

**CURRENT DEPARTMENT OF ANATOMY & PHYSIOLOGY COURSES**

# / Type	Credits/ Grading	Offered	Standing	Course	Catalog Descriptions	Coordinator(s)
AP 600	3	Spring	Undergrad/ Graduate	Introduction to Pharmacology for Health Professionals	Introduction to Pharmacology for Health Professionals is designed to provide an introduction to the principles of pharmacology and how they apply to health professionals. PREREQUISITES: BIOL 198; CHM 110; BIOCH 571, OR ASI 533 OR BIOL 442 OR KIN 360 OR current standing in Veterinary Medicine OR instructor consent.	Martinez, B. KuKanich
AP 773	2-3	Fall/Spring	Graduate	Bioinstrumentation Lab	This course is joint listed in Electrical Engineering and has been designed to introduce fundamental principles of biomedical instrumentation commonly used in biomedical engineering research labs and hospitals. Techniques and principles of bioinstrumentation include bio signal and noise, biosensors, electrodes, electrocardiogram (ECG), defibrillators, pacemakers, electroencephalography (EEG), electromyogram (EMG), respiratory instruments, and optical microscopy. Biomedical circuit and electronics will be reviewed.	Weiss
AP 788	3	Fall/Odd Years /Online	Graduate/ VAP 877 Cross- listing	Basic and Applied Pharmacokinetics	Provides a conceptual and quantitative understanding of the absorption, distribution, metabolism, and excretion of drugs and factors that influence these processes. PREREQUISITES: One semester of calculus, physiology, pharmacology, toxicology, or biochemistry.	Martinez
AP 803	1	Fall/Spring	Graduate	Seminar	This course is primarily based on attendance of the Department of Anatomy and Physiology Seminar Series. Each student is also required to give a report on a research topic.	Comer
AP 803-B	1	Spring	Graduate (OYM)	Seminar for OYM Students	An introduction to current research and topics in Anatomy & Physiology.	Basel
AP 805	3	Fall	Graduate	Cell Physiology	Functions of the animal body are described with a primary focus at the cellular and molecular level with correlations to clinical topics. Course content builds on knowledge of chemistry, biochemistry, physics and biology. Basic physiological and pathophysiological mechanisms are examined in the context of the cell environment, intermediary metabolism and cell signaling.	Schultz
AP 807	5	Fall	Graduate	Integrated Physiological Systems I	Microstructure and function of the cardiovascular, endocrine, respiratory, and renal systems of domestic animals with emphasis on physiologic control mechanisms, interrelationships of body systems, and criteria for evaluating animal health. Microanatomy laboratory is restricted to DVM students. Graduate students should enroll in 5 credits unless they have made arrangements with the course instructor.	Basel
AP 808	1	Fall	Graduate	Introduction to Veterinary Medicine and Biomedical Research: Concepts and Values	This course is intended to provide first-year students an opportunity to experience the depth of veterinary/biomedical research required to advance the practice of veterinary medicine and advance the field of medicine in general. The students will examine the challenges of conducting 1) foundational and translation research (genetic/genomic and mechanistic research), 2) foundational and applications to clinical research 3) population and observational research (epidemiology, prospective clinical trials, retrospective	Schultz

					studies), 4) pharmacologic research (the impact of pharmacology on the biomedical sciences). The students will examine relevant connections, consider conceptual relationships, and critically evaluate integrative issues germane to both the practice of and the innovative progress of veterinary medicine. Faculty members in the Departments of A&P, DM/P, and CS, will present topical overviews, based on their professional experiences. This will be designed to connect and integrate fundamental principles and relationships between research and clinical application. These presentations provide examples of the fundamental requirements for clinical therapies and provide examples of how innovative science leads to new therapies for long standing clinical disease. Additionally, students will learn the tools required to search relevant topic to their career paths within the medical literature. Finally, drawing on the multidisciplinary literature presented by faculty, students will explore the challenges in conducting genetic/genomic research, using genomic information, implementing research results to clinical practice, as well as addressing the social, legal, and professional policies that are emerging from new research. Students will be expected to do reading and to complete online worksheets and present their findings/opinions in class. Class time will be devoted to presentations and to discussion of readings and related current events.	
AP 816	5		Graduate (with permission of instructor)	Gross Anatomy II	Gross dissection of the horse and ruminant with comparative aspects of the pig, laboratory animals, and the chicken. PREREQUISITE: AP 806.	Klimek
AP 817	3	Spring	Graduate	Integrated Physiological Systems 2	Microstructure and function of the reproductive and digestive systems of domestic animals with emphasis on physiologic control mechanisms, interrelationships of body systems, and criteria for evaluating animal health. Microanatomy laboratory is restricted to DVM students. Graduate students should enroll in 3 credits unless they have made arrangements with the course instructor.	Basel
AP 828	2	Spring	Graduate	Electricity in Biological Systems	This course provides students in the life and/or physical sciences with foundational understanding of electrical concepts that contribute to life processes spanning the molecular, cellular, systems, and ultimately organismal levels. Historical and cultural discussions of bioelectric phenomena introduce essential concepts for further consideration through critical reading of primary literature. PREREQUISITES: Graduate/Professional level courses in cellular and organ systems physiology, or with the permission of the instructor.	Fong
AP 837	2	Summer	Graduate (OYM)	Introduction to Cell Physiology	An introduction to cellular physiology. The objective of this course is to introduce students to the principles of cellular physiology and prepare them to apply the knowledge of cellular physiology to other medical disciplines such as Pharmacology.	Basel
AP 838	3	Summer	Graduate (OYM)	Anatomy 1	Part 1 of the comparative anatomy sequence (AP 838, AP 842). An introduction to comparative anatomy with a focus on human clinical anatomy.	
AP 839	3	Spring	Graduate (OYM)	Biomedical Methods Laboratory	An introduction to the theory and practice of advanced biomedical laboratory techniques.	Shrestha, Basel

AP 840	1	Summer	Graduate (OYM)	Study Methods and Career Development for Health Professional Students	Introduces and examines research-based study methods that are applicable to advanced study in medical sciences. Challenges students to identify and improve current study habits. Prepares students to prepare an effective application to professional school.	Basel
AP 841	3	Summer	Graduate (OYM)	Introduction to Histology	This course is intended to provide 1-year Professional Master of Science students a brief introduction to the microscopic structure of the cells and tissues of a mammalian body. The class format will be a lecture followed by a laboratory session. The lectures will introduce the day's material, which will then be developed through laboratory sessions that include using light microscopy to read and interpret micrographs, drawing, making glass slides.	Malreddy
AP 842	3	Fall	Graduate (OYM)	Anatomy 2	An introduction to comparative human and domestic animal anatomy with a focus on clinical relevance. PREREQUISITES: AP 838 (Anatomy 1) and One Year Master's Standing.	Curtis, Malreddy, Klimek, Chandler
AP 843	4	Fall	Graduate (OYM)	Systems Physiology	An introduction to human and domestic animal physiology. The physiology of each body system will be introduced and important variations in medically relevant species will be compared.	Basel
AP 850	2	Fall/Spring	Graduate	Stem Cell Techniques	This is a laboratory class to teach basics of stem cell culture, differentiation and characterization. Topics are selected by student interest and include aseptic technique, pipetting, medium preparation, use of a biological safety cabinet, lab safety when manipulating human material, manipulation of mesenchymal stromal cells, rat and mouse embryonic stem cells, human and canine induced pluripotent stem cells, differentiation and characterization of stem cells. Methods include collection of cells, freezing and thawing of cells, cell counting (Live/dead), plating cells, colony forming unit fibroblast, MSC differentiation to bone, cartilage and fat, ESC differentiation to cardiac or neural cells, embryoid body formation and manipulation, immunocytochemistry, transient transfection and isolation of transfected clones, clonal expansion, micrography, flow cytometry, PCR including primer design, RNA isolation.	Weiss, He
AP 875	3	Spring	Graduate	Structure-Based Drug Design	This course is designed for graduate students in the life or physical sciences with interest in computational medicine and drug design. The course focuses on the basics of protein architecture and the thermodynamics of protein–ligand binding, virtual screening of drug candidates, modeling of unknown protein structure, the pharmacophore concept, explicit-solvent molecular dynamics simulation, the thermodynamics of protein–ligand association, and free-energy calculation techniques. For each of these topics, practical knowledge is developed through computer-based practical exercises using professional and academic grade software. In addition to treating the traditional focus of drug design, i.e., maximizing the binding affinity of a candidate drug for the target biomolecule, the course also addresses the increasing use of similar techniques for predicting other interactions important for the safety and efficacy of a drug, such as screening for side effects due to interactions with off-target biomolecules.	Comer
AP 880	3	Fall/Spring	Graduate/ by appt.	Mechanisms of Drug Action	Discussion of pharmacologic mechanisms at the molecular and cellular level, including receptors, second messengers, and pharmacokinetics. Specialized	Martinez, B. KuKanich

					areas of pharmacology such as neuropharmacology and drug design will be discussed. Areas of current research interest will be emphasized. <b>PREREQUISITE:</b> Instructor consent.	
AP 890	Variable /1-18	Fall/Spring /Summer	Graduate/ by appt.	Problems in Pharmacology	Individual investigations of the interactions of pharmaceutical compounds with living systems. <b>PREREQUISITE:</b> Instructor consent.	B. KuKanich, Martinez
AP 893	1	Spring	Graduate	Introduction to Nanomedicine	This course is a brief introduction to nanomaterials and nanomedicine with a focus on clinical applications of nanotechnology. The course presents basic principles of nanotechnology; current clinical applications of nanomedicine; future horizons in nanomedicine.	Basel
AP 894	1	Spring	One Year Master's program, or permission of instructor.	Comparative Embryology	An overview of development anatomy as it relates to clinically important developmental defects and/or normal structure and function of common domestic animals.	Klimek
AP 896	2	Fall	Graduate	Introduction to Responsible Conduct of Biomedical Research	This course will focus on providing graduate/professional students an introduction to the regulations, practices, ethical considerations, and professional interactions that define responsible conduct of biomedical research. Investigator responsibilities associated with initiating and establishing a research program, conducting experimental studies, analyzing and reporting data, publishing in peer-reviewed journals, considerations for submitting grant applications, and understanding compliance issues and regulations will be emphasized. Students will learn through reading journal articles and discussion of pertinent topics to identify and consider issues that are germane to the biomedical research environment.	Schultz
AP 995	1	Fall/Spring	Graduate	Stem Cells & Regenerative Medicine Journal Club	Students and faculty take turns leading discussion of current scientific literature. Topics include cell and molecular biology of stem cells, cancer, cell therapy, gene therapy, diagnostics and experimental treatments.	Weiss
AP/VAP 844	4	Fall		Veterinary Pharmacology I	The objectives of the course are to: gain an understanding of foundational aspects of pharmacology; understand the interactions of chemical compounds and living systems (pharmacokinetics and pharmacodynamics); learn to categorize drugs based upon mechanisms of action; learn the names (generic and proprietary as indicated) of selected common drugs from various drug groups, and their actions and interactions in animals; learn how to evaluate data and drug product information distributed to veterinarians.	B. KuKanich
AP/VAP 846	2	Spring		Veterinary Pharmacology II	This course is an extension of Pharmacology I (AP/VAP 844). The objectives of the course are to: gain an understanding of foundational aspects of pharmacology; understand the interactions of chemical compounds and living systems (pharmacokinetics and pharmacodynamics); learn to categorize drugs based upon mechanisms of action; learn the names (generic and proprietary as indicated) of selected common drugs from various drug groups, and their actions and interactions in animals; learn how to evaluate data and drug product information distributed to veterinarians	B. KuKanich

VAP 805	3	Fall	1 <sup>st</sup> Year DVM	Cell Physiology	Functions of the animal body are described with a primary focus at the cellular and molecular level with correlations to clinical topics. Course content builds on knowledge of chemistry, biochemistry, physics and biology. Basic physiological and pathophysiological mechanisms are examined in the context of the cell environment, intermediary metabolism and cell signaling.	Schultz
VAP 807	6	Fall	1 <sup>st</sup> Year DVM	Veterinary Systems 1	Microstructure and function of the cardiovascular, endocrine, respiratory, and renal systems of domestic animals with emphasis on physiologic control mechanisms, interrelationships of body systems, and criteria for evaluating animal health.	Basel
VAP 808	1	Fall	1 <sup>st</sup> Year DVM	Introduction to Veterinary Medicine and Biomedical Research: Concepts and Values	This course is intended to provide first-year students an opportunity to experience the depth of veterinary/biomedical research required to advance the practice of veterinary medicine and advance the field of medicine in general. The students will examine the challenges of conducting 1) foundational and translation research (genetic/genomic and mechanistic research), 2) foundational and applications to clinical research 3) population and observational research (epidemiology, prospective clinical trials, retrospective studies), 4) pharmacologic research (the impact of pharmacology on the biomedical sciences). The students will examine relevant connections, consider conceptual relationships, and critically evaluate integrative issues germane to both the practice of and the innovative progress of veterinary medicine. Faculty members in the Departments of A&P, DM/P, and CS, will present topical overviews, based on their professional experiences. This will be designed to connect and integrate fundamental principles and relationships between research and clinical application. These presentations provide examples of the fundamental requirements for clinical therapies and provide examples of how innovative science leads to new therapies for long standing clinical disease. Additionally, students will learn the tools required to search relevant topic to their career paths within the medical literature. Finally, drawing on the multidisciplinary literature presented by faculty, students will explore the challenges in conducting genetic/genomic research, using genomic information, implementing research results to clinical practice, as well as addressing the social, legal, and professional policies that are emerging from new research. Students will be expected to do reading and to complete online worksheets and present their findings/opinions in class. Class time will be devoted to presentations and to discussion of readings and related current events.	Schultz
VAP 816	5	Spring	1 <sup>st</sup> Year DVM	Gross Anatomy II	Gross dissection of the horse and ruminant with comparative aspects of the pig, laboratory animals, and the chicken. PREREQUISITE: VAP 806.	Klimek
VAP 817	4	Spring	1 <sup>st</sup> Year DVM	Veterinary Systems 2	Microstructure and function of the reproductive and digestive systems of domestic animals with emphasis on physiologic control mechanisms, interrelationships of body systems, and criteria for evaluating animal health.	Basel
VAP 835	1	Fall	1 <sup>st</sup> Year Core	Animal Welfare	This course will describe the veterinarian's role in protecting the health and welfare of animals. Students will learn how to assess an animal's welfare in a variety of settings using science-based methods and reasoning. The history, evolution, basic principles, and application of <u>animal welfare science</u> for multiple species will be discussed.	Viscardi

VAP 888-B	1	Fall	Veterinary Elective	Stem Cells & Regenerative Medicine	A wide range of topics related to stem cells and regenerative biology. Topics include a history of the field, sources of stem cells, preclinical and clinical translation of stem cells as a regenerative therapy, tissue engineering, and the political and ethical issues surrounding the stem cell debate. The student learning objectives (SLOs) of this course: 1) List the properties that define a stem cell; 2) List different stem cell types used for scientific research; 3) Compare and contrast tissue-specific stem cell types (e.g., blood, skin), and the basic mechanisms that regulate them; 4) List some preclinical and clinical use(s) of stem cells; 5) Compare and contrast vertebrate animal models of regeneration research; 6) Discuss the ethical / political issues related to stem cell research.	Weiss, Basel
VAP 897	1	Spring	2 <sup>nd</sup> Year Elective /Graduate	Problems in Animal Welfare	Students will be introduced to the major philosophical positions of animal use. The evolution of animal welfare science will be discussed, and students will learn how to assess the welfare of companion, laboratory, zoo and food animals. Common causes of reduced animal welfare and ethical dilemmas will be covered.	Viscardi
VAP 893	1	Spring	1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup> Year DVM	Introduction to Nanomedicine	This course is a brief introduction to nanomaterials and nanomedicine with a focus on clinical applications of nanotechnology. The course presents basic principles of nanotechnology; current clinical applications of nanomedicine; future horizons in nanomedicine.	Basel
VAP 894	1	Spring	1st, 2nd, or 3rd Year DVM	Comparative Embryology	An overview of development anatomy as it relates to clinically important developmental defects and/or normal structure and function of common domestic animals.	Klimek