**VETERINARY BIOMEDICAL SCIENCES (VBSC)**

**VBSC 5000 Master's Research and Thesis**  
**Prerequisites:** Graduate standing.  
**Description:** Research problem for meeting requirements of the Masters degree. Previously offered as VAPP 5000. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.  
**Credit hours:** 1-6  
**Contact hours:** Contact: 1-6 Other: 1-6  
**Levels:** Graduate, Professional  
**Schedule types:** Independent Study  
**Department/School:** Dean of Veterinary Med  

**VBSC 5010 Professional Skills for Biomedical Sciences**  
**Prerequisites:** Graduate student standing; consent of instructor.  
**Description:** Acquiring skills that are usually not taught in other courses but are essential to be successful in the graduate program as well as in a career in science. Writing and publishing a scientific paper, writing a successful grant proposal, preparing effective oral and poster presentations, and understanding professional ethics in the conduct of scientific research. Offered for variable credit, 1-3 credit hours, maximum of 3 credit hours.  
**Credit hours:** 1-3  
**Contact hours:** Contact: 1-3 Other: 1-3  
**Levels:** Graduate, Professional  
**Schedule types:** Independent Study  
**Department/School:** Dean of Veterinary Med  

**VBSC 5013 Veterinary Biomedical Sciences I**  
**Prerequisites:** Graduate standing and consent of instructor.  
**Description:** The course is designed to provide a comprehensive understanding of cellular and molecular biology including protein and DNA structure and function, gene regulation, membrane function and traffic, mitochondria, cytoskeleton, cell communication, cell cycle, cell death, and cell junctions, adhesion and extracellular matrix as well as other relevant topics.  
**Credit hours:** 3  
**Contact hours:** Lecture: 3 Contact: 3  
**Levels:** Graduate, Professional  
**Schedule types:** Lecture  
**Department/School:** Dean of Veterinary Med  

**VBSC 5023 Veterinary Biomedical Sciences II**  
**Prerequisites:** VMED 5013 or permission of the department.  
**Description:** Integrated applied biology and pathobiology of hosts and pathogens of veterinary interest including infectious disease processes; hemodynamics, inflammatory, immune and tissue repair responses; genetic, environmental, nutritional, and neoplastic disorders; and aging.  
**Credit hours:** 3  
**Contact hours:** Lecture: 3 Contact: 3  
**Levels:** Graduate, Professional  
**Schedule types:** Lecture  
**Department/School:** Dean of Veterinary Med  

**VBSC 5103 Biochemical and Molecular Toxicology**  
**Prerequisites:** Consent of instructor.  
**Description:** In-depth overview of biochemical and molecular mechanisms of interactions between exogenous chemicals and living systems. Transport, distribution, elimination and alteration of exogenous chemicals within the body and mechanisms whereby exogenous chemicals disrupt biochemical processes critical for cell/organ/organismal integrity and function. Same course as ITOX 5103.  
**Credit hours:** 3  
**Contact hours:** Lecture: 3 Contact: 3  
**Levels:** Graduate  
**Schedule types:** Lecture  
**Department/School:** Dean of Veterinary Med  

**VBSC 5110 Special Problems**  
**Prerequisites:** Graduate standing and consent of instructor.  
**Description:** Special research problems in the various fields of veterinary biomedical sciences. Previously offered as VIDP 5110. Offered for variable credit, 1-6 credit hours, maximum of 20 credit hours.  
**Credit hours:** 1-6  
**Contact hours:** Contact: 1-6 Other: 1-6  
**Levels:** Graduate, Professional  
**Schedule types:** Independent Study  
**Department/School:** Dean of Veterinary Med  

**VBSC 5123 Veterinary Histology**  
**Prerequisites:** Graduate student standing; consent of instructor.  
**Description:** Organization and structure of cells and tissues of domestic animals. Classroom/Lab Supply & Materials Fee of $20.00 applies. Same course as VMED 7123.  
**Credit hours:** 3  
**Contact hours:** Lecture: 2 Lab: 2 Contact: 4  
**Levels:** Graduate, Professional  
**Schedule types:** Lab, Lecture, Combined lecture and lab  
**Department/School:** Dean of Veterinary Med  

**VBSC 5134 Veterinary Physiology I**  
**Prerequisites:** Graduate standing and consent of instructor.  
**Description:** Molecular, cellular and organ system physiology. Establishing a base of knowledge and understanding requisite to subsequent courses. Same course as VMED 7114.  
**Credit hours:** 4  
**Contact hours:** Lecture: 2 Lab: 4 Contact: 6  
**Levels:** Graduate, Professional  
**Schedule types:** Lab, Lecture, Combined lecture and lab  
**Department/School:** Dean of Veterinary Med  

**VBSC 5143 Veterinary Physiology II**  
**Prerequisites:** Graduate standing and consent of instructor.  
**Description:** Molecular, cellular and organ system physiology. Establishing a base of knowledge and understanding requisite to subsequent courses. Same course as VMED 7113.  
**Credit hours:** 3  
**Contact hours:** Lecture: 3 Contact: 3  
**Levels:** Graduate, Professional  
**Schedule types:** Lecture  
**Department/School:** Dean of Veterinary Med
VBSC 5155 Veterinary Physiology III
Prerequisites: Graduate standing and consent of instructor.
Description: Molecular, cellular and organ system physiology. Establishing a base of knowledge and understanding requisite to subsequent courses. Same course as VMED 7235.
Credit hours: 5
Contact hours: Lecture: 5 Contact: 5
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med
VBSC 5221 Epidemiology and Evidence-Based Medicine
Prerequisites: Graduate standing and consent of instructor.
Description: Principles and uses of evidence-based practice of veterinary medicine; comprehension and utilization of scientific research; interpretation of basic concepts of observational study of disease. Same course as VMED 7221 and MPH 5221.
Credit hours: 1
Contact hours: Lecture: 1 Contact: 1
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med
VBSC 5223 Veterinary Parasitology I
Prerequisites: Graduate standing and consent of instructor.
Description: Introduction to the general principles of parasitism and parasites of veterinary medical importance including taxonomy, morphology, biology of parasites, modes of transmission, host-parasite relationships, infectious processes and pathogenicity, diagnostic methods, treatment and control measures and public health importance. Classroom/Lab Supply & Materials Fee of $30.00 applies. Same course as VMED 7223.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 2 Contact: 4
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med
VBSC 5253 Veterinary Immunology
Prerequisites: Graduate standing and consent of instructor.
Description: Basic principles of immunology and their application to veterinary medicine. Same course as VMED 7253.
Credit hours: 3
Contact hours: Lecture: 1 Lab: 4 Contact: 5
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med
VBSC 5264 General Pathology
Prerequisites: Graduate standing and consent of instructor.
Description: Cellular and tissue pathology, pigments, inflammation, immunopathology, disturbances of growth and circulation, and neoplasia. Functional disturbances that accompany changes in structures as well as the causes and pathogenesis of diseases. Same course as VMED 7264.
Credit hours: 4
Contact hours: Lecture: 3 Lab: 2 Contact: 5
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med
VBSC 5323 Veterinary Parasitology II
Prerequisites: Graduate standing and consent of instructor.
Description: Principles of diagnostic, treatment, control and prevention of animal diseases produced by arthropod, protozoan, rickettsial, and helminth parasites. A problem-based approach to parasitic diseases affecting the integumentary, respiratory, hemic-lymphatic, reproductive, urinary, nervous/sensory, musculoskeletal, and alimentary systems with emphasis on diseases of domestic animals. Same course as VMED 7323.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 2 Contact: 4
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med
VBSC 5333 Pharmacology I
Prerequisites: Graduate standing and consent of instructor.
Description: Introduction of the principles of pharmacodynamics, drug disposition and pharmacokinetics. Pharmacological effects, mechanisms of actions, metabolism, disposition, clinical indications and toxic effects of drugs acting on the autonomic, central nervous, cardiovascular, respiratory, and renal systems. Same course as VMED 7333.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med
VBSC 5354 Infectious Diseases I
Prerequisites: Graduate standing and consent of instructor.
Description: Important animal diseases caused by bacteria, fungi and viruses will be covered on a system basis. Mechanisms of infectious disease processes and the relationship of such processes to disease development, diagnosis, treatment and control. The relationship of zoonotic diseases to community and environmental health as well as important zoonoses. Same course as VMED 7354. Additional flat fee of $75.00 applies.
Credit hours: 4
Contact hours: Lecture: 2 Lab: 4 Contact: 6
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med
VBSC 5363 Clinical Pathology
Prerequisites: Graduate standing and consent of instructor.
Description: Basic concepts pertinent to data interpretation and laboratory methods used in evaluation of disease. Classroom/Lab Supply & Materials Fee of $15.00 applies. Same course as VMED 7363.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 2 Contact: 4
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med
VBSC 5404 Techniques in Parasitology
Prerequisites: Graduate standing and general parasitology; helminthology or concurrent enrollment.
Description: Experimental application of basic research and teaching techniques in helminthology and protozoology. Individual participation and analysis of experimental situations and techniques applicable to all areas of zoology. Previously offered as VIDP 5404.
Credit hours: 4
Contact hours: Lecture: 2 Lab: 2 Contact: 5
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5413 Food Safety and Public Health
Prerequisites: Graduate standing and consent of instructor.
Description: Introduction to public health and diseases transmissible to humans. Potential human health hazards in foods of animal origin and principles of safe food production, processing, handling and inspection, including pathogen reduction and HACCP regulations. Same course as VMED 7413 and MPH 5413.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5432 Pharmacology II
Prerequisites: Graduate standing and consent of instructor.
Description: Continuation of VBSC 5333 that includes the mechanisms of action, disposition, adverse effects, and indications for groups of pharmacological agents used in veterinary medicine. Same course as VMED 7432.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5454 Infectious Diseases II
Prerequisites: Graduate standing and consent of instructor.
Description: Continuation of Infectious Diseases I (VMED 5354).
Credit hours: 4
Contact hours: Lecture: 2 Lab: 4 Contact: 6
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med

VBSC 5482 Hemolymphatic and Oncology
Prerequisites: Graduate standing and consent of instructor.
Description: Pathogenesis, diagnosis, pathology, medical and surgical treatment and prevention of diseases related primarily to the blood and lymphatic system. (6 week module). Same course as VMED 7482.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5512 Laboratory Animal Medicine
Prerequisites: Graduate standing and consent of instructor.
Description: Introductory course focusing on the biology and major diseases of commonly used laboratory animals. (One - 3 hour lab per semester). Same course as VMED 7512.
Credit hours: 2
Contact hours: Lecture: 2 Lab: 1 Contact: 3
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med

VBSC 5532 Molecular Genetics
Prerequisites: Graduate standing and consent of instructor.
Description: The expression, purification, characterization, and application of biological macromolecules in therapeutics and diagnostic relevant to animal and human health. Same course as VMED 7532.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5533 Toxicology
Prerequisites: Graduate standing and consent of instructor.
Description: Diagnosis and management of intoxications involving plant, chemical, and biological toxins. (Nine week course) (Two - 2 hour labs per 9 weeks). Classroom/Lab Supply & Materials Fee of $15.00 applies. Same course as VMED 7533.
Credit hours: 2
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5542 Clinical Endocrinology I
Prerequisites: Graduate standing and consent of instructor.
Description: Advanced medical endocrinology addressing diagnostic endocrinology and therapeutic endocrinology. Diagnostic endocrinology shall examine the physiological and medical basis for selecting provocative or non-provocative testing procedures as an adjunct to completing a definitive diagnosis. Therapeutic endocrinology involves the use of diagnostic endocrinology to evaluate the efficacy of medical treatment of endocrinopathies and the medical use of hormonal preparations to control animal physiology or endocrinology and non-endocrine diseases. Same course as VMED 7542.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5563 Musculoskeletal System
Prerequisites: Graduate standing and consent of instructor.
Description: Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the musculoskeletal system. (Ten week course) (Two - 2 hour labs per 10 weeks). Same course as VMED 7563.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med
**VBSC 5564 Alimentary System**
Prerequisites: Graduate standing and consent of instructor.
Description: Pathogenesis, diagnosis, pathology, medical and surgical treatment and prevention of diseases related primarily to the alimentary system. (Fourteen week course). Same course as VMED 7564.
Credit hours: 4
Contact hours: Lecture: 4 Contact: 4
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5583 Dermatology and Endocrinology**
Prerequisites: Graduate standing and consent of instructor.
Description: Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to skin and the endocrine system (nine-week model). (One - 4 hour lab per nine weeks). Same course as VMED 7583.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5612 Clinical Neurology**
Prerequisites: Graduate standing and consent of instructor.
Description: Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of nervous system diseases. (Four week course). Same course as VMED 7612.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5613 Biology of Parasites**
Prerequisites: Graduate standing, general parasitology, or consent of instructor.
Description: A systematic and ecologic approach to the study of parasitology. Host-parasite relationships, physiology, ecology and behavioral aspects of parasitic organisms. Previously offered as VIDP 5613.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5614 Cardiopulmonary System**
Prerequisites: Graduate standing and consent of instructor.
Description: Pathogenesis, diagnosis, pathology, medical and surgical treatment, and prevention of diseases related primarily to the cardiovascular and respiratory systems. (Nine week course) (Four - 2 hour labs per nine weeks). Same course as VMED 7614.
Credit hours: 4
Contact hours: Lecture: 2 Lab: 4 Contact: 6
Levels: Graduate, Professional
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Dean of Veterinary Med

**VBSC 5632 Exercise Physiology**
Prerequisites: Graduate standing and consent of instructor.
Description: Current knowledge base pertaining to the acute and chronic adaptations to exercise in domestic animals and current techniques for the evaluation and correction of poor performance. Same course as VMED 7632.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5661 Infectious and Parasitic Diseases of Wild Animals**
Prerequisites: Graduate standing and consent of instructor.
Description: Systematic approach to infectious and parasitic diseases that affect wild animals. Emphasis will be placed on disease recognition in wild species, ecology of transmission, and population management implications of disease diagnosis. Same course as VMED 7661.
Credit hours: 1
Contact hours: Lecture: 1 Contact: 1
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5662 Urinary System**
Prerequisites: Graduate standing and consent of instructor.
Description: Pathogenesis, diagnosis, pathology, medical and surgical treatment and prevention of diseases related primarily to the urinary system. (Three week module). Same course as VMED 7662.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5671 Clinical Endocrinology II**
Prerequisites: Graduate standing and consent of instructor.
Description: Advanced medical endocrinology, focusing on endocrine diseases associated with 1) dysfunction of the endocrine pancreas, 2) selected endocrinopathies of the reproductive system, and 3) therapeutic use of hormones to control reproductive activity of animals. Same course as VMED 7671.
Credit hours: 1
Contact hours: Lecture: 1 Contact: 1
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

**VBSC 5691 A Focus on Zoonotic Diseases**
Prerequisites: Graduate standing and consent of instructor.
Description: Overview of zoonotic aspects of infectious diseases, including the transmission to man, incidence and prevalence, prevention and control strategies, assessment of risk, and governmental and regulatory aspects of these public health threats. Diseases of all veterinary species will be balances according to various aspects of importance, ease of transmission, incidence, and other current concepts. Same course as VMED 7691.
Credit hours: 1
Contact hours: Lecture: 1 Contact: 1
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med
VBSC 5801 Nonclinical Drug Development
Prerequisites: Graduate standing and consent of instructor.
Description: This course will cover the basic to highly-regulated concepts in nonclinical drug development including pharmacology, pharmacokinetics, and toxicology, along with topics in chemistry manufacturing and controls.
Credit hours: 1
Contact hours: Lecture: 1 Contact: 1
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5802 Experimental Principles and Approaches
Prerequisites: Graduate standing and consent of instructor.
Description: A review of experimental principles and approaches essential for design, conduct and analysis of research.
Credit hours: 2
Contact hours: Lecture: 2 Contact: 2
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 5902 Toxicology of Chemical Warfare and Chemical Terrorism
Prerequisites: Graduate standing and consent of IOR.
Description: The course will review the history and current issues related to the use of chemicals as agents of warfare and terrorism. Students will participate in weekly roundtable lectures/discussions and review publications related to various toxicological issues surrounding these chemicals. Same course as ITOX 5902.
Credit hours: 2
Contact hours: Lecture: 1 Contact: 2 Other: 1
Levels: Graduate
Schedule types: Discussion, Combined lecture & discussion, Lecture
Department/School: Dean of Veterinary Med

VBSC 6000 PhD Research and Dissertation
Prerequisites: Graduate standing.
Description: Research problem for meeting requirements of the PhD degree. Offered for variable credit, 1-15 credit hours, maximum of 45 credit hours.
Credit hours: 1-15
Contact hours: Contact: 1-15 Other: 1-15
Levels: Graduate, Professional
Schedule types: Independent Study
Department/School: Dean of Veterinary Med

VBSC 6210 Seminar
Prerequisites: Graduate standing.
Description: Literature and research problems pertaining to veterinary biomedical sciences. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate, Professional
Schedule types: Independent Study
Department/School: Dean of Veterinary Med

VBSC 6213 Toxicology: From Molecules to Ecosystems
Prerequisites: Graduate standing and consent of instructor.
Description: An integrated systems-based approach to toxicology from molecular, cellular, organ, organismal, and ecological perspectives. Previously offered as VBSC 6210. Same course as ITOX 6213.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate, Professional
Schedule types: Lecture
Department/School: Dean of Veterinary Med

VBSC 6223 Xenobiotic Disposition
Prerequisites: Graduate standing and consent of instructor.
Description: Quantitative analysis of xenobiotic absorption, metabolism, and excretion. Analysis of xenobiotic concentration-time data using pharmacokinetic software. Same course as ITOX 6223. Previously offered as VBSC 6201.
Credit hours: 3
Contact hours: Lecture: 2 Contact: 3 Other: 1
Levels: Graduate, Professional
Schedule types: Independent Study, Lecture, Combined lecture & IS
Department/School: Dean of Veterinary Med

VBSC 6233 Laboratory in Electron Microscopy
Prerequisites: Consent of instructor.
Description: Students learn sample preparation, theory, and operation of transmission electron microscope and scanning electron microscope. Lab Supply and Materials Fee $100.00.
Credit hours: 3
Contact hours: Lab: 6 Contact: 6
Levels: Graduate, Professional
Schedule types: Lab
Department/School: Dean of Veterinary Med

VBSC 6710 Seminar
Prerequisites: Graduate standing.
Description: Literature and research problems pertaining to veterinary clinical sciences. Offered for variable credit, 1-3 credit hours, maximum of 3 credit hours.
Credit hours: 1-3
Contact hours: Contact: 1-3 Other: 1-3
Levels: Graduate, Professional
Schedule types: Independent Study
Department/School: Dean of Veterinary Med