

PHARMACEUTICAL SCIENCES

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Graduate Study in Pharmaceutical Sciences

The graduate program in Pharmaceutical Sciences encompasses a multi-disciplinary approach to graduate training, culminating in the MS degree. The program is administered by the Department of Pharmacy Sciences, School of Pharmacy and Health Professions. The program of study leads either to a joint (dual track) Doctor of Pharmacy (PharmD)/MS or to an MS degree only. Two types of students are envisioned as entrants in this program. The first type consists of students who possess a B.S. degree in pharmacy or a biological, physical or chemical science and wish to further their education in an advanced degree program. The second type consists of students who are currently enrolled in Creighton's PharmD program who want to obtain an additional advanced academic degree during the course of their studies. The program of study is tailored to the individual needs of each student and is based on the background and career objectives of each student. Students are expected to complete a series of required and elective courses and to perform original research. Furthermore, students are required to submit a thesis based on the outcome of their research. The program provides opportunity for students to specialize in the following areas: pharmacology, toxicology, pharmaceuticals, pharmacokinetics, medicinal chemistry, and social and administrative pharmacy. In addition, the program encourages student interactions with faculty in the Departments of Biomedical Sciences, Medical Microbiology and Immunology, and Chemistry.

Program Goals

The specific goals of this program are:

1. Graduates will be able to design and conduct research, analyze and interpret data, and effectively communicate information both orally and in writing to scientists and non-scientists.
2. Graduates will master the key concepts in the discipline of their interest in pharmaceutical sciences.
3. Graduates will be able to work independently and in collaboration with others in their area of expertise as an investigator.
4. Graduates will be prepared for progression towards an advanced higher degree, or a career in industry, or government through classroom learning, seminars, mentored research, and the writing of a thesis.
5. Graduates will address global perspectives and concerns that are related to their research work.
6. Graduates will develop problem-solving skills and critical thinking ability and apply these in developing the experimental design for obtaining the specific aims of their thesis research.
7. Graduates will review the literature critically and provide scientifically sound explanations and summaries of new developments in their area of interest.
8. Graduates will demonstrate honesty, integrity, and ethical behavior in their research and teaching.

9. Graduates will disseminate his/her work in peer reviewed journals and/or national/international conferences.

Admission Requirements

1. A Bachelor's degree or its equivalent in pharmacy or a biological, physical or chemical science from an accredited college or university.
2. Students who are in the PharmD program must be admitted into the Graduate School in order to participate in the joint PharmD/MS program in pharmaceutical sciences.
3. An overall GPA of 3.0 and the GRE score are required for all applicants.
4. The Graduate School requires all students from countries in which English is not the native language to demonstrate competence in English by obtaining either a minimum overall TOEFL (Test of English as a Foreign Language) score of 90 (no sub score lower than 20) or IELTS (International English Language Testing System) academic version band score of 6.5 (no sub-score lower than 6).

Degrees in Pharmaceutical Sciences

- M.S., Pharmaceutical Sciences (<http://catalog.creighton.edu/graduate/graduate-programs-courses/pharmaceutical/pharmaceutical-sciences-ms/>)
- Doctor of Pharmacy (PharmD)/ (<http://catalog.creighton.edu/graduate/graduate-programs-courses/pharmaceutical/ms-doctor-pharmacy-pharmd-ms/>)M.S., Pharmaceutical Sciences Dual Degree (<http://catalog.creighton.edu/graduate/graduate-programs-courses/pharmaceutical/ms-doctor-pharmacy-pharmd-ms/>)

Courses

MPS 509. Industrial Pharmacy. 3 credits.

This course will prepare students to design, manufacture and evaluate different pharmaceutical dosage forms in an industrial environment. The course content will include preformulation studies, formulation of liquid and solid oral pharmaceutical dosage forms, recent advances and trends in controlled or sustained release formulations, drug regulatory affairs and current good manufacturing practices. P. PHA 317.

MPS 531. Chemical Basis Drug Action I. 3 credits.

This course instructs the student on the chemical basis for drug behavior, both in vivo and in vitro. General chemical principles, physicochemical properties, and drug-receptor interactions are used to derive structure-activity relationships for important and commonly encountered classes of drugs. This permits the understanding of pharmacological and biopharmaceutical profiles of currently available drug products, and explains the scientific rationale behind their therapeutic use. Chemically based therapeutic case studies and structurally based therapeutic evaluations are utilized to help students develop a scientific basis for rational therapeutic decision-making. This practice-oriented approach, which emphasizes the relevance of chemistry to contemporary pharmacy practice, gives students the skills necessary to predict biological properties and therapeutic activities of future drug molecules. This course builds upon previously acquired knowledge of biochemistry, pharmaceuticals and basic pharmaceutical sciences principles, and compliments concepts being addressed in pharmacology. P. BMS 301.

MPS 532. Chemical Basis Drug Action II. 2 credits.

A continuation of MPS 531/PHA 337.

MPS 543. Basic Pharmacokinetics. 2 credits.

Pharmacokinetics is the mathematics of the time course of Absorption, Distribution, Metabolism, and Excretion (ADME) of drugs in the body. The biological, physiological, and physicochemical factors which influence the transfer processes of drugs in the body also influence the rate and extent of ADME of those drugs in the body. In many cases, pharmacological action, as well as toxicological action, is related to plasma concentration of drugs. Consequently, through the study of pharmacokinetics, the pharmacist will be able to individualize therapy for the patient.

MPS 544. Introduction to Research Methods and Biostatistics. 3 credits.

Students will identify and interpret research questions, hypotheses, variables, sampling methods, research designs, as well as, descriptive and inferential statistics. The emphasis is to evaluate and assess the validity and significance of these research components so there is appropriate interpretations of research results. The goal is for students to become critical readers and users of research so they can practice evidence-based pharmacy and contribute to pharmacy's knowledge base. Students will learn to interpret the validity and the statistics of a research report, but will not necessarily learn to conduct research or perform statistical calculations.

MPS 600. Ocular Pharmacology. 2 credits.

Utilization of knowledge of physiology, biochemistry and anatomy of the eye to develop an understanding of etiology and pharmacological therapy of various ocular diseases. Course content will include a review of anatomy, physiology and biochemistry of the eye, pharmacokinetics and drug delivery relevant to ocular therapy, etiology and pharmacological treatment of ocular diseases such as glaucoma, uveitis, cataract, retinopathy and age-related macular degeneration and cataract. Ocular effects of systemic drugs and ophthalmic toxicology will be examined, in addition to examining advances in ocular therapies.

MPS 601. Parental Drug Dosages Forms. 3 credits.

Parental Drug Products incorporates basic theory and practical experience in the preparation, handling, and dispensing of sterile dosage forms including proper aseptic preparation of parenteral chemotherapeutic agents, and specialty solutions. U.S.P. Chapter 979 will be thoroughly reviewed and discussed. Parental access devices, electronic delivery devices and other related equipment are also reviewed.

MPS 602. Analytic Aspects of Pharmaceutical Sciences Research. 3 credits.

This course covers the theory, instrumentation and application of commonly used laboratory equipment, including, absorption spectroscopy (UV, visible and infrared); mass spectroscopy (MS), high pressure liquid chromatography (HPLC) and nuclear magnetic resonance (NMR), amongst others. The course will combine lectures with hands-on laboratory exercises/demonstrations by Pharmacy Sciences faculty.

MPS 603. Introduction to Pharmaceutical Materials Science. 1 credit.

This course provides an introduction to the excipients and inactive ingredients involved in pharmaceutical preparations. The physicochemical, toxicologic, and regulatory properties of common excipients will be discussed. In addition, the functional roles of common pharmaceutical excipients will be discussed.

MPS 617. Advanced Pharmaceutics. 3 credits.

This course will provide an in-depth study of the physical and chemical principles which are involved in the development, formation and stabilization of selected pharmaceutical dosage forms for optimization of drug bioavailability and therapeutic utility.

MPS 621. Health Systems and Patient Safety. 3 credits.

This course examines structural, economic, service delivery, professional, and patient factors influencing contemporary pharmacy practice. This course emphasizes development of a culture of best practices in patient safety. Included are concepts of safe patient care systems as well as public health principles and practices in the context of public responsibility.

MPS 622. Advanced Medicinal Chemistry. 3 credits.

This course will build upon the scientific foundation laid by the Chemical Basis of Drug Action professional course sequence. The structure-activity relationships of complex drug molecules will be investigated and discussed. Students as well as faculty will be involved in presenting information on the chemically important aspects of drug delivery, stability, receptor affinity and selectivity, metabolic vulnerability and distribution.

MPS 633. Research Methods. 1-3 credits.

Laboratory rotations in which graduate students perform or observe methods used in pharmaceutical and administrative sciences research. The value of the methods and their applications to the research efforts of the pharmaceutical sciences faculty are described in detail. P. DC.

MPS 634. Pharmaceutical Dosage Forms and Drug Delivery Systems. 2-3 credits.

Basic principles of pharmaceutical dosage forms and drug delivery systems are taught with respect to formulating drugs for bioavailability enhancement and drug targeting. Pertinent pharmaceutical examples that are discussed include: Oral, parenteral, transdermal, aerosol, etc., with emphasis placed on their importance, formulation considerations and ongoing research.

MPS 643. Ophthalmic Pharmacodynamics. 2 credits.

This course will provide instruction on both basic and clinical principles of drug action in the eye. A review of anatomy, physiology, and biochemistry of the ocular system will provide the essential background necessary for understanding the mechanism of drug action in the eye. Pharmacokinetic and toxicological principles relevant to the ocular system will also be reviewed. The use of drugs in the treatment of diseases of the eye such as uveitis, cataracts and glaucoma will be discussed. P. MPS 631/PHR 631; MPS 632/PHR 632.

MPS 645. Qualitative Methods in Research. 2 credits.

This course covers the theory and application of qualitative research methods approaches needed in health care. Two qualitative approaches: grounded theory and case study, are developed with greater depth. Field observation skills are developed.

MPS 646. Mixed Methods in Research. 2 credits.

This course covers the theory and application of mixed methods research approaches to conduct cross, inter and transdisciplinary research projects designed to address complex problems in the health care environment.

MPS 652. Pharmacoeconomics. 3 credits.

This course introduces fundamental pharmacoeconomic topics, defines the terminology used in pharmacoeconomic research, and gives many examples using case studies. Students completing this course should be able to understand, interpret, and determine the usefulness of pharmacoeconomic research articles and also be able to design a pharmacoeconomic decision tree analysis.

MPS 656. Ethics in the Health Professions. 3 credits.

This course prepares students to approach ethical dilemmas objectively with a thorough understanding of professional moral responsibility. This course assists students to: distinguish ethical from other kinds of issues; identify the morally relevant features of a case; identify the moral options open to a pharmacist faced with a moral problem; provide justification for the best options; consider counter arguments for one's position; practice the act of responding personally to an ethical problem in clinical practice through group interaction; and enhance commitment to promoting the dignity of others.

MPS 665. Advanced Pharmacokinetics. 2 credits.

Computer modelling of the absorption, distribution, metabolism, and excretion of drugs will be the core of the course content.

Multicompartmental analysis, non-compartmental analysis as well as non-linear kinetics will be discussed. Development of a pharmacokinetic protocol through the various phases of INDA submission as well as in vitro - in vivo correlations will be considered.

MPS 675. Solid Delivery Systems. 3 credits.

The course uses a physical chemistry approach to solving the problems associated with practical design of solid dosage forms as well as those associated with their evaluation.

MPS 676. Disperse Systems. 3 credits.

The course uses a physical chemistry approach to solving the problems associated with practical design of disperse system dosage forms as well as those associated with their evaluation.

MPS 677. Macromolecular Systems. 3 credits.

The course uses a physical chemistry approach to solving the problems associated with the manufacture, evaluation and utilization of polymers in the design of drug delivery systems as well as macromolecules as drugs.

MPS 690. Pharmacology of Immune Response. 2 credits.

The course will provide instruction about the pharmacologic regulation of immune response and the role of immune products on human physiology. P. Gr stdg.

MPS 691. Pharmaceutical Science Seminar. 1 credit.

Seminar in selected subjects for pharmaceutical sciences graduate students. P. DC.

MPS 692. Directed Independent Study. 1-5 credits.

Supervised independent projects that may include laboratory work, assigned readings, research papers, etc. Available in toxicology, biopharmaceutics, medicinal chemistry, pharmacodynamics and pharmacokinetics. P. Undergraduate or graduate stdg. and DC.

MPS 693. Directed Independent Research. 1-5 credits.

Supervised independent research for motivated students to become involved in ongoing original research projects of the pharmaceutical sciences faculty. P. Undergraduate or graduate stdg. and DC.

MPS 697. Industrial Pharmacy. 3 credits.

This course will prepare students to learn the basic principles involved in the designing and manufacturing of different pharmaceutical dosage forms. The course content will include preformulation studies, formulation of liquid and solid oral pharmaceutical dosage forms, novel drug delivery systems, drug regulatory affairs and current good manufacturing practices.

MPS 792. Pharmaceutical Sciences Discussion Series. 1-2 credits.

Graduate students in Pharmaceutical Sciences will learn how to read journal articles for optimum retention, critically evaluate the data, and objectively determine the paper's contribution to the over-all body of knowledge. In addition they will gain valuable presentation and public speaking skills.

MPS 793. Pharmaceutical Sciences Presentation Series. 1-2 credits.

This course focuses on scientific communication of research material in various situations. Students will read and understand journal articles for optimum retention, critically evaluate the data, and objectively determine the paper's contribution to the over-all body of knowledge. Emphasis will be on presenting information/research data in an appropriate and effective manner.

MPS 797. Master's Directed Independent Research. 1-4 credits.

Supervised original research. P. DC.

MPS 799. Master's Thesis. 1-8 credits.

Review of the literature and research data; writing of the thesis. Student must register for this course in any term when engaged in formal preparation of the Master's thesis; however, eight credit hours are the maximum applicable toward the degree. P. DC.