430 Principles of Drug Action
Fall, Summer. 1(1-0) P: CEM 251 or CEM 252 or PSL 250 or PSL 310 RB: Chemistry and/or Physiology background recommended. R: Open to undergraduate students or lifelong graduate students or lifelong undergraduate students. Not open to students with credit in PHM 350.


431 Pharmacology of Drug Addiction
Fall. 3(3-0) P: (PSL 250 or PSL 310) or (PSL 431 and PSL 432) R: Not open to freshmen.


450 Introduction to Chemical Toxicology
Spring. 3(3-0) P: (BS 110 or LBS 144) and (BS 111 or LBS 145 or BS 111) and CEM 251 R: Not open to freshmen or sophomores.

Mammalian toxicology. Disposition of chemicals in the body, detoxication, elimination, and mechanisms of toxicity in major organ systems. Selected toxic agents.

480 Special Problems
Fall, Spring. Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Approval of department. Individual work on selected research problems.

552 Veterinary Pharmacology I: Principles and Neuropharmacology
Spring. 2(2-0) R: Open to graduate-professional students in the College of Veterinary Medicine. SA: PHM 556

Basic principles of pharmacology and mechanisms of action of drugs used to affect nervous system function.

553 Veterinary Pharmacology II: Systems and Infectious Diseases
Fall. 3(3-0) RB: Completion of Year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. SA: PHM 556

Principles of pharmacology of infectious disease and specific organ systems, including mechanisms of action and adverse effects of drugs.

557 Veterinary Toxicology
Fall. 2(2-0) RB: Completion of Year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. Determinants of toxic responses, analytical toxicology, genetic toxicology, and toxic management. Diagnosis, prevention, and treatment of common toxicoses.

563 Medical Pharmacology
Summer. 3(3-0) R: Open only to graduate-professional students in the colleges of Human and Osteopathic Medicine.

General principles of pharmacology and selected drugs. Rational drug therapy.

590 Case Studies in Clinical Pharmacology
Spring. 2(2-0) P: PHM 563 RB: Completion of Year 2 in the College of Osteopathic Medicine or College of Human Medicine. R: Open to graduate-professional students in the College of Osteopathic Medicine or in the College of Human Medicine or approval of department.

Selected case studies emphasizing clinical applications of pharmacological principles. Evaluation of new drugs, drug advertising, and adverse drug reactions.

658 Research Problems in Pharmacology or Toxicology
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department. Selected research problems in pharmacology or toxicology.

804 Molecular and Developmental Neurobiology
Fall. 3(3-0) P: PHM 827 and PSL 828 R: Approval of department. Comprehensive overview of the cellular and molecular mechanisms of drug and chemical actions on the major organ systems of humans and other mammals.

820 Cellular, Molecular and Integrated Systems Pharmacology and Toxicology
Fall. 4(4-0) RB: PSL 827 and PSL 828 R: Approval of department. Comprehensive overview of the cellular and molecular mechanisms of drug and chemical actions on the major organ systems of humans and other mammals.

827 Physiology and Pharmacology of Excitable Cells
Fall. 4(4-0) Interdepartmental with Neuroscience and Physiology and Zoology. Administered by Pharmacology and Toxicology. R: Open to graduate students or lifelong undergraduate students or doctoral students or lifelong graduate students.

Description of targets in the mammalian central nervous system of clinically useful drugs and the mechanism of action, clinical use, and side effects of those drugs. Offered first ten weeks of semester.

830 Experimental Design and Data Analysis
Fall. 3(3-0) RB: Undergraduate degree in biology, chemistry or related field. R: Not open to undergraduate students. Not open to students with credit in PHEM 980.

Practical application of statistical principles to the design of experiments and analysis of experimental data in pharmacology, toxicology, and related biomedical sciences.

831 Endocrine Pharmacology
Fall. 2(2-0) P: PHM 819 Not open to students with credit in PHEM 820.

Physiology, pharmacology, and Toxicology of the endocrine system. Endocrine diseases, pharmacological intervention, hormone therapy, endocrine disruptors, role of hormones in normal metabolism and metabolic disorders, and animal models of endocrine and metabolic disorders.
Pharmacology and Toxicology—PHM

832 Applied Integrative Pharmacology Laboratory
Summer. 4(2-4) P: PHM 819 and PHM 830 RB: Undergraduate degree in biology, chemistry or related field. Prior biomedical lab experience helpful. R: Not open to undergraduate students. Approval of department. Integrative and organ-level pharmacology. Regulatory issues in the use of experimental animals, animal models of diseases, animal and tissue preparation for whole-animal and organ-level pharmacology experiments, experimental design, data collection, data analysis, and data interpretation.

833 Gastro-Intestinal and Liver Pharmacology
Spring. 2(2-0) P: PHM 819 Specific drugs and their mechanisms of action in the treatment of gastrointestinal and liver diseases. Toxic effects of drugs and other xenobiotics on the gastrointestinal tract, including the liver.

834 Respiratory Pharmacology
Spring. 2(2-0) P: PHM 819 RB: Some prior coursework in physiology useful. Integrative study of drugs, their mechanisms of action, and their side effects in the treatment of major diseases and pathologies of the respiratory system.

839 Systems Neuroscience
Spring. 4(4-0) Interdepartmental with Human Anatomy and Neuroscience and Psychology and Psychology and Zoology. Administered by Neuroscience. R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Agriculture and Natural Resources, Natural Science, Social Science, and Veterinary Medicine. SA: ANT 839 Anatomy, pharmacology, and physiology of multicellular neural systems. Sensory, motor, autonomic, and chemo-regulatory systems in vertebrate brains.

840 Safety Pharmacology
Spring. 2(2-0) P: PHM 350 or PHM 819 RB: Undergraduate degree in biology, chemistry or related area. Prior coursework in physiology useful. R: Open to seniors or graduate students or lifelong graduate students. Systems study of current experimental models, risk assessment, and regulatory guidelines for evaluating drug candidates for pharmacologic effects unrelated to therapeutic effects.

850 Communications for Biomedical Researchers
Summer. 2(2-0) Effective research and business communication, including written and verbal skills for a variety of audiences and purposes.

851 Intellectual Property and Patent Law for Biomedical Sciences
Fall. 2(2-0) RB: Strong reading and writing skills helpful. R: Not open to Law students. Fundamentals of intellectual property and patent law encountered by biomedical scientists, including issues of prevention, patent prosecution, and enforcement of patents in a litigation setting.

854 Leadership and Team-Building for Biomedical Research
Fall. 2(2-0) RB: Experience supervising others and/or participation in workplace teams is strongly suggested. Not open to students with credit in CMBA 804 or CMBA 805 or CMBA 806 or CMBA 832. Evaluation of current leadership methods. Models of leadership. Practice of specific skills and development of a plan to increase their influence and extend learning beyond the class.

855 The Business of Biomedical Research Organizations
Spring. 2(2-0) Theories, methods, terminology, and culture of business as used in biomedical research and development environments.

857 Project Management
Spring, Summer. 2(2-0) R: Open to graduate students in the Biomedical Laboratory Diagnostics Program or in the Department of Pharmacology and Toxicology or approval of department. Not open to students with credit in PHM 889. Formal project management culture, principles, knowledge areas, and terminology. Specific tools and techniques including work breakdown structure, earned value analysis, risk management, and quality control for managing scientific research. Offered first ten weeks of semester.

858 Project Management and the Drug Development Process
Fall. 3(3-0) RB: Some experience working on laboratory or clinical research projects is useful. Project management standards and best practices in drug development process, including clinical trials.

870 Research Rotation
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. RB: Open only to first year graduate students in Pharmacology and Toxicology. R: Approval of department. Individual work on selected research problems.

895 Applied Project in Integrative Pharmacology
Fall, Spring, Summer. 3 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. P: PHM 819 and PHM 830 and PHM 832 RB: All coursework for the MS in Integrative Pharmacology should be completed prior to beginning the Applied Project unless there is Departmental approval to complete final courses concurrently with the Applied Project. R: Open to masters students in the Department of Pharmacology and Toxicology. Approval of department. An on-site project that addresses a research, theoretical, or applied problem in whole-animal or organ level pharmacology, in cooperation with the students’ employer or laboratory partner.

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to graduate students in the Department of Pharmacology and Toxicology. Approval of department. Master’s thesis research.