

PHARMACEUTICAL SCIENCES INTEGRATED

PSI-601 Analytical Methods in Pharmaceutics (1 credits)

This course introduces graduate students to the analytical techniques and methodologies used to evaluate pharmaceutical substances and dosage forms across drug development, formulation, and quality assurance. Students examine key chromatographic, spectroscopic, and physicochemical methods-including HPLC, GC, mass spectrometry, and UV-Vis and IR spectroscopy-with emphasis on method development, validation, impurity analysis, stability testing, and dissolution assessment. The course integrates interpretation of analytical data with regulatory expectations, including cGMP and ICH guidelines, and addresses analytical challenges associated with modern drug delivery systems and emerging pharmaceutical technologies. Upon completion, students will be able to select appropriate analytical approaches, evaluate data quality, and apply analytical science principles to pharmaceutical research, development, and quality control.

PSI-605 Pharmacokinetics (3 credits)

This course introduces drugs as molecules, including the basic principles related to molecules such as equilibrium and kinetic phenomena. Initial information provided in the course also includes the molecular basis of drug selectivity and drug action. The latter portion of the course then focuses on the primary determinants of the disposition of drugs in the body, namely absorption, distribution, metabolism and excretion.

PSI-606 Medicinal Chemistry (3 credits)

The initial portion provides an introduction to the role of pharmacology in pharmacy and moves on to basic receptor pharmacology and enzymology. The course then continues the molecular basis of pharmacologic activity, protein binding, complexation and drug action. Basic aspects of medicinal chemistry and drug metabolism are also covered. The latter portion of the course then delves into various dosage forms and routes of drug delivery.

PSI-608 Pharmaceutics (3 credits)

The initial portion provides an introduction to the role of pharmacology in pharmacy and moves on to basic receptor pharmacology and enzymology. The course then continues the molecular basis of pharmacologic activity, protein binding, complexation and drug action. Basic aspects of medicinal chemistry and drug metabolism are also covered. The latter portion of the course then delves into various dosage forms and routes of drug delivery.

PSI-609 Pharmacodynamics (2 credits)

The initial portion provides an introduction to the role of pharmacology in pharmacy and moves on to basic receptor pharmacology and enzymology. The course then continues the molecular basis of pharmacologic activity, protein binding, complexation and drug action. Basic aspects of medicinal chemistry and drug metabolism are also covered. The latter portion of the course then delves into various dosage forms and routes of drug delivery.

PSI-611 Literature Seminar I (1 credits)

In this course, students learn basic concepts of research methodology in order to develop, analyze, and present their own research projects and critically evaluate the validity and clinical relevance of published articles. Students learn to appropriately analyze various types of data using parametric and non-parametric statistics, probability and inferential statistics (e.g. analysis of variance and multiple regressions).

PSI-612 Literature Seminar II (1 credits)

Students demonstrate effective communication and organizational skills by preparing, delivering, and evaluating professional seminars.

PSI-613 Drug Development in Pharmaceutics (2 credits)

This course provides an overview of the scientific, regulatory, and translational processes involved in the development of pharmaceutical products from discovery through commercialization. Students examine the stages of drug development, including preformulation studies, formulation design, preclinical evaluation, clinical development, manufacturing scale-up, and regulatory approval. Emphasis is placed on the integration of pharmaceuticals principles with biopharmaceutics, pharmacokinetics, quality-by-design (QbD), and risk-based development strategies to optimize drug product performance and patient outcomes. The course also explores regulatory pathways, intellectual property considerations, and current industry practices, enabling students to understand how multidisciplinary teams advance safe, effective, and high-quality medicines to market.

PSI-614 Biostatistics and Research Methods in Pharmaceutics (2 credits)

This course provides graduate students with foundational knowledge in biostatistics and research methodology as applied to pharmaceutical sciences and pharmaceuticals research. Students learn principles of study design, data collection, and statistical analysis used in preclinical, clinical, and formulation-based investigations. Topics include descriptive and inferential statistics, hypothesis testing, regression analysis, experimental design, and interpretation of variability and uncertainty in pharmaceutical data. Emphasis is placed on critical appraisal of scientific literature, ethical research practices, and the application of statistical software to analyze and interpret research findings. By the end of the course, students will be able to design rigorous studies, apply appropriate statistical methods, and effectively communicate data-driven conclusions in pharmaceutical research and development contexts.

PSI-615 Spectroscopy in Pharmaceutics (2 credits)

This course introduces the fundamental principles and practical applications of spectroscopic techniques used in pharmaceutical analysis and development. Students explore the theory and use of ultraviolet-visible (UV-Vis), infrared (IR), nuclear magnetic resonance (NMR), fluorescence, and mass spectrometry for the qualitative and quantitative characterization of drug substances, excipients, and dosage forms. Emphasis is placed on structural elucidation, impurity identification, solid-state characterization, and the role of spectroscopy in formulation development, stability assessment, and quality control. Through applied examples and data interpretation, students develop the ability to select appropriate spectroscopic methods and critically analyze spectral data to support pharmaceutical research, development, and regulatory compliance.

PSI-616 Toxicology (2 credits)

This class will provide a foundation of knowledge in clinical toxicology, covering toxicology history, poisoning epidemiology, structure and function of poison centers and poison prevention, as well as the toxicity and treatment of numerous specific substances including various prescription and over the counter drugs, household poisons (toxic alcohols, carbon monoxide, caustics, etc.), substances of abuse, and environmental toxins, among others. Throughout the course there will be a focus on the mechanisms and indications for various antidotes and application to various patient cases.

PSI-702 Capstone Project in Pharmaceuticals (8 credits)

The Capstone Project in Pharmaceuticals provides students with an opportunity to integrate and apply knowledge and skills acquired throughout the Integrated Pharmaceutical Science Master of Science program to a comprehensive, practice- or research-focused project. Under faculty mentorship, students design and execute an independent project addressing a relevant problem in pharmaceuticals, such as formulation development, analytical evaluation, drug delivery optimization, or pharmaceutical research and development. The course emphasizes project planning, scientific inquiry, data analysis, and professional communication, culminating in a written report and formal presentation. Through this experience, students demonstrate competency in applying pharmaceuticals principles, critical thinking, and evidence-based decision-making to real-world pharmaceutical challenges.

PSI-704 Pharmaceutical Biotechnology (2 credits)

This course introduces the principles and applications of biotechnology in the discovery, development, and manufacture of modern pharmaceutical products. Students explore the design, production, and characterization of biologics, including recombinant proteins, monoclonal antibodies, vaccines, and nucleic acid-based therapies. Emphasis is placed on cell culture systems, bioprocessing, purification techniques, formulation considerations, and stability challenges unique to biopharmaceuticals. The course also examines regulatory requirements, quality control strategies, and emerging technologies such as gene and cell therapies. By integrating scientific and regulatory perspectives, students develop an understanding of how biotechnology advances innovative therapeutic products and expands the scope of pharmaceuticals in contemporary drug development.