

# Pharmacology - Toxicology

## Bachelor of Science Degree

### About the Program

The Bachelor of Science Pharmacology-Toxicology program at UW-Madison is constructed as an upper-level four-semester undergraduate sequence, administered by the School of Pharmacy. It is one of few such baccalaureate programs in the nation. Basic science-rich and research-driven, the program features a broad interdisciplinary 41-credit core curriculum including biochemistry, genetics, pathology, physiology, statistics and pharmacology & toxicology coursework. "PharmTox" is considered among the most challenging of biological science undergraduate majors at UW-Madison. Unique components of the program include pharmacology courses taken with student pharmacists, toxicology coursework at the graduate level, and a one semester independent study research experience in a campus laboratory. The program provides considerable flexibility in electives, allowing students to tailor their degree towards personal interests and goals.

### What are Pharmacology and Toxicology?

Pharmacology and toxicology are often referred to as sister disciplines. Pharmacology is the study of the sites, properties, effects, and mechanisms of drug action—the interactions of chemicals with biological systems. Toxicology addresses adverse effects of chemicals on humans and animals and includes exposure assessment, hazard identification, dose response assessment, and risk characterization. Both subjects integrate multiple scientific disciplines. Both fields rely on cutting-edge biotechnological approaches to gain insight into drug and toxicant action at the molecular level.

### Admission to the Major

Entry to the major is competitive; applications are due February 1 for fall admission. A minimum of 60 credits of prerequisites is required to apply, including biology (with lab), general and organic chemistry (with lab), first semester physics (with lab), calculus, communications, and social science courses. For prerequisite specifics, course equivalencies and details, visit [pharmacy.wisc.edu/programs/pharm-tox/admissions/prerequisites](http://pharmacy.wisc.edu/programs/pharm-tox/admissions/prerequisites). Multiple factors are used in making admissions decisions, with overall academic achievement as the central criterion. Applicants are expected to present credentials that demonstrate strong success in math and science courses. Other selection criteria include communications skills, interest and experience in research-based learning, and the diversity of background and experiences presented by the applicant. An admissions interview may be required. For more details on selection criteria, visit [pharmacy.wisc.edu/programs/pharm-tox/admissions/selection-criteria](http://pharmacy.wisc.edu/programs/pharm-tox/admissions/selection-criteria).

### Career Opportunities

Students completing the program will be well qualified to pursue entry-level scientific career employment in industry (e.g., biomedical, biotechnology, consumer products, health care, contract research organizations, or pharmaceutical), in academic research laboratories, or in various agencies of government. The program's depth and breadth has proved to be an excellent foundation for graduate work in pharmacology, toxicology, or other related biomedical sciences, for medical school, veterinary medicine, and other health profession schools (e.g., pharmacy, dental, public health, etc.). For students who tailor their general education and elective coursework appropriately, the Pharmacology-Toxicology program can also uniquely launch students into scientific writing, business positions, or law school. As future professionals well-versed in the pharmacological and toxicological sciences, Pharmacology-Toxicology graduates are well poised to make meaningful improvements in human and animal health.

### Message for Prospective Students

Dear Prospective Students,

We hope this flyer raises your curiosity about Wisconsin's Pharmacology-Toxicology undergraduate program in the School of Pharmacy. Please take the time to look at the information provided below. We invite you to connect with us as you explore or prepare to apply to this unique, small, and rigorous biomedical sciences degree. Thanks for your time and consideration of the PharmTox Program.

Sincerely,

**Professor Jeffrey Johnson**  
PharmTox Program Director  
([jeffrey.johnson@wisc.edu](mailto:jeffrey.johnson@wisc.edu))

**Kendra Gurnee**  
PharmTox Advisor/Coordinator  
([kgurnee@wisc.edu](mailto:kgurnee@wisc.edu))



# UNIVERSITY OF WISCONSIN-MADISON

## BACHELOR OF SCIENCE PHARMACOLOGY - TOXICOLOGY CURRICULUM – EFFECTIVE FALL 2017

JUNIOR YEAR COURSES	
FALL SEMESTER	
<b>BIOCHEM 507</b> , <i>General Biochemistry I</i> . Chemistry of biological materials, intermediary metabolism and protein structure. First semester of a year-long course in biochemistry.	3 cr.
<b>PHM SCI 558</b> , <i>Laboratory Techniques in Pharmacology-Toxicology</i> . Basic laboratory techniques employed in pharmacological and toxicological research.	2 cr.
<b>PHYSIOL 335</b> , <i>Physiology (with lab)</i> . Lectures, recitations, demonstrations, and labs.	5 cr.
<b>STATISTICS*</b> May be completed in the summer prior to entering the program or in the first two semesters.	3-4 cr.
<b>ELECTIVES***</b>	2-8 cr.
<b>Semester Total</b>	12-18 credits, with 2 labs
SPRING SEMESTER	
<b>BIOCHEM 508</b> , <i>General Biochemistry II</i> . Chemistry and metabolism of nucleic acids and protein synthesis. Molecular and cellular biology.	3 cr.
<b>GENETICS 466**</b> , <i>Principles of Genetics</i> . Genetics in eukaryotes and prokaryotes. Includes Mendelian genetics, mapping, molecular genetics, genetic engineering, cytogenetics, quantitative genetics, and population genetics. Illustrative material includes viruses, bacteria, plants, fungi, insects, and humans.	3 cr.
<b>PATH 404</b> , <i>Pathophysiologic Principles of Human Diseases</i> . Primarily for students of pharmacy and nursing to provide a basic understanding of the causes, pathophysiology, pathology and clinical manifestations of disease states.	3 cr.
<b>PHM SCI 679</b> , <i>Pharmacology &amp; Toxicology Seminar</i> . Senior student presentations of independent research or of published papers on a specific topic approved by the course coordinator. Faculty-led seminars on selected topics regarding responsible conduct of research. The course also provides a venue for career talks by Pharmacology-Toxicology alumni and guests working in a variety of professional settings including research, industry, and healthcare. Junior students participate via seminar observation, discussion, and construction of a written scientific research proposal.	1 cr.
<b>ELECTIVES***</b>	2-8 cr.
<b>Semester Total</b>	12-18 credits

\*STATISTICS: PharmTox students are required to take one semester of statistics. Students can select Statistics 371, 3cr. (Introductory Applied Statistics for the Life Sciences), Statistics 301, 3 cr. (Introduction to Statistical Methods), Statistics 541, 3cr. (Introduction to Biostatistics), Statistics 571, 4cr. (Statistical Methods for Bioscience I), or Botany 575, 3 cr. (Introduction to Modern Statistical Methods for Biologists). Stat 541 or Stat 571 is recommended for students preparing for graduate studies in the sciences. The statistics requirement may be fulfilled in the summer prior to entering the program or in the first two semesters.

\*\* General Genetics I (467) and II (468), (6 cr.), may be used as a substitute for Genetics 466. The additional 3 cr. would count towards the 5 cr. of electives in the PharmTox major.

\*\*\*ELECTIVES: Consist of any remaining pre-pharmacology & toxicology course requirements and 5 credits of electives in the Pharmacology-Toxicology major (see advisors for approved list); any remaining non-major curriculum graduation requirements (Communication "B", humanities, ethnic studies, and second semester physics with lab), and any free choice electives needed to reach the required total of 120 degree credits.

SENIOR YEAR COURSES	
FALL SEMESTER	
<b>PHM SCI 521</b> , <i>Pharmacology I</i> . Pharmacological actions of important drugs, including drugs that affect the peripheral nervous system, the central nervous system, and the gastro-intestinal tract.	3 cr.
<b>PHARM SCI 623</b> , <i>Pharmacology III</i> . Pharmacological actions and underlying basic and clinical science of antimicrobial and antiviral drugs. Pharmacology of hormones and other drugs affecting the endocrine system.	3 cr.
<b>OR</b>	
<b>BIOCHEMISTRY 630</b> , <i>Cellular Signal Transduction Mechanisms</i> . Comprehensive coverage of human hormones, growth factors and other mediators; emphasis on hormone action and biosynthesis, cell biology of hormone-producing cells.	
<b>PHM SCI/M&amp;ENVTOX 625</b> , <i>Toxicology I</i> . Basic principles of toxicology and biochemical mechanisms of toxicity in mammalian species and man. Correlation between morphological and functional changes caused by toxicants in different organs of the body.	3 cr.
<b>PHM SCI 699</b> , <i>Advanced Independent Study</i> . Must be completed in semester 1, 2, or 3 of the PharmTox curricular sequence. Must have prior approval to meet PharmTox major curriculum requirements. A wet-lab basic science experience available in a variety of academic departments can fulfill the requirement.	2 cr.
<b>ELECTIVES***</b>	1-7 cr.
<b>Semester Total</b>	12-18 credits
SPRING SEMESTER	
<b>PHM SCI 522</b> , <i>Pharmacology II</i> . Pharmacological actions of important drugs, including hematopoietic, thrombolytic, antihyperlipidemic, immunopharmacologic, anticancer, antiinflammatory, diuretic, antihypertensive, antianginal, and antiarrhythmic agents, and agents used to treat congestive heart failure.	3 cr.
<b>PHM SCI/M&amp;ENVTOX 626</b> , <i>Toxicology II</i> . Course surveys the basic methods and fundamental biochemical mechanisms of toxicity. Toxicity in mammalian organ systems, techniques for evaluating toxicity, as well as mechanisms of species specificity, and environmental interactions (with toxicant examples) are presented.	3 cr.
<b>PHM SCI 679</b> , <i>Pharmacology &amp; Toxicology Seminar</i> . Senior student presentations of independent research or of published papers on a specific topic approved by the course coordinator. Faculty-led seminars on selected topics regarding responsible conduct of research. The course also provides a venue for career talks by Pharmacology-Toxicology alumni and guests working in a variety of professional settings including research, industry, and healthcare.	1 cr.
<b>ELECTIVES***</b>	5-11 cr.
<b>Semester Total</b>	12-18 credits