

PHARMACEUTICAL SCIENCES

Pharmaceutical sciences is the translational branch of chemistry, biochemistry, physiology and pharmacology. Basic science discoveries that identify disease processes and targets for intervention are translated by pharmaceutical scientists into therapies that directly impact patient care. This field includes drug discovery, development, and manufacturing. The research conducted by pharmaceutical scientists determines a new drug's effectiveness, optimal dosage, administration frequency, and potential complications – often leading to new inventions and therapeutic advancements.

The strength of our program lies in students from the undergraduate BS, MS, and PhD interacting across disciplines. This approach offers guidance and mentoring opportunities for students, allowing them to develop mentoring skills early in their careers. Graduates frequently express their appreciation for the nurturing environment and emphasis on peer mentoring, which is an integral part of the curriculum. Our department's mission revolves around student-centricity, interdisciplinary integration, and fostering diversity, equity, and inclusion. Guided by dedicated research advisors, our curriculum is crafted to the individual needs of students, preparing them for successful careers in the biomedical field, graduate studies, or health professions. We provide internship opportunities at pharmaceutical companies as early as sophomore year, allowing ample time for professional growth. The faculty members deliver innovative and interactive courses, ensuring academic excellence.

Diverse expertise within the Department of Pharmaceutical Sciences forms the core of our research philosophy and drives our success. Our department fosters groundbreaking research in pharmacology, toxicology, medicinal chemistry, and drug formulation and delivery. Many faculty members engage in preclinical studies focusing on precision medicine, bridging the gap between benchside research and clinical applications. Several faculty members have founded companies and hold multiple patents, reflecting our commitment to innovation. Our students serve as pioneers in our laboratories and contribute directly to our research success. In both our labs and classrooms, innovation propels us towards breakthroughs in medical science.

Faculty

Our department has trained pharmacists and pharmaceutical scientists for 200 years, and our esteemed faculty continues this tradition, educating and mentoring students as they advance in this dynamic field.

Department of Pharmaceutical Sciences Faculty (<https://www.sju.edu/departments/pharmaceutical-sciences/faculty/>)

Programs

Undergraduate Majors

- Pharmaceutical Sciences & Drug Developments (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharm-sciences-major/>)
- Pharmacology & Toxicology (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharm-tox-major/>)

Undergraduate Minors

- Pharmaceutical Sciences & Drug Development (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharm-sci-minor/>)
- Pharmacology (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharm-minor/>)
- Toxicology (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/tox-minor/>)

Graduate

- Drug Development & Industrial Pharmacy (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/drug-dev-industrial-pharm-ms/>)
- Drug Discovery & Cell Gene Therapy (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/drug-disc-cell-gene-therapy-ms/>)
- Pharmacology & Toxicology (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharm-tox-ms/>)
- Pharmaceutics (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharmaceutics-ms/>)

Doctoral

- Pharmacology & Toxicology (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharm-tox-phd/>)
- Pharmaceutics (<https://academiccatalog.sju.edu/health-professions/phila-college-pharm/pharm-sciences/pharmaceutics-phd/>)

Courses

Pharmacology

PHT 282 Pharmacology/Toxicology Orient (1 credit)

Introduction to research literature in pharmacology/toxicology.

PHT 305 Fundamentals of Pharmacology (3 credits)

Basic principles and therapeutic approaches to the treatment of diseases. Students will be introduced to the role and actions of drugs and their classes as they relate to biological receptors, disease, health, and body systems.

PHT 306 Biomethods in Pharmac & Tox (3 credits)

Survey of biological methods employed in pharmacology and toxicology to assess efficacy and safety of drugs and chemicals. Experiments are designed to illustrate pharmacological principles and to detect and evaluate potential local and systemic toxicities.

PHT 307 Introduction to Toxicology (2 credits)

This course introduces the basic principles of the effects of toxic substances on biological systems, including consideration of the history, scope, and applications of toxicology, toxicant exposure, the mechanisms of toxic action, some major types of toxicants, and fundamental methods of toxicology studies. Students will apply the basic principles of toxicology to evaluate the safety risks in preclinical, environmental, and forensic studies and practices

PHT 320 Techniques in Pharmacol & Tox (2 credits)

A laboratory course designed to familiarize students with standard methodology used to assess drug and chemical safety.
Restrictions: Enrollment is limited to Undergraduate Day Division level students.

PHT 324 Pharmacology & Toxicology Sem (1 credit)

Presentation by students and discussion of primary scientific literature in pharmacology and toxicology by students and faculty.

PHT 340 Intro Neuropsychopharmacology (3 credits)

This course will provide a working knowledge of the neurobiological and neurochemical basis of behavior and the mechanism by which drugs influence synaptic neurotransmission to alter behavior and function in neurologic and psychiatric disorders.

Restrictions: Enrollment is limited to Undergraduate Day Division level students.

Attributes: Undergraduate

PHT 350 Toxicology of Drug Abuse (2 credits)

This course will consider the toxicity of deliberately ingested, inhaled, injected materials that are used to alter the psychological state. The course will provide a working knowledge of the neurobiological and neurochemical basis of behavior and the mechanism by which drugs influence synaptic neurotransmission to alter behavior and function in Addiction. No prior courses in pharmacology are required.

PHT 395 Research Experience (1-4 credits)

this course is a research opportunity for students to work with a faculty mentor (or faculty's lab team members) to gain insight and skills in research literature interpretation, hypothesis testing, laboratory measures, and data analysis. The course is pass/fail, with specific objectives and expectations agreed upon by mentor and students, and can be taken multiple times.

PHT 402 Advanced Pharmacology (3 credits)

This course will introduce concepts involved in drug actions in the body. Principles of medicinal chemistry, pharmacokinetics, pharmacodynamics and pharmacogenomics will be explored from a theoretical standpoint with integration of chemical and biological principles. This course engages students to think critically through medicinal chemistry concepts and designs including functional groups, isomerism, bonding, physicochemical properties, salts, and prodrugs while being able to delve into examples of structure activity relationships with regard to interactions between drugs and their targets. A large emphasis on interaction between a ligand and its target (receptors, signaling cascades, second messengers, enzymes, transporters, etc.) and methodology and experimental design at the preclinical level describing the processes and parameters that determine absorption, distribution, metabolism, and excretion/elimination (ADME) of chemicals will also be covered.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHT 403 Advanced Toxicology (3 credits)

This course introduces the biochemical, genetic, cellular basis of cytotoxicity. Based on this knowledge, the course will study the toxic effects and their underlying mechanisms in different organ systems (e.g., liver, kidney, lung, eye, immunity, endocrine, and reproductive system).

Restrictions: Enrollment is limited to Undergraduate Day Division level students.

Attributes: Undergraduate

PHT 404 Pharmacology&Toxicology Sem II (1 credit)

Formal science-based presentations by students using primary scientific literature.

PHT 405 Pharmacology in Drug Discovery (3 credits)

This course will describe pharmacological classes of therapeutic agents with emphasis on mechanisms of actions and medicinal chemistry. Students will also apply previous knowledge of physiology and pathophysiology to drug treatment and build to understand the mechanisms of actions and medicinal chemistry linked to effectiveness and side effects of drugs. Structure activity function related to drug design will also be introduced for several drugs discussed. Students will also participate in interactive learning related to special topics in pharmacology through engaging discussions.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHT 407 Tox Subst Use Disorder (Appld) (3 credits)

Students will develop a working knowledge of the key neurotransmitters and mechanisms involved in substance use disorders. They will also explore the neurobiological and neurochemical theories proposed for different types of substance use disorders. Students will delve into the neurotoxicology of both the central and peripheral nervous systems, as well as gain insights into the principles of drug metabolism for substances with abuse potential. Lastly, they will examine the mechanisms through which substance use can modify behavior and mood, ultimately leading to the development of disease states.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHT 421 Advanced Medicinal Chem/Pharm (4 credits)

This course will introduce concepts involved in drug actions in the body. Principles of medicinal chemistry, pharmacokinetics, pharmacodynamics and pharmacogenomics will be explored from a theoretical standpoint with integration of chemical and biological principles.

Restrictions: Enrollment is limited to Undergraduate Day Division level students.

Attributes: Undergraduate

PHT 440 Drug Disc Neurodegenerative (3 credits)

The goal of this course is to examine the drug discovery process for neurodegenerative disorders. Using Alzheimer's disease as a model, we will examine the diagnosis, epidemiology, current therapeutics, and strategies for drug discovery. The in vitro disease models with resulting outcomes in translational studies will be discussed. At the end of the course students will utilize NIH guidelines to develop their own proposal for future studies.

PHT 450 Analysis of Publications (1-3 credits)

The purpose of this course is to use the information learned from retracted scientific papers in the medical/pharmaceutical field to teach many aspects of scientific publication. The class will discuss the specific reasons for the retractions, for example, errors in data, plagiarism, or fraudulent data including manipulated photo images. Using data from subsequent publications that led to the particular retraction, we will analyze the original data in terms of the rigor of statistics, reproducibility, and hints of data manipulation. We will also analyze the impact of the retracted papers on the scientific concepts and to public health. A retracted paper means that the particular data no longer exist in the literature; therefore in this course, we will discuss the ethics and responsibility of authorship, including coauthors. We will also discuss the process of scientific publication and the peer review process that varies widely among journals. Examples of the adverse consequences of retracted papers to medical science, to the biomedical community, and to the public at large will be given in class and discussed in terms of the responsibility of scientists and the ethics in scientific publications. For students electing to receive a letter grade in the course, two written assignments will be required.

Attributes: Undergraduate

PHT 460 Toxicology of Drug Abuse (3 credits)

This course will consider the toxicity of deliberately ingested, inhaled, injected materials that are used to alter the psychological state. The course will provide a working knowledge of the neurobiological and neurochemical basis of behavior and the mechanism by which drugs influence synaptic neurotransmission to alter behavior and function in Addiction.

Attributes: Undergraduate

PHT 470 Special Topics Pharmacology (4 credits)

This course will describe pharmacological classes of therapeutic agents with emphasis on mechanisms of actions at the cellular and organ levels. Students will also participate in interactive learning related to special topics in pharmacology.

Attributes: Undergraduate

PHT 471 Special Topics in Toxicology (3 credits)

This course considers special topics related to organ-specific pathology and applications of clinical toxicology. Special topics may include substance use disorders, cancer therapeutics, immunotherapy, nanotherapy, and the toxicology of medical devices. The course will provide a working knowledge of toxicology principles that impact specific disease states and therapy.

PHT 495 Independent Research Project (1-4 credits)

"This course is a research opportunity for students to work with a faculty mentor (or faculty's lab team members) to gain insight and skills in research literature interpretation, hypothesis testing, laboratory measures, and data analysis, as well as research summarization and conclusion generation, with poster preparation and data presentation to a broad audience. Faculty mentor and student should agree upon the specific objectives and expectations for the course at the beginning of the course; usually the course will follow one or more PC 395 courses, with the added course requirement here for preparation and presentation of data at a local or regional science meeting. This course can be taken multiple times."

PHT 702 Advanced Pharmacology (3 credits)

This graduate level course will introduce concepts involved in drug actions in the body. Principles of medicinal chemistry, pharmacokinetics, pharmacodynamics and pharmacogenomics will be explored from a theoretical standpoint with integration of chemical and biological principles. This course engages students to think critically through medicinal chemistry concepts and designs including functional groups, isomerism, bonding, physicochemical properties, salts, and prodrugs while being able to delve into examples of structure activity relationships with regard to interactions between drugs and their targets. A large emphasis on interaction between a ligand and its target (receptors, signaling cascades, second messengers, enzymes, transporters, etc.) and methodology and experimental design at the preclinical level describing the processes and parameters that determine absorption, distribution, metabolism, and excretion/elimination (ADME) of chemicals will also be covered.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHT 703 Advanced Toxicology (3 credits)

This course introduces the biochemical, genetic, cellular basis of cytotoxicity. Based on this knowledge, the course will study the toxic effects and their underlying mechanisms in different organ systems (e.g., liver, kidney, lung, eye, immunity, endocrine, and reproductive system).

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHT 705 Pharmacology in Drug Discovery (3 credits)

This graduate course will describe pharmacological classes of therapeutic agents with emphasis on mechanisms of actions and medicinal chemistry. Students will also apply previous knowledge of physiology and pathophysiology to drug treatment and build to understand the mechanisms of actions and medicinal chemistry linked to effectiveness and side effects of drugs. Structure activity function related to drug design will also be introduced for several drugs discussed. Students will also participate in interactive learning related to special topics in pharmacology through engaging discussions guided by relevant and high impact literature.

PHT 707 Tox Subst Use Disorder (Appld) (3 credits)

Students will develop a working knowledge of the key neurotransmitters and mechanisms involved in substance use disorders. They will also explore the neurobiological and neurochemical theories proposed for different types of substance use disorders. Students will delve into the neurotoxicology of both the central and peripheral nervous systems, as well as gain insights into the principles of drug metabolism for substances with abuse potential. Lastly, they will examine the mechanisms through which substance use can modify behavior and mood, ultimately leading to the development of disease states.

Restrictions: Enrollment is limited to Graduate level students.

PHT 709 Research Project Drug Discov (1-4 credits)

This course is an independent projects in Drug Discovery. Students can either elect to research literature on topics guided by mentoring faculty and write a semester project paper (dissertation style) and give a presentation to content experts in the Department (self-paced) or can choose to engage in a research faculty's research to gain experience on hands on techniques utilized in the research and field of drug discovery.

PHT 721 Advanced Medicinal Chem/Pharm (4 credits)

This course will introduce concepts involved in drug actions in the body. Principles of medicinal chemistry, pharmacokinetics, pharmacodynamics and pharmacogenomics will be explored from a theoretical standpoint with integration of chemical and biological principles.

Restrictions: Enrollment is limited to Graduate level students.

PHT 740 Drug Disc Neurodegenerative (3 credits)

The goal of this course is to examine the drug discovery process with focus on neurodegenerative disorders. Using Alzheimer's disease for illustration, we will examine diagnosis, epidemiology, current therapeutics, strategies for drug discovery (amyloid hypothesis, tau, apo E, insulin, and various receptors) in vitro and in vivo disease models. We will examine the in vivo models to see how well they simulate the disease and thus how reliable they may be in translational studies. Although the focus of the course is on preclinical studies, we will examine how some of the compounds that have done well in preclinical studies have fared in clinical studies thus illustrating challenges in this field.

Restrictions: Enrollment is limited to Graduate level students.

PHT 750 Research Ethics and Conduct (2-3 credits)

This course discusses research ethics and publication ethics and delves into data manipulations, including image manipulation, statistical manipulation such as p-hacking. The course uses retracted literature that are known to contain errors or manipulated data, and failed to be reproduced by other scientists. This course discusses the adverse consequences of retracted papers to medical science, to the biomedical community and to the public at large and focuses on the responsibility of scientists and the ethics in scientific publications as an author or co-author. The course is entirely online. There will be modules of different topics which will be self-paced and engaging.

PHT 752 Intro Scientific Data Analysis (1 credit)

The course is designed to give an introduction to the important maxim of "truth" in science. The foundation of science is the data that form the basis of hypothesis must be verifiable. Errors in science do occur and can lead to retraction, that leads to the concept of science being a self-correcting process. In this introductory course, we use retracted literature (from both basic research and clinical research) to teach students how to analyze data. Retracted literature are known to be due to errors or manipulated data, many are highly cited papers and published in high impact journals. In this course we will discuss the source of errors, for example in image manipulation, interpretation of statistical p-value. We will also discuss the ethics in conducting research. As an introductory course, this course can be taken as a "stand alone" course as well as in conjunction with the existing PHT750 courses to satisfy students who need 3-credit electives.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHT 770 Special Topics in Pharmacology (4 credits)

This course will describe pharmacological classes of therapeutic agents with emphasis on mechanisms of actions at the cellular and organ levels. Students will also participate in interactive learning related to special topics in pharmacology.

Restrictions: Enrollment is limited to Doctoral level students.

PHT 799 Master's Research (1-10 credits)

"Candidates for the master of science degree complete an independent research project, equivalent to at least 10 research credits, under the direction of an Advisory Committee of graduate faculty."

PHT 801 Research Lit in Pharm/Tox (1 credit)

"Weekly presentations by graduate students and faculty on current research papers from journals relevant to the fields of pharmacology and toxicology, followed by group discussion. Attendance and active participation are required during fall and spring semesters."

PHT 802 Advanced Pharmacology (3 credits)

This course will introduce concepts involved in drug actions in the body. Principles of medicinal chemistry, pharmacokinetics, pharmacodynamics and pharmacogenomics will be explored from a theoretical standpoint with integration of chemical and biological principles. This course engages students to think critically through medicinal chemistry concepts and designs including functional groups, isomerism, bonding, physicochemical properties, salts, and prodrugs while being able to delve into examples of structure activity relationships with regard to interactions between drugs and their targets. A large emphasis on interaction between a ligand and its target (receptors, signaling cascades, second messengers, enzymes, transporters, etc.) and methodology and experimental design at the preclinical level describing the processes and parameters that determine absorption, distribution, metabolism, and excretion/elimination (ADME) of chemicals will also be covered.

Attributes: Doctoral

PHT 803 Advanced Toxicology (3 credits)

This course introduces the biochemical, genetic, cellular basis of cytotoxicity. Based on this knowledge, the course will study the toxic effects and their underlying mechanisms in different organ systems (e.g., liver, kidney, lung, eye, immunity, endocrine, and reproductive system).

Attributes: Doctoral

PHT 804 Intro Drug Discovery and Dev (3 credits)

This course will allow students to gain insight into the process of drug discovery and development. By interacting with different experts in the field of drug discovery and development, students will learn about the steps to drug discovery including new target identification, selection and validation, screening of potential candidates, understanding the formulation process, packaging and delivery of new drugs and finally being exposed to the important regulatory aspects of the drug discovery process and how it applies to taking novel discoveries to clinic and patients. This course also introduces basic concepts of medicinal chemistry as applied to drug discovery.

PHT 805 Pharmacology in Drug Discovery (3 credits)

This course will describe pharmacological classes of therapeutic agents with emphasis on mechanisms of actions and medicinal chemistry. Students will also apply and build an understanding of the mechanisms of actions and medicinal chemistry linked to effectiveness and side effects of drugs. Structure activity function related to drug design will also be introduced for several drugs discussed. Students will also participate in interactive learning related to special topics in pharmacology through engaging discussions.

Attributes: Doctoral

PHT 807 Tox Subst Use Disorder (Appld) (3 credits)

Students will develop a working knowledge of the key neurotransmitters and mechanisms involved in substance use disorders. They will also explore the neurobiological and neurochemical theories proposed for different types of substance use disorders. Students will delve into the neurotoxicology of both the central and peripheral nervous systems, as well as gain insights into the principles of drug metabolism for substances with abuse potential. Lastly, they will examine the mechanisms through which substance use can modify behavior and mood, ultimately leading to the development of disease states.

Restrictions: Enrollment is limited to Doctoral level students.

Attributes: Doctoral

PHT 810 Research in Pharm and Tox (3 credits)

This course is a research opportunity for students to work with a faculty mentor (or faculty's lab team members) to gain insight and skills in research literature interpretation, hypothesis testing, laboratory measures, and data analysis, as well as research summarization and conclusion generation, with poster preparation and data presentation to a broad audience. Faculty mentor and student should agree upon the specific objectives and expectations for the course at the beginning of the course.

PHT 811 Research Techniques Laboratory (1-3 credits)

"During the first year of enrollment, each student satisfactorily completes an experiential rotation through the research laboratories of at least two departmental graduate faculty and selects a primary research topic."

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHT 821 Molecular Pharmacology (3 credits)

"This is an advanced pharmacology course with a focus on cell signal transduction. Major mammalian signaling pathways will be reviewed and how therapeutics, especially anticancer therapeutics, perturb these signaling pathways for therapeutic purposes will be discussed. Instructors will provide appropriate recent review and research papers to the class. Students are required to read these papers and actively participate in class discussion. Students are also required to write a mock research proposal and present it in class."

PHT 840 Drug Disc Neurodegenerative (3 credits)

The goal of this course is to examine the drug discovery process with focus on neurodegenerative disorders. Using Alzheimer's disease for illustration, we will examine diagnosis, epidemiology, current therapeutics, strategies for drug discovery (amyloid hypothesis, tau, apo E, insulin, and various receptors) in vitro and in vivo disease models. We will examine the in vivo models to see how well they simulate the disease and thus how reliable they may be in translational studies. Although the focus of the course is on preclinical studies, we will examine how some of the compounds that have done well in preclinical studies have fared in clinical studies thus illustrating challenges in this field.

Restrictions: Enrollment is limited to Doctoral level students.

Attributes: Doctoral

PHT 851 Drug Discovery & Development (3 credits)

This is an advanced 3-credit course of pharmacology & toxicology focusing on drug discovery and development. The primary objective of this course is to provide students with an in-depth knowledge about the major steps involved in drug discovery and development with real examples. The course will cover all major stages for advancing a molecule from the pre-clinical space into clinical FIH (First in Human) trials. These include target identification and validation, screening and selection of appropriate targeting molecules, non-clinical safety assessment, PK/PD modeling, clinical trial design, FIH dose calculation and efficacy assessment, et al. In addition to the didactic teaching, students will be assigned with a group project to use the knowledge they have learned to solve problems in drug discovery and development. After completing the course, students will have a deep understanding and practical knowledge of how pharmaceutical industry develops small molecule chemicals and biological macromolecules to become life-saving medicines.

PHT 880 Pharm Tox Seminar (1 credit)

"Reports on current research topics by guest scientists, departmental faculty, and graduate students, followed by group discussion. Attendance and participation are required during fall and spring semesters."

PHT 895 Independent Research Project (1-4 credits)

This course is a research opportunity for post-bac and graduate students that have already acquired a BS degree to work with a faculty mentor (or faculty's lab team members) to gain insight and skills in research literature interpretation, hypothesis testing, laboratory measures, and data analysis, as well as research summarization and conclusion generation, with poster preparation and data presentation to a broad audience. This course can be taken multiple times.

PHT 899 Doctoral Research (10 credits)

"Candidates for the doctor of philosophy degree fulfill their thesis-directed research requirement, equivalent to at least 20 research credits, under the supervision of an Advisory Committee of graduate faculty."

Pharmaceutical Sciences

PHS 150 First Year Seminar (3 credits)

This first year Pharmaceutical Sciences seminar course will allow students to explore the history of medication and pharmacy (from "poisons" to drugs) and learn about pharmaceutical companies and rapid advances in the field. Through fun and engaging debates around ethical and social issues attached to a rapidly evolving field of biomedical research and healthcare, students will engage and communicate effectively through written and oral modes of expression and learn to apply principles of cooperative and efficient teamwork while learning to develop academic success strategies to become successful scientist in the Pharmaceutical Industry and beyond. Students will also attend presentations by experts from pharmaceutical industries or biomedical professions and by our own program faculty on their research programs.

Restrictions: Enrollment is limited to students with a major in PharmSci Drug Development or Pharmacology Toxicology.

Attributes: First-Year Seminar, Undergraduate

PHS 151 Science Talk Seminar (0 credits)

This course is a seminar that engages students with faculty and experts in the field of Pharmaceutical Sciences by allowing the students to research the field of research of their faculty or scientist match and give a detailed presentation on the subject and person. The result will be seminar presentations driven by students and will introduce the importance of networking in the field of Pharmaceutical Sciences which is build to advance quickly through these important communications amongst scientists.

Attributes: Undergraduate

PHS 200 Biopharmaceutical Foundation I (3 credits)

Students in this course will connect concepts learned to real life application to human disease, pharmacology, and drug discovery. Biopharmaceutical foundations I lays a strong foundation to prepare students for subsequent and more advanced knowledge linked to the field of Drug Discovery and Development and provide a better understanding on how medicines work in the body. This course provides students with a introductory level understanding of structure, properties, biological functions, bioenergetics, and metabolic fate of macromolecules essential to life (i.e. proteins, lipids, carbohydrates, and nucleic acids), the impact of molecular genetics on these processes.

Prerequisites: CHM 210 and PHY 101 and BIO 101 and BIO 102

Attributes: Undergraduate

PHS 203 Pharm Sciences Orientation II (1 credit)

"The course introduces students to the different steps in the new drug development process and familiarizes them with FDA regulations pertaining to each of these steps."

PHS 300 Biopharmaceutical Foundatn II (2 credits)

Biopharmaceutical Foundation II, is a 2-credit course designed to instruct students in the knowledge and applications of molecular biology, biotechnology, and genetics relevant to pharmaceutical sciences and drug discovery and development. Through lectures and interactive discussions, students delve into both basic and applied topics, including gene expression, DNA replication, recombinant DNA technology, pharmacogenomics, and biopharmaceutics. Upon completion of the course, students will have acquired essential knowledge and practical skills to propel their studies forward and pursue careers in pharmaceutical research and development.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHS 301 Biopharmaceutical Foundatn III (3 credits)

PHS301, Biopharmaceutical Foundation III is a 3-credit course designed to provide students in with a thorough understanding of physiological principles relevant to biopharmaceuticals. Building on Biopharmaceutical Foundation II, this course explores essential physiological systems, including the nervous, cardiovascular, respiratory, gastrointestinal, and endocrine systems. Through lectures, labs, and discussions, students explore into the physiological mechanisms impacting drug absorption, distribution, metabolism, and excretion, along with concepts like homeostasis, cellular signaling, and organ function. By course completion, students gain insight into drug action and metabolism, enabling them to analyze pharmacological data, assess drug efficacy and safety, and contribute to pharmaceutical research and development.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHS 302 Intro Lab Tech in Biomedicine (3 credits)

This course is designed to engage students in fundamentals of laboratory procedures, such as pipetting, preparation of buffers, animal handling, dosing, protein and enzyme assays, recording and interpretation of experimental data and results and calculations. These skills are further developed in PHS 306 and will help students that are preparing to become scientists in the biopharmaceutical field. Each week, students will perform a laboratory exercise. A pre-laboratory lecture is included to familiarize students with the concepts and expectations of the laboratory exercise scheduled for the subsequent lab.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHS 302L Intro Lab Tech in Biomed Lab (0 credits)

This course is designed to engage students in fundamentals of laboratory procedures, such as pipetting, preparation of buffers, animal handling, dosing, protein and enzyme assays, recording and interpretation of experimental data and results and calculations. These skills are further developed in PHS 306 and will help students that are preparing to become scientists in the biopharmaceutical field. Each week, students will perform a laboratory exercise. A pre-laboratory lecture is included to familiarize students with the concepts and expectations of the laboratory exercise scheduled for the subsequent lab.

Attributes: Undergraduate

PHS 303 Pharma & Biopharmaceutics I (3 credits)

Provides the physicochemical and pharmaceutical principles for understanding the development, behavior, preparation, and stability of pharmaceutical dosage forms and drug delivery systems.

PHS 303L Pharma & Biopharmac I Lab (1 credit)**PHS 304 Intro Drug Discovery & Dev (3 credits)**

This course will allow students to gain insight into the process of drug discovery and development. By interacting with different experts in the field of drug discovery and development, students will learn about the steps to drug discovery including new target identification, selection and validation, screening of potential candidates, understanding the formulation process, packaging and delivery of new drugs and finally being exposed to the important regulatory aspects of the drug discovery process and how it applies to taking novel discoveries to clinic and patients. This course also introduces basic concepts of medicinal chemistry as applied to drug discovery.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHS 306 Advanced Biomedical Methods (3 credits)

The undergraduate level course will familiarize students with advanced techniques utilized in the biomedical field through hands on training on techniques including chromatography, dissolution, electrophoresis, protein assays, liquid chromatography and mass spectroscopy (LC-MS/MS) and basic cell culture as it applies to the field of Pharmaceutical Sciences.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHS 306L Adv Biomedical Methods Lab (0 credits)

Students enrolled in this biomedical laboratory methods will apply and develop practical skills related to advanced techniques utilized in the biomedical field through hands on training on techniques including chromatography, dissolution, electrophoresis, protein assays, liquid chromatography and mass spectroscopy (LC-MS/MS) and basic cell culture as it applies to the field of Pharmaceutical Sciences.

Attributes: Undergraduate

PHS 308 Pharma and Biopharmaceutics I (3 credits)

This course provides the physicochemical and pharmaceutical principles for understanding the development, behavior, preparation, and stability of pharmaceutical dosage forms and drug delivery systems.

Prerequisites: PHY 101 and PHY 102 and CHM 125 and CHM 210

Attributes: Undergraduate

PHS 308L Pharma & Biopharmaceutics I Lab (0 credits)

This course provides hand on experience in the lab to apply and develop practical knowledge related to physicochemical and pharmaceutical principles related to the development, behavior, preparation, and stability of pharmaceutical dosage forms and drug delivery systems. Students will actively participate and design experiments in the pharmaceuticals laboratory.

Attributes: Undergraduate

PHS 309 Pharm-Biopharmaceutics II (3 credits)

Study of the fundamental principles of rate processes and their application to predicting and computing the rate of drug dissolution, absorption, distribution, metabolism, elimination, and pharmacological action.

Attributes: Undergraduate

PHS 317 Pharm-Biopharmaceutics II (4 credits)

Study of the fundamental principles of rate processes and their application to predicting and computing the rate of drug dissolution, absorption, distribution, metabolism, elimination, and pharmacological action.

Attributes: Undergraduate

PHS 391 Pharm Sciences Seminar I (1 credit)

Pharmaceutical topics of ongoing and current interest are reviewed and presented by students, followed by questions from the audience. Emphasis is placed on learning to prepare and deliver a presentation.

PHS 400 Cosmetic Science (2 credits)

This undergraduate level course introduces students to the science of cosmetics. To achieve this, we will discuss the biology and chemistry of the two organs of application of cosmetics, the skin and the hair. In addition, discussion will also include the chemistry of the ingredients of cosmetics, and formulation strategies for cosmetics and trends in market. Formulation topics include moisturizing products (creams, lotions, anti-aging products), hair care products (shampoos, conditioners, etc.), and sunscreen products.

Prerequisites: CHM 210 and CHM 215 and PHY 101

Attributes: Undergraduate

PHS 400L Cosmetic Science Lab (2 credits)

This undergraduate level course is designed to give the student practical experiences in cosmetics formulating techniques, particularly of the more common types of products. The aim of this course is to allow each student or group to use basic compounding tools to make small-scale but practical products and to use the same basic raw materials that go into commercial products. Overall the students will gain the knowledge and hands-on experience to prepare products with the same function and usefulness as those that are commercially available. Students will be in our state of the art pharmaceuticals laboratory preparing a variety of types of cosmetics formulations, such as moisturizing products (creams and lotions), hair care products (shampoos and conditioners), oral hygiene products (toothpastes and mouthwashes), beach products (sunscreen lotions, depilatories, and bleaching products), and lip care preparations (lipstick and lip gloss).

Prerequisites: CHM 210 and CHM 215 and PHY 101

Attributes: Undergraduate

PHS 402 Controlled-Release Dosage Form (2 credits)

Study of controlled-release (CR) drug dosage forms. Covers drug release profiles from conventional and nonconventional systems and their relevance in therapeutic outcomes.

Restrictions: Enrollment is limited to Undergraduate Day Division level students.

Attributes: Undergraduate

PHS 404 Seminar Pharmaceutical Scncs (1 credit)

Through this interdisciplinary course seminar led by faculty with expertise in pharmacology, toxicology, formulation and drug development, students will acquire experience using advanced AI search engine to select reliable literature and gain experience in reading and critically thinking and presenting a selected scientific publication to an engaged audience. Students will be trained on how to generate scientific presentations outline to build a scientific presentation, and use special software to generate graphical supporting working model that summarizes data, discussion and conclusions of the study. The selected high impact scientific literature will include topics related to novel technologies related to drug development, gene therapies, formulation as well as pharmacology and medicinal chemistry focused studies. Through this course students will understand how the scientific field moves forward one publication at a time by taking the audience through the journey of the scientific discoveries of the authors.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102 and PHY 101

Attributes: Undergraduate

PHS 411 Drug Development I (3 credits)

This undergraduate level course is needed for students joining the Pharmaceutical Industry (drug development) or for those interested in both the science and regulations (regulatory affairs) behind the manufacturing stages of pharmaceutical products (drugs, medical preparations and devices). Specifically, this course trains students on the technology and processes involved in industrial preparation of common dosage forms such as tablets and capsules. Students will be introduced to Good Manufacturing Practice (GMP) and best practices currently used in the Pharmaceutical industry through taught by our knowledgeable faculty and invited speakers from the industry. Upon completion students will understand the basic operating structure of a typical major manufacturers of pharmacy products, gain an understanding of the regulatory and historical aspects of these processes, describe manufacturing stages in the industry and be involved in discussing and understanding the ethical and moral aspects and impact to proper manufacturing.

Prerequisites: CHM 210 and CHM 215 and PHY 101

Attributes: Undergraduate

PHS 411L Drug Development I Lab (0 credits)

This undergraduate level course is needed for students joining the Pharmaceutical Industry (drug development) or for those interested in both the science and regulations (regulatory affairs) behind the manufacturing stages of pharmaceutical products (drugs, medical preparations and devices). Specifically, this course trains students on the technology and processes involved in industrial preparation of common dosage forms such as tablets and capsules. Students will be introduced to Good Manufacturing Practice (GMP) and best practices currently used in the Pharmaceutical industry through taught by our knowledgeable faculty and invited speakers from the industry. Upon completion students will understand the basic operating structure of a typical major manufacturers of pharmacy products, gain an understanding of the regulatory and historical aspects of these processes, describe manufacturing stages in the industry and be involved in discussing and understanding the ethical and moral aspects and impact to proper manufacturing.

Attributes: Undergraduate

PHS 413 Drug Development II (3 credits)

Study of controlled release (CR) drugs dosage forms. Covers drug release profiles from conventional and non conventional systems and their relevance in therapeutics and outcomes.

Prerequisites: PHY 101 and CHM 125 and PHY 102 and CHM 210

Attributes: Undergraduate

PHS 414 Advanced Pharma Analysis (3 credits)

This course offers a dynamic exploration into the realm of pharmaceutical analytics, set against the engaging backdrop of a cell manufacturing process. This course provides students with invaluable hands-on experience, bridging the gap between theoretical knowledge and practical application in both manufacturing and analytical roles within the pharmaceutical industry. Through direct involvement in a comprehensive cell manufacturing process and exposure to cutting-edge batch release analytical technologies, students will acquire skills and insights that directly translate into competencies required for success in analytical and manufacturing positions in the pharmaceutical sector.

Prerequisites: CHM 210 and CHM 215 and BIO 101 and BIO 102

Attributes: Undergraduate

PHS 414L Advanced Pharma Analysis Lab (0 credits)

This course provides hands on training on all major analytical instruments in the laboratory utilized in pharmaceutical industry, especially those that provide specialized and precise characterization during drug discovery and development processes.

Attributes: Undergraduate

PHS 450 Manufacturing Pharmacy (2 credits)

This undergraduate level course is needed for students joining the Pharmaceutical Industry (drug development) or for those interested in both the science and regulations (regulatory affairs) behind the manufacturing stages of pharmaceutical products (drugs, medical preparations and devices). Specifically, this course trains students on the technology and processes involved in industrial preparation of common dosage forms such as tablets and capsules. Students will be introduced to Good Manufacturing Practice (GMP) and best practices currently used in the Pharmaceutical industry through taught by our knowledgeable faculty and invited speakers from the industry. Upon completion students will understand the basic operating structure of a typical major manufacturers of pharmacy products, gain an understanding of the regulatory and historical aspects of these processes, describe manufacturing stages in the industry and be involved in discussing and understanding the ethical and moral aspects and impact to proper manufacturing.

Prerequisites: CHM 210 and CHM 215 and PHY 101

Restrictions: Enrollment is limited to Undergraduate Day Division level students.

Attributes: Undergraduate

PHS 450L Manufacturing Pharmacy Lab (1 credit)

This undergraduate level course provides engaging hands on experiences in techniques utilized in Drug Development in the Pharmaceutical Industry. This course mirrors practices associated with manufacturing large-scale batches of products while keeping accurate and detailed records of the manufacturing process through use of a batch record and recording appropriate observations. Specifically students will get advanced hands on experience using manufacturing level equipment to produce creams and lotions, tablets and capsule formulations and delve into the techniques such as homogenizer, tablet press and coating and important quality control involved in drug development and testing such as hardness, fragility and desintegration testing as well as learning how to operate capsule filling equipment and spheronizer, extruder and granulator.

Prerequisites: CHM 210 and CHM 215 and PHY 101

Restrictions: Enrollment is limited to Undergraduate Day Division level students.

Attributes: Undergraduate

PHS 495 Analysis of Current Literature (1-3 credits)

Analysis and discussion of current literature in areas of interest in pharmaceutics. Papers are presented informally by students and faculty.

PHS 700 Cosmetic Science (2 credits)

This graduate level course introduces students to the science of cosmetics. To achieve this, we will discuss the biology and chemistry of the two organs of application of cosmetics, the skin and the hair. In addition, discussion will also include the chemistry of the ingredients of cosmetics, and formulation strategies for cosmetics and trends in market. Formulation topics include moisturizing products (creams, lotions, anti-aging products), hair care products (shampoos, conditioners, etc.), and sunscreen products.

PHS 700L Cosmetic Science Lab (2 credits)

This graduate level course is designed to give the student practical experiences in cosmetics formulating techniques, particularly of the more common types of products. The aim of this course is to allow each student or group to use basic compounding tools to make small-scale but practical products and to use the same basic raw materials that go into commercial products. Overall the students will gain the knowledge and hands-on experience to prepare products with the same function and usefulness as those that are commercially available. Students will be in our state of the art pharmaceutics laboratory preparing a variety of types of cosmetics formulations, such as moisturizing products (creams and lotions), hair care products (shampoos and conditioners), oral hygiene products (toothpastes and mouthwashes), beach products (sunscreen lotions, depilatories, and bleaching products), and lip care preparations (lipstick and lip gloss).

PHS 701 Biopharmaceutical Foundatn III (3 credits)

Biopharmaceutical Foundation III is a 3-credit course designed to provide students in with a thorough understanding of physiological principles relevant to biopharmaceuticals. This advanced course explores essential physiological systems, including the nervous, cardiovascular, respiratory, gastrointestinal, and endocrine systems. Through lectures, labs, and discussions, students explore into the physiological mechanisms impacting drug absorption, distribution, metabolism, and excretion, along with concepts like homeostasis, cellular signaling, and organ function. By course completion, students gain insight into drug action and metabolism, enabling them to analyze pharmacological data, assess drug efficacy and safety, and contribute to pharmaceutical research and development.

Attributes: Doctoral

PHS 702 Controlled-Release Dosage Form (2 credits)

Study of controlled-release (CR) drug dosage forms. Covers drug release profiles from conventional and nonconventional systems and their relevance in therapeutic outcomes.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHS 703 Pharma & Biopharmaceutics I (3 credits)

Provides the physicochemical and pharmaceutical principles for understanding the development, behavior, preparation, and stability of pharmaceutical dosage forms and drug delivery systems.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHS 703L Pharmaceutics Laboratory (1 credit)**PHS 704 Intro Drug Discovery & Dev (3 credits)**

This course will allow students to gain insight into the process of drug discovery and development. By interacting with different experts in the field of drug discovery and development, students will learn about the steps to drug discovery including new target identification, selection and validation, screening of potential candidates, us virtual reality technology (VR) to experience receptor-ligand interactions in 3 dimensional space, understanding the formulation process, packaging and delivery of new drugs and finally being exposed to to the important regulatory aspects of the drug discovery process and how it applies to taking novel discoveries to clinic and patients.

Attributes: Doctoral

PHS 706 Advanced Biomedical Methods (3 credits)

The graduate level course will familiarize students with advanced techniques utilized in the biomedical field through hands on training on techniques including chromatography, dissolution, electrophoresis, protein assays, liquid chromatography and mass spectroscopy (LC-MS/MS) and basic cell culture as it applies to the field of Pharmaceutical Sciences.

PHS 709 Pharm-Biopharmaceutics II (3 credits)

Study of the fundamental principles of rate processes and their application to predicting and computing the rate of drug dissolution, absorption, distribution, metabolism, elimination, and pharmacological action.

Attributes: Doctoral

PHS 711 Drug Development I (3 credits)

This graduate level course is needed for students joining the Pharmaceutical Industry (drug development) or for those interested in both the science and regulations (regulatory affairs) behind the manufacturing stages of pharmaceutical products (drugs, medical preparations and devices). Specifically, this course trains students on the technology and processes involved in industrial preparation of common dosage forms such as tablets and capsules. Students will be introduced to Good Manufacturing Practice (GMP) and best practices currently used in the Pharmaceutical industry through taught by our knowledgeable faculty and invited speakers from the industry. Upon completion students will understand the basic operating structure of a typical major manufacturers of pharmacy products, gain an understanding of the regulatory and historical aspects of these processes, describe manufacturing stages in the industry and be involved in discussing and understanding the ethical and moral aspects and impact to proper manufacturing.

Attributes: Doctoral

PHS 711L Drug Development I Lab (0 credits)

This course is needed for students joining the Pharmaceutical Industry (drug development) or for those interested in both the science and regulations (regulatory affairs) behind the manufacturing stages of pharmaceutical products (drugs, medical preparations and devices). Specifically, this course trains students on the technology and processes involved in industrial preparation of common dosage forms such as tablets and capsules. Students will be introduced to Good Manufacturing Practice (GMP) and best practices currently used in the Pharmaceutical industry through taught by our knowledgeable faculty and invited speakers from the industry. Upon completion students will understand the basic operating structure of a typical major manufacturers of pharmacy products, gain an understanding of the regulatory and historical aspects of these processes, describe manufacturing stages in the industry and be involved in discussing and understanding the ethical and moral aspects and impact to proper manufacturing.

Attributes: Doctoral

PHS 713 Drug Development II (3 credits)

Study of controlled release (CR) drugs dosage forms. Covers drug release profiles from conventional and non conventional systems and their relevance in therapeutics and outcomes.

PHS 714 Advanced Pharma Analysis (1 credit)

This course explores in depth of all major analytical instruments utilized in Pharmaceutical Industry, especially those that can be utilized for specialized and precise characterization during drug discovery and development in the Pharmaceutical Industry. This course is the pre-lab that will help prepare students to be trained on these instruments in the lab.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

Attributes: Doctoral

PHS 714L Advanced Pharma Analysis Lab (2 credits)

This course provides hands on training on all major analytical instruments in the laboratory utilized in pharmaceutical industry, especially those that provide specialized and precise characterization during drug discovery and development processes. This course is a lab.

Attributes: Doctoral

PHS 717 Pharm-Biopharmaceutics II (4 credits)

Study of the fundamental principles of rate processes and their application to predicting and computing the rate of drug dissolution, absorption, distribution, metabolism, elimination, and pharmacological action.

PHS 750 Manufacturing Pharmacy (2 credits)

This graduate level course is needed for students joining the Pharmaceutical Industry (drug development) or for those interested in both the science and regulations (regulatory affairs) behind the manufacturing stages of pharmaceutical products (drugs, medical preparations and devices). Specifically, this course trains students on the technology and processes involved in industrial preparation of common dosage forms such as tablets and capsules. Students will be introduced to Good Manufacturing Practice (GMP) and best practices currently used in the Pharmaceutical industry through taught by our knowledgeable faculty and invited speakers from the industry. Upon completion students will understand the basic operating structure of a typical major manufacturers of pharmacy products, gain an understanding of the regulatory and historical aspects of these processes, describe manufacturing stages in the industry and be involved in discussing and understanding the ethical and moral aspects and impact to proper manufacturing.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHS 750L Manufacturing Pharmacy Lab (1 credit)

This graduate level course provides engaging hands on experiences in techniques utilized in Drug Development in the Pharmaceutical Industry. This course mirrors practices associated with manufacturing large-scale batches of products while keeping accurate and detailed records of the manufacturing process through use of a batch record and recording appropriate observations. Specifically students will get advanced hands on experience using manufacturing level equipment to produce creams and lotions, tablets and capsule formulations and delve into the techniques such as homogenizer, tablet press and coating and important quality control involved in drug development and testing such as hardness, fragility and desintegration testing as well as learning how to operate capsule filling equipment and spheronizer, extruder and granulator.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHS 751 Advanced Pharmaceutics (3 credits)

This course presents the areas of pharmaceutical sciences and drug delivery at an advanced level. The topics include physical properties of drugs, ionic equilibria, solubility and related phenomena, drug diffusion and permeability, drug stability, interfacial phenomena, colloids, micromeritics, drug dissolution, and biomaterials.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHS 760 Reg Issues in Pharma (2-3 credits)

This course covers in depth the various steps in the process of filing drug approval applications.

Restrictions: Enrollment is limited to Graduate level students.

Attributes: Doctoral

PHS 761 Pharmaceutical Product Dev (3 credits)

This course focuses on the process of drug development from laboratory to scale-up.

Prerequisites: PHS 703

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHS 762 Pre-formulation and Phys Pharm (3 credits)

This is an introductory course in the study of pharmaceutical materials for their physico-chemical properties as they pertain to the development of formulations.

Prerequisites: PHS 703

PHS 763 Res Proj in Drug Dev & Ind Pha (3 credits)

An advanced level research project in a selected area of drug delivery systems. This course can be taken multiple times.

Prerequisites: PHS 761

Attributes: Doctoral

PHS 799 Master's Research (1-10 credits)

Students in the master of science degree program (thesis option) specializing in pharmaceuticals are required to complete a research project under the direction of a member of the graduate faculty in pharmaceuticals.

PHS 800 Biopharmaceutical Foundatn II (2 credits)

Biopharmaceutical Foundation II, is a 2-credit course designed to instruct students in the knowledge and applications of molecular biology, biotechnology, and genetics relevant to pharmaceutical sciences and drug discovery and development. Through lectures and interactive discussions, students delve into both basic and applied topics, including gene expression, DNA replication, recombinant DNA technology, pharmacogenomics, and biopharmaceutics. Upon completion of the course, students will have acquired essential knowledge and practical skills to propel their studies forward and pursue careers in pharmaceutical research and development.

Attributes: Doctoral

PHS 802 Intro Lab tech and Biomedicine (3 credits)

This course is designed to engage students in advanced and applied fundamentals of laboratory procedures, such as pipetting, preparation of buffers, animal handling, dosing, protein and enzyme assays, recording and interpretation of experimental data and results and calculations. These skills will help students that are preparing to become scientists in the biopharmaceutical field. Each week, students will perform a laboratory exercise. A pre-laboratory lecture is included to familiarize students with the concepts and expectations of the laboratory exercise scheduled for the subsequent lab.

Attributes: Doctoral

PHS 804 Intro Drug Discovery and Dev (3 credits)

This course will allow students to gain advanced insight into the process of drug discovery and development. By interacting with different experts in the field of drug discovery and development, students will learn about the steps to drug discovery including new target identification, selection and validation, screening of potential candidates, understanding the formulation process, packaging and delivery of new drugs and finally being exposed to the important regulatory aspects of the drug discovery process and how it applies to taking novel discoveries to clinic and patients. This course also introduces advanced concepts of medicinal chemistry as applied to drug discovery.

Attributes: Doctoral

PHS 811 Drug Diffusion and Controlled (2 credits)

This course covers the theory of drug permeation through polymer and biological membranes. The mechanistic basis for controlled delivery devices and specialized delivery systems is discussed.

PHS 813 Design of Experiments (2 credits)

The student is provided a review of concepts in basic statistics and then a development of those concepts into approaches to the statistical design of experiments that allow screening of factors and eventual optimization of conditions. Emphasis is placed on applications to preformulation studies and formulation of drug products.

PHS 851 Advanced Pharmaceutics (3 credits)

This course presents the areas of pharmaceutical sciences and drug delivery at an advanced level. The topics include physical properties of drugs, ionic equilibria, solubility and related phenomena, drug diffusion and permeability, drug stability, interfacial phenomena, colloids, micromeritics, drug dissolution, and biomaterials.

Attributes: Doctoral

PHS 860 Reg Issues in Pharma (2 credits)

This course covers in depth the various steps in the process of filing drug approval applications.

Restrictions: Enrollment is limited to Doctoral level students.

PHS 875 Drug Dynamics (3 credits)

Focuses on determination of pharmacokinetic parameters using compartment models. Other topics include statistical moments, protein binding, clearance volume of distribution, nonlinear pharmacokinetics, and pharmacodynamics. Experimental data will be used to correlate practical applications with theory.

PHS 880 Pharmaceutical Polymers (3 credits)

Covers the physical properties and characterization methods for polymeric materials, specifically as they apply to the design of pharmaceutical dosage forms and drug delivery systems.

PHS 890 Pharmaceutics Seminar (1 credit)

Presentation of recent research by current graduate students and invited guests will be followed by group discussion.

Restrictions: Enrollment is limited to Doctoral or Graduate level students.

PHS 895 Analysis of Current Literature (2 credits)

Analysis and discussion of current literature in areas of interest in pharmaceuticals. Papers are presented informally by students and faculty.

PHS 897 Research in Pharmaceutics (3 credits)

The student completes two seven-week rotations through the laboratories of graduate faculty in pharmaceuticals, providing experience in basic and applied techniques utilized in conducting research.

PHS 899 Doctoral Research (10 credits)

Students in the doctor of philosophy degree program specializing in pharmaceuticals are required to fulfill their research requirement under the direction of a member of the graduate faculty in pharmaceuticals.