Additional topics to be covered include an introduction to viruses, protozoa, and fungi, the nature of infectious diseases, and the immune response. Graded on A-F basis only.

Credit Hours: 3
Recommended: BIO_SC 1500 or equivalent

V_PBIO 2011: Fundamentals of Microbiology Laboratory
This laboratory course, which is designed for microbiology or life sciences majors, provides an overview of the procedures used for isolation, characterization, and identification of microbes. This laboratory course is intended to provide students with a broad background in microbiology laboratory practice and theory. Students will learn fundamentals of light microscopy, bacterial culture techniques, and methods to isolate and identify microorganisms. Graded on A-F basis only.

Credit Hours: 2
Prerequisites or Corequisites: V_PBIO 2010 or equivalent

V_PBIO 2950: Undergraduate Research in Microbiology
Research for students in which independent research is less than 50% of total. Graded on S/U basis only.

Credit Hour: 1-3
Prerequisites: Departmental consent

V_PBIO 2950H: Honors Undergraduate Research in Microbiology
Honors Laboratory research for students in which independent research is less than 50% of total. Graded on A-F basis only. May be repeated for credit.

Credit Hour: 1-3
Prerequisites: Consent of instructor; Microbiology major; Honors eligibility required; course in Microbiology

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V_PBIO 3345: Fundamentals of Parasitology
This course will provide a basic understanding of protozoan and metazoan parasites as well as the vectors that transmit these parasites. Special emphasis will be placed on those parasites and vectors of major medical/veterinary consequence throughout the world. Because parasites cause significant morbidity and mortality throughout the world, the main focus of lectures will be on the biology and epidemiology of parasitic diseases and on the parasite-host association. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: BIO_SC 1030 or BIO_SC 1500 or consent of instructor

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V_PBIO 3345H: Fundamentals of Parasitology - Honors
This course will provide a basic understanding of protozoan and metazoan parasites as well as the vectors that transmit these parasites. Special emphasis will be placed on those parasites and vectors of major medical/veterinary consequence throughout the world. Because parasites cause significant morbidity and mortality throughout the world, the main focus of lectures will be on the biology and epidemiology of parasitic diseases and on the parasite-host association. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: BIO_SC 1030 or BIO_SC 1500 or consent of instructor; Honors eligibility required

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V_PBIO 3500HW: Issues in Vector-borne and Emerging Infectious Diseases - Honors/Writing Intensive
This writing intensive course will focus on vector-borne and emerging infectious diseases, with an emphasis on recent infectious diseases in the news and current issues related to this subject area. The lectures will include pathogen life cycles, ecology, and epidemiology along with discussion of such topics as vaccines, insecticide usage, novel vector control technologies, public health responses and other relevant issues. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: V_PBIO 2001 and V_PBIO 2010 or instructor's consent required. Honors eligibility required

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V_PBIO 3500W: Issues in Vector-borne and Emerging Infectious Diseases - Writing Intensive
This writing intensive course will focus on vector-borne and emerging infectious diseases, with an emphasis on recent infectious diseases in the news and current issues related to this subject area. The lectures

will include pathogen life cycles, ecology, and epidemiology along with discussion of such topics as vaccines, insecticide usage, novel vector control technologies, public health responses and other relevant issues. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: V_PBIO 2001 and V_PBIO 2010 or instructor consent required

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V_PBIO 3551: Introduction to Immunology I
Comprehensive introduction to the basic principles of immunology. The course is designed for undergraduates majoring in biology, biochemistry or health professions. Introduction to cells and organs of the immune system, innate and adaptive immunity, development, activation and effector functions of lymphocytes, hypersensitivity, host response to infection and vaccination, autoimmunity and tumor immunology. Introduction to Immunology 1. Graded on A-F basis only.

Credit Hours: 3
Recommended: BIO_SC 2200 and BIO_SC 2300

V_PBIO 3554: Introduction to Virology
Comprehensive introduction to the basic principles of virology. The course is designed for undergraduates majoring in biology, biochemistry, or health professions. The course covers general virology including the molecular structure of viruses, the multiplication strategies of the major virus families, and viral latency, persistence, and oncology. The major families of the bacterial, plant, and animal viruses are discussed. Human viruses and infectious diseases are emphasized. Viral immunology, viral defenses, viral vaccines and antiviral compounds will also be addressed. Graded on A-F basis only.

Credit Hours: 3
Recommended: BIO_SC 3750 or V_PBIO 2001, BIO_SC 2300

V_PBIO 3557: Microbial Pathogenesis I
This course examines the relationships between microbes and their hosts that lead to human disease. Select bacterial, viral, parasitic and fungal pathogens will be discussed. Emphasis will be placed on the basic mechanisms of pathogenesis that lead to disease. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: V_PBIO 2001 or V_PBIO 2010 or BIO_SC 3750, or consent of instructor

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V_PBIO 3560: Microbial Physiology
The course will focus on introducing the basic principles of the functions and activities of microorganisms and we will discuss on the normal cellular mechanisms associated with growth, metabolism, reproduction and survival. The course will cover our understanding and knowledge about the way in which a living microorganism functions including all physical and chemical processes. We will also focus on anatomy i.e., physical characteristics, growth and living, metabolism, chemical processes and control functions and functional entities. Graded on A-F basis only.

Credit Hours: 3
Recommended: A course in microbiology or biochemistry or permission of the instructor

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V_PBIO 3600: Bacterial Genetics and Genomics
This course will provide undergraduate students with an understanding of bacterial genes, genomes and genetic systems that will serve as both a "stand-alone" course as well as one that synergizes with courses taken by students pursuing degrees in Microbiology, Biochemistry, Biological Sciences, Food Science, Animal Sciences, Health Professions or students interested in the "One Health" paradigm. The course covers diverse aspects of bacterial genetics and genomics, beginning with asking "what is a gene?" through understanding how this genetic information is stored and processed into biological function in a highly regulated manner. The course will also familiarize students with the discoveries that have powered the field of molecular biology (e.g. cloning, DNA sequencing and CRISPR-mediated gene editing) to current cutting-edge research that is driving advances at the interface of microbial science and engineering, as well as microbiomes. Knowledge gained by completion of this course will be of value to those interested in basic microbiology, bacterial pathogenesis, environmental and food microbiology. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: V_PBIO 2001, V_PBIO 2010 or BIO_SC 3750 or equivalent

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V_PBIO 3650: Applied Microbiology and Biotechnology
Introduction to the basic principles of molecular microbiology in relation to the industrial applicability. The course will focus on microorganisms commonly used in industrial microbiology and biotechnology with an emphasis on the biological and molecular basis of productivity. We will also focus on nutrition of industrial organisms and metabolic pathways for the biosynthesis of industrial microbiology products such as engineered or designer proteins, antibiotics and products of medical importance. Manipulation of the genome of industrial organisms will be discussed in the context of making beneficial products. Graded on A-F basis only.

Credit Hours: 3
Recommended: BIO_SC 3750 or V_PBIO 2001 or a course in microbiology

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V_PBIO 3658: Public Health Microbiology
Epidemiology of transmissible diseases including pathogenic characteristics of the infectious organism, modes of transmission, mechanism of infection, diagnostic aids, effective treatments, immunizing procedures, and methods of preventing infection. Subjects covered will include emerging infectious diseases, vector borne diseases, control of infectious human disease, water and food borne disease, zoonotic diseases, sexually transmitted diseases and antibiotic resistance. Graded

on A-F basis only. Recommended: One of the following courses: V_PBIO 2001, BIO_SC 3750, MICROB 2800, or MICROB 3200.

Credit Hours: 3
Prerequisites: BIO_SC 1500 or equivalent

V_PBIO 3700: Medical and Veterinary Entomology
Ecology and systematics of arthropods that affect the health of animals and people, including insect and tick vectors of pathogens causing tropical and temperate diseases such as African sleeping sickness, anaplasmosis, babesiosis, bartonellosis, Chagas' disease, chikungunya, dengue, ehrlichiosis, filariasis and heartworm disease, leishmaniasis, Lyme disease, malaria, mosquito-borne encephalitis, plague, rickettsiosis, theileriosis, tick-borne encephalitis and yellow fever. Emphasis will be placed on arthropod identification and effects of arthropods and arthropod-borne pathogens on vertebrate hosts. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: BIO_SC 1030 or BIO_SC 1500 or consent of instructor
Recommended: V_PBIO 3345 or PLNT_SCI 3710

V_PBIO 3700H: Medical and Veterinary Entomology - Honors
Ecology and systematics of arthropods that affect the health of animals and people, including insect and tick vectors of pathogens causing tropical and temperate diseases such as African sleeping sickness, anaplasmosis, babesiosis, bartonellosis, Chagas' disease, chikungunya, dengue, ehrlichiosis, filariasis and heartworm disease, leishmaniasis, Lyme disease, malaria, mosquito-borne encephalitis, plague, rickettsiosis, theileriosis, tick-borne encephalitis and yellow fever. Emphasis will be placed on arthropod identification and effects of arthropods and arthropod-borne pathogens on vertebrate hosts. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: BIO_SC 1030 or BIO_SC 1500 or consent of instructor; Honors eligibility required
Recommended: V_PBIO 3345 or PLNT_SCI 3710

V_PBIO 3900: Beneficial Microbes
This course will bring together topics in environmental microbiology (such as microbial photosynthesis and nutrient cycling, bioremediation), human and animal health (for example, the role of the microbiome in health and disease prevention, probiotics, vaccines), food preservation and flavoring, biofuel production, plant growth/disease protection and utilization of microbe-derived tools in molecular genetics (for example, restriction enzymes and CRISPR/Cas editing). Knowledge gained by completion of this course will be of value to those interested in basic microbiology, human and animal health and disease, environmental, industrial and food microbiology. Graded on A-F basis only.

Credit Hours: 3
Recommended: V_PBIO 2010 or BIO_SC 3750 or equivalent Microbiology Course

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V_PBIO 3900W: Beneficial Microbes - Writing Intensive
This course will bring together topics in environmental microbiology (such as microbial photosynthesis and nutrient cycling, bioremediation), human and animal health (for example, the role of the microbiome in health and disease prevention, probiotics, vaccines), food preservation and flavoring, biofuel production, plant growth/disease protection and utilization of microbe-derived tools in molecular genetics (for example, restriction enzymes and CRISPR/Cas editing). Knowledge gained by completion of this course will be of value to those interested in basic microbiology, human and animal health and disease, environmental, industrial and food microbiology. Graded on A-F basis only.

Credit Hours: 3
Recommended: V_PBIO 2010 or BIO_SC 3750 or equivalent Microbiology Course

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V_PBIO 4500: Fundamentals of High-Containment Microbiology Operations and Research
This course is designed to provide a basic understanding of microbiological research conducted in high-containment microbiology laboratories. Special emphasis will be placed on topics in microbiological research of major medical/veterinary infectious diseases of high consequence throughout the world. Because these infectious diseases cause significant morbidity and mortality worldwide and have zoonotic potential, they must be handled with special precautions in biosafety level three facilities. The focus will be on the biology and epidemiology of paradigm diseases and on the special procedures, facilities and equipment used to conduct infectious disease research. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: V_PBIO 2001 or V_PBIO 2010 or BIO SC 3750 and MICROB 2800 or MICROB 3200 or V_PBIO 3658 or Instructor consent required
Recommended: A separate 1-hour laboratory course is offered and highly encouraged but not required

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V_PBIO 4510: Fundamentals of High-Containment Microbiology Operations and Research Laboratory
This laboratory course is designed to provide a hands-on experience of practices used in microbiological research conducted in high-containment microbiology laboratory. Because medical/veterinary infectious diseases can cause significant morbidity and mortality, they must be handled with special precautions within biosafety level three facilities. The focus of this laboratory is on the special procedures and equipment used to conduct infectious disease research at the Laboratory for Infectious Disease Research (LIDR), a biosafety level three laboratory on campus. Because students will be working in a biosafety level three facility, an expectation of medical fitness is expected; generally healthy persons with a current medical condition must disclose this information to determine if they need a medical evaluation prior to participating in the laboratory. This laboratory course is a prerequisite for obtaining a certificate in High Containment Microbiology Operations and Research. Graded on A-F basis only.

Credit Hour: 1
Prerequisites or Corequisites: V_PBIO 4500

V_PBIO 4600: Host-Associated Microbiomes in Health and Disease
(cross-leveled with V_PBIO 7600). This course will provide a broad and comprehensive background on host-associated microbial communities such as the gut, dermal, and respiratory microbiotas. Course content will focus primarily, but not completely, on bacterial communities colonizing human and animal hosts, and each week will focus on a different topic within microbiome research. This course will also focus on the physiological role of host-associated microbial communities in health and disease-associated changes in composition and function, rather than the methodology used to characterize these communities or analyze the data. Nonetheless, students will gain a strong familiarity with sequencing platforms, methods, and common outcomes measures during this course. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: Introductory undergraduate course on basic medical microbiology (e.g., MICROB 3200 or equivalent)

V_PBIO 4600W: Host-Associated Microbiomes in Health and Disease - Writing Intensive
(cross-leveled with V_PBIO 7600). This course will provide a broad and comprehensive background on host-associated microbial communities such as the gut, dermal, and respiratory microbiotas. Course content will focus primarily, but not completely, on bacterial communities colonizing human and animal hosts, and each week will focus on a different topic within microbiome research. This course will also focus on the physiological role of host-associated microbial communities in health and disease-associated changes in composition and function, rather than the methodology used to characterize these communities or analyze the data. Nonetheless, students will gain a strong familiarity with sequencing platforms, methods, and common outcomes measures during this course. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: Introductory undergraduate course on basic medical microbiology (e.g., MICROB 3200 or equivalent)

V_PBIO 4787: Historical, Societal and Ethical Topics in Medicine and Biomedical Research
(cross-leveled with V_PBIO 7787). Advances in medicine, genetics, reproduction and technologies underpinning biomedical research can have profound implications not only scientifically but in terms of societal and ethical impact. Using several historical events such as the establishment of the first immortal cell line, the Tuskegee syphilis study, the eugenics movement in the United States and the cloning of Dolly the sheep as starting points, we will explore the historical, societal and ethical context and issues surrounding these events and relate them to current ethical and moral questions that have been generated by recent scientific and medical progress. Graded on A-F basis only.

Credit Hours: 2
Prerequisites: junior or senior standing
Recommended: Successful completion of a general biology course

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V_PBIO 4950: Advanced Undergraduate Research in Microbiology
Research credit for students doing an independent microbiology research project under the guidance of a faculty member. Project must be arranged by student and faculty member prior to registration. May be repeated to a maximum of 6 hours. Student may choose the S/U grading option only if not using course to fulfill microbiology degree capstone and/or honors program requirements.

Credit Hour: 1-3
Prerequisites: Departmental consent
Recommended: Overall GPA of at least 2.75; 20 hours of Microbiology/Biological Sciences and/or Chemistry

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V_PBIO 4950H: Honors Advanced Undergraduate Research in Microbiology
Honors research credit for students doing an independent microbiology research project under the guidance of a faculty member. Project must be arranged by student and faculty member prior to registration. Graded on A-F basis only.

Credit Hour: 1-3
Prerequisites: instructor's consent; microbiology major; Honors eligibility required

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V_PBIO 4970: Capstone Undergraduate Research in Microbiology
Capstone research course for students doing an independent microbiology research project under the guidance of a faculty member. Project must be arranged by student and faculty member prior to registration. Includes presentation of the research as an oral presentation or poster at a scientific meeting OR writing up the research project in a scientific journal article format. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: 3 credit hours of V_PBIO 4950

V_PBIO 4970H: Honors Capstone Undergraduate Research in Microbiology
Three credit Capstone research course for students from the Honors College to conduct an independent microbiology research project under the guidance of a faculty member. Project must be arranged by student and faculty member prior to registration. Includes presentation of the research as an oral presentation or poster at a scientific meeting OR writing up the research project in a scientific journal article format. A research training plan and research project must be agreed to by the student and faculty mentor prior to the start of the semester. Graded on A-F basis only.

Credit Hours: 3

Prerequisites: Honors eligibility required, be a Microbiology major, have completed 3 credit hours of V_PBIO 4950 or V_PBIO 4950H, and have the approval of the faculty instructor

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V_PBIO 4980: Capstone Senior Seminar
Readings and critical evaluation of selected problems and theories in microbiology. Integrates perspectives, methods, and topics from undergraduate courses. Requires written and oral presentations. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: Microbiology major, senior standing, or instructor's consent

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V_PBIO 5511: Veterinary Immunology
Basic immunology techniques. Topics include innate and adaptive immunity, development of the immune system, induction and expression of the immune response, structure and function of antibodies, antigen-antibody reactions, the major histocompatibility complex, aspects of immunology in disease.

Credit Hour: 1.5

V_PBIO 5512: Veterinary Immunology
Continuation of V_PBIO 5511.

Credit Hour: 1.5

V_PBIO 5552: Veterinary Bacteriology with Laboratory
Classification and properties of pathogenic bacteria and fungi of animals; relationship to public health; considers pathogenesis, immunology of infection. Instructional period 5.

Credit Hours: 3
Prerequisites: enrollment in the College of Veterinary Medicine

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V_PBIO 5553: Veterinary Bacteriology II
Continuation of V_PBIO 5552. Instructional period 6.

Credit Hours: 2.5

V_PBIO 5554: Veterinary Virology
Classification and properties of viruses. Considers the etiologic, pathologic and immunologic aspects of viral diseases of animals. Instructional periods 6 and 7.

Credit Hours: 2.5
Prerequisites: enrollment in the College of Veterinary Medicine

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V_PBIO 5555: Epidemiology and Biostatistics with Laboratory
(cross-leveled with V_PBIO 8455). This course introduces students to methods of determining the influence of disease on populations and how this information is applied to individual animals. Biostatictics and evidence based medicine are also discussed in this course. The knowledge gained in this course is applied to reading professional literature during the course. Instructional period 4.

Credit Hours: 2

V_PBIO 5557: Veterinary Parasitology with Laboratory
(cross-leveled with V_PBIO 8457). Parasites and parasitic diseases of ruminants, horses, swine, dogs, cats, poultry and other animals. Includes classification, morphology, and bionomiics of protozoa, helminths, and arthropods. Instructional period 6.

Credit Hours: 3

V_PBIO 5558: Veterinary Public Health
In this course students are introduced to the wide range of veterinary involvement in maintaining and assuring human health, nationally and globally. Topics discussed include: agencies such as USDA, FDA, CDC, food safety and meat inspection, veterinary responsibility in identifying diseases, legal issues of drug use, and zoonotic diseases. Instructional period 7.

Credit Hours: 2

V_PBIO 5575: Veterinary Pathology with Laboratory
General Pathology. Tissue reactions to various disease agents in domestic animals. Instructional period 5.

Credit Hours: 3

V_PBIO 5576: Veterinary Systemic and Special Pathology with Laboratories
Special and systemic pathology. Tissue reactions to disease in special systems in domestic animals. Instructional period 6.

Credit Hours: 3

V_PBIO 5577: Veterinary Systemic and Special Pathology II with
Follows the general pathology and continues the systemic pathology taught in V_PBIO 5576. The course, consisting of daily lectures and weekly laboratories, covers disease, mainly in domestic animals, of the following systems or organs: cardiovascular, respiratory, lymphoid, cutaneous, mammary, ophthalmic, and otic. Instructional period 7.

Credit Hours: 3

V_PBIO 5578: Veterinary Clinical Pathology with Laboratory
Physiologic basis, interpretation and clinical application of laboratory assays in hematology, chemistry, cytology, and urinalysis, utilization of laboratory methods to define pathological states and to diagnose disorders of domestic animals. Instructional period 8.

Credit Hours: 3
Prerequisites: enrollment in College of Veterinary Medicine

V_PBIO 5579: Veterinary Genomics
Study of genomes, an organism's entire set of the genetic information. Used for detection of pathogen genomes, and markers for mutation causing inherited disease. Instructional period 5.

Credit Hour: 1

V_PBIO 5601: Animals in Emergencies & Basic Emergency Response Training for Vet Students
This course will enable veterinary and graduate students to understand their role in society during disasters and credential as responders. Graded on A-F basis only.

Credit Hour: 1
Prerequisites: Students must be enrolled in the College of Veterinary Medicine and pursuing a DVM degree or be a student pursuing an MPH degree. Instructor consent required for non-veterinary graduate students seeking MPH degrees

V_PBIO 5991: Introduction to Avian Medicine
Introduction to Avian Medicine

Credit Hour: 1

V_PBIO 5995: Foundations in Veterinary Research and Discovery
This course will introduce veterinary students to concepts of research including hypothesis development, experimental design, data interpretation, grantsmanship, responsible conduct of research, biomedical research careers and presentation and publication methods.

Credit Hours: 2

V_PBIO 6010: Laboratory Animal Medicine
Principles of Veterinary Medicine applied to laboratory animals as pets and in research. Husbandry, handling and clinical techniques, diseases, and use as disease models are discussed. Instructional period 8.

Credit Hour: 1.5

V_PBIO 6647: Pathology and Laboratory Diagnostics
Application of laboratory techniques used to diagnose disease by macroscopic, microscopic, biochemical, microbiologic, serological and toxicologic findings. Case method of teaching. Domestic and avian species. Six times yearly. Graded on A-F basis only.

Credit Hours: 8

V_PBIO 6676: Laboratory Animal Medicine and Management Elective
Elective offered 3rd- and 4th-year students, subject to approval of course coordinator and supervising faculty. Concentrated study/experience in laboratory animal disease(s)/colony management. Available to veterinarians as a continuing education program.

Credit Hour: 2-6

V_PBIO 6678: Epidemiology and Community Health
Elective covering advanced aspects of epidemiology and community health. Emphasizes problem solving and is designed to meet needs of the individual student. Instructional period arranged.

Credit Hour: 2-6
Prerequisites: V_PBIO 5558 or instructor's consent

V_PBIO 6679: Diagnostic Pathology and Special Species Medicine
Third- and fourth-year students. Elective. Approval of coordinator and supervisory staff. Continuation of V_PBIO 6647 with more depth. Available to D.V.M.'s as part of continuing education program.

Credit Hour: 2-6

V_PBIO 6684: Research Techniques in Veterinary Pathobiology
Research Techniques in Veterinary Pathobiology

Credit Hour: 1-6

V_PBIO 7110: Veterinary Cytology
(cross-leveled with BIOMED 4110, VET_TCH 4110). This course of Veterinary Cytology is designed to hone the skills of the practicing Veterinary Technician, Veterinary Student, or Veterinarian and assumes some basic knowledge of microscope usage and normal hematology. The review of normal cells will be minimal and emphasis will be placed on findings associated with inflammatory and neoplastic diseases. The graduate level course will include discussion of ancillary tests, special stains and treatment alternatives. The focus will be on canine and feline diseases but some common equine and bovine disease.

Credit Hours: 2

Prerequisites: DVM or equivalent degree or instructor's consent

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V_PBIO 7210: Animal Issues in Disasters
(cross-leveled with BIOMED 4210). Course provides a broad overview of the complex issues that arise when animals are present within a disaster impact area. The course includes information about the legal requirements for animal disaster response, how the existence of the human-animal bond influences human behavior during a disaster, and the common animal welfare and public health issues that arise during disasters. Students will use current information about disaster preparedness at pertinent websites to prepare individual emergency response plans for their families and animals. Additionally, students will complete 5 FEMA certifications associated with disaster response of animals. Finally, students will analyze appropriate literature to improve their preparedness for and response to a future disaster. Graded on A-F basis only.

Credit Hour: 1
Prerequisites: Admittance into MS in Biomedical Sciences, emphasis Veterinary Sciences or emphasis Veterinary Medicine and Surgery, or instructor's consent required

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V_PBIO 7600: Host-Associated Microbiomes in Health and Disease
(cross-leveled with V_PBIO 4600). This course will provide a broad and comprehensive background on host-associated microbial communities such as the gut, dermal, and respiratory microbiotas. Course content will focus primarily, but not completely, on bacterial communities colonizing human and animal hosts, and each week will focus on a different topic within microbiome research. This course will also focus on the physiological role of host-associated microbial communities in health and disease-associated changes in composition and function, rather than the methodology used to characterize these communities or analyze the data. Nonetheless, students will gain a strong familiarity with sequencing platforms, methods, and common outcomes measures during this course. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: Introduction to medical microbiology (e.g., MICROB 3200 or equivalent)

V_PBIO 7787: Historical, Societal and Ethical Topics in Medicine and Biomedical Research
(cross-leveled with V_PBIO 4787). Advances in medicine, genetics, reproduction and technologies underpinning biomedical research can have profound implications not only scientifically but in terms of societal and ethical impact. Using several historical events such as the establishment of the first immortal cell line, the Tuskegee syphilis study, the eugenics movement in the United States and the cloning of Dolly the sheep as starting points, we will explore the historical, societal and ethical context and issues surrounding these events and relate them to current ethical and moral questions that have been generated by recent scientific and medical progress. Graded on A-F basis only.

Credit Hours: 2
Prerequisites: Consent of Instructor

V_PBIO 8085: Teaching Practicum
Learning experience designed to develop and enhance teaching skills under the supervision of teaching mentors. May be taken more than once. Graded on S/U basis only.

Credit Hour: 1-6
Prerequisites: Instructor's consent

V_PBIO 8090: Thesis Research in Veterinary Pathobiology
Open to graduate students with requisite preparation. Research on specific animal diseases, prevention and treatment. Graded on a S/U basis only.

Credit Hour: 1-99

V_PBIO 8400: Histopathology Slide Seminar
Each semester Histopathology Seminar is held every Thursday between 9-10am in the Multi-head Microscope Room W114, Veterinary Medicine Building. Histology slides to be discussed are available the previous week in Veterinary Medical Diagnostic Lab (Room D117). Four histopathology cases are selected by the course coordinator (a veterinary anatomic pathologist). Interesting cases from MU Veterinary Medical Diagnostic Laboratory's necropsy/biopsy cases and The Joint Pathology Center (JPC) Wednesday Slide Conference cases (https://www.askjpc.org/wsco/index.php) are used. Veterinary pathology residents/graduate students must read those 4 histology slides and prepare descriptions before each seminar. Graded on S/U only.

Credit Hour: 1
Prerequisites: DVM or equivalent degree

V_PBIO 8401: Topics in Veterinary Pathobiology
Courses with lectures in various topics in veterinary pathobiology will be given on a trial basis, depending on faculty expertise and student demand. Credit hours are usually 1 or 3. Specialized topics will be covered.

Credit Hour: 1-99
Prerequisites: instructor's consent

V_PBIO 8402: Evidenced Based Medicine - Application from Literature Review
This course is designed to teach students how to assess best current evidence in their primary area of study and apply it to their ongoing research and to patient-based delivery of care. Students are instructed in all aspects of medical literature review and complete weekly assignments to demonstrate their learning. The assignments and discussions with the instructor(s) include determination of appropriate application of the knowledge gained.

Credit Hours: 3

V_PBIO 8403: Histopathology of Joint and Disc Degeneration
This course will focus on the degenerative/osteoarthritic changes seen in synovia, menisci, articular cartilage, subchondral bone, ligaments, fat pad, tendon and intervertebral discs in biped and quadruped animals. Scoring systems used to quantify these changes will be reviewed. Cases will be provided and discussed. Laboratories with hands-on dissection of joints and processing of tissues for histology will be offered. Graded on A-F basis only.

Credit Hours: 3
Prerequisites: Instructor's consent

V_PBIO 8404: Topics - Scientific Writing for Musculoskeletal Research
This course is designed to teach students how to write scientific abstracts, manuscripts, and grants in order to most effectively and successfully present, disseminate, and apply their research in the musculoskeletal field. Students are instructed in all aspects of scientific writing and complete weekly assignments to demonstrate their learning. The assignments and discussions with the instructor(s) include determination of appropriate application of the knowledge gained. Graded on A-F basis only.

Credit Hours: 3

V_PBIO 8410: Seminar in Veterinary Pathobiology
Discussion of current research methods in veterinary pathobiology.

Credit Hour: 1

V_PBIO 8431: Research Methods and Data Analysis
Specific assignments on diagnostic methods including surgical pathology, necropsies, toxicology.

Credit Hour: 2-4
Prerequisites: departmental consent

V_PBIO 8432: Advanced Histopathology
Advanced microscopic study of pathological tissues.

Credit Hours: 5
Prerequisites: departmental consent

V_PBIO 8434: Advanced Clinical Pathology
Lecture/tutorial teaching; pathogenesis of clinical laboratory abnormalities in the common domesticated species. Emphasis is placed on mechanisms of disease and pathophysiology of the changes seen in each organ system.

Credit Hours: 3
Prerequisites: departmental consent

V_PBIO 8435: Advanced Microscopy in Veterinary Clinical Pathology
Recognition and pathogenesis of abnormalities found via microscopic analysis of blood smears or cytology.

Credit Hour: 1
Prerequisites: V_PBIO 5578 and departmental consent; DVM or current enrollment in veterinary curriculum

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V_PBIO 8436: Pathogenic Mechanisms in Veterinary Pathobiology
This course is designed to prepare veterinary clinical and anatomic pathology residents for Phase I of the certifying board exam. There will be extensive reading from the relevant portions of Robbins and Cotran's Pathologic Basis of Disease, plus links to current general pathology review papers and occasional reference to Zachary's Pathologic Basis of Veterinary Disease. Assignments will focus on preparation of boards-style multiple choice questions, with the opportunity to review and critique your classmates' questions.

Credit Hours: 3
Prerequisites: DVM degree, instructor consent
Recommended: Current enrollment within a veterinary clinical or anatomic pathology residency

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V_PBIO 8439: Gross and Microscopic Pathology Examination and Interpretation
Specific assignments on gross and microscopic pathology examination including necropsies and surgical biopsies and their interpretation along with or without ancillary test results including cytology examination, CBC/Blood chemistry, bacterial culture, PCR testing, serology testing, fecal testing, and/or toxicology testing.

Credit Hour: 2-4
Prerequisites: Departmental consent

V_PBIO 8440: Pathology Journal Review
Critical review of the current veterinary pathology literature with a focus on ACVP board preparation. Grade on S/U basis only.

Credit Hour: 1
Prerequisites: DVM degree

V_PBIO 8445: Vectors and Vector-borne Diseases
This course will focus on arthropod vectors (insects and ticks) and the medically important pathogens / diseases that they transmit, including arboviruses, bacteria, protozoa and nematodes. An emphasis will be on the interactions between the vectors and disease-causing pathogens.

Topics include: introductions to systematics, anatomy, physiology, life cycles, and ecology of vectors and classification and biology of the pathogens responsible for such diseases as dengue, yellow fever, malaria, leishmaniasis, lymphatic filariasis, etc. The focus will be not only on specific pathogen-vector interactions but also on big picture topics / discussions of vector competence, insecticide resistance, vector control (including genetically modified insects) and other current issues in vector biology research. Students will learn how these important vector-borne diseases are transmitted, how they are spread and introduced into new regions, and what control strategies exist or are currently under development. Students will realize what impact vector-borne diseases have on global human and animal health as well as develop and hone critical thinking skills.

Credit Hours: 3
Prerequisites: Graduate standing in the Life Sciences

V_PBIO 8448: Molecular Methods in Nucleic Acids
The course will focus on the most recent developments in technology related to eukaryotic and prokaryotic molecular biology and as analysis a manipulation of nucleic acids and their application to define structure, function and biosynthesis of macromolecules.

Credit Hours: 3
Prerequisites: instructor's consent

V_PBIO 8450: Non-Thesis Research in Veterinary Pathobiology
Research not expected to terminate in dissertation.

Credit Hour: 1-99

V_PBIO 8451: Introduction to Immunology
Fundaments of immunology as applied to domestic animals.

Credit Hours: 3

V_PBIO 8452: Cell and Molecular Electron Microscopy
Lecture class that describes the use of electron microscopy (transmission and scanning) in biomedical research. Students receive hands-on experience by completing a laboratory project.

Credit Hours: 4

V_PBIO 8454: Domestic Animal Virology
Classification and properties of viruses. Considers the etiologic, pathologic and immunologic aspects of viral diseases of animals. Instructional periods 6.

Credit Hours: 2.5

V_PBIO 8455: Epidemiology and Biostatistics
Graduate level introduction to veterinary epidemiology and bio-statistics.

Credit Hour: 2-3

V_PBIO 8457: Animal Parasitology
(cross-leveled with V_PBIO 5557).

Credit Hour: 3-5

V_PBIO 8458: Veterinary Public Health
In this course students are introduced to the wide range of veterinary involvement in maintaining and assuring human health, nationally and globally.

Credit Hours: 2

V_PBIO 8552: Veterinary Pathogenic Bacteriology and Mycology I
This course deals with the bacterial pathogens of animals emphasizing the pathogenesis and pathology of the diseases, diagnostic problems, appropriate treatments and prevention measures. Course graded A-F only.

Credit Hours: 3
Prerequisites: instructor's consent

V_PBIO 8553: Veterinary Pathogenic Bacteriology and Mycology II
This course deals with the bacterial pathogens of animals emphasizing the pathogenesis and pathology of the diseases, diagnostic procedures, appropriate treatments and prevention measures. Graded on A-F basis only.

Credit Hours: 2.5
Prerequisites: V_PBIO 5552 or V_PBIO 8552 and instructor's consent

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V_PBIO 8601: Animals in Emergencies & Basic Emergency Response Training for Vet Students
This course will enable veterinary and graduate students to understand their role in society during disasters and credential as responders. Graded on A-F basis only.

Credit Hour: 1
Prerequisites: Students must be enrolled in the College of Veterinary Medicine and pursuing a DVM degree or be a student pursuing an MPH degree. Instructor consent required for non-veterinary graduate students seeking MPH degrees

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V_PBIO 8641: Introduction to Research Ethics
This course provides students with a brief overview of many of the ethical issues that confront today's scientist. It is important that scientist think about and develop their abilities to make well-reasoned responses to ethical problems.

Credit Hour: 1

V_PBIO 9085: Teaching Practicum
Learning experience designed to develop and enhance teaching skills under the supervision of teaching mentors. May be taken more than once. Graded on S/U basis only.

Credit Hour: 1-6
Prerequisites: Instructor's consent

V_PBIO 9090: Area Veterinary Pathobiology Dissertation Research
Dissertation Research for PhD students. May be repeated for credit. Graded on S/U basis only.

Credit Hour: 1-99
Prerequisites: departmental consent