VIBS - VET INTEGRATIVE BIOSCI.

VIBS 601 Anatomy
Credits 4. 2 Lecture Hours. 6 Lab Hours.
Topographical dissection of one of the following domestic animals: horse, ox, dog or cat. May be taken more than once but not to exceed 12 hours of credit toward a graduate degree.
Prerequisite: VIBS 912 or 305 or equivalent.

VIBS 602 Histology
Credits 4. 2 Lecture Hours. 6 Lab Hours.
Molecular phenomena placed in context with tissues, organs and organ systems; cell and tissue structures visualized by light microscopy and electron micrographs for functional relationships; clinical correlations reveal relevance of histology in specific disease states; conceptual thinking exercises facilitate problem-solving skills.
Prerequisite: Graduate classification.

VIBS 603/NRSC 603 Neuroanatomy
Credits 4. 2 Lecture Hours. 6 Lab Hours.
Gross, developmental and microscopic anatomy of nervous system of selected laboratory and domestic animals.
Prerequisite: Approval of instructor.
Cross Listing: NRSC 603/VIBS 603.

VIBS 604/NRSC 604 Biomedical Neuroendocrinology and Endocrine Disorders
Credits 3. 3 Lecture Hours.
Prerequisite: Approval of instructor.

VIBS 605 Chemical Hazard Assessment
Credits 3. 3 Lecture Hours.
Chemical and biological methods for testing hazardous chemicals and complex mixtures; chemical analysis; microbial bioassays; developmental toxicity; enzyme induction; mammalian cell culture.
Prerequisite: Graduate classification.

VIBS 606/NRSC 605 Neuroanatomical Systems
Credits 3. 3 Lecture Hours.
Emphasis on major neural systems that govern identifiable physiological functions, behavior and neurodegenerative disease; whole-brain anatomy is approached from a "systems" perspective, wherein components of defined functional systems are described in terms of their location, inputs and outputs, and physiological /behavioral significance in health and disease.
Prerequisite: Approval of instructor.
Cross Listing: NRSC 605/VIBS 606.

VIBS 607 Applied Epidemiology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
An introductory course of the application of epidemiological concepts to the study of disease occurrence in populations of lower animals and man. The purpose of epidemiology is to identify the host, agent and environmental determinants and dynamics of disease spread that provide the basis for successful preventive medicine and public health programs.

VIBS 608 Epidemiology Methods I
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Epidemiology concepts and methods used in the investigation of determinants of health or disease in populations; stressing basic methods for experimental design, conduct and analysis of both observational and experimental studies.
Prerequisite: STAT 651 or equivalent.

VIBS 609 Anatomy of Reproductive Systems
Credits 4. 2 Lecture Hours. 6 Lab Hours.
Gross and microscopic anatomy of the reproductive systems of domestic animals.
Prerequisite: VIBS 601 or VIBS 602 or VIBS 910 or equivalent. (Offered in alternate years.)

VIBS 610 Epidemiologic Methods II and Data Analysis
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Principles and methods for the analysis of data from epidemiologic studies including the purpose of data analysis and role of statistics, sampling distributions, probability distributions, analysis of crude, stratified and matched data, and the use of linear and logistic regression methods.
Prerequisites: VIBS 608 and STAT 651 or approval of instructor.

VIBS 611 Tumor Cell Biology and Carcinogenesis
Credits 3. 3 Lecture Hours.
Basic principles of tumor biology; role of gene-environment interactions; molecular mechanisms regulating cancer initiation and progression; therapeutic treatment of cancer.
Prerequisites: BIMS 320/GENE 320 or equivalent; graduate classification.

VIBS 612 Mammalian Embryology
Credits 3. 3 Lecture Hours.
Embryology of domestic mammals; gametogenesis, fertilization, cell proliferation and differentiation, and organogenesis; selected commonly occurring congenital defects of domestic animals used to emphasize embryologic sequences and processes.
Prerequisite: Approval of instructor.

VIBS 613 Evolutionary Bioinformatics
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Principles and concepts in molecular evolution, population genetics, and evolutionary genomics; applications of quantitative approaches (computation, statistics, and mathematics) in analyzing large and complex biological data sets; algorithm design and development of scientific software using high-level high-performance computer languages; emerging techniques for integrative data analysis, and the assumptions, advantages, and limitations of these techniques.
Prerequisites: BIOL 451 or GENE 320/BIMS 320/BIMS 320/GENE 320 or equivalent; or approval of instructor.

VIBS 615 Food Hygiene
Credits 4. 3 Lecture Hours. 4 Lab Hours.
Clinical description, pathogenesis, diagnosis, source, epidemiology and prevention or control of food borne diseases caused by biological, chemical and natural hazards.
Prerequisite: Graduate classification.
VIBS 616 Advanced Developmental Neurotoxicology  
Credits 3. 3 Lecture Hours.  
Study of mechanisms of toxicity of substances potentially devastating  
to the developing brain and spinal cord including lead, mercury and other  
heavy metals, alcohol, nicotine (smoking), pesticides, flame retardants,  
and others.  
Prerequisite: Approval of instructor.

VIBS 617 Cell Biology  
Credits 1 to 5. 1 to 5 Lecture Hours.  
Series of five 1-hour credit modules focusing on selected aspects of  
structure, function, and signal transduction in eukaryotic cells through  
critical analysis of recent literature in the field. Each module listed as  
separate course section; students may enroll in up to five 1-hour module  
sections per semester.  
Prerequisite: Approval of instructor.

VIBS 619 Food Toxicology II  
Credits 3. 3 Lecture Hours.  
Public health implications of toxic factors in foods, their source, nature,  
occurance and distributions; emphasis on mycotoxins including their  
isolation, detection, identification and toxicology; study of state-of-the-art  
food safety research techniques.  
Prerequisite: Graduate classification.

VIBS 620/GENE 620 Cytogenetics  
Credits 3. 3 Lecture Hours.  
Examination and analysis of variation in chromosome structure, behavior  
and number; developmental and evolutionary effects of this variation.  
Prerequisite: GENE 603.  
Cross Listing: GENE 620.

VIBS 621/NRSC 621 Fundamental Neuroanatomy  
Credits 4. 4 Lecture Hours.  
A comprehensive review of the neuroanatomical determinants of  
function; rigorous neuroanatomical foundation relevant for research  
investigating changes in neural pathways and/or networks involved in  
sensory and motor functions, learning and memory, perception, selective  
attention, as well as recovery of function following brain damage.  
Cross Listing: NRSC 621/VIBS 621.

VIBS 622 Endocrine Toxicology  
Credits 4. 4 Lecture Hours.  
Impacts of endocrine toxicity on endocrine system; prevalence,  
environmental and occupational use and disposal of environmental  
disrupting chemicals (EDCs); structure, toxicokinetics and mechanism  
of action of EDCs; effects of EDCs on the development and function,  
disorders and diseases of the endocrine and reproductive  
organs.  
Prerequisite: Graduate classification; approval of instructor.

VIBS 624/VTTP 624 Endocrinology  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Neuroendocrine control of puberty menstruation, ovulation, pregnancy,  
labor, lactation, female reproductive cycles, male reproductive functions,  
thyroid and parathyroid, adrenal and kidney, diabetes, obesity, sleep,  
memory, learning and aging, and their endocrine disorders; overview  
on biosynthesis, transport and signaling of peptide and neuropeptide  
hormones, steroids and prostaglandins.  
Prerequisite: Graduate classification.  
Cross Listing: VTTP 624/VIBS 624.

VIBS 625/ENTO 626 Methods in Vector-Borne Disease Ecology  
Credits 3. 1 Lecture Hour. 5 Lab Hours.  
Methodological understanding of how vector-borne disease are studied  
in the field and the laboratory; hands-on exploration of the ecology  
of disease systems in a one health framework; concepts of design,  
execution, and presentation of research projects; outdoor field work and  
bi-o-safety level 2 laboratory.  
Cross Listing: E NT O 626/VIBS 626.

VIBS 627 Optical Microscopy and Live Cell Imaging  
Credits 3. 2 Lecture Hours. 3 Lab Hours.  
Principles and practice of optical microscopy for life sciences;  
applications with fixed samples and live cells using digital microscopy,  
confocal and multiphoton microscopy, TIRF and laser capture  
microscopy equipment; applications with fluorescence probes of cellular  
function.  
Prerequisite: Approval of instructor.

VIBS 633 Animal Diseases in Comparative Medicine  
Credits 3. 3 Lecture Hours.  
Study of major zoonotic diseases, including frequency of occurrence,  
clinical signs, diagnosis, epidemiology, bioterrorism concerns and the  
preservation or control in animals and humans.  
Prerequisite: Graduate classification.

VIBS 640/NRSC 640 Neurobiology  
Credits 1 to 5. 1 to 5 Lecture Hours.  
Biology of the mammalian central nervous system with emphasis  
on cellular and molecular interactions; contemporary research  
topics in areas such as neuron-glia interactions, neuroimmunology,  
neuroendocrinology, developmental neurobiology and neurogenetics;  
extensive readings from primary literature.  
Prerequisites: Undergraduate or graduate cell biology, genetics and  
biochemistry or approval of instructor.  
Cross Listing: NRSC 640/VIBS 640.

VIBS 641 Principles of Human Health Risk Assessment of Chemicals  
Credits 3. 3 Lecture Hours.  
Principles of toxicology and environmental health with the basic  
concepts and approaches for conducting human health risk assessment  
of chemicals; use of different types of data and analysis approaches  
to conduct both qualitative and quantitative assessments of exposure,  
human health hazard, dose-response, and risk from chemicals in  
the environment; introduction to how risk assessment informs risk  
management decisions such as pollution regulations or hazardous waste  
cleanups.  
Prerequisites: Graduate classification in toxicology, public health and  
related disciplines; VTPP 673, VIBS 670, PHEO 605, PHEO 610, PHEB 600,  
PHEB 605, or equivalent, or concurrent enrollment; PHEB 602, PHEB 603,  
STAT 651, or equivalent; or approval of instructor.

VIBS 645 Practice of Evaluating Human Health Risks of Chemicals  
Credits 3. 3 Lecture Hours.  
Basic principles of toxicology and environmental health with real-life  
examples of how diverse types of information are integrated for the  
purpose of judging what chemical exposures may pose a risk to human  
health; the complex process of qualitative evaluation and quantitative  
estimation of the risks that chemicals in the environment may pose  
to humans; integration of knowledge across epidemiology, toxicology,  
exposure assessment and other disciplines necessary to paint a  
comprehensive picture of what chemicals may pose hazard, what level of  
exposure may be considered safe, and what are the mechanisms of the  
adverse effects of exposures to a particular hazardous agent.  
Prerequisites: BICH 601, BICH 602, VTPP 625, or similar; VTPP 673,  
VIBS 670, or similar; and VIBS 641.
VIBS 650 Education in a Veterinary Medical and Biomedical Environment  
Credits 1 to 3. 1 to 3 Lecture Hours.  
Philosophical, stylistic and methodological consideration for designing, planning implementing and evaluating effective veterinary medical and biomedical teaching and learning. Orientation for graduate school.  
**Prerequisite:** Graduate classification.  

VIBS 655 Methods of Specialized Journalism  
Credits 3. 3 Lecture Hours.  
Writing and placement of magazine and journal articles in specialized areas of media content such as agriculture, ecology, science, business, education, natural resources; individual projects directed to student's field of interest.  

VIBS 657 Issues in Science and Technology Journalism  
Credits 3. 3 Lecture Hours.  
Current issues, fundamental concepts in science and technology journalism, communication theory, science and journalism components, philosophy and literature of the field.  

VIBS 658 Research Methods in Science and Technology Journalism  
Credits 3. 3 Lecture Hours.  
Research methods including theory, hypothesis formulation, design, data collection, data analysis, measurement and report writing. Qualitative and quantitative methods. Research topics.  

VIBS 660 Reporting Science and Technology  
Credits 3. 3 Lecture Hours.  
Gathering, writing and editing complex information, translation techniques, interpretation and analysis, literary and organizational devices and measurement of readability.  

VIBS 663 Biomedical Reporting  
Credits 3. 3 Lecture Hours.  
Sources of biomedical information, specialized information-gathering skills, key biomedical vocabulary/concepts, audiences, outlets, translation/interpretation, research, ethical issues.  

VIBS 664 Risk and Crisis Reporting  
Credits 3. 3 Lecture Hours.  
Assessment and analysis of environmental and health risk, analytical procedures, interpretation of risk factors, reporting science crisis events.  

VIBS 670 Environmental Toxicology  
Credits 3. 3 Lecture Hours.  
Toxic effects of drugs and chemicals on major mammalian organ systems and ecological receptors; general principles of toxicokinetics and toxicodynamics; case studies of toxic effects of environmental exposures.  
**Prerequisite:** VIBS 602 or approval of instructor.  

VIBS 681 Seminar  
Credit 1. 1 Lecture Hour.  
Review and discussion of current scientific work in one of the department's areas of specialization (anatomy, cellular and molecular biology, epidemiology, food safety, genetics, informatics, neuroscience, public health concepts, reproduction/developmental biology, toxicology, zoonoses).  

VIBS 684 Professional Internship  
Credits 1 to 4. 1 to 4 Other Hours.  
A directed internship in an organization to provide students with on-the-job training with professionals in settings appropriate to the student's professional objectives.  
**Prerequisite:** Approval by committee chair.  

VIBS 685 Directed Studies  
Credits 1 to 4. 1 to 4 Other Hours.  
Research problem in one of the department's areas of specialization (anatomy, cellular and molecular biology, epidemiology, food safety, genetics, informatics, neuroscience, public health concepts, reproduction/developmental biology, toxicology, zoonoses, science and technology journalism).  

VIBS 688 Epidemiological Modeling of Infectious Diseases  
Credits 3. 2 Lecture Hours. 2 Lab Hours.  
Concepts of mathematical modeling of infectious diseases; steps and methods for the development and analysis of models.  
**Prerequisite:** Graduate classification.  

VIBS 689 Special Topics in...  
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.  
Selected topics in one of the department's areas of specialization (anatomy, cellular and molecular biology, epidemiology, food safety, genetics, informatics, neuroscience, public health concepts, reproduction/developmental biology, toxicology, zoonoses, science and technology journalism).  

VIBS 690 Theory of Research  
Credits 3. 3 Lecture Hours.  
Theory and design of research related to current biomedical problems especially those involving study of animal disease; philosophical perspectives underlying historical advances in research pertaining to the study, prevention and treatment of disease.  
**Prerequisite:** Graduate classification.  
**Cross Listing:** VTPP 690 and VPAT 690.  

VIBS 691 Research  
Credits 1 to 23. 1 to 23 Other Hours.  
Research reported by writing of thesis or dissertation as partial requirement for MS or PhD degree.  
**Prerequisite:** Approval of department head.  

VIBS 910 Small Animal Anatomy  
Credits 4. 2 Lecture Hours. 6 Lab Hours.  
Nomenclature, structures and principles of functional anatomy of dogs and cats; emphasis on topographical, radiographic and functional anatomy of structures with clinical importance.  
**Prerequisite:** Enrollment in first year of professional DVM curriculum.  

VIBS 911 Histology  
Credit 1. 1 Lecture Hour.  
Clinical application of histological content; basic tissues and major organ systems of common domestic species; normal microscopic appearance of cells, tissues and organs with the introduction of normal tissue and organ cytology; content correlates gross anatomy, microscopic anatomy and the physiological state of common domestic species.  
**Prerequisite:** Enrollment in first year of professional DVM curriculum.  

VIBS 912 Clinical Anatomy of Large Animals  
Credits 3. 2 Lecture Hours. 4 Lab Hours.  
Gross and topographical anatomy of domestic livestock including equine, ruminant, porcine and avian gross anatomy through use of cadavers, models and images; emphasis on structures of clinical importance, relationships to common medical and surgical procedures and functions in the animal body.  
**Prerequisite:** Enrollment in first year of professional DVM curriculum.
VIBS 913 Microscopic Anatomy II
Credits 4. 2 Lecture Hours. 6 Lab Hours.
Developmental anatomy of domestic animals with special emphasis on structural congenital defects; functional neuroanatomy and clinical neurology of domestic animals; essential clinical skills for the theory and practice of veterinary neurology.
Prerequisite: Enrollment in first year of professional curriculum.

VIBS 914 Professional & Clinical Skills II
Credits 3. 1 Lecture Hour. 6 Lab Hours.
Professional & Clinical Skills II. Integration and reinforcement of foundational knowledge offered in concurrent courses through critical thinking exercises, professional skills application activities (ethics/contextual decision-making, leadership, skills for well-being, personal/practice financial literacy, core communication skills) and application of technical skills; opportunities for learning include didactic, hands-on, and case-based interactions utilizing simulation, models, animals, actors and case scenarios; part II of a VI part series.
Prerequisites: Enrollment in the first year of professional DVM curriculum.

VIBS 926 Introduction to Public Health Concepts
Credit 1. 1 Lecture Hour.
Basic concepts and issues of public health as they relate to the veterinary medical profession.
Prerequisite: Enrollment in first year of the professional curriculum.

VIBS 928 Public Health, Epidemiology and Evidence-Based Medicine
Credits 3. 3 Lecture Hours.
Basic principles of epidemiology, public health, zoonoses and introduction to evidence-based medicine methodology, its application in clinical decision making; emphasis on synthesis of basic principles; application of evidence-based medicine; and epidemiological skills within the context of private and public veterinary practice.
Prerequisites: Enrollment in the second year of professional curriculum.

VIBS 930 Public Health
Credits 4. 4 Lecture Hours.
Principles and applications of epidemiology in veterinary medicine and the literature; history, epidemiology, symptoms, prevention and control of diseases transmitted between animals and humans; emphasis on emerging zoonotic diseases presenting occupational hazards for veterinary medicine; safety of foods of animal origin including foodborne illnesses.
Prerequisite: Enrollment in third year of professional curriculum or enrollment in graduate studies with approval of instructor.

VIBS 936 Veterinarians in Society
Credits 2. 2 Lecture Hours.
The breadth of career opportunities in veterinary medicine; the diversity of roles that veterinarians play in society including companion animal practice, large animal practice, public health, biomedical research, conservation medicine, emergency response and shelter medicine.
Prerequisite: Enrollment in first year of professional DVM curriculum.

VIBS 948 Didactic Electives in Veterinary Anatomy
Credits 1 to 12. 1 to 12 Lecture Hours.
Elective course in veterinary anatomy (with emphasis on neuroscience, cell biology, genetics, reproduction, developmental biology, marine mammal anatomy) for professional students who wish to supplement required curriculum. May be repeated for credit.
Prerequisite: Enrollment in third year of professional curriculum.