

# VIBS - VET INTEGRATIVE BIOSCI

## VIBS 601 Anatomy

**Credits 4. 2 Lecture Hours. 6 Lab Hours.** Clinical and functional anatomy focused on pre-professional training; includes anatomy of all major body systems. **Prerequisite:** Graduate classification.

## 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.** Gross and functional anatomy and endocrine functions of neuroendocrine systems, hypothalamus and pituitary. Neuroendocrine control of puberty, sexual behavior, menstruation, ovulation, pregnancy, labor, lactation, testis, thyroid, growth, stress, diabetes, obesity, sleep, memory, learning and aging and their disorders. Overview biosynthesis, transport and signaling of neuropeptides, prostaglandins, peptide and steroid hormones. **Prerequisite:** Approval of instructor. **Cross Listing:** NRSC 604/VIBS 604.

## 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 3. 3 Lecture Hours.** Introduction to the application of epidemiological concepts to the study of disease occurrence in populations of lower animals and man; identify the host, agent and environmental determinants and dynamics of disease spread that provide the basis for successful preventive medicine and public health programs. **Prerequisite:** Graduate classification.

## 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/VTMI 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. **Cross Listing:** VTMI 610/VIBS 610.

## 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:** Graduate classification or approval of instructor.

## 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 622 Endocrine Toxicology

**Credits 4. 4 Lecture Hours.** Impacts of endocrine toxicology on endocrine system; prevalence, environmental and occupational use and disposal of environmental endocrine 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/VTPP 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:** VTPP 624/VIBS 624.

## VIBS 626/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 bio-safety level 2 laboratory. **Cross Listing:** ENTO 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 630/GENE 630 Comparative Genomics

**Credits 3. 3 Lecture Hours.** Analysis of comparative genome architecture, function and evolution; modern genome assembly, annotation, alignment and comparative analysis; functional coherence of chromosomes; evolution of genomes at population and macroevolutionary levels. **Prerequisite:** GENE 603 or VTPB 613 or equivalent. **Cross Listing:** GENE 630/VIBS 630.

## 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 prevention or control in animals and humans. **Prerequisite:** Graduate classification.

## VIBS 636 Genetic Basis for Phenotypic Variation

**Credit 1. 1 Lecture Hour.** Emphasis on the genetic basis for phenotypic variation in domestic animals; methods to use for genetics and genomics to map genes controlling phenotypic variation, as well as experimental methods to validate the functional significance of sequence variants pinpointed by genetic analysis. **Prerequisite:** Approval of instructor.

## 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.

## VIBS 642 Histological Research Methods

**Credits 3. 2 Lecture Hours. 3 Lab Hours.** Theoretical information and practical experiences; learn and perform proper procedures used in biomedical research including tissue fixation, processing and embedding tissue samples, sectioning and staining protocols for standard and special stains. **Prerequisites:** Graduate classification or approval of instructor.

## 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 Preparing Scientific Papers and Presentations

**Credits 3. 3 Lecture Hours.** Writing and placement of journal articles in student's research field; preparation of oral and poster presentations; basics of writing grant proposals; other aspects of scientific communication. **Prerequisite:** Graduate classification.

## 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 665 Science Editing

**Credits 1 to 3. 1 to 3 Lecture Hours.** Editing materials both for segments of the public and for readers in scientific and technical fields. **Prerequisites:** Graduate classification or approval of instructor.

## VIBS 676 Speciation Genetics

**Credits 3. 3 Lecture Hours.** Introduction to the ability to speciate into biologically diverse forms via microevolutionary processes; literature on the origin of species beginning with Darwin and continuing through contemporary work; overview of several major topics in speciation with special emphasis on the genetics of speciation in this genomic era. **Prerequisites:** GENE 603 and BIOL 610 or BIOL 466, or equivalent. **Cross Listing:** EEBL 676 and GENE 676.

## 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. Must be taken on a satisfactory/unsatisfactory basis. **Prerequisite:** Graduate classification. **Cross Listing:** NRSC 690 and VTPP 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 1.5. 1.5 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

**Credit 1.5. 1.5 Lecture Hour.** 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.

## VIBS 985 Directed Studies

**Credits 1 to 4. 1 to 4 Other Hours.** Directed individual study of a selected problem in veterinary anatomy (with emphasis on neuroscience, cell biology, genetics, reproductive biology, developmental biology, or marine mammal anatomy) or directed individual study of advanced topics in veterinary public health or epidemiology (with emphasis on food safety, toxicology, informatics, or zoonoses). May be repeated for credit. **Prerequisite:** Matriculation in veterinary professional curriculum.

## VIBS 988 Veterinary Medicine and Surgery Selective

**Credits 2. 2 Lecture Hours.** In-depth study of public health and regulatory associated processes in veterinary medicine. **Prerequisites:** Third year classification in veterinary medicine and in good standing. May be taken for credit up to eight hours.

## VIBS 989 Special Topics in...

**Credits 1 to 4. 1 to 4 Lecture Hours.** Selected topics in an identified area of veterinary anatomy (with emphasis on neuroscience, cell biology, genetics, reproductive biology, developmental biology or marine mammal anatomy) or selected topics in veterinary public health, epidemiology, zoonoses, food hygiene and food toxicology. **Prerequisite:** Matriculation in veterinary professional curriculum.