PHARMACEUTICAL SCIENCES (PHM SCI)

PHM SCI 310 — DRUGS AND THEIR ACTIONS
2 credits.
Introduces students to the biological effects of drugs on human health. Emphasis on how drugs, especially those used in diseases of major human health significance, act in the body. Drugs that are abused also will be covered. This course is not intended for medical, nursing, pharmacy, and physician assistant students. Enroll Info: None
Requisites: Not open to students declared in the Nursing, Physician Assistant, or Doctor of Pharmacy programs
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 420 — PHYSICOCHEMICAL PRINCIPLES OF DRUG FORMULATION AND DELIVERY
3 credits.
Applications of physicochemical principles to pharmaceutical systems. Enroll Info: None
Requisites: Declared in Doctor of Pharmacy program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 421 — INTRODUCTION TO BIOPHARMACEUTICS AND PHARMACOKINETICS
3 credits.
To integrate and utilize the knowledge obtained from chemistry, biochemistry, physiology, pathophysiology, and anatomy in order to develop an understanding of the fundamental principles governing biopharmaceutics, drug pharmacokinetics and drug pharmacodynamics. Enroll Info: None
Requisites: PHM SCI 420 and PHYSIOL 335
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI/B M E 430 — BIOLOGICAL INTERACTIONS WITH MATERIALS
3 credits.
Addresses the range of materials currently being utilized for various biomedical applications, the biological systems governing biomaterial applications, analytical techniques pertinent to biomaterial evaluation, and selected major medical applications in which biomaterials play an important role. Enroll Info: None
Requisites: (ZOOLOGY/BIOLOGY 101 and 102, ZOOLOGY/BIOLOGY/BOTANY 151, ZOOLOGY 153, or BIOCORE 383) and (CHEM 341 or 343)
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 432 — PHARMACEUTICAL BIOCHEMISTRY
4 credits.
Chemistry of metabolic processes and products of living matter with emphasis on pharmaceutical and medicinal aspects as well as recombinant DNA technology. Laboratory experience with the chemistry of metabolic processes, products of living matter and recombinant DNA. Enroll Info: None
Requisites: Declared in Doctor of Pharmacy program
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 490 — SELECTED TOPICS IN PHARMACEUTICAL SCIENCES
1-4 credits.
Specialized subject matter of current interest to undergraduate and professional students. Enroll Info: None
Requisites: Consent of instructor
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2018

PHM SCI 491 — SELECTED TOPICS IN PHARMACEUTICAL SCIENCES
1-4 credits.
Specialized subject matter of current interest to graduate students. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2016

PHM SCI 492 — SELECTED TOPICS IN PHARMACEUTICAL SCIENCES
1-4 credits.
Specialized subject matter of current interest to graduate students. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2019

PHM SCI/PHMCOL-M 521 — PHARMACOLOGY I
3 credits.
Pharmacological actions of important drugs, including drugs that affect the peripheral nervous system, the central nervous system, and the gastrointestinal tract. Enroll Info: None
Requisites: Junior standing and Pharmacology and Toxicology undergraduate program or declared in the Doctor of Pharmacy program with second year standing
Repeatable for Credit: No
Last Taught: Fall 2020
PHM SCI/PHMCOL-M 522 — PHARMACOLOGY II
3-4 credits.
Pharmacological actions of important drugs, including hematopoietic, thrombolytic, antihyperlipidemic, immunopharmacologic, anticancer, anti-inflammatory, diuretic, antihypertensive, antianginal, and anti-arrhythmic agents, and agents used to treat congestive heart failure. Enroll Info: None
Requisites: PHMCOL-M/PHM SCI/PHMCOL-M 521
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 531 — MEDICINAL CHEMISTRY I
3 credits.
Basic concepts in the chemistry of small molecule medicinal products. Structure activity of cholinergic, adrenergic, serotoninergic and dopaminergic agents, antidepressant, antianxiety drugs, opioids, and antihistamines. Overview of drug metabolism and the clinical effects of metabolic drug interactions and genetic variability in drug metabolism genes. Enroll Info: None
Requisites: PHM SCI 432
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 532 — MEDICINAL CHEMISTRY II
2 credits.
Chemistry of medicinal products, including antihyperlipidemics, glucocorticoids, estrogens, progestins, nonsteroidal anti-inflammatories, antitumor agents, and enzyme inhibitors. Enroll Info: None
Requisites: PHM SCI 531
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 540 — DRUG DELIVERY SYSTEMS FOR PHARMACOTHERAPY
3 credits.
The application of physical, chemical and biological principles to the study of drug delivery using a variety of solid, solution and disperse systems as dosage forms. Rationale for therapeutic use, formulation and manufacture, and evaluation of stability and bioavailability. Enroll Info: None
Requisites: PHM SCI 421 and concurrent enrollment in PHM SCI 542
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 541 — PHARMACEUTICAL CALCULATIONS, DISPENSING AND COMPOUNDING
3 credits.
Introductory laboratory course in compounding and dispensing of pharmaceutical dosage forms, including sterile products. Includes practice in interpretation of prescription orders, pharmaceutical calculations, compounding procedures, physical manipulation of drugs and dosage form components, and product packaging and labeling. Enroll Info: None
Requisites: PHM SCI 420
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 542 — PARENTERAL THERAPY AND NUTRITION
3 credits.
An introduction to parenteral therapy and nutrition focusing on the fundamental properties, calculations involved and the methods to prepare safe and reliable injectable medications for patients. Enroll Info: None
Requisites: PHM SCI 541 and concurrent registration in PHM SCI 540
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 558 — LABORATORY TECHNIQUES IN PHARMACOLOGY AND TOXICOLOGY
2 credits.
Basic laboratory techniques employed in pharmacological and toxicological research. Enroll Info: None
Requisites: Declared in the Pharmacology and Toxicology undergraduate program
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 581 — MOLECULAR AND CELLULAR PRINCIPLES IN PHARMACOLOGY
4 credits.
Provides an in-depth introduction to the molecular and cellular principles of pharmacology. Emphasis is on the mechanisms of drug and small molecule action in cells, with a particular focus on downstream signaling pathways, second messenger systems, protein kinase cascades, and the regulation of gene transcription. Enroll Info: None
Requisites: PHMCOL-M/PHM SCI/PHMCOL-M 521
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 623 — PHARMACOLOGY III
3 credits.
Pharmacological actions and underlying basic and clinical science of antimicrobial and antiviral drugs. Pharmacology of hormones and other drugs affecting the endocrine system. Enroll Info: None
Requisites: PHMCOL-M/PHM SCI/PHMCOL-M 522
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI/M&ENVTOX/ONCOLOGY/PHMCOL-M/POP HLTH 625 — TOXICOLOGY I
3 credits.
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. Enroll Info: None
Requisites: (BIOCHEM 501 or 508) and (ANAT&PHY 335, 435, or (BIOCORE 485 486)) and PATH 404; or graduate/professional standing
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Description</th>
<th>Enroll Info</th>
<th>Requisites</th>
<th>Course Designation</th>
<th>Last Taught</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHM SCI 626</td>
<td>TOXICOLOGY II</td>
<td>3</td>
<td>Survey of 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.</td>
<td>None</td>
<td><strong>Requisites</strong>: PHMCOL-M/POP HLTH/M&amp;ENVTOX/ONCOLOGY/PHM SCI/PHMCOL-M 625&lt;br&gt;Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req&lt;br&gt;Level - Advanced&lt;br&gt;L&amp;S Credit - Counts as Liberal Arts and Science credit in L&amp;S&lt;br&gt;Grad 50% - Counts toward 50% graduate coursework requirement</td>
<td>Repeatable for Credit: No</td>
<td>Spring 2021</td>
</tr>
<tr>
<td>PHM SCI 679</td>
<td>PHARMACOLOGY AND TOXICOLOGY SEMINAR</td>
<td>1</td>
<td>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 and Toxicology alumni and guests working in a variety of professional settings - research, industry (pharmaceutical; biotech; contract research; consumer products; etc.), a variety of healthcare professions, and law.</td>
<td>None</td>
<td><strong>Requisites</strong>: Declared in the Pharmacology and Toxicology undergraduate program&lt;br&gt;Repeatable for Credit: Yes, for 2 number of completions</td>
<td>Repeatable for Credit: No</td>
<td>Spring 2021</td>
</tr>
<tr>
<td>PHM SCI 691</td>
<td>SENIOR THESIS</td>
<td>2</td>
<td>Individual study for seniors completing theses as arranged with a faculty member.</td>
<td>None</td>
<td><strong>Requisites</strong>: Consent of instructor&lt;br&gt;Repeatable for Credit: No</td>
<td>Repeatable for Credit: No</td>
<td>Fall 2010</td>
</tr>
<tr>
<td>PHM SCI 692</td>
<td>SENIOR THESIS</td>
<td>2</td>
<td>Individual study for seniors completing theses as arranged with a faculty member.</td>
<td>None</td>
<td><strong>Requisites</strong>: Consent of instructor&lt;br&gt;Repeatable for Credit: No</td>
<td>Repeatable for Credit: No</td>
<td>Fall 2011</td>
</tr>
<tr>
<td>PHM SCI 699</td>
<td>ADVANCED INDEPENDENT STUDY</td>
<td>0-3</td>
<td>Directed study projects as arranged with a faculty member.</td>
<td>None</td>
<td><strong>Requisites</strong>: Consent of instructor&lt;br&gt;Course Designation: Level - Advanced&lt;br&gt;L&amp;S Credit - Counts as Liberal Arts and Science credit in L&amp;S&lt;br&gt;Repeatable for Credit: Yes, unlimited number of completions</td>
<td>Repeatable for Credit: No</td>
<td>Summer 2021</td>
</tr>
<tr>
<td>PHM SCI 750</td>
<td>THE DRUG DEVELOPMENT PROCESS</td>
<td>3</td>
<td>Overview of the drug development process from target identification, development, preclinical studies, clinical trials to post approval monitoring. Small and Large molecules (biologics) will be covered along with a basic coverage of regulatory authorities. Brief history of drug development as well as case studies that offer insights into the development and approval process. Comprehensive overview of the process of drug development, some of the decision-making logic, the vocabulary, and the ability to communicate within the industry.</td>
<td>None</td>
<td><strong>Requisites</strong>: Declared in the MS Pharmaceutical Sciences: Applied Drug Development&lt;br&gt;Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement</td>
<td>Repeatable for Credit: No</td>
<td>Fall 2020</td>
</tr>
<tr>
<td>PHM SCI 751</td>
<td>INTRODUCTION TO REGULATORY PRACTICE</td>
<td>3</td>
<td>Identifies and examines the key regulatory agencies and practices that govern the highly regulated and diverse biotechnology industry, both domestically and internationally. Highlights current and emerging FDA and ICH regulations and guidance documents to successfully navigate meeting with the agencies and to submit required documentation for successful product development.</td>
<td>None</td>
<td><strong>Requisites</strong>: Declared in the MS Pharmaceutical Sciences: Applied Drug Development&lt;br&gt;Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement</td>
<td>Repeatable for Credit: No</td>
<td>Fall 2020</td>
</tr>
<tr>
<td>PHM SCI 752</td>
<td>GXP (GOOD PRACTICE): WORKING IN A REGULATED ENVIRONMENT</td>
<td>3</td>
<td>The pharmaceutical and biopharmaceutical industries have strict documentation and production requirements. Prepares the learner to work in a regulated environment. Explains roles and responsibilities across multiple disciplines and proper documentation practices. Prepares learner for protocol, report creation and audit responses. Discusses specifications, guidances and root-cause analysis.</td>
<td>None</td>
<td><strong>Requisites</strong>: Declared in the MS Pharmaceutical Sciences: Applied Drug Development&lt;br&gt;Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement</td>
<td>Repeatable for Credit: No</td>
<td>Spring 2021</td>
</tr>
</tbody>
</table>
PHM SCI 753 — PHARMACEUTICAL ECONOMICS AND PROJECT MANAGEMENT
3 credits.
Provides an introduction to key terminology and lays a foundation of the critical body of knowledge project team members must master in a contemporary drug development enterprise. The latest project management theory is integrated with practical techniques and tools so that course participants learn to properly manage and schedule quality, budget, and progress objectives. Provides an overview of the economic structures, management and policy issues that drive and challenge the pharmaceutical and biotechnology industries. Enroll Info: None
Requisites: Declared in the MS Pharmaceutical Sciences: Applied Drug Development
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 755 — LABORATORY AND INSTRUMENTATION METHODS
3 credits.
Teaches the theory and application of many common laboratory techniques and instruments used in drug discovery and development. Includes a laboratory component to teach safety and basic techniques necessary for working in a lab. Instruction begins with basic techniques and builds up these techniques to instruct in proper sample preparation and handling for analysis using a variety of analytical instrumentation. Enroll Info: None
Requisites: Declared in the MS Pharmaceutical Sciences: Applied Drug Development
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 759 — CURRENT TRENDS IN DRUG DISCOVERY AND DEVELOPMENT
1 credit.
Provides the experience and skill to find, read and critically analyze scientific and regulatory literature in the field of drug discovery and development. Enroll Info: None
Requisites: Declared in the MS Pharmaceutical Sciences: Applied Drug Development
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI 760 — SUMMATIVE RESEARCH INTERNSHIP
4 credits.
Summation of core coursework to a real-world project and/or internship experience. Synthesis of knowledge, skills and abilities to demonstrate aptitude for careers in respective industries. Enroll Info: None
Requisites: Declared in MS Pharmaceutical Sciences
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Summer 2021

PHM SCI/ CHEM 766 — MOLECULAR RECOGNITION
2-3 credits.
Requisites: CHEM 561
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 768 — PHARMACOKINETICS
3 credits.
Quantitative aspects of drug absorption, distribution, metabolism, and excretion. Philosophy and applications of pharmacokinetic modeling and its use in clinical practice. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 773 — MOLECULAR SOLIDS
2 credits.
Describes the structures, properties, formation, and transformation of molecular solids, with emphasis on pharmaceutical solids. In each area, relevant theory, experiments, and case studies are presented. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

PHM SCI 775 — POLYMERIC DRUG DELIVERY
2 credits.
Introduction to polymers used in drug delivery, specifically polymers used in the spatial and temporal control of drugs. Discussion of basic reactions for the synthesis of polymers, biodegradable polymers, water-soluble polymer-drug conjugates, polymer assembly and nanoscale devices, and stimuli-sensitive polymers. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2020
PHM SCI 780 — PRINCIPLES OF PHARMACEUTICAL SCIENCES
3 credits.

Introductory-level graduate course providing overview of the drug development process, involving drug discovery, drug action, and drug delivery. Exposes students to cutting-edge research and the chemistry, biology, physical chemistry, and engineering that underpin pharmaceutical sciences research. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

PHM SCI 786 — NATURAL PRODUCT SYNTHESIS, BIOSYNTHESIS AND DRUG DISCOVERY
3 credits.

Synthesis and biosynthesis of natural products in drug discovery. Topics include: natural products in drug discovery; biosynthetic pathways and synthetic strategies for major natural product classes; and basic bioorganic chemistry and enzyme mechanisms in biosynthesis. Enroll Info: None
Requisites: CHEM 345 and BIOCHEM 508
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

PHM SCI/B ME 801 — SEMINAR ON DEVELOPMENT OF MEDICAL DEVICES AND DRUGS
1 credit.

An overview of three major sectors of medical product and technology development including pharmaceuticals, medical devices and combination products. Regulatory framework, disclosure and patenting, technical design and development strategy, academia-specific development challenges will be among the major lecture topics. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

PHM SCI 891 — HIGHLIGHTS AT THE CHEMISTRY-BIOLOGY INTERFACE II
1 credit.

Principles of key discoveries at the chemistry-biology interface. This course is required of all Chemistry-Biology Interface trainees. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

PHM SCI 931 — PHARMACEUTICAL SCIENCES SEMINAR
1 credit.

Weekly series that provides exposure to a diverse array of research topics. Students enroll in one of three sections, corresponding to their research core (Drug Action, Drug Discovery, or Drug Delivery). Students in their 2nd year and beyond present their research progress or review literature. The course includes talks from nationally and internationally recognized scientists from academia and industry. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2020

PHM SCI 932 — PHARMACEUTICAL SCIENCES SEMINAR
1 credit.

Weekly series that provides exposure to a diverse array of research topics. Students enroll in one of three sections, corresponding to their research core (Drug Action, Drug Discovery, or Drug Delivery). Students in their 2nd year and beyond present their research progress or review literature. The course includes talks from nationally and internationally recognized scientists from academia and industry. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2021

PHM SCI 990 — RESEARCH
1-12 credits.

Independent research and writing for graduate and students under the supervision of a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2021

PHM SCI 999 — ADVANCED INDEPENDENT STUDY
1-12 credits.

Directed study projects for graduate students as arranged with a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2021