Pharmaceutical Sciences (PS)

Course information contained within the Bulletin is accurate at the time of publication in June 2025 but is subject to change. For the most up-to-date course information, please refer to the Course Catalog.

PS 3011. Introduction to Pharmaceutical Sciences I. 1 Credit Hour.
This is the first in a series of two courses that reviews the science and opportunities for students in the field of pharmaceutical sciences. The two courses will cover foundational concepts in drug discovery, development, and delivery, including basic biology, chemistry, microbiology, pharmacology, pharmacokinetics, pharmacodynamics, dosage forms, and quality control. In this semester, we will focus on understanding the scientific principles behind the initial design of drugs, considerations for the pharmacokinetics and metabolism of drugs, and the earlier processes of bringing a new medication to market. Finally, we will introduce our students to a breadth of disciplines and careers in pharmaceutical sciences as we introduce the basic principles of drug discovery.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1031, MATH 1041, or MATH 1941), (CHEM 2202 or CHEM 2922), (CHEM 2204 or CHEM 2924), (BIOL 1111 or BIOL 1911), (BIOL 1112, BIOL 1912, BIOL 2112, or BIOL 2912), (PHYS 1021, PHYS 1061, PHYS 1961, PHYS 2021, or PHYS 2921), (KINS 1222 or KINS 1224), and SCTC 2396.

PS 3012. Introduction to Pharmaceutical Sciences II. 1 Credit Hour.
This is the second in a series of two courses that reviews the science and opportunities for students in the field of pharmaceutical sciences. The two courses will cover foundational concepts in drug discovery, development, and delivery, including basic biology, chemistry, microbiology, pharmacology, pharmacokinetics, pharmacodynamics, dosage forms, and quality control. In this semester, we will focus on understanding the scientific principles behind the delivery of drugs, formulation development, preclinical and clinical testing and the later processes of bringing a new medication to market. Finally, we will introduce our students to a breadth of disciplines and careers in pharmaceutical sciences as we introduce the basic principles of drug discovery.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3011.

PS 3145. Immunology/Biotechnology. 3 Credit Hours.
This course provides foundational knowledge of the functions of the immune system at the molecular, cellular, and anatomical levels. The first part of the course describes the innate and adaptive immune systems, their cells and anatomical structures, their intricate methods of cell-cell communication, and how immune responses can be mounted against a virtually unlimited array of pathogens while minimizing collateral damage to the host. Next, we will consider natural immunity and vaccination against specific pathogens, immune responses in cancer and transplantation, and the unwanted consequences of immune responses in inflammation, hypersensitivity, and autoimmune diseases, and the drugs and vaccines to treat those conditions. The last part of the course will introduce the biotechnologies that are fueling the rapid discovery and development of vaccines and immunotherapeutic agents for a wide variety of diseases.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1031, MATH 1041, or MATH 1941), (CHEM 2202 or CHEM 2922), (CHEM 2204 or CHEM 2924), (BIOL 1111 or BIOL 1911), (BIOL 1112, BIOL 1912, BIOL 2112, or BIOL 2912), (PHYS 1021, PHYS 1061, PHYS 1961, PHYS 2021, or PHYS 2921), (KINS 1222 or KINS 1224), and SCTC 2396.

PS 3151. Medicinal Chemistry I. 4 Credit Hours.
The course provides students with information regarding the chemical and physical properties of biomolecules. Moreover, the interrelated roles of these molecules in a functioning biological system are emphasized. As we progress through the course, study with the following goals in mind: Learn to speak the language of medicinal chemistry and comprehend the meaning, significance, and origin of terms; Understand the physical, chemical and biological context in which each biomolecule, reaction, or pathway operates; Focus on major themes, especially those relating to regulation, thermodynamics, and the relationship between structure and function; Know the most important techniques that have brought us to our current understanding of biochemistry/medicinal chemistry; Make connections between pathways and identify gaps in our knowledge that promise to challenge future generations of scientists. Upon course completion you should be able to: Understand the fundamental relationships between biochemistry, medicinal chemistry and pharmacology; Describe the metabolic pathways responsible for normal and abnormal human physiology; Identify the biochemical impact of diseases and some of the drugs used to treat these conditions.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1031, MATH 1041, or MATH 1941), (CHEM 2202 or CHEM 2922), (CHEM 2204 or CHEM 2924), (BIOL 1111 or BIOL 1911), (BIOL 1112, BIOL 1912, BIOL 2112, or BIOL 2912), (PHYS 1021, PHYS 1061, PHYS 1961, PHYS 2021, or PHYS 2921), (KINS 1222 or KINS 1224), and SCTC 2396.

PS 3152. Medicinal Chemistry II. 4 Credit Hours.
The course is designed to provide an understanding of the importance of molecular structure and molecular properties in determining the pharmacodynamic (PD) and pharmacokinetic (PK) profiles of drug molecules. The goal of this segment of the course is to present the student with the basic principles of medicinal chemistry related to major drug classes that will enhance their ability to apply this basic, foundational knowledge to the practice of pharmacy. Basic principles/concepts/themes in medicinal chemistry will be introduced early in the course and then applied to various drug classes throughout the semester. The mechanisms of action of drug classes, common adverse effects of drug classes, and the structural features of drug molecules that are responsible for their activity (structure-activity relationships; SARs) will be major topics covered throughout the semester. The expected outcomes are that students will learn a body of knowledge that builds and integrates with other courses in the curriculum and can be applied to their practice of pharmacy. The foundational knowledge supplied in the course may be applied in practice now and in the future as new drugs, with new mechanisms of action continue to be approved.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3151.

PS 3161. Pharmaceutics I. 3 Credit Hours.
Upon the conclusion of this course students will have been introduced to biopharmaceutical aspects of a variety of dosage forms. They will become familiar with the format of prescriptions and the organization and contents of monographs and their appendices. The application of mathematics to the preparation of prescriptions and drug products will be introduced. The design, preparation, properties, and evaluation of solution dosage forms including incompatibilities will be introduced. Pertinent physical and chemical principles involving solubility, pH effects, selection of excipients (e.g., color, flavor, buffers, preservatives) and their effect on the performance and quality of these dosage forms will be examined. Students will become familiar with oral solutions, ophthalmic solutions and colligative properties. Pharmaceutical Calculations will be emphasized during this course. Students must show mastery of pharmaceutical calculations at the completion of this course.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1031, MATH 1041, or MATH 1941), (CHEM 2202 or CHEM 2922), (CHEM 2204 or CHEM 2924), (BIOL 1111 or BIOL 1911), (BIOL 1112, BIOL 1912, BIOL 2112, or BIOL 2912), (PHYS 1021, PHYS 1061, PHYS 1961, PHYS 2021, or PHYS 2921), (KINS 1222 or KINS 1224), and SCTC 2396.

PS 3162. Pharmaceutics II. 3 Credit Hours.
This is a lecture-based, integrative course on the physical pharmacy principles and dosage forms (both traditional and novel). The description, preparation and product care for the following types of pharmaceutical products (and related dosage forms): parenterals, emulsions, creams, lotions, paste, gel, aerosols, transdermal delivery systems, suppositories, suspensions, tablets and capsules will be covered. Selection of excipients and their effects on performance and quality, chemical incompatibilities among drugs and excipients, drug degradation, surfactants, and pharmaceutical polymers will be discussed. In addition, students will learn the recent fields in pharmaceutical sciences such as nanomedicine and biotechnology.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3161.

PS 3164. Pharmacology I. 4 Credit Hours.
This course is the first semester of a two-semester sequence. The goal of the course is for students to learn the basic principles of pharmacology which will enhance their ability to apply this knowledge to the practice of pharmacy and communicate their knowledge with other health care professionals. The mechanisms of drug action, absorption, distribution, metabolism, adverse effects, drug interactions, and misuse are covered. Students will apply and integrate pharmacological principles to their other pharmaceutical science courses.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3145 and PS 3151.

PS 3265. Pharmacology II. 3 Credit Hours.
This course is the second semester of a two-semester sequence. The goal of the course is for students to learn the basic principles of pharmacology which will enhance their ability to apply this knowledge to the practice of pharmacy and communicate their knowledge with other health care professionals. The mechanisms of drug action, absorption, distribution, metabolism, adverse effects, drug interactions, and misuse are covered. Students will apply and integrate pharmacological principles to their other pharmaceutical science courses.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3164.

PS 3318. Clinical Drug Development. 3 Credit Hours.
This course studies the drug development process from discovery through FDA marketing approval. It reviews the process of development and the interrelationships linking the various disciplines, introducing students to regulations governing the process, including the interactions with FDA, ICH, and other regulatory agencies.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1031, MATH 1041, or MATH 1941), (CHEM 2202 or CHEM 2922), (CHEM 2204 or CHEM 2924), (BIOL 1111 or BIOL 1911), (BIOL 1112, BIOL 1912, BIOL 2112, or BIOL 2912), (PHYS 1021, PHYS 1061, PHYS 1961, PHYS 2021, or PHYS 2921), (KINS 1222 or KINS 1224), and SCTC 2396.

PS 3476. Toxicology and Good Laboratory Practices in Drug Development. 3 Credit Hours.
This entry-level course is specifically designed for undergraduate-level students with no industry experience, introducing them to the roles of pre-clinical toxicology and Good Laboratory Practices (GLPs) in the pharmaceutical drug development process. GLPs refer to the specific regulations and guidances of the U.S. Food and Drug Administration (FDA) that must be followed in the preclinical development of all regulated pharmaceutical products. The established GLPs guidelines focus on: safety pharmacology and LD50; reproductive toxicology; carcinogencity studies; personnel, facilities, and data handling. The first half of the course reviews basic principles of preclinical toxicology studies, including pharmacologic effects, dose-response relationships, types of toxicology studies, and regulatory guidelines for nonclinical toxicity evaluation. Students subsequently explore why GLPs were implemented, how GLPs requirements must be incorporated into the design of preclinical research, and standard practices for documenting GLPs compliance. Since this is an introductory course, time will be spent defining and explaining commonly used industry terminology and acronyms regarding GLPs and toxicology studies.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3318.

PS 3477. Current Good Manufacturing Practices. 3 Credit Hours.
This course is specifically designed for undergraduate-level students with no industry experience, introducing them to 1) the concept and requirements of the regulated pharmaceutical and biopharmaceutical industries, and 2) the "cGMPs" (or current good manufacturing practices), which refer to the specific regulations and guidances of the U.S. Food and Drug Administration (FDA) that must be followed in the manufacturing of all regulated pharmaceutical products. The course provides an overview of the concepts of "quality assurance," "regulatory affairs," and "compliance" which govern every aspect of the pharmaceutical, biopharmaceutical and related industries which are employed and followed to assure that consistency and quality outcomes are obtained. Since this is an introductory course, time will be spent defining and explaining commonly used industry terminology and acronyms. Class discussions will focus on the regulations for drugs that appear in the Food, Drug and Cosmetic Act (21 CFR 210 and 211), and how these are applied to every aspect of the manufacturing process, including personnel, buildings, equipment, and records. Class workshops will enable students to write and critique the creation of SOPs (standard operating practices) for GMPs and also delve into the consequences if companies are non-compliant with the GMPs.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3318.

PS 4254. Biostatistics and Medical Literature Evaluation. 2 Credit Hours.
The goal of this course is to prepare the student to evaluate and apply data from the published medical primary literature. Additionally, the student will understand the potential pitfalls of statistical methodologic flaws and inherent research study biases.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in (MATH 1041, MATH 1941, or MATH 1031)

PS 4261. Concepts in Pharmacogenomics. 3 Credit Hours.
The goal of this course is to present the contemporary pharmacogenetic principles applied to the latest innovations in medication therapy. In accordance with this goal, the course overviews genetic factors contributing to drug metabolism and drug response. Here, the emphasis is made on how the genetic makeup of individuals defines the reaction of a human body to drug therapy, with the accent on the relationship between genetic variability and adverse effects of drug therapy. Topics in the course provide a good background to bring together the disciplines of drug metabolism, pharmacogenomics, and clinical pharmacy practice. Basic procedures in pharmacogenetic evaluation of patients will be addressed during the lab exercise. As future pharmacists, it is your primary responsibility to provide pharmaceutical care and have knowledge of therapeutic effects as well as side effects of drugs. You are expected to understand and be able to disseminate/communicate new knowledge about human genome and genetic variability to patients, health professionals, and public health. We hope that students will appreciate the importance of genetic considerations in drug therapy for their future profession.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3162.

PS 4262. Pharmacokinetics. 3 Credit Hours.
The objective of this course is to present the fundamental principles of pharmacokinetics. The topics will include pharmacokinetic data analysis, dosage regimen design and the determinants of drug absorption, distribution, metabolism, and excretion.

College Restrictions: Must be enrolled in one of the following Colleges: Pharmacy.

Repeatability: This course may not be repeated for additional credits.

Pre-requisites: Minimum grade of C- in PS 3164.