



Pharmaceutical Sciences Undergraduate Courses – Fall 2024

All courses are available for registration via UAccess. Contact Rebecca Field at rmitch@arizona.edu with any registration questions. Interested in the Pharmaceutical Sciences major or minor? Email Rebecca for more information!

Fall 2024 course options include the following. Course details and times can be found below.

Core and Sub-Core Major Courses:

- PCOL 200 – Drugs & Humanity
- PCOL 305 – Scientific Writing for Health Sciences
- PCOL 310 – Drug Approval: The 3 Billion Dollar Bet
- PCOL 355 – Drug Delivery Systems
- PCOL 390 – Biomarkers: Analysis of Drug Effect & Toxicity
- PCOL 406 – Comprehensive Human Pharmacology
- PCOL 410 – Medicinal Chemistry

PharmSci Approved Major Electives:

- PCOL 300 – Pharmacology of Cosmetics & Self-Care Products
- PCOL 313 – Pharmacological and Therapeutic Aspects of Longevity and Ageing (NEW COURSE!)
- PCOL 320 – What's Your Poison? Toxicology of the Substances that Surround Us
- PCOL 396-001 – Special Topics: Neuropsychopharmacology (NEW COURSE!)
- PCOL 405 – Current Techniques in Pharmaceutical Sciences
- PCOL 436 – Cardiovascular Pharmacology (NEW COURSE!)
- PCOL 445 – Over-the-Counter Drug Information
- PCOL 465 – Infectious Disease Pharmacology

Elective Seminars (just for fun)

- PCOL 196D - The Joy of Drugs: An Introduction to Pharmaceutical Sciences
- PCOL 325 – Controversies in Healthcare Practice
- PCOL 395B – The History of Pharmacy
- PCOL 395C - Professional Pharmacy Pathways
- PCOL 395D – Exploring Careers in Pharmaceutical Sciences

PCOL 196D – The Joy of Drugs: An Introduction to Pharmaceutical Sciences (1 unit)

Wednesdays 3:00 – 3:50 PM

Instructor: Jennifer Schnellmann

This seminar will offer students who may be unfamiliar with the breadth and reach of pharmaceutical sciences as a discipline a timely and entertaining overview of this field. Topics will include an introduction to drug discovery and development, drug pricing and advertising, drug dosage forms and delivery vehicles, the science of drug efficacy and toxicity, pharmacokinetics and pharmacodynamics, a review of common drug classes (mechanism of action, indication, side effects), and the most problematic human diseases for which we have no cures (and why!). The series will conclude with hilarious stories about impromptu drug re-purposing when crazy side effects emerged. Taught using plain language and current cultural references, this course proves that you don't have to be a scientist to understand science. Open to all majors.

PCOL 200 – Drugs & Humanity (3 units)

Tues/Thurs 9:30 – 10:45AM

Instructor: Bernie Futscher

Drugs shape society. Drugs can prevent and cure mortal diseases and have dramatically increased human lifespan, thereby forever changing the fabric of society and civilization. Drugs have evolved alongside human inquiry and have informed many areas medicine, science, art, justice, and policy. The consequences of drug use or pharmacotherapy, intended and unintended, may alleviate pain and ward off death, while at the same time contribute to pain and death. Such are the complexities of small molecules ingested often in vanishingly small amounts. While the effects may appear magical, they are rooted in science, technology, engineering and mathematics.

This course uses examples of drugs that shaped humanity to examine the underlying biologic mechanisms and pharmacologic principles that underlie the drug's desired and undesired physiologic/psychologic effects. We will attempt to put these drugs in the historical context in which they emerged, how societal modernization provided the foundation for organized, reasoned drug development and the establishment of the pharmaceutical industry. As the course draws to a close, we will examine the likely pharmacologic agents and approaches that will impact society in the near future. No prerequisites, but some background in biology strongly encouraged. Required PharmSci major course.

PCOL 300 – Pharmacology of Cosmetics and Self-Care Products (3 units)

Wednesdays 2:00 – 2:50 PM + online (hybrid course)

Instructor: Jennifer Schnellmann

Students will expand their knowledge of pharmaceuticals, pharmacology, and toxicology and apply this information to an array of substances that they encounter or deliberately use daily. Students will also learn the regulatory aspects of cosmetic creation, advertising, and sale; the chemistry behind ingredient selection for each category of product; and the efficacy that can be expected due to the pharmacological and toxicological characteristics of these formulations. At the end of the course, students will be better-informed consumers, better equipped to select and purchase beauty and self-care products that deliver meaningful results, avoiding products of limited efficacy or which may be unsafe. Prerequisite: CHEM 152 (or equivalent). PharmSci major elective.

PCOL 305 - Scientific Writing for Health Sciences (3 units)

Wednesdays 1:00 – 1:50 PM + online (hybrid course)

Instructor: Jennifer Schnellmann

In this three-credit course, students will learn to read and interpret basic and clinical science papers and to write scientific manuscripts and research proposals. Emphasis will be placed on conveying the significance of research, outlining aims, and discussing results for scientific papers and grant proposals. Students will learn the traditional sections of a scientific paper (and why), how methods are used and presented, how results are communicated, and what a discussion contains (and does not). Best practices for figures and tables (data presentation) will be described and students will be shown how to craft an abstract from a work of literature. Next, students will learn what a research proposal contains (modeled after the R01) and how they are constructed. Students will also learn about peer-review and participate in drug information retrieval. Writing Emphasis Course. Prerequisite: ENGL 102, 108, or ENGL 109H and CHEM 151 (or equivalent). PharmSci majors and minors receive priority registration. Required PharmSci major course.

PCOL 310 – Drug Approval: The 3 Billion Dollar Bet (2 units)

Mon/Wed 10:00 – 10:50 AM LIVE ONLINE

Instructor: Beth Zerr

Almost 60 billion dollars are spent annually on pharmaceutical research and development in the United States and almost 425 billion dollars are spent annually in drug purchasing. Drugs are key economic and therapeutic factors in the health care arena; yet, among patients and consumers the pharmaceutical industry lacks public trust and the process of drug approval is often shrouded in mystery. In this course we'll address the decisions drug manufacturers consider, including time, cost, risk and value in bringing a new drug product to market. We will explore how a new drug product is developed from concept to bedside. Prerequisite: ENGL 102, 108, or ENGL 109H. PharmSci majors receive priority registration. Required PharmSci major course.

PCOL 313 - Pharmacological and Therapeutic Aspects of Longevity & Ageing (3 units)

Mondays 1:00 – 1:50 PM + online (hybrid course)

Instructor: Jennifer Schnellmann

In this course, students will learn how mainstream medicine is designed to keep us alive but not healthy. We will cover the main determinants of premature death and actual interventions that prevent or reverse these conditions, contrasting these approaches to the currently used and very poor therapies that simply keep people ill longer. We will address myths of ageing and the differences between centenarians and the rest of the population. Finally, we will cover diet, exercise, and drugs that can be deployed now to increase our lifespan as well as our healthspan. Prerequisites: MCB 181R and CHEM 152. Approved PharmSci major elective.

PCOL 320 – What's Your Poison? Toxicology of the Substances that Surround Us (3 units)

Mondays 2:00 – 2:50 PM + online (hybrid course)

Instructor: Jennifer Schnellmann

Honors and Non-Honors Sections Available

This course covers the toxicology of plants, fish, insects and reptiles, foods, drugs of abuse, and other common poisonous substances in addition to information about carcinogens, teratogens, and risk assessment. Students will learn about snake, spider, and scorpion venoms; marine toxins produced by exotic underwater creatures; and common food poisonings. We will cover non-food plant toxicities, drugs of abuse, approaches to risk assessment, compounds that cause cancer and birth defects, and more. Prerequisites: MCB 181R+181L and CHEM 151 (or equivalent). PharmSci major elective course.

PCOL 325 – Controversies in Healthcare (3 units)

Mondays 3:00 – 3:50 PM + online (hybrid course)

Instructor: Jennifer Schnellmann

Honors and Non-Honors Sections Available

This course will allow students to explore the most controversial and timely topics in healthcare that are based in medicine and healthcare. We will cover specific drugs for lethal injection, euthanasia, pregnancy termination as well as human physical and cognitive enhancement. We will also focus on inconsistencies in drug applications such as social medication, disease mongering, and compassionate use of drugs for the terminally ill. In each session, we will cover the laws or policies involved, where they have been and where they are heading. Drug pricing, advertising, and black-market purchases will be described and we will end the session with unlawfully obtained patient data and transgender healthcare concerns. Topics are diverse and challenging, allowing students to see behind the curtain of medicine to visualize many of the struggles our providers face daily. Students will broaden their understanding of pharmacology (drug name, purpose, mechanism of action, and potential toxicity), current events, ethics, persuasive argument, and philosophical approaches to decisions about medicine and healthcare. No prerequisites. PharmSci minor course, does not count in major.

PCOL 355: Drug Delivery Systems (3 units)

Tues/Thurs 2:00 – 3:15 PM

Instructors: Jianqin Lu and Bo Sun

The purpose of this course is to provide the student with a basis of understanding of pharmaceutical dosage forms. An overview of traditional and novel dosage forms will be presented along with a discussion on scientific and regulatory requirements necessary to get a drug product approved. The course will emphasize the relationship between Physical Pharmacy (chemistry and physical science) and the pharmaceutical dosage form. Critical thinking and problem solving will be applied to the above principals. Prerequisites: CHEM 241B and 243B. PharmSci sub-core major course.

PCOL 390: Biomarkers – Analysis of Drug Effect & Toxicity (3 units)

Tues/Thurs 12:30 – 1:45 PM

Instructor: James Galligan

A biomarker is a defined characteristic that is measured as an indicator of normal biological processes, pathogenic processes, or responses to an exposure or intervention, including therapeutic interventions. These indicators may be molecular, histologic, radiographic, or physiologic characteristics. Biomarkers can be used in a variety of settings including basic, translational, and clinical research and in clinical practice settings. This course will provide an introduction to the exploration, validation, and application of biomarkers during the drug development process and in predicting and monitoring drug efficacy and safety during patient care. Key concepts in bioanalytical technologies used in biomarker measurements will also be introduced. The pathways for regulatory biomarker interpretation and acceptance will also be discussed. Prerequisites: PSIO 202 or 380, and CHEM 241A (or equivalent). PharmSci sub-core major course.

PCOL 395B – The History of Pharmacy (1 unit)

ONLINE

Instructor: Beth Zerr

Pharmacy is a time-honored profession, dating back to ancient Mesopotamia. This seminar will explore pharmacy's rich history, and further students' understanding of the role that pharmacists, apothecaries, and medicinal healers have played over the centuries. A special emphasis will be placed on the history of pharmacy in the old west and Arizona territory. Course meetings will include frequent visits to the University of Arizona's own History of Pharmacy museum. Open to students in all majors.

PCOL 395C – Professional Pharmacy Pathways (1 unit)

Tuesdays 11-11:50AM – LIVE ONLINE

Instructor: Beth Zerr

The purpose of this seminar is to expose undergraduate students to different professional paths and opportunities that are available with a Doctorate of Pharmacy (PharmD) degree. Students will have the opportunity to learn from various professionals working in a multitude of different settings as they present on their career experiences. Students will also have the opportunity to interact with these professional during structured question and answer sessions. This will be a synchronous online course, meaning that students must participate online during the designated course time. This course will be assessed through class participation and reflection assignments. Open to students in all majors.

PCOL 395D – Exploring Careers in Pharmaceutical Science (1 unit)

Mondays 12:00 – 12:50 PM

Instructor: Bernard Futscher

Pharmaceutical Sciences is a dynamic field that is critical to the discovery of new therapies and improvements in healthcare. But what do pharmaceutical scientists actually do? In this course, students will be exposed to a variety of professional pathways within the pharmaceutical sciences, including drug discovery, medicinal chemistry, toxicology, pharmacoconomics, regulatory affairs, pharmaceutical sales, and more. Students will learn about the specific tasks associated with jobs in those fields and the type of course work needed in order to prepare for different types of work. Knowledge gained in this course may help students identify research areas in which they may pursue laboratory experience during their undergraduate program. Open to students in all majors.

PCOL 396-001 – Special Topics: Neuropsychopharmacology (3 units)

Tuesdays 10:00 – 10:50 AM + online (hybrid course)

Instructor: Ashley Campbell

The human brain is a complex organ that can be impacted by a spectrum of neurological conditions and diseases at all stages of life. The economic and social burden of neurological disorders is vast, so there is impetus to better understand brain disorders and to find new pharmacological and non-pharmacological treatments. To this end, this course will allow students to explore brain disorders and their current treatments. These include neurodegenerative disorders including Parkinson disease and Alzheimer disease; as well as neuropsychiatric conditions, such as depression, attention deficit hyperactivity disorder (ADHD), sleep-wake disorders, and seizure disorders. Current neuropsychopharmacology will be the overall focus. Prerequisite: PSIO 201. EMAIL REBECCA FIELD at rmitch@arizona.edu so she can confirm you've met the prerequisite and are eligible for registration. Fall 2024 offering of PCOL 396-001 approved as PharmSci major course. Course will be renumbered as PCOL 429 in future semesters.

PCOL 405 – Current Techniques in Pharmaceutical Science (3 units)

Monday/Thursday 4:00 – 5:15 PM

Instructor: Daekyu Sun

This co-convened team-taught course is offered by the faculty of the Department of Pharmacology and Toxicology and other invited speakers. This course will cover essential laboratory techniques that are used in the fields of medicinal chemistry, pharmacology, and pharmaceuticals. The objective of this course is to provide students with practical knowledge and hands-on experience with some of the most common experimental methods used in the field of Drug Discovery and Development, Pharmacology, Toxicology, and Pharmaceuticals. Laboratory techniques covered in this course include biochemical and molecular biological methods or procedures that are used to study living cells, analytical methods or procedures that are used in pharmacology, toxicology, and pharmaceuticals, and preclinical in vitro and in vivo experimental models of drug metabolism and disposition in drug discovery and development. Prerequisites: CHEM 241B AND BIOC 384 or 385 AND MIC 205A. PharmSci major elective course.

PCOL 406: Comprehensive Human Pharmacology (5 units)

M/T/W/Th 4:00 – 5:05 PM

Instructor: George Watts

Pharmacology is the study of how drugs change human physiology to prevent disease and to reduce/remove the impact of diseases. This course will present the basic principles of pharmacology, as well as instruction in the diverse mechanisms-of-action, and pharmacological effects (both desired and undesired!) of the major classes of drugs currently used to treat and prevent human diseases. Prerequisites: PSIO 202 co-requisite or PSIO 380 prerequisite AND CHEM 241A. Required PharmSci major course.

PCOL 410 – Medicinal Chemistry (4 units)

Mon/Wed/Fri 11:15AM – 12:25 PM

Instructor: Jeremy Snell

PCOL 410 will be a lecture course delivering content in the application of the foundation sciences to drug design. At an appropriate level of content targeting, students will draw on prior math, physics, and chemistry courses in the study of how drugs are conceptualized, designed, and developed. Content will build from basic concepts (structural factors associated with drug activity, drug solubility, pharmacophores) to a consideration of relevant biological drug targets, as well as basic content in structural biology analytical approaches. Prerequisites: CHEM 241B+243B required, BIOC 384 or 385 strongly recommended. Required PharmSci major course.

PCOL 436 – Cardiovascular Pharmacology (3 units)

Wednesdays 3:00 – 3:50 PM + online (hybrid course)

Instructor: Qin Chen

This course provides a comprehensive understanding of cardiovascular pharmacology, focusing on the mechanisms of action, therapeutic uses, adverse effects, and interactions of drugs commonly used in the management of cardiovascular diseases. Students will learn about the underlying pathophysiology of cardiovascular disorders and explore the pharmacological interventions targeting various aspects of cardiovascular function. This includes antihypertensives, cholesterol-lowering drugs, anti-ischemic therapy, and drugs to treat heart failure. Additional material will cover dysrhythmias and arrhythmias and anticoagulants and their reversal agents. Renal dynamics as well as the renin-aldosterone-angiotensin system will be reviewed as well as common concepts in hemodynamics, afterload and preload, and the contribution of the CNS to heart function. Students will leave with a greater understanding of cardiovascular physiology supplemented with fundamental pharmacological concepts that allow them significant advantages when exploring healthcare careers. Prerequisites: CHEM 152 or equivalent and MCB 181R. PharmSci Major Elective Course

PCOL 445 – Over-the-Counter Drug Information (3 units)

W/F 9:00 – 9:50 AM + online (hybrid)

Instructor: Bernadette Cornelison

In one semester, learn everything about the most important drug laws that allow us to have safe and efficacious drugs without a prescription. We will cover OTC, BTC, and Rx drugs; dosage forms and bioequivalence; analgesics, gastrointestinal drugs; antiallergy products, drugs for the lips and skin and mucous membranes; cough and cold remedies, hair drugs, smoking cessation compounds, and sleep medications. For each category, students will learn mechanisms of action, uses, and potential side effects. Prerequisites: CHEM 152 and PSIO 202 or 380. PharmSci major elective course.

PCOL 465 – Infectious Disease Pharmacology (3 units)

Tues/Thurs 11:00AM – 12:15PM

Instructor: George Watts

The treatment of infectious disease puts us at the crossroads of many avenues of understanding: history and principles of scientific knowledge, biology, chemistry, physiology, genetics, evolution, epidemiology, and more. Within this framework, we will learn about the drugs and therapies used to treat and prevent infection, how and why they work, and how microbes combat their effectiveness. We will learn how these drugs are absorbed, distributed, metabolized, and excreted by both humans and microbes. Additionally, we will discuss how and why one treatment is chosen over another, side effects, contraindications, and other concerns with the use of these drugs. The overall goal of the course is to provide the student with a broad understanding of the context, mechanisms, and pharmacologic principles in which the drugs used to treat infectious disease operate. Prerequisites: MCB 181R, CHEM 241A. PharmSci major elective course.