School of Pharmacy

Degrees Offered

- Doctor of Pharmacy (Pharm.D.)
- Doctor of Philosophy (Ph.D.)

Introduction

The mission of the West Virginia University (WVU) School of Pharmacy is to improve the health of West Virginians and our global community by developing exemplary pharmacists and scientists; conducting meaningful research; and advancing pharmacy practice.

Pharmacy was first offered at West Virginia University as a department in the School of Medicine in 1914. The College of Pharmacy emerged as a separate entity in 1936 and became the School of Pharmacy in 1958. In 1960, the School of Pharmacy changed from a four-year to a five-year program and in 1998 to a six-year program. The Doctor of Pharmacy (Pharm.D.) program comprises four years of professional study preceded by a minimum of two years of pre-pharmacy study.

Many pharmacy graduates enter practice in community or health-system pharmacy. Graduates from WVU are very competitive for receiving postgraduate pharmacy residency programs that offer the opportunity for additional training and experience in general pharmacy practice and in areas of specialty practice. Positions are also available in ambulatory care clinics, various government agencies, the pharmaceutical industry, long-term care, nuclear pharmacy, home health-care organizations and many other areas. Pharmacists are eligible for commission in the armed forces and the U.S. Public Health Service. Pharmacists may also have a career in teaching or research.

The WVU School of Pharmacy also offers Ph.D. programs in health services and outcomes research and pharmaceutical and pharmacological sciences.

Accreditation

The School of Pharmacy is fully accredited by the Accreditation Council for Pharmacy Education, an autonomous and independent agency that is recognized by the U.S. Department of Education as the national agency for the accreditation of professional degree programs in pharmacy. The Board of Directors is composed of members from the American Pharmacists Association, the National Association of Boards of Pharmacy, the American Association of Colleges of Pharmacy, and the American Council on Education.

The School of Pharmacy holds membership in the American Association of Colleges of Pharmacy, whose mission is to advance pharmacy education, research, scholarship, practice and service, in partnership with members and stakeholders, to improve health for all.

ADMINISTRATION

DEAN

- William P. Petros - Pharm.D. (Philadelphia College of Pharmacy and Science)

SENIOR ASSOCIATE DEAN FOR ACADEMIC AFFAIRS AND EDUCATIONAL INNOVATION

- Mary K. Stamatakis - Pharm.D. (The Ohio State University)

SENIOR ASSOCIATE DEAN FOR RESEARCH AND STRATEGIC INITIATIVES

- Paul R. Lockman - Ph.D. (Texas Tech University Health Sciences Center)

ASSOCIATE DEAN FOR ADMISSIONS AND STUDENT AFFAIRS

- Ashleigh L. Barrickman - Pharm.D. (West Virginia University)

ASSISTANT DEAN FOR ASSESSMENT AND STRATEGIC PLANNING

- Marie A. Abate - Pharm.D. (University of Michigan)

ASSISTANT DEAN FOR STUDENT SUCCESS

- Lena M. Maynor - Pharm.D. (West Virginia University)

ASSISTANT DEAN FOR COMMUNITY ENGAGEMENT

- Thomas E. Menighan - B.S. Pharm (West Virginia University)

FACULTY

PROFESSORS

- Marie A. Abate - Pharm.D. (University of Michigan)
  Department of Clinical Pharmacy
- Gina M. Baugh - Pharm.D. (University of Pittsburgh)
  Director, Introductory Pharmacy Practice Experiences, Department of Clinical Pharmacy
- Krista D. Capehart - Pharm.D. (University of Michigan)
  Director, Wigner Institute for Advanced Pharmacy Practice, Department of Clinical Pharmacy
- David P. Elliott - Pharm.D. (University of Texas)
  Department of Clinical Pharmacy
- Gretchen M. Garofoli - Pharm.D. (University of Pittsburgh)
  Department of Clinical Pharmacy
- Werner J. Geldenhuys - Ph.D. (North-West University, South Africa)
  Chair, Department of Pharmaceutical Sciences
- Lori A. Hazlehurst - Ph.D. (University of Vermont)
  Department of Pharmaceutical Sciences
- Jason D. Huber - Ph.D. (Florida A&M)
  Department of Pharmaceutical Sciences
- Franklin Huggins - Pharm.D. (University of Utah)
  Department of Pharmaceutical Sciences
- Khalid Kamal - Ph.D. (West Virginia University)
  Chair, Acting Graduate Program Director, Department of Pharmaceutical Systems and Policy
- Paul R. Lockman - Ph.D. (Texas Tech University)
  Department of Pharmaceutical Sciences
- John (Jay) Martello - Pharm.D. (Duquesne University)
  Department of Clinical Pharmacy
- Lena M. Maynor - Pharm.D. (West Virginia University)
  Director of Skills Activities, Department of Clinical Pharmacy
- William P. Petros - Pharm.D. (Philadelphia College of Pharmacy & Science)
  Department of Pharmaceutical Sciences
- Mary K. Stamatakis - Pharm.D. (The Ohio State University)
  Department of Clinical Pharmacy
- Jon P. Wietholter - Pharm.D. (University of Pittsburgh)
  Chair, Department of Clinical Pharmacy

ASSOCIATE PROFESSORS

- Ashleigh L. Barrickman - Pharm.D. (West Virginia University)
  Department of Clinical Pharmacy
- Matthew Blommel - Pharm.D. (Mercer University)
  Director of Continuing Education and Director, West Virginia Center for Drug and Health Information, Department of Clinical Pharmacy
- Benoit Driesschaert - Ph.D. (Catholic University of Louvain)
  Co-Director PPS Graduate Program, Department of Pharmaceutical Sciences
- Betsy M. Elswick - Pharm.D. (West Virginia University)
  Director, WVU School of Pharmacy Alumni Affairs, Department of Clinical Pharmacy
- Angela L. Goodhart - Pharm.D. (Northeast Ohio Medical University)
  Departments of Clinical Pharmacy and Family Medicine
- Marina Galvez Peralta - Ph.D. (University of Seville, Spain)
  Director, Student Professional Development, Assistant Chair for Teaching, Department of Pharmaceutical Sciences
- Mark Garofoli - Pharm.D. (University of Pittsburgh)
  Director of Experiential Learning, Department of Clinical Pharmacy
- Ahmad Hanif - Ph.D. (West Virginia University)
  Co-Director PPS Graduate Program, Department of Pharmaceutical Sciences
- Kazuhiko Kido - Pharm.D. (University of Iowa)
  Department of Clinical Pharmacy
- Cassandra Simpkins - Pharm.D. (University of Charleston)
  Departments of Clinical Pharmacy and Family Medicine

- Christopher M. Terpening - Ph.D. (University of Colorado)
  Departments of Clinical Pharmacy and Family Medicine
- Tara R. Whetsel - Pharm.D. (West Virginia University)
  Department of Clinical Pharmacy

ASSISTANT PROFESSORS

- Martha Abraham - Pharm.D. (Cedarville University)
  Departments of Clinical Pharmacy and Family Medicine
- Sharan Kumar Reddy Bobbala - Ph.D. (University of Otago, New Zealand)
  Department of Pharmaceutical Sciences
- Rachel Cruickshank - Pharm.D. (West Virginia University)
  Director, West Virginia Poison Center, Department of Clinical Pharmacy
- Lei Raymond Guo - Ph.D. (Northern Illinois University)
  Department of Pharmaceutical Systems and Policy
- Natalie M. Hall - Pharm.D. (Belmont University College of Pharmacy and Health Sciences)
  Departments of Clinical Pharmacy and Family Medicine
- Sarah Karpinski - Pharm.D. (Drake University)
  Department of Clinical Pharmacy
- Sabina O. Nduaguba - Ph.D. (The University of Texas at Austin)
  Department of Pharmaceutical Systems and Policy and Cancer Prevention and Control
- Heather N. Owens - Ph.D. (University of South Florida)
  Departments of Pharmaceutical Systems and Policy and Cancer Prevention and Control
- Taylor Thompson - Pharm.D. (West Virginia University)
  Departments of Clinical Pharmacy and Family Medicine
- Angela Wowczuk - Pharm.D. (West Virginia University)
  Director, Rational Drug Therapy Program, Department of Pharmaceutical Systems and Policy

Degree Designation Learning Outcomes

DOCTOR OF PHARMACY (PHARM.D.)

Upon successful completion of the West Virginia University Doctor of Pharmacy degree program, the graduate will be able to accomplish the following educational outcomes (EOs):

EO 1 Foundational Knowledge and Skills (Learner) - Develop, integrate, and apply foundational knowledge (e.g., concepts, facts, principles) from biological, pharmaceutical, social, behavioral, administrative, and clinical sciences to evaluate the scientific literature, explain drug actions, solve therapeutic problems, and advance individual and population health.

- Acquire and demonstrate depth and breadth of knowledge of foundational scientific, clinical, socioeconomic, and humanistic concepts and skills.
- Explain how knowledge in the foundational sciences is integral to pharmacy practice.
- Integrate knowledge from foundational sciences to explain how specific drugs or drug classes work and evaluate their potential value in individuals and populations.
- Apply foundational concepts and skills to practice.
- Use scientific reasoning and critical thinking skills in practice to address problems, issues, or concerns.
- Develop and apply creative and innovative approaches to effectively resolve problems and improve patient outcomes.
- Apply an evidence-based approach to practice by identifying appropriate questions to address, using databases and other resources to retrieve information, critically analyzing and interpreting relevant scientific information and other evidence, formulating sound conclusions, and integrating the best published evidence with expertise and individual patient values/needs.
- Analyze and use epidemiologic, pharmacoeconomic, medication utilization, and quality improvement data when developing evidence-based programs and protocols.
- Apply knowledge of research methodology to design or conduct basic research, practice-based studies, or clinical trials.
- Use information technology where appropriate to enhance individual knowledge and skills.

EO 2 Communication Skills (Communicator, Educator) – Effectively communicate verbally and nonverbally when interacting with an individual, group, or organization.

- Use appropriate verbal and nonverbal communication skills with individuals or groups, including patients, health professionals and others.
- Use effective written communication skills with patients, health professionals, and others, including the development of documents pertinent to professional or organizational needs (e.g., monographs, reports).

- Educate target audiences by using the most effective method to deliver information, in coordination with other health care professionals as appropriate.
- Use technology to facilitate or enhance professional communications and presentations.

EO 3 Professionalism, Advocacy, and Leadership (Professional, Leader, Advocate) - Exhibit behaviors and values consistent with the professional trust given by patients, healthcare providers, and society; assure that patients' best interests are represented; and demonstrate responsibility for achieving shared goals regardless of position.

- Conduct pharmacy practice duties and patient care responsibilities in accordance with applicable federal, state, and local laws, statutes, and regulations, as well as professional guidelines and standards.
- Serve as an advocate, leader, and change agent for pharmacy and pharmacists' professional roles and responsibilities by implementing or participating in new, evidence-based models for cost-effective pharmacist-delivered patient care.
- Serve as an advocate for community and patient health and medication therapy needs, including disadvantaged or underserved patients and those from diverse cultural and socioeconomic backgrounds, while honoring their autonomy and dignity.
- Serve as a positive role model in actions/communications for peers and other health care providers by maintaining a high standard for personal and professional demeanor and ethical conduct.
- Respect all points of view in professional interactions while placing patients' needs and desires at the forefront.
- Demonstrate compassion, empathy, honesty, integrity, ethical behavior and altruism in all actions and communications with patients, families, and care providers.
- Develop professional competence through ongoing, active and self-directed pursuit of new knowledge and skills.
- Identify and analyze emerging health care and pharmacy issues and incorporate new roles, products and services into practice that can improve patient outcomes.
- Accept accountability and responsibility for one's words and actions.

EO 4 Self-Awareness (Insightful) – Examine and assess personal knowledge, skills, abilities, attitudes, beliefs, motivation, and emotions and strive for continual improvement.

- Conduct self-assessments on a regular basis and create, implement, evaluate, and modify as needed plans for personal improvement and continuing professional development.
- Recognize personal strengths and limitations and seek assistance when needed.
- Approach tasks and situations with flexibility and a desire to learn.
- Accept constructive criticism and display a willingness to correct and learn from errors.

EO 5 Interprofessional Collaboration (Collaborator) – Actively participate as a healthcare team member by demonstrating mutual respect, understanding, and values to meet patient care needs.

- Collaborate with health care professionals, patients, and/or caregivers to ensure that desired patient-specific or population-based health outcomes are achieved.
- Facilitate team building among health care professionals by developing and maintaining an atmosphere of mutual respect and shared values that place the patient at the forefront.
- Effectively utilize the knowledge, expertise, and unique roles of health care team providers and refer patients to others when indicated.
- Serve as the medication expert on a collaborative care team by managing the pharmacotherapy for patients' medical conditions and by proactively providing drug product and other medication related information to team members.
- Accept responsibility for medication-related outcomes on the care team.

EO 6 Patient Care (Provider) – Provide patient-centered care as the medication expert.

- Accurately interpret, prepare and/or compound, handle and dispense prescriptions for patients.
- Obtain necessary patient-specific data (e.g., consulting patient records, taking medication histories, performing basic physical assessments, ordering/interpreting lab tests), and evaluate and use these data when performing patient care related responsibilities.
- Evaluate pharmaceutical products, including information about the drug, dosage form, delivery system and cost/benefit, when conducting a medication review or preparing a care plan.
- Conduct comprehensive medication reviews and prepare individualized care plans to optimize patient outcomes, with emphasis on commonly encountered chronic or high risk conditions amenable to pharmacotherapy and patients at greater risk for adverse events.
- Work with patients, caregivers, and health care professionals to implement specific therapy plans.
- Educate and empower patients to take an active role in their health and incorporate recommendations for healthy living and self-care into care plans.
- Monitor and evaluate patients during therapy for drug product or pharmacotherapy problems, patient concerns, or adherence issues and recommend or implement solutions.
- Work with patients and other health care providers to ensure the continued success of individual care plans.

- Document patient-care services in charts/medical records and on forms needed for reimbursement.
- Counsel patients and/or caregivers about the following to help ensure a care plan's success: i) medications, non-drug therapy, dietary supplements and natural products; ii) insurance and other options for obtaining necessary medications; iii) proper use of testing devices and medical goods and equipment; and iv) healthy lifestyle changes.

EO 7 Population-Based Care (Promoter, Provider) – Design and implement prevention, intervention, and educational strategies for communities to manage chronic disease and improve health and wellness.

- Develop, recommend, and provide preventive health services, such as administration of vaccines and screening tests.
- Develop and implement disease management programs based upon identified needs and priorities (e.g., cost, access, and patient satisfaction considerations; commonly encountered, chronic conditions managed by pharmacotherapy).
- Evaluate and adjust interventions as needed to maximize population health.
- Promote public awareness of health promotion and disease prevention strategies.
- Design, develop, and disseminate public health related educational materials or services in a culturally competent manner.
- Work with health care professionals and other personnel to identify and help resolve key public health issues and problems, and participate in policies or strategies to address them.

EO 8 Pharmacy and Medication Use Systems (Manager) – Manage patient healthcare needs using human, financial, technological, and physical resources to optimize the safety and efficacy of medication use systems.

- Demonstrate knowledge of pharmacy management including operations, human and fiscal resources, marketing, and leadership principles.
- Design, use, and manage systems to prepare, dispense, distribute and administer medications to optimally serve patient's drug-related needs.
- Use knowledge of the organization and financing of the U.S. healthcare system to provide and effectively manage progressive pharmacy services.
- Develop a business plan for integrating clinical and distributive services that includes methods for supporting and obtaining reimbursement for clinical services provided to patients.
- Demonstrate and apply knowledge of national standards, guidelines, best practices, and established principles and processes for safe medication use to protect patient safety.
- Participate in quality improvement programs and employ performance indicators to enhance the quality of care and cost effectiveness of services provided and to optimize safe, appropriate medication use.
- Participate in developing and performing medication use evaluations to identify and resolve drug therapy problems or concerns.
- Reconcile a patient's medications when transitioning from one care setting to another by communicating effectively with all involved health care professionals.
- Use current and emerging information and system technologies to enhance safe and effective medication use.
- Provide recommendations for developing and managing a formulary that incorporate pharmacoeconomic principles.
- Actively participate in, and contribute to the development of, strategies to minimize drug misuse/abuse.

DOCTOR OF PHILOSOPHY (PH.D.)

The overall goals of the Ph.D. program in Health Services and Outcomes Research are:

- To educate and train highly qualified individuals to pursue independent research in health services and outcomes research (HSOR) within interdisciplinary teams, and to function and contribute as a member of a research team.
- To prepare competent scientists able to contribute to health-related research, industrial research and development, pharmaceutical education, and scholarship.
- To advance research in pharmaceutical and healthcare delivery.
- To provide leadership for the pharmacy profession in research, graduate education, and health policy making.

The program is designed to prepare students to become independent researchers. Students will develop competencies in the scientific research process through didactic studies and conceptualizing, designing, conducting, and reporting original research.

Didactic Studies

- To learn basic principles and apply these principles to specific disciplines and related fields to cultivate a broad background of knowledge.
- To develop research skills, including scientific communication and critical thinking/problem solving abilities by participating in seminars and designated research skill courses.

Research Training

- To acquire practical experience in conducting original research, including acquisition of background information (e.g. literature research), problem development, experimental design and experimentation, collecting primary data and using secondary data, and data analyses.

- To foster research communication skills by writing abstracts for research presentations, manuscripts for publication, research grant proposals, and a thesis or dissertation.
- To gain additional insight into research and scholarship by participating in scholarly exchanges with faculty and students in the WVU School of Pharmacy, the Health Sciences Center (HSC), as well as the national and international healthcare community.

DOCTOR OF PHILOSOPHY (PH.D.)

Student Learning Outcomes of the Pharmaceutical & Pharmacological Sciences graduate education program are focused on preparing students to become independent researchers. To be successful in our program pathways, students will need to develop competencies in the scientific research process through didactic studies in an area of emphasis and then conceptualizing, designing, conducting, and reporting original research.

Student Learning Outcomes

- Demonstrate competency in the 5 content areas of pharmaceutical and pharmacological sciences:
  - Drug Chemistry
  - Pharmacokinetics
  - Principles of Drug Action
  - Approaches to Drug Discovery
  - Biopharmaceutics
- Independently design experimental protocols that include the principles of rigor and reproducibility, conduct the experiments, analyze the results, and defend the experimental approach to other scientists.
- Develop and plan the test of hypotheses regarding significant problems in the student's chosen area of specialization
- Demonstrate critical thinking/problem solving ability by effectively criticizing the neuroscience literature and by asking relevant questions in seminars.
- Ability to effectively reference the relevant literature in support of the student's research project. Ability to identify significant gaps in knowledge on this scientific topic.
- Effectively communicate scientific information in written abstracts for research presentations, manuscripts for publication, research grant proposals, and the dissertation.
- Effectively communicate scientific information in both formal and informal oral presentations.

Accreditation

The Pharm.D. program within the School of Pharmacy has specialized accreditation through the Accreditation Council for Pharmacy Education.

COURSES

PHAR 615. Pharmaceutical and Cosmetic Compounding. 2 Hours.
PR: PHAR 801 and PHAR 802 and Second professional year standing or consent. Provides the knowledge and the skills needed for the design and formulation of cosmeceuticals, emphasizing regulatory standards and compliance.

PHAR 620. Herbal Supplements and Phytotherapy. 2 Hours.
PR: PHAR 801 and Second professional year standing or consent. This course provides an advanced understanding of the scientific, therapeutic and clinical principles and the evidence-based medicine underlying the use of medicinal plants, herbal medications, natural products, and supplements. Key medicinal plants as well as vitamins, minerals and supplements - their efficacy, adverse effects and drug interactions will be discussed, as well as current regulations governing their use.

PHAR 691. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

PHAR 693. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

PHAR 694. Seminar. 1-6 Hours.
Seminars arranged for advanced graduate students. Grading may be S/U.

PHAR 696. Graduate Seminar. 1-3 Hours.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

PHAR 697. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.).

PHAR 703. Pharmacy Practice Experience 1. 1 Hour.
PR: First professional year standing or consent. Introduces student to the practice of pharmacy with a focus on career exploration. Pharmacy Practice Experience (PPE) 1 is the first course in a sequence that introduces students to the roles of pharmacists in a variety of practice settings. Interprofessional education (IPE) is introduced and emphasized throughout the course.

PHAR 705. Advanced Cardiology Pharmacotherapy. 2 Hours.
PR: PHAR 824. For students with an interest in cardiology pharmacotherapy and will be highly useful for prospective pharmacy residents. This course serves as a bridge between the cardiology system-based teaching course PHAR 824 and advanced pharmacy practice experiences rotations. This class will contain didactic lectures, small group discussions, pros and cons clinical controversy debate, and patient case-based applied therapeutics.

PHAR 706. Biopharmaceutics. 2 Hours.
Introduces the fundamental principles of biopharmaceutics. This area of knowledge deals with the drug performance at the delivery system – human body interface, and addresses how physico-chemical drug properties, delivery system characteristics, and physiological processes influence drug distribution and affect the body, as well as drug bioavailability.

PHAR 707. Drug-Induced Diseases. 2 Hours.
Focused study of adverse effects of prescription and non-prescription medications designed for practical application across multiple disease states.

PHAR 710. Pharmacy Practice Experience 2. 1 Hour.
PR: PHAR 703 or consent. Introduces student to the practice of pharmacy with a focus on career exploration. Pharmacy Practice Experience (PPE) 2 is the second course in a sequence that introduces students to the roles of pharmacists in a variety of practice settings. Interprofessional education (IPE) is introduced and emphasized throughout the course.

PHAR 713. Oncology Pharmacotherapy. 2 Hours.
Provides practical aspects to oncology pharmacy practice including clinical decision making and more in-depth review of specialty areas of practice within hematology/oncology.

PHAR 714. Entrepreneurship/Intrapreneurship in Pharmacy. 2 Hours.
PR: Second professional year standing or consent. Focuses on entrepreneurship, intrapreneurship and entrepreneurial leadership in pharmacy.

PHAR 718. Pediatric Pharmacotherapy. 2 Hours.
PR: Second professional year standing or consent. Overview of common pathophysiology and pharmacotherapy principles in the pediatric population and selection of drug therapy to treat the pediatric patient.

PHAR 720. AI and Health Data Science Research. 2 Hours.
PR: Second professional year standing or consent. Provides pharmacy students the opportunity for hands-on learning about basic Artificial Intelligence (AI) and Data Science methods by analyzing health-related data.

PHAR 721. Advocacy and Leadership. 2 Hours.
PR: Second and third professional year standing or consent. The course will focus on developing the student's leadership skills as an advocate for the profession of pharmacy.

PHAR 729. Introduction to SAS. 2 Hours.
Provides didactic instruction on and practical exposure to SAS programming for health outcomes research through the simulation of the analysis of published research adapted for active learning, take-home assignments, and full-length projects.

PHAR 743. Teach to Learn: Learn to Teach. 2 Hours.
Provides pharmacy students the opportunity to learn how to teach in higher education/pharmacy and develop their teaching skills by participating in select teaching and learning activities.

PHAR 744. Education Journal Club. 1 Hour.
PR: PHAR 743 or Consent. Evaluate educational research articles from pharmacy education and other healthcare disciplines. Students will present and critically analyze educational literature and develop presentation skills.

PHAR 745. Critical Care Pharmacotherapy. 2 Hours.
PR: Third professional year standing or consent. Gain knowledge in multiple facets of critical care pharmacotherapy, particularly for students interested in pharmacy residency training in a clinical setting.

PHAR 747. History of Pharmacy. 2 Hours.
Gives the student a deeper appreciation of the background of pharmacy and its development from ancient times to present.

PHAR 748. Acute Care Case Studies. 2 Hours.
PR: Third professional year standing or consent. Gain experience developing pharmaceutical care plans in an acute care setting. Further prepares students interested in pursuing pharmacy residency training.

PHAR 749. Pharmaceutical Investigation. 1-2 Hours.
Original investigation in pharmaceutics, medicinal chemistry, pharmacology and pharmacogenomics, pharmaceutical systems and policy, education in pharmacy, patient outreach and community pharmacy or clinical pharmacy.

PHAR 751. Geriatrics. 2 Hours.
PR: Second or third year pharmacy students. A review of common pharmacotherapeutic and social issues of importance to older adult patients.

PHAR 752. History of Drug Discovery. 2 Hours.
This course is concerned with the way in which advances in chemistry and biochemistry have influenced advances in drug discovery and therapeutics beginning with the late 18th century through today.

PHAR 753. Social and Behavioral Theory and Health Outcomes Research. 3 Hours.
Basic social and behavioral theories related to the health behavior change and health outcomes. Open to graduate students in pharmacy, public health, or other health care fields.

PHAR 754. Decision Analysis in Healthcare. 3 Hours.
Core skills in clinical decision analysis which builds on concepts derived from epidemiology, biostatistics, computing, economics and operations research and applies them to medical and pharmacological decisions.

PHAR 755. Pharmacoeconomics. 3 Hours.
This graduate-level course is intended to train graduate students in evaluating and conducting pharmacoeconomic research.

PHAR 756. Health Survey Research Methods. 3 Hours.
This course seeks to increase students' understanding of survey research methods and to develop basic skills in survey development and administration.

PHAR 757. Patient Reported Outcomes. 3 Hours.
Provides a foundation in health outcomes research with an emphasis on patient reported outcomes in health service research.

PHAR 758. Ethical and Regulatory Aspects of Clinical Research. 2 Hours.
Provides overview of ethical and regulatory aspects of clinical research.

PHAR 759. Clinical and Population Practicum. 1 Hour.
Expose students to a population of interest in preparation for a research project. This course will help students to understand the lived experience of the population of interest and expose students to aspects of the healthcare system. Students will either work with a clinical population or community-based population to address one or more disease states. Grading will be Pass/Fail.

PHAR 760. APPE 1. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 761. APPE 2. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 762. APPE 3. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 763. APPE 4. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 764. APPE 5. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 765. APPE 6. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 766. APPE 7. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 767. Scientific Writing: Health Services and Outcomes Research. 3 Hours.
Students will be trained in effective written communication skills by developing scientific journal articles in health services and outcomes research.

PHAR 768. HEOR/HSOR Internship. 1-6 Hours.
Strengthen practical knowledge and hands-on experience in the areas of Health Services and Outcomes Research/Health Economics and Outcomes Research by working with pharmaceutical companies, clinical research organizations, federal, state, and local governments, policy think tanks, or health care systems.

PHAR 769. Advanced Health Service Research Methods. 3 Hours.
Provides a working knowledge of health services research methods and how to apply these methods to answer typical research questions in health services research. The course will examine concepts but will have an applied focus with hands-on research using publicly available datasets or those that students have access for their dissertations/manuscripts.

PHAR 771. Introduction to Specialty Pharmacy. 2 Hours.
PR: Second professional year standing or consent. Provides a comprehensive overview of workflow, disease states, and pharmacists' roles in specialty pharmacy. The course will address day-to-day operations including business components, dispensing, and disease state management with a focus on appropriate patient care for specialty disease states.

PHAR 772. APPE 8. 5 Hours.
PR: Fourth year professional standing or consent. Advanced Pharmacy Practice Experiences (APPEs) are clinical rotations that collectively provide experience in delivering comprehensive patient care across various healthcare settings and provides exposure to different sectors of pharmacy practice.

PHAR 773. Recent Research Advancement in Cardiology Journal Club. 1 Hour.
To impart a fundamental understanding of the recent research advancements in cardiology. The course provides a basis for understanding recent advances in basic, clinical and translational cardiology (cardiovascular research).

PHAR 774. Managed Care Principles and Policies. 1 Hour.
PR: Second professional year standing or consent. Introduces students to managed care pharmacy practice. Students will cover topics in formulary management, drug utilization review, medication therapy management, specialty pharmacy, pharmacoeconomics, outcomes research, pharmaceutical contracting, pharmacy benefit design, and current issues in managed care.

PHAR 775. Substances of Abuse. 2 Hours.
Focuses on substances of abuse including both legal prescription, over-the- counter, supplement, and general substances in addition to substance abuse, substance use disorder (addiction), and drug diversion.

PHAR 776. Preparing Residency Applicants. 2 Hours.
Increase knowledge and skills needed to pursue postgraduate residency training in pharmacy, and implement measures to increase pharmacy residency competitiveness.

PHAR 777. Health Outcomes Research Designs. 2 Hours.
Focuses on the skills required to design, conduct, and analyze research topics in health outcomes research. Includes a study of statistics, analysis of research design and methodology, use of library resources, and evaluation of current literature.

PHAR 778. Travel Medicine and Global Pharmacy Practice. 2 Hours.
Identifies and explores major issues in global health with a specific focus on global pharmacy practice and medication therapy. Students will also learn fundamentals in travel medicine so they can assist international travelers in preventing and treating travel-related maladies.

PHAR 779. Drug Discovery. 3 Hours.
PR: Graduate Standing or permission of instructor. Instruction in the process of drug discovery to the development of new forms for therapeutic use. Topics covered included drug design/discovery, target identification and development, lead optimization, and pre-clinical and clinical development.

PHAR 780. Introduction to Molecular Modeling. 4 Hours.
PR: Graduate standing or permission of instructor. Introduction to molecular modeling describes computational methods for chemical and biological problems and is designed to enable the student to use molecular modeling methods as a research tool in their current or future research activities.

PHAR 781. Drug Metabolism. 3 Hours.
PR: Graduate standing or permission of instructor. This course presents a comprehensive review of the field of drug metabolism with an emphasis on the chemistry and enzymology of drug biotransformation, and current methods in drug metabolism research.

PHAR 782. Tumors of the Central Nervous System Journal Club. 1 Hour.
(May be repeated for a maximum of 15 credit hours.) Fundamental and advanced topics focused on drug distribution into normal brain, brain pathology and brain cancers. Other areas of focus include, advanced drug delivery methods, pharmacokinetics, experimental design and statistical analysis. Students will present and critically analyze scientific literature and develop presentation skills.

PHAR 783. Pharmacy Cell Biology Seminar. 1 Hour.
A literature review course in which each student will present and critically analyze primary literature in cell and molecular biology as pertinent to pharmaceutical and biomedical sciences.

PHAR 784. Pharmacology Journal Club. 1 Hour.
A primary literature based course that critically evaluates the latest findings and methods used in pharmacological research.

PHAR 785. Pharmacoepidemiology. 3 Hours.
This course covers basic principles and research study designs used in pharmacoepidemiology, as well as a review of the primary literature that details case examples of drugs withdrawn from the US drug market.

PHAR 786. Health Services Research and Secondary Database. 3 Hours.
PR: PHAR 785. This course presents various topics related to large databases including common study designs, advantages and limitations, and basic steps to extracting and analyzing large databases.

PHAR 787. Drug Discovery and Development. 1 Hour.
This seminar will teach students in the Pharmaceutical Sciences and related disciplines the current state-of-the- art of drug discovery, design, and development, develop student presentation skills, and convey the importance of staying current with key developments.

PHAR 788. Graduate Seminar in Health Outcomes Research. 1 Hour.
(May be repeated for credit toward graduation.) Forum for graduate students to present research, discuss research issues and contemporary topics of interest, develop an understanding of research methods through discussion, while focusing on scientific presentation skills. Topics vary from semester to semester.

PHAR 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of pharmacy. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be P/F.).

PHAR 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

PHAR 792. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

PHAR 793. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

PHAR 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

PHAR 796. Graduate Seminar. 1-3 Hours.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

PHAR 797. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.).

PHAR 800. Introduction to Pharmacy. 4 Hours.
PR: First professional year standing or consent. Introduces students to the profession and practice of pharmacy. Students will gain an understanding of the history of pharmacy, the role of pharmacists in the US healthcare system, and the foundations of pharmacy law. Students develop hands-on skills in patient communication and drug information retrieval.

PHAR 801. Drug Delivery. 5 Hours.
An introduction to the concepts and techniques involved in the design and evaluation of pharmaceutical dosage forms, principles of physical pharmacy and drug delivery, and their applications in patient care.

PHAR 802. Preparation of Pharmaceutical Products. 1 Hour.
Preparation of sterile and non-sterile dosage forms. Students will apply the principles of pharmaceutics to the preparation of pharmaceutical products.

PHAR 803. Physical Pharmacy. 2 Hours.
Provides an overview of the principles of physical pharmacy and their application in drug formulation and administration. Topics include: drug dissolution, acid-base chemistry, drug solubility, diffusion, distribution, and drug stability.

PHAR 804. Drug Delivery Systems. 3 Hours.
Introduces the students to the principles and technologies involved in the preparation and evaluation of pharmaceutical dosage forms and drug delivery systems. Students will develop skills in dosage form design and evaluation, as well as their applications in patient care. The course integrates and applies basic physicochemical and biological principles to solve problems in drug delivery in pharmacy practice.

PHAR 805. Drug Chemistry. 2 Hours.
Introduces principles of chemical stability and chemical properties as they relate to drugs and to the basic metabolic processes observed for drug molecules. Topics include functional group analysis, solubility, oil/water partitioning, organic acids/bases, drug decomposition, basic metabolic processes including oxidation, reduction, hydrolysis, and conjugation.

PHAR 807. Pharmacy Calculations. 1 Hour.
Gain experience in pharmaceutical calculations that reflect activities in a variety of practice settings.

PHAR 808. Pharmacogenomics. 2 Hours.
Introduces the fundamental principles of pharmacogenomics and individualized medicine. It provides a basis for understanding how an individual's genetic background affects their response to a specific drug or class of drugs. Pharmacogenomic principles include pharmacogenetic characteristics of drug metabolizing enzymes, drug transporter activity, and receptor sensitivity. Other basic concepts of genetic counseling, personalized medicine, ethics and costs will be discussed.

PHAR 809. Principles of Drug Action. 2 Hours.
Provides a basis for understanding the biochemical and molecular mechanisms by which drugs and the body interact. This course will use drug classes to introduce foundational concepts of drug action and the application of pharmacological tools to better understand how drugs work in the body.

PHAR 810. Community Pharmacy Practice. 2 Hours.
PR: First professional year standing or consent. Focuses on the various roles of a pharmacist including the prescription dispensing and medication management processes in the community pharmacy setting. Legal aspects of community pharmacy practice are also discussed.

PHAR 811. Foundational Pharmacy Skills. 1 Hour.
PR: First professional year standing or consent. Provide students with foundational skills necessary for the provision of patient care including physical assessment, point of care testing, and oral and written communication. Many skills learned during this course will be further strengthened throughout pharmacy school.

PHAR 812. Drug Chemistry. 2 Hours.
PR: First professional year standing or consent. Introduces principles of chemical stability and chemical properties as they relate to drugs and to the basic metabolic processes observed for drug molecules.

PHAR 813. Biopharmaceutics and Pharmacogenomics. 4 Hours.
PR: First professional year standing or consent. Develops an understanding of fundamental principles of biopharmaceutics and pharmacogenomics.

PHAR 814. Biochemical Pharmacology. 4 Hours.
PR: First professional year standing or consent. Provides a basis for understanding the biochemical and molecular mechanisms by which drugs and the body interact. This course will use drug classes to introduce foundational concepts of drug action and the application of pharmacological tools to better understand how drugs work in the body.

PHAR 815. Self-Care. 3 Hours.
PR: First professional year standing or consent. Provides an introduction to nonprescription medications and the application to patient care. Learners will assess the patient, make appropriate recommendations, and educate the patient on self-care treatment options for commonly encountered disease states and patient complaints.

PHAR 816. Pharmacokinetics. 2 Hours.
Introduces fundamental principles of the pharmacokinetic and biological processes that the drug undergoes once it enters the body. The students will be exposed to various pharmacokinetics techniques and problem-solving methods, which should prepare them to design and refine drug therapeutic regimens.

PHAR 817. Principles of Immunology and Microbiology. 2 Hours.
PR: First professional year standing or consent. Introduces scientific principles of immunology as well as introduces students to the pharmacist's role as vaccination advocate, and provides the knowledge and skills required to safely administer vaccines. Lastly, it provides an introduction to microbiology and mechanisms of action of antibiotics.

PHAR 818. Intro Community Rotation. 4 Hours.
PR: PHAR 800 and PR or CONC: PHAR 810. Introductory pharmacy practice experience in a community pharmacy setting.

PHAR 820. Population Health and Policy. 3 Hours.
PR: Second professional year standing or consent. Introduces the role of the pharmacist in population-based care and promoting preventative health services. Includes epidemiology and public policy in the healthcare system, and integrates content with interprofessional service outreach projects.

PHAR 821. Pain. 1 Hour.
PR: Second professional year standing or consent. A course in the systems-based therapy series with a focus on pain management and treatment of associated disorders, including addiction therapy. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with pain-associated disorders.

PHAR 823. Pulmonology. 2 Hours.
PR: Second professional year standing or consent. First course in the systems-based therapy series with a focus on pulmonology. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with pulmonary diseases.

PHAR 824. Cardiology. 5 Hours.
PR: Second professional year standing or consent. Second course in the systems-based therapy series with a focus on cardiology. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with cardiovascular diseases.

PHAR 825. Nephrology. 2 Hours.
PR: Second professional year standing or consent. Third course in the systems-based therapy series with a focus on nephrology. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with kidney diseases.

PHAR 826. Evidence-Based Practice. 3 Hours.
PR: Second professional year standing or consent. The components of evidence-based practice are reviewed. Emphasis is placed on the appropriate use of information resources in practice and the critical analysis and evaluation of primary literature and other types of information.

PHAR 830. Health Systems Pharmacy Practice. 2 Hours.
PR: Second professional year standing or consent. Introduces and reinforces the distributive, clinical, and administrative roles of pharmacists with a focus on health-systems pharmacy practice and management.

PHAR 833. Endocrinology. 3 Hours.
Fourth course in the systems-based therapy series with a focus on endocrinology. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with endocrine diseases.

PHAR 835. Autoimmune Diseases. 2 Hours.
A course in the systems-based therapy series with a focus on management of autoimmune diseases. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with these diseases.

PHAR 836. Research in Pharmacy. 1 Hour.
PR: Second professional year standing or consent. An overview of the process of conducting pharmacy-related research focusing on concepts, principles and methodology involved with the research process. Students gain experience in design, conduct and dissemination of pharmacy-based research. Student learning is facilitated by didactic lectures, active learning and independent small group sessions.

PHAR 837. Quality and Outcomes in Pharmacy Practice. 2 Hours.
PR: Second professional year standing or consent. Emphasizes the implementation of quality improvement in pharmacy practice, monitoring outcomes of drug therapy to ensure optimal patient care, and implementation of systems to prevent and minimize patient risk. Application of pharmacoeconomic principles to daily pharmacy practice are discussed.

PHAR 838. Intro Institutional Rotation. 2 Hours.
PR or CONC: PHAR 830. Gain experience in an institutional pharmacy setting.

PHAR 840. Pharmacy Practice Management. 3 Hours.
PR: Third professional year standing or consent. Focuses on pharmacy management related to financial and operational management of pharmacies, marketing of pharmacy services, and human resources management.

PHAR 843. Gastroenterology and Nutrition. 2 Hours.
PR: Third professional year standing or consent. A course in the systems-based therapy series with a focus on gastroenterology and nutrition. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with gastrointestinal diseases and nutrition support.

PHAR 844. Infectious Diseases. 3 Hours.
Eighth course in the systems-based therapy series with a focus on infectious diseases. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with infectious diseases.

PHAR 845. Neurology and Psychiatry. 4 Hours.
Ninth course in the systems-based therapy sequence with a focus on neurology and psychiatry. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with neurologic and psychiatric diseases.

PHAR 848. Acute Care Practice Experience. 2 Hours.
Gain knowledge as well as hands-on experience in the acute care setting. Students will learn the key components of acute care practice, perform activities that would be expected to be completed in acute care experiential rotations (such as medication reconciliation and formulary monographs), and simulate rounding experiences in an interprofessional environment. Interprofessional education is a component of this course.

PHAR 849. Ambulatory Care Practice Experience. 2 Hours.
Gain knowledge as well as hands-on experience in the ambulatory care setting. Activities will include ambulatory patient assessment, medication regimen evaluation, patient presentations, direct patient education, and targeted group education. Interprofessional education is a component of this course.

PHAR 853. Hematology/Oncology. 3 Hours.
PR: Third professional year standing or consent. A course in the systems-based therapy series with a focus on hematology-oncology. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems in patients with hematological diseases and cancer.

PHAR 854. Special Populations. 3 Hours.
The final course in the systems-based therapy series that addresses special populations such as geriatrics, pediatrics and women's health (pregnancy, lactation, menopause) as well as disease processes that involve multiple body systems. Integrates scientific principles with clinical practice to enable students to prevent, identify, and resolve drug therapy problems.

PHAR 857. Pharmacy Ethics. 1 Hour.
The ethical basis of pharmacy practice. Students learn and apply the Code of Ethics for Pharmacists and core bioethical principles to ethics related situations that can arise during pharmacy practice.

PHAR 858. Comprehensive Assessment of Practice. 3 Hours.
Assess students' readiness for successful completion of the upcoming advanced pharmacy practice experiences curriculum. Provides focused reinforcement of essential material relative to ensuring a student is practice ready, as well as reviewing difficult material from throughout the curriculum. Students complete a final objective structured clinical examination, which requires the demonstration of specific skills, including communication.

PHAR 859. Pharmacy Law. 2 Hours.
PR: Third professional year standing or consent. The legal basis of pharmacy practice. Students learn about federal and state statutes, rules, and regulations that affect pharmacy practice.

PHAR 860. Current Topics in Pharmacy. 1 Hour.
PR: Fourth professional year standing or consent. Discussion of current topics in pharmacy practice. Core components of giving a seminar and journal club will be practiced.